Geologically Speaking

A Michigan Section AIPG Publication

Inside This Issue:

Section Officers

PRESIDENT

Mellisa Powers-Taylor, MEM
EGLE
Tel. (517) 388-0795
powerstaylorm@michigan.gov

VICE PRESIDENT,

Kalan Briggs, MEM
EGLE
Tel. (517) 930-5227
briggsk2@michigan.gov

TREASURER

Poonam Rameshbabu, CPG
Mannik & Smith Group
Tel. (734) 397-3100
prameshbabu@manniksmithgrop.com

SECRETARY

Ashley Miller, ECP
Mannik & Smith Group
Tel. (330) 646-7870
amiller@manniksmithgrop.com

ECP LIAISON

Joseph Swarz, ECP
Wood
Tel. (947) 465-6056
joseph.e.swarz@gmail.com

PAST PRESIDENT

Bill Mitchell, CPG
EGLE
Tel. (269) 873-5549
mitchellvickybill@sbcglobal.net

NEWSLETTER EDITOR

Adam Heft, CPG
WSP USA
Tel. (517) 886-7400
adam.heft@wsp.com

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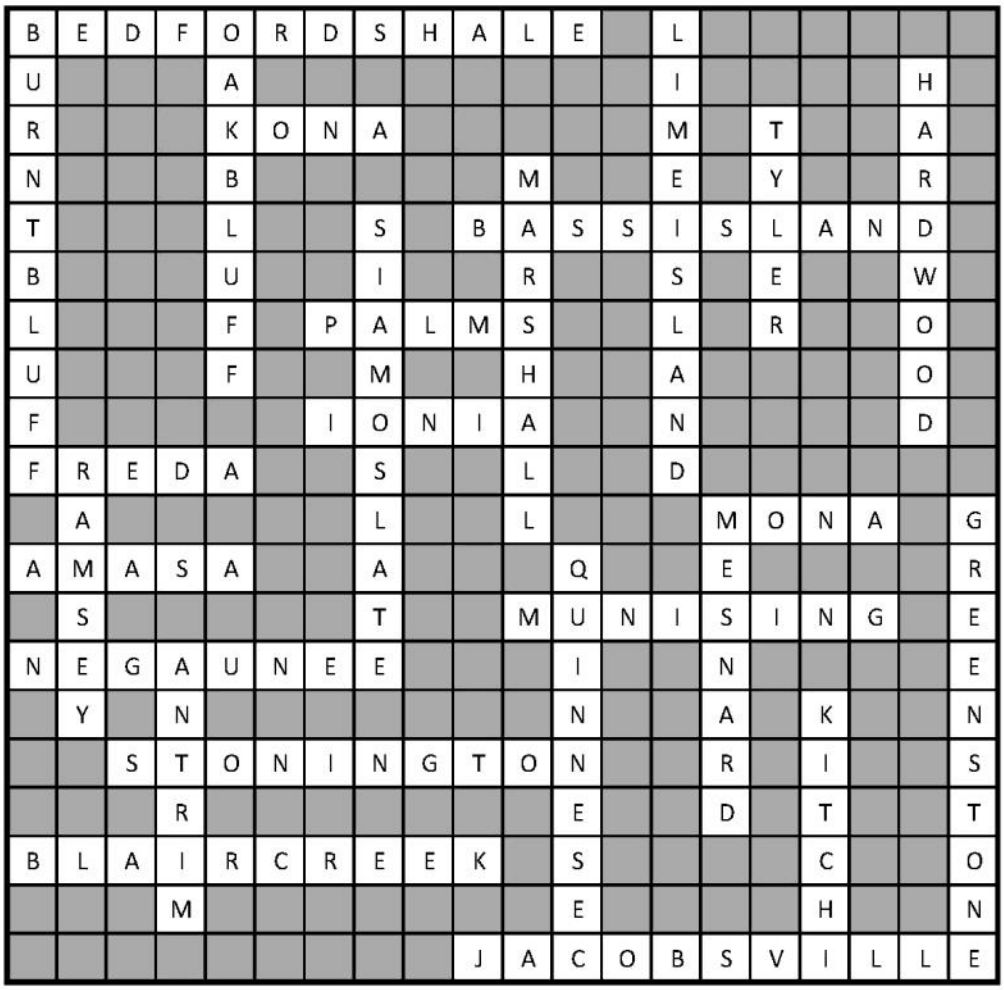
Front Cover: Lower Montreal Falls at the edge of Lake Superior, along the south side of the Keweenaw Peninsula near its eastern tip. The bedrock at the falls is the early Keweenawan Age Portage Lake Volcanics. The basalt at this location consists of ophitic flows. Photo taken by Adam Heft in 2020.

Geology Crossword #7



Across

1. Equivalent to the Ellsworth Shale
5. Petoskey stone of the U.P.
9. Something fishy here
10. Tropical tree
11. Jurassic Formation
12. Oronto Group coastal town
14. Of Marquette pillows
16. Oval iron formation
18. Cambrian sandstone
19. Marquette District Iron Formation
21. Oldest Marquette rock
22. Equivalent to the Utica Shale
23. Nothing witchy here
24. Widely used building stone

Down

1. Fiery Cliffs
2. Cliff-dweling hardwood
3. Citrus spot in an ocean
4. Not pine or spruce trees, but nice
6. Goegebic equivalent to the Michigamme
7. Law enforcer
8. Blue eyed cat metamorphic
13. Oldest Gogebic formation
14. Equivalent to the Sturgeon Quartzite
15. Of Badwater
17. Rock at Piers Gorge
20. Gassy Devonian shale
21. Oldest Marquette District rock

From the President's Desk

Happy New Year AIPG! 2021 was definitely an improvement over 2020, but not quite back to normal. It was so great to see so many of you at the joint meeting with MAEP back in September and the AIPG annual meeting in December. I really look forward to all of the wonderful AIPG activities 2022 has to bring. We have a lot of great events coming up like the back-in-person Annual Summer Workshop and the 2022 AIPG National Conference in Marquette.

The new year is always a great opportunity for reflection. I've been thinking about the last 10 years as a member of AIPG and all of the people that have made an impact in my life along the way. I started out as a student member during my undergrad at Wayne State in 2011. I had the opportunity to be one of the founding members of that student chapter. That first group of WSU Student Chapter members built such a strong camaraderie. They kept me motivated to work hard, have fun, and push through until the end. I enjoyed getting to know the professionals that ended up being some of my closest colleagues.

The geologists that I met as a student have become some of my most trusted mentors. I remember attending the quarterly Section Meetings all by myself as a student. I was really shy in large social settings, but those awesome executive committee members took me under their wing and taught me the importance of networking. One section meeting in particular sticks out. It was the Winter 2015 Section Meeting at Cleary University. I was one of the only students to attend, and I was there to advertise the upcoming spring Section Meeting at the Detroit Historical Museum. I remember standing around off to the side during the social hour, but not really engaging with anyone. One of the members of the executive committee came up and gave me a push to start talking to the professionals at the meeting. He said that these people were my future employers. The impact of that statement didn't really hit me until I started applying for jobs later on that semester. Networking truly was important, and the folks that I met through AIPG helped me find job leads and served as references on my applications, which ultimately helped me land my first job as an environmental consultant.

My experience as a student member of AIPG has become my motivation for several of my goals as a leader in the organization. Over the last few years, the AIPG executive committee has worked extremely hard to build up the student chapters in our state. We've built on the strong foundation laid for us by other dedicated members including Adam Heft and John Barkach. In 2020-2021, the executive committee established the early career professionals committee. This committee in part works to increase participation from early career professionals in the Michigan section and to serve as liaisons to the five Michigan student chapters. The committee has been evolving over time to provide more and more support for the student sections. The subcommittee chairs meet monthly and hold a student chapter leadership call once a month. Kalan Briggs championed bringing a virtual Meet-a-Professional series to the students. The various student chapters are becoming more connected and the students from the different chapters now interact more together and reach out to one another for support.

In 2021, the Michigan section bylaws were updated and created a brand new member position on the AIPG Michigan section board. Beginning in August of 2022, the executive committee will be welcoming our very first Early Career Professional position and Joe Swarz Into that role. The elected early career professional will serve as the chair of the early career professional committee and continue building a stronger relationship between other early career professionals in Michigan and our student members.

I look forward to continuing my journey with the AIPG as the 2022 Section President. I have had a great journey getting to where I am today, and I look forward to seeing where this organization will bring me in the future.

Mellisa Powers-Taylor

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 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!

WMU Student Chapter Activities

Greetings fellow AIPG members!

The AIPG Student Chapter at Western Michigan University (dba Geology Club at WMU) has been ecstatic to be back in person and planning their year after a difficult year of not being able to meet in person. The first meeting of our club back in September of 2021 was full of a diverse and excited group of new members, eager to be a part of a great organization, learn more about the big world of geosciences and to make new, in-real-life friends with shared interests. One of the first orders of business for the WMU AIPG Student Chapter was the election of the executive board members for the 2021-22 year. After the dust settled and each of the prospective board members had a fair chance to campaign, the following members were elected to the Executive Board for 2021-22:

President - Sara Alqamshouai; 4th year, Geochemistry major (sara.alqamshouai@wmich.edu)

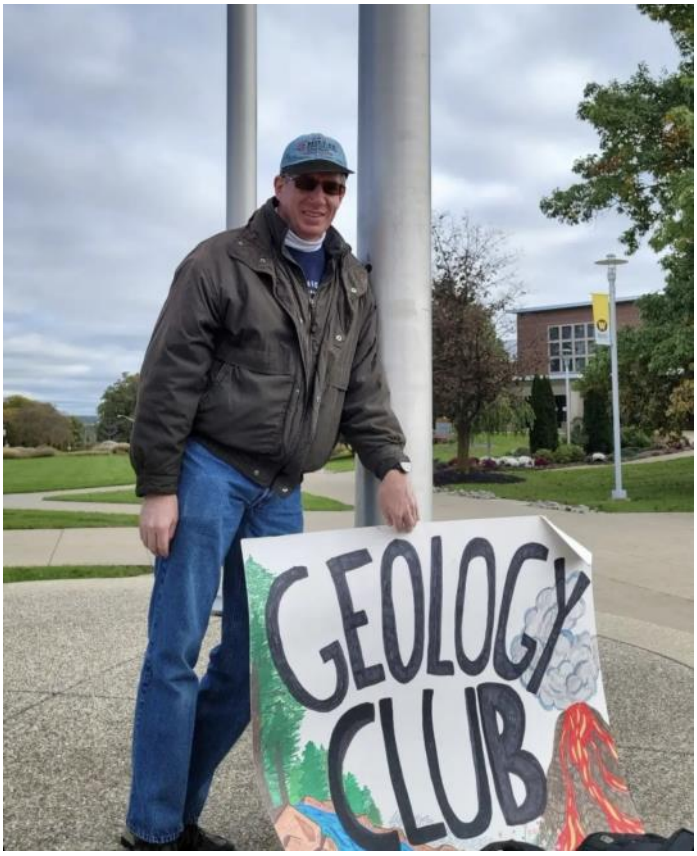
Vice President – Ashley Patti; 3rd year; Geology and Journalism major (ashley.c.patti@wmich.edu)

Secretary – Avi Jackson: 3rd year; Environmental Geology major (avianna.m.jackson@wmich.edu)

Treasurer – Bri Salome: 4th year; Hydrogeology major (brianna.a.salome@wmich.edu)

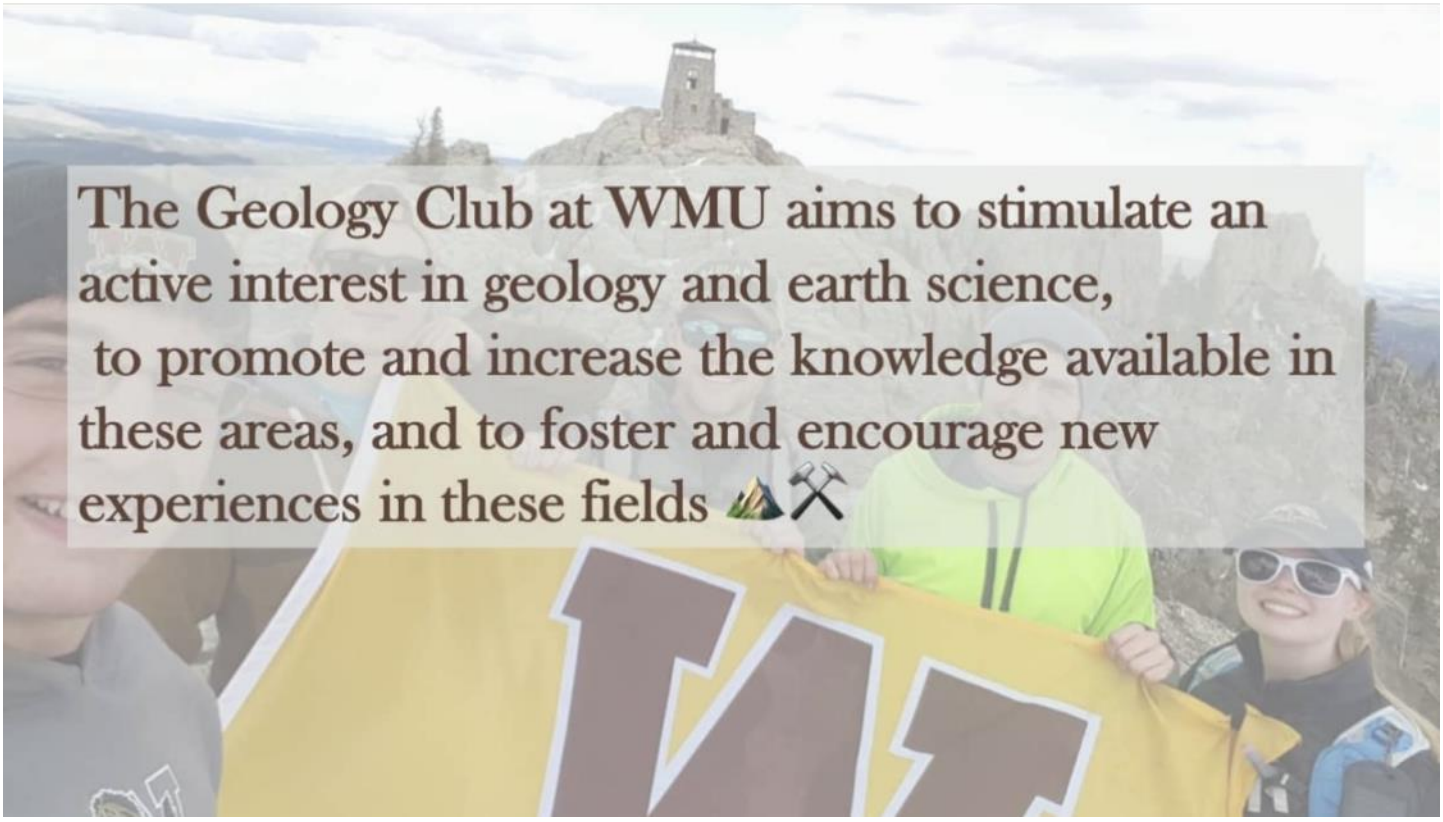
Advisor – Tom Howe: WMU Geoscience Specialist, Sr. (thomas.r.howe@wmich.edu)

Student chapter volunteers, Cam Rinehart, Sara Alqamshouai, Moira Burns, Avianna Jackson, and Ashley Patti, who helped with the rock & mineral sale. Photo by Sara Alqamshouai.



Matthew Carlson; photo taken during the rock & mineral sale. Photo by Sara Alqamshouai.

Our very first event was the WMU Geological and Environmental Science Alumni, Friends, and Family Homecoming Gathering in October at Revel and Roll in Kalamazoo. Here, the members got the chance to network with WMU alumni and ask questions about careers and advice in the geosciences. The student members helped assist in the activities and even got the chance to raise some funds by selling mineral samples and t-shirts. To help identify where we will be going for our annual spring geology field trip, the club did a 'Donate to Decide' fundraiser at the alumni event giving those who attended the option to help pick the location of the AIPG student chapter annual spring trip. The alumni voted and the spring trip will be to Glacier National Park with some excellent field stops and camp sites planned along the way. We are very excited to make the journey and create some memories and have started planning the trip already. To help make the trip more accessible to more members of the group, we have held fundraisers on the Western Michigan University campus. We sold rocks, minerals, t-shirts, doughnuts, and coffee and passed out free rocks and geological insight to those passing by. To top it off, we were able to gain more interest in the geology program and our club amongst the general student population and were able to



add some more members to the student chapter. The club now boasts more than 30 active members! We are planning to hold another fundraiser in mid-November.

This year the WMU AIPG student chapter formal meetings are held every other week and to engage members to get to know others in the club; there are bonding events such as movie nights on the alternate weeks. The most recent bonding night, the club watched a "bad" geology movie, "Megafault" on campus in Rood Hall. In the future, we have other networking and social events planned to make rock candy, rock climb, and go ice skating and skiing at our local topographic highs. We also have a couple of workshops planned with our advisor, Tom Howe. Some of the ideas planned so far include a lapidary workshop, a thin section workshop and a field classification of rock and soils demonstration. We also look forward to connecting to the members of AIPG-Michigan Section and the other AIPG Student chapters at the annual meeting in December in Ann Arbor. To reach even more people about the amazing aspects of geology and AIPG, the members have taken to social media via Facebook and Instagram. Look out for weekly posting about geology, and unique geological locations. As the semester starts to wind down, we are excited to continue full force in planning the spring trip, fundraising, and make memories and lasting connections!

Please like and follow us on social media at:

On Instagram: geology_club_at_wmu

On Facebook: Geology Club at WMU

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.

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.

SALE

50 year life time collection

Private museum with thousands of specimens;

MINERALS, FOSSILS, ARTIFACTS, CARVINGS, JEWELRY, ASIAN ANTIQUES, ETC.

From the collections of William J. Micol, Milford, MI… Can be contacted at 1-248-842-1705 APPOINTMENT ONLY
BEST PRICES GUARANTEED!!!

Annual Meeting Planning

The AIPG Michigan Section will be hosting the 2022 Annual Meeting in Marquette on August 6-9, 2022. The planning committee is growing and needs your help! The committee is chaired by Adam Heft. If you are interested in helping with the 2022 Annual Meeting or would like to be on the planning committee, please email Adam at adam.heft@wsp.com.

As one of the most active AIPG Sections, Michigan wants to have an exciting program and a highly successful Annual Meeting with many attendees. If you have any suggestions or ideas that will make the 2022 Annual Meeting one to remember, please pass them along.

The planning committee has finalized the list of potential field trips to six:

- Eagle Mine/Mill: Surface tour (underground tour is unlikely)
- Pictured Rocks: Miner's Castle, Miner's Falls, Munising Falls, and boat tour
- Tilden Mine/Mill, includes a visit to the main mine pit
- Historic Iron Mining: Michigan Iron Industry Museum, Jackson Mine Park, Cliffs Shaft Museum
- Republic Mine and Reclamation: Overlook, rock piles, tailings reclamation
- Two-day, post-meeting trip to the Keweenaw Peninsula

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:

- Champion Mine
- Fayette/Big Spring
- Pictured Rocks National Lakeshore
- Harvey Quarry
- Stonington Peninsula
- Waterfall Tour

We may also provide information to meeting participants on the following activities:

- Brewery Tour
- Lake Superior Fishing Charter

The field trips are being planned by Allan Blaske, Dave Adler, and Mark Petrie. The field trip descriptions and other meeting information will be available in the Apr/May/Jun edition of *TPG*. The Call for Abstracts has been released, and is included at the end of this edition of *Geologically Speaking*.

Although meeting planning is moving ahead, we are still looking for volunteers to help with meeting planning. Principle needs include

- **Advertising/Exhibitor Committee members** to help identify and get sponsors and exhibitors;
- **Swag Coordinator** to help coordinate swag for the meeting, including T-shirts and other items
- **A silent auction coordinator**. As part of the meeting activities, we will be holding a silent auction. The proceeds of which will go to the Foundation of the AIPG. We need to obtain items to be auctioned at this event. If you have items you would be willing to donate for this cause, please consider doing so.

Look for additional updates on the Annual Meeting planning 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…

Each year, AIPG holds an Annual Meeting; the location of the meeting moves around the country, and is hosted by a different Section each year. There are many benefits to attending the Annual Meeting when you can, and whether you are a student member of AIPG, an early career professional, an associate member, a professional member, or a CPG. Here is a list of reasons why you should consider attending:

1. Field Trips! Who doesn't love a chance to go into the field and look at rocks or features of geologic interest? The trips organized as part of the Annual Meeting are first rate, and you will often have the opportunity to see or do something that the general public will not.
2. Technical Presentations. Many individuals need to obtain continuing education hours as part of a licensure or employment requirement. The Annual Meeting is a one-stop opportunity to obtain all the hours you need. The technical presentations are very informative, and of course, you have the opportunity to give a presentation on your area of specialty.
3. Networking! The old adage "It's not what you know, it's who you know" is very true. The Annual Meeting is your chance to get to know professionals from all over the country, and even from other countries. They cover a wide spectrum of companies, industry, government agencies, and colleges/universities. By getting to know these individuals, you are making contacts that could lead you to your next job!
4. Career Day. Students, there is a full day of activities devoted to students, including resume building and review, a career overview, mock interviewing with do's and don'ts, job searching skills, and a Q&A ses-

sion. In addition, the day typically ends with a "speed dating" event where students get to talk for a few minutes with a variety of professionals working in disciplines that may interest them.

5. Business Meeting. The National Executive Committee meets during the Annual Meeting (on Saturday) to conduct Institute business. This meeting is open to ALL AIPG members to attend, and if anyone has an issue to bring before the Executive Committee, you are able to do so. In addition to the Executive Committee meeting, the Advisory Board also meets, and provides a summary of the issues facing the individual Sections. And the Advisory Board elects four individuals to join the National Executive Committee and be part of its deliberations.

These are just some of the reasons to attend the Annual Meeting. I have heard a number of reasons why members don't attend. The most common of these include "I don't have time", "It's too far away", and "It costs too much".

Let me address these; in many cases, these may be excuses for someone that doesn't see value in attending. First, the "I don't have time" reason can be easily worked around. Everyone takes a vacation from work during the year—and almost everyone gets a number of paid days off. The Annual Meeting is scheduled a year or more in advance, and the dates are widely circulated. You can plan for that the same way you would for a vacation. In fact, you can roll attending the meeting into a pre or post meeting vacation. Since the meeting location moves around each year, you have the opportunity to see a different part of the country and check out the interesting locations nearby. That's what a number of our members do (my wife and I included).

Distance really isn't an issue. You can hop a plane to get to any of the meeting locations. If you don't' like flying, you can take a train to many locations, or at least get reasonably close, and drive an hour or three to get to most locations. And of course, you could always do a road trip and drive to the meeting.

The issue of cost is perhaps the one hardest to overcome. Yes, the meeting can take a bit of a bite out of your wallet. Many companies and government agencies reimburse their employees for attending a professional meeting, particularly if they are presenting a technical paper or will be learning something that directly benefits their employee's skill set or gives them the continuing education hours they need. It might be worth asking your supervisor if the company would pay for you to attend the meeting. The worst they can say is "no".

There are a few individuals for which the listed reasons hold true, and they just aren't able to attend. I understand; all of us have issues at one point or another in our careers that preclude an "extra" like attending the Annual Meeting. In those cases, if you aren't able to attend this year, consider doing so next year or the year after that. You will find that the meeting will benefit you in some way. Many of our members, once they have attended one meeting, return again and again.

For 2022, the Michigan Section is hosting the Annual Meeting in Marquette on August 6-9. This is within easy drive time of all our members—a maximum of eight to 10 hours tops. And August is the perfect time to visit the Marquette area, and there are lots of things to see and do—see the write-ups in *TPG* and elsewhere withing this and past editions of *Geologically Speaking* for additional details.

Coming Events

January 12, 2022: Remediation and Risk Management Webinar Series: Improving PFAS Site Characterization through Emerging Technologies. Register at: https://register.gotowebinar.com/register/8228876283764508175 .

January 12, 2022: MBGS Monthly Meeting. John Yellich, Director of the Michigan Geological Survey, will present "Lake Michigan Shorelines, Catastrophic Failure or Stable, That is the Question. 7 pm via zoom. Go to MBGS.org for link.

February 9, 2022: MBGS Monthly Meeting. Mark Wollensak to discuss an upcoming MBGS Grand Canyon Field Excursion. Go to MBGS.org for more information.

Late February/Early March, 2022: Michigan Section AIPG Section meting. Exact date, location, speaker, and topic TBA.

March 9, 2022: MBGS Monthly Meeting. John Esch to talk about LiDAR. Go to MBGS.org for more information.

April 13, 2022: MBGS Monthly Meeting. Speaker and topic TBA. Go to MBGS.org for more information

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

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.

Where in Michigan?

The October 2021 edition of *Geologically Speaking* featured a photograph of the Middle Hungarian Falls and the Precambrian aged, 1.0 Ga Jacobsville Sandstone. The falls are located near Hubbell in the Keweenaw. The photograph was correctly identified by Dave Adler.

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. 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 when you update your contact information. Thank you!

2021 Section Awards

By Mellisa Powers-Taylor, Awards Chair

The Michigan Section of the AIPG believes recognizing those contributing to our organization or our profession is important to our sustainability as a professional group. The Executive Committee decided to initiate an awards program in 1997 and held the first awards ceremony in 1998. Since that time, awards have been given out at each annual meeting of the Michigan Section.

Each year, the awards committee receives nominations from the membership for the any following awards:

Member Awards

- Significant Contribution to the Michigan Section – Given on an annual basis to an active AIPG Member for making significant contributions to the Michigan Section.
- Outstanding Professional Geologist – Given at any time to an AIPG Member for making a significant contribution to the field of Geology.

Member or Non-Member Awards

- Legislative Award – Given at any time to non-AIPG members who have contributed to the development of legislation related to the practices of the geological sciences that is deemed beneficial to our profession and/or society.
- Outstanding Regulator – Given at any time to geoscientists working in the public sector for making outstanding contributions to regulatory programs impacting the profession of geology.
- Outstanding Educator – Given to at any time to geoscientists for making outstanding contributions in the area of geological education.
- Educational Advancement Award – Given on an annual basis to a K-12 teacher for promoting the advancement of geological sciences in the classroom.

The following geologists were presented with awards in 2021.

2021 Annual Awards:

Outstanding Regulator – Emily Bertolini, Michigan Department of Environment, Great Lakes, and Energy, Remediation and Redevelopment Division – Warren District Office

"Emily has a gift of being extremely smart and knowledgeable in environmental regulation yet remaining down to earth when talking about them. Emily shows constant professionalism in her position as a Senior Geologist 12 with the Department of Environment, Great Lakes and Energy, Warren District Office. Emily knows her stuff and takes the time to make sure anyone she is talking to fully understands what is happening. She will take the most technical related language and concepts and explain it in such a way that someone not familiar with what it will be able to understand what is happening by the end of the discussion. For example, I am new to the Remediation and Redevelopment Division, and I am getting used to the new terminology I am exposed to, such as Part 211 and Part 213 sites. Emily provided me with a little tidbit to help me remember what Part 211 is (underground storage tanks) and Part 213 (unlucky, #13, underground storage tanks or leaking underground storage tanks). In addi-

Emily Bertolini receiving her award for Outstanding Regulator from Mellisa Powers-Taylor. Photo by Poonam Rameshbabu.

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. Technical requirements may be found on the AIPG website.

tion, from knowing and talking with Emily, I understand what vapor intrusion (commonly known as VI) is, the reasoning behind this type of testing, and how it can apply to the work that RRD does.

Emily is also a graduate of the 2017 Quality of Life Leadership Academy (QOL-LA) and sits on the QOL-LA steering committee that develops the course curriculum. Emily is always eager to help with developing or revising new guidance and/or training documents to make them clearer to the audience and reviewing processes that may be updated to assist with streamlining reporting requirements when her schedule and workload allows. Emily has uses her valuable skills and trainings to "lead from where she is" which allows her to accomplish so much with her position within EGLE." – Karen Nichols

"Emily Bertolini has worked for EGLE-RRD-Warren District Office- North Unit for over 7yrs. She has been a great asset to RRD. Emily has taken on several high priority projects with multiple issues from contaminated drinking water to characteristically hazardous contaminated soils to vapor intrusion in a residential neighborhood. She brings much knowledge and experience from her work prior to joining EGLE. We were able to benefit from that experience when she was assigned as state project manager to working with the property owner on a power plant decommissioning project. There were multiple areas of concern, contaminants, and pathways as well as significant public interest when it came to demolition of the smoke stack. Emily successfully worked with the property owner and their consultant, municipality, local residents, and other EGLE Divisions. The project was also presented at an AIPG training.

Emily also brings character and personality. She has a great sense of humor and easily makes others feel comfortable, even in uncomfortable situations. Emily is able to give great analogies and relate everyday life to the work we do. She was a presenter in one of the best RRD Digging Deeper trainings we have ever had. This is not just my opinion, but is based on the post survey results.

Emily taught me (and now we share) the Cowgirl Motto that "you learn nothing if only good things happen to you". -Cheryl Wilson

Outstanding Educator – Lawrence Lemke, Central Michigan University

"Dr. Lemke is *that* professor. You know the type. The kind where you sit down in their Intro to Geology class and on day one they change your life. He is the kind of professor that inspires and motivates with kindness and a warm smile.

Dr. Lemke was my very first professor in the department as an undergraduate and my last professor in the department as a grad student. Students could always go to Larry with questions, as his door was always open. His classes were extremely challenging but some of the most fun I had in college. He is the kind of professor that immerses his students in the material through real life application and practical exercises. He challenges his students to be better and they tried harder because he is the kind of professor you don't want to let down. He is the kind of professor that genuinely cares about his student's education and their well-being. He goes above and beyond to help his students succeed.

Dr. Larry Lemke receiving his award for Outstanding Educator from Mellisa Powers-Taylor. Photo by Poonam Rameshbabu.

He continues to inspire and motivate students. From Wayne State to Central Michigan. The consensus from his students is that he is a wonderful educator and very deserving of this award." -Mellisa Powers-Taylor

Significant Contributions to the Michigan Section – David Adler, Mannik and Smith, Michigan Technical University

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.

Student Section Advisor

"I am nominating Dave because of his ongoing support and participation within the chapter. I especially want to highlight is passion and enthusiasm for the Michigan Tech University student chapter. He is a cornerstone in that organization and continues to advocate for the topics that are always in the best interest of students. Even with the geographic constraints of MTU, Dave has fostered a relationship that makes them feel included and welcomed, while also helping them be one of, if not the, strongest student chapters in the greater organization.

Outside of student involvement, Dave provides content for member distribution, participates in event planning, and is a staple at most chapter meetings. Currently, Dave is even helping plan the National event taking place in 2022 with the production of field trip guides and planning. Dave is a model member of our Michigan Section and deserves to be recognized as such, serving as an example of what this organization can do for members and vice-versa. Thank you!" – Kalan Briggs

David Adler receiving his award for Significant Contribution to the Michigan Section from Mellisa Powers-Taylor. Photo by Poonam Rameshbabu.

Longevity Awardees:

The following members are recognized for **35 years** of membership:

Duane Jorgensen, CPG-07038; Thrasos Eftaxiadis, CPG-07045; and Kenneth Wiley, CPG-07104.

The following members are recognized for **30 years** of membership:

Thomas Brunelle, CPG-08068; Donald Carpenter, CPG-08154; Curt Cramer, CPG-08162; John Rodwan, CPG-08257; Erik Johnson, CPG-08240; Michael Serafini, CPG -08267; Timothy Hebert, CPG-08297; Michael Colvin, CPG-08325; and Virginia Himich, CPG-08346.

The following members are recognized for **25 years** of membership:

David Regalbuto, CPG-09727; Roger Anderson, CPG-09747; Eric Larcinese, CPG-09746; Jeffrey Simsa, CPG-09744; Eric Kimber, CPG-11415; Joseph Mark, CPG-09781; Michael Wolf, CPG-09791; James Arduin, CPG-09796; Gordon Hotchkiss, CPG-09800; Linda Hensel, CPG-09867; John Marsh, CPG-09922; Michael Pozniak, CPG-CPG-09924; Lee Thor, CPG-09919; Kurt Cunningham, CPG-09927; Laura Badalamenti, CPG-09975; Andrew Foerg, CPG-09977; Jean Talanda, CPG-09985; and Charles Brumleve, CPG-09991.

The following members are recognized for **20 years** of membership:

Thomas Cok, CPG-10554; William Prall, CPG-10559; Matthew Stuk, CPG-10578; Scott Cesarz, CPG-10600; Joyce Dunkin, CPG-10621; Rick Dunkin, CPG-10615; Kristopher Nolan, CPG-11177; and Michael Zack, CPG-10641.

The following members are recognized for **15 years** of membership:

Eric Walters, CPG-10961; Christopher Gellasch, CPG-10964; Nicole Rottet, CPG-11704; Kim Steinmann, CPG-11006; and Aaron Martin, CPG-11969.

The following members are recognized for **10 years** of membership:

Roy Hoin, CPG-11813; Brian Beach, CPG-11806; Emily Peabody, CPG-11878; Benjamin Hinks, ECP-0261; Phillip Backers, MEM-2636; Thomas Howe, SA-5050; Jason Armstrong, CPG-11470; Tony Anthony, CPG-11460; and Dayna Kent, MEM-2405.

Members at the December 2021 Section Annual Meeting at Weber's Inn, Ann Arbor enjoying tasty beverages and being able to meet in person!. Photo by Poonam Rameshbabu.

Regulatory Roundup

Happy New Year! We are kicking off the new year with wishes that the pandemic would just go away. Despite the pandemic and many of us getting ready to check off another year of working from home, limited traveling, and new health and safety protocols that we never dreamed of, legislative efforts for environmental programs are going strong especially when it comes to our water resources and supplying them safely to citizens.

Water infrastructure and quality are key in Senate Bills SB 488 and SB 565 that were initially introduced in June 2021 for the purpose of providing supplemental funding to state department budgets including EGLE. We reported on them here in the last two Regulatory Roundup articles because they call for the much-needed funding of the Michigan Geological Survey to provide critical geologic mapping across the state. After the announcement of federal infrastructure monies coming to the state, SB 565 has become a $3.3 billion supplemental appropriation bill directed at several water quality and infrastructure initiatives. The bill passed on December 2, 2021, in the senate chamber and was sent to the House that same day.

The bill sponsor, Senator Jon Bumstead made the following statements while in session, “From lead in water to dams in critical condition and beyond, Michigan has serious water infrastructure needs that must be addressed to protect and enhance all of our communities across the state. Senate Bill No. 565 is a step towards ensuring our state water infrastructure undergoes transformational improvements that will benefit every Michigander for generations to come. This one-time funding of $3.3 billion will go to support replacing lead pipes across the state, upgrading local drinking water and wastewater facilities, installing filtered water stations inside schools, addressing the harmful impact of PFAS chemicals, repairing and removing and replacing dams, and investing in surface water monitoring, among others. Colleagues, this is a historic opportunity and I urge you to support Senate Bill No. 565 so we can make major improvements to improve and protect Michigan’s water quality, infrastructure, and our natural resources.”

Again, we encourage you to read the bills and take opportunities to reach out to your legislators lending your expertise on the subject.

The following article was published by Gongwer News Service on December 6, 2021.

Billions In Spending The Question Before Legislature Adjourns

Governor Gretchen Whitmer and the Legislature have available to them about $5 billion in federal funds to spend now and considerable uncertainty over how much of those funds, if any, will be appropriated before the Legislature wraps up session for 2021 sometime next week.

Those funds don't even count the second half of the $6.5 billion in state fiscal recovery funds Michigan will receive next spring (another $3.25 billion) plus the $10 billion the state is set to receive for infrastructure plus the massive surplus in state revenues (about $2.4 billion) and projected state revenue lapses from the 2020-21 fiscal year ($208 million General Fund in addition to $98 million in lower than expecting spending on Medicaid).

Ms. Whitmer has spent much of the last six months laying out her ideas on how to spend the federal aid from the American Rescue Plan Act. Republicans, particularly in the House, have offered far fewer suggestions. The Senate passed a $3.3 billion water infrastructure bill. The House passed a $368 million bill to augment public safety and policing.

On November 19, the Whitmer administration forwarded a supplemental appropriations request to the Legislature totaling $2.52 billion, most of which it said were previously requested for the 2020-21 and are being renewed. The administration is especially emphasizing the $300.8 million for COVID-19 testing in schools that was proposed many months ago.

Where this all will land is as yet unclear. If any headway has been made in negotiations, no one is saying, setting up the likelihood of another last-second budget agreement with billions in new spending approved with little to no public discussion.

Should nothing significant clear the Legislature this year, work will be on hold until January 12, when lawmakers reconvene.

Republicans in the House were tight lipped when asked about year-end priorities. While Gideon D'Assandro, spokesperson for House Speaker Jason Wentworth (R-Farwell), said the House had not made any changes to its current schedule – which puts the last day of session on December 16 for the year – he did not say much regarding specific priorities for the caucus between now and then.

"The House is still working on several issues," Mr. D'Assandro said. "Too soon to say which are ready to get finalized in the next few days."

The $3.3 billion Senate supplemental, which passed out of the chamber last week, is likely among those issues. Similar to how the House passed a $368.5 million public safety supplemental, the Senate on Thursday gave the OK to a bill which contains, among other things, $1 billion for lead line replacements and $250 million to repair dams which broke in the Midland area during torrential rainstorms in 2020 (See Gongwer Michigan Report, December 2, 2021).

A status for the supplemental, along with the House's, prior to the last days of session "will depend on the larger negotiations going on between the House, Senate and the admin," Mr. D'Assandro said.

Attempts to seek further clarification on the status of the supplemental from either Rep. Thomas Albert (R-Lowell) or Rep. Joe Tate (D-Detroit) – chair and vice chair

of the House Appropriations Committee , respectively – were not returned in time for publication.

Senate Majority Leader Mike Shirkey (R-Clarklake) told reporters last Wednesday when asked how much federal funding he would like to get out the door by the end of this year that "there's no financial goal on that."

"Right now, we're trying to get as many specific supplementals in play to allow it to go through the legislative process," Mr. Shirkey said. "There's no goal and number of dollars. We're just going to continue following our overarching mantra and that is focusing on things that are capital-constrained that but for the privilege and benefit of having a lot of extra money around we wouldn't even be able to think about it."

Movement to get the water infrastructure supplemental through the Senate in the successful vote last week was a priority, Mr. Shirkey said.

As to pandemic mitigation, Mr. Shirkey said there has been money approved for things including COVID-19 testing, with more than $200 million for testing still unspent, saying he believed there is no lack of funds for departments to use.

Senate Appropriations Committee Chair Sen. Jim Stamas (R-Midland) introduced several shell bills last week that would serve as vehicles for various supplemental appropriations. Two of them, SB 753 and SB 754, are school aid supplementals, while SB 755, SB 756, SB 757 and SB 758 are bills for other various state departments and agencies.

Mr. Stamas has said the vote on SB 565 was a first step and further negotiations with the governor's administration and House leaders would be needed. His hope is to see further movement on the bill in early 2022.

A year-end supplemental is the other main priority to end this year, he said Monday. The senator added there is no agreement yet on a set dollar amount for the year-end supplemental.

Last Thursday the House passed a $368.5 million supplemental bill, HB 5522, focusing mainly on public safety and law enforcement. The bill is currently being reviewed and discussed, and a decision on when to begin movement in the Senate, and if it might move before the end of the year, is still pending.

"We continue to review each of them," Mr. Stamas said of proposed supplementals.

He, too, said he believed a methodical approach was best given the unprecedented scale of the federal funding being provided to the state. Mr. Stamas added there is a balance between getting priority dollars out the door and not overwhelming the departments and agencies receiving the funds.

"The amount of money going out is immense," Mr. Stamas said. "I think that we've been doing well."

Prior to SB 565's movement in the Senate, Governor Whitmer signed an executive directive focusing on drinking water protections to prevent and respond to water quality issues.

The following is the press release issued by the Governor's office on November 4, 2021.

LANSING, Mich. — Today, Governor Gretchen Whitmer signed an Executive Directive seeking to strengthen the State of Michigan's water regulations, rules, and policies. The directive, comprised of six parts, focuses on prevention and response to water quality issues. The State of Michigan will continue working to ensure that every community has access to safe drinking water.

"Every parent in Michigan should be able to give their kid a glass of water with confidence, knowing that it is safe," said **Governor Gretchen Whitmer**. "Today, I signed an Executive Directive to begin a comprehensive review of the State of Michigan's role in local water systems. The six-part directive will take several steps to tighten regulations, seek to deliver more resources, expand community engagement, and more. Our top priority here remains guaranteeing safe drinking water for every Michigander, no matter who they are or where they live. We will not rest until every community has safe drinking water and every parent feels confident to give their kid a glass of water."

"Every Michigan community deserves access to clean and safe drinking water," said **Lt. Governor Garlin Gilchrist II.** "Today's executive directive will keep Michiganders safe and improve the efficiency with which we prevent and respond to water quality issues. The comprehensive review will give our communities the information we need to improve water infrastructure, reduce inequities affecting low-wealth communities, and protect public health. Governor Whitmer and I will continue to use every resource available in state government to support local water systems to deliver clean and safe water to every Michigander."

"Michigan is committed to protecting and being proactive when it comes to public health and ensuring Michiganders have safe, clean drinking water," said **Elizabeth Hertel, Director of the Michigan Department of Health and Human Services**. "A safe environment is critical to the health of our children, families and communities. This Executive Directive helps us continue to protect Michiganders from exposure to lead, PFAS and any future threats by strengthening the ways in which we share data, engage local families and communities and deliver programs and services."

"Michigan is blessed with an abundance of fresh water that provides quality source water to every tap in the state, but the aging infrastructure that delivers that water needs aggressive and immediate upgrades," said **Liesl Clark, Director of the Michigan Department of Environment, Great Lakes, and Energy**. "This directive combined with Governor Whitmer's MI Clean Water initiative and support from our legislative partners will help jump start that work in community water systems throughout the Great Lakes State."

"Every Michigander deserves clean, safe and affordable water from their tap. We applaud the Governor's action today to further examine and take actionable steps to improve Michigan's response to drinking water issues," said **Mary Brady-Enerson, Michigan Director of Clean Water Action.** "This directive will ensure that the State's response to future issues is robust and comprehensive.

Rapid removal of lead service lines, greater access to data, and expanded community education and engagement are critical to protect the health of Michigan families."

Executive Directive Details

Part One: Laws and Regulations

Mandate a line-by-line review of existing laws and regulations governing water. While Michigan already has the toughest lead rules nationwide, there are still areas of improvement. The review will recommend reforms that could include legislation, amendments to existing rules, new rules, and executive reorganization.

Part Two: Resources

Identify the state and local resources needed to better assist public water suppliers, collect data, and enforce water laws. The current water funding shortfall disproportionately impacts low-income communities.

Part Three: Education & Engagement

Analyze efforts around education and engagement to ensure every Michigander who lives in a community experiencing water quality issues get the information they need to protect themselves.

Part Four: Lead Mitigation

Direct departments to continue finding ways to reduce lead in drinking water, including a proposal for the rapid and safe removal of lead service lines across the state, which are a primary source of lead contamination in drinking water.

Part Five: Data

Examine existing data collection and sharing practices, with the goal of strengthening the collection and transfer of information and formalizing best practices already in place. While the state does not operate public water supplies, it does regulate these systems. Protecting public health demands better access to data on local water assets.

Part Six: Planning

Find opportunities for equitable regional planning in the sourcing, treatment, and delivery of drinking water. Ensure resources are being used effectively to deliver safe drinking water.

To view the full executive directive, click the link below:

ED 2021-09, Ensuring safe drinking water (final signed).pdf

Background Information

Whitmer-Gilchrist Administration Actions

Since the Whitmer-Gilchrist Administration took office in January 2019, the State of Michigan has invested more in its water infrastructure than the previous five years—from 2014 to 2018—combined.

The governor launched the MI Clean Water plan to invest $700 million to build up drinking and wastewater infrastructure while supporting 10,000 good-paying jobs. The plan addresses high water rates, tackles toxic contaminants like PFAS, builds up sewer and septic systems that can't meet demand, and replaces lead service lines. In addition to MI Clean Water plan, Michigan has invested millions in drinking water, stormwater, and wastewater facilities across the state supporting thousands of local jobs.

The administration established health-based PFAS standards for drinking water, has held polluters accountable, and created statewide positions to pursue environmental justice and advocate for clean water while also continuing to enforce the strongest Lead and Copper Rule in the country.

There are many more bills that have been introduced on the topics including solid waste, bottle deposit funding, fracking, and more.

Be sure to look through the list of bills for items of interest to you and the work you do.

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.

GIS of All U.S. Energy Infrastructure and Resources : https://atlas.eia.gov/apps/5039a1a01ec34b6bbf0ab4fd57da5eb4/explore.

Flash Flood, Debris Flow in Johnson Canyon, Utah: https://www.youtube.com/watch?v=ORJtxkuD62E .

Overview of Water Quality in Principal Aquifers: https:// https://www.usgs.gov/media/images/overview-water-quality-principal-aquifers-0.

Geology in Michigan – Waterfalls of the Marquette, Michigan Area

By David Adler, CPG-11377

Introduction

Falling water seems to have a special allure that stirs something inside us. Waterfalls induce relaxation and a special sense of peace and tranquility. It's hard to describe, but is nonetheless especially appealing in an almost universal way. Waterfalls also happen to be great places to experience geology firsthand.

Michigan has approximately 300 waterfalls, almost all of which are located in the Upper Peninsula. The Marquette area alone has upwards of 70 or more waterfalls, many of which are within or in close proximity to the city limits. Some of the Marquette area's waterfalls are quite spectacular, others not so much. Almost without exception, each waterfall offers an opportunity to observe and examine the local bedrock geology.

This field trip guide focuses on 17 waterfalls located in and around the city of Marquette; all but two are located within or just outside the city limits (see Figure 1). Nine of the 17 waterfalls covered in this guide are located in the Dead River Gorge. Four more (Reany Falls #1 through #4) are located just a very short walk from the Dead River Gorge parking area. Pinnacle Falls and Yellow Dog Falls are both located on the Yellow Dog River approximately 30-35 miles driving distance northwest of Marquette (see Figure 2). One of the waterfalls located within the city limits is an unnamed waterfall where some of the most interesting bedrock outcrops in the Marquette area can be observed.

FIGURE 2 | AREA MAP 2

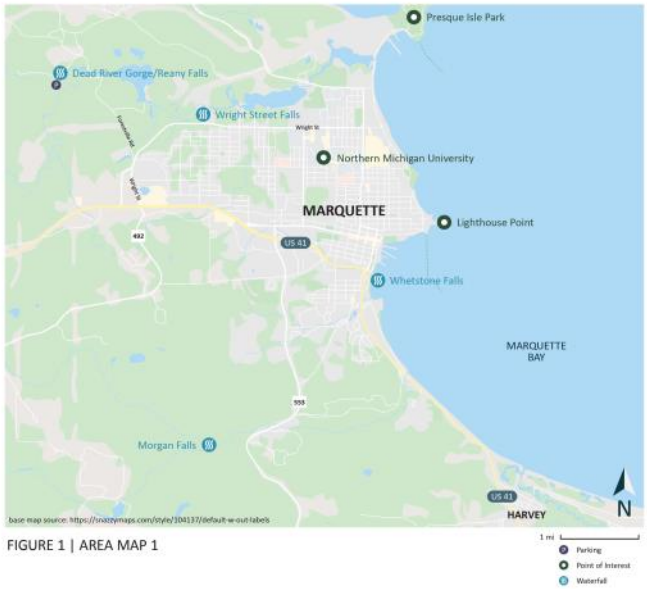


FIGURE 1 | AREA MAP 1

Each of the 17 waterfalls included in this field trip guide was visited by the author during the summer and early autumn of 2021. The waterfall names, locations, location coordinates, and directions are for the most part based on those used by Stagg (2017). Other waterfall names, directions, and even location coordinates may be used for these same waterfalls in the various guidebooks and available sources of information.

Geologic Setting

The geology of the Marquette area and surrounding region is complex to say the least. Bedrock formations in and around Marquette range in age from Archean/Lower Precambrian rocks on the order of 2-3 billion years old (e.g., the Mona Schist and Compeau Creek Gneiss) to the Jacobsville Sandstone whose age is described in the published literature as Cambrian by Door and Eschmann (1970), Middle Proterozoic by Sims (1991), questionable

Late-Proterozoic to Lower and Middle Cambrian by Regis and Anderton (1999), Early and Middle Cambrian by Hamblin (1958), Middle Proterozoic by Cannon and Nicholson (1996 and 2001), and as Upper Precambrian/ Upper Keweenawan by Bornhorst, Rose, and Paces (1983). The geologic and tectonic history, stratigraphy, bedrock structures, age relationships, and stratigraphic nomenclature of the region remain subjects of ongoing research and debate.

The Marquette area is located in the southern portion of the Superior Province of the Canadian Shield. To demonstrate the complexity of the regional geology, the Lake Superior segment of the Canadian Shield has been described by Sims (1996a) as: "…a collage consisting mainly of Archean cratonic elements (3.6-2.5 Ga), assigned to the Superior province, a flanking Early Proterozoic (~2.1-1.84 Ga) orogenic belt (Penokean orogen), and a Middle Proterozoic (~1.1 Ga) intracratonic rift assemblage (Midcontinent rift system) that transects older Archean and Proterozoic rocks. In addition, intracratonic igneous and sedimentary rocks in the approximate age range 1.82-1.63 Ga overlap older rocks on the south, and anorogenic intrusions (~1.47 Ga) intrude older rocks in central Wisconsin. The rocks represent several major crust forming events, reactivation of Archean basement rocks locally within the Penokean orogen, the erosion and deposition of epicratonic successions, and the local intrusion of anorogenic magmas." It doesn't get much less complex as one works through the public domain literature.

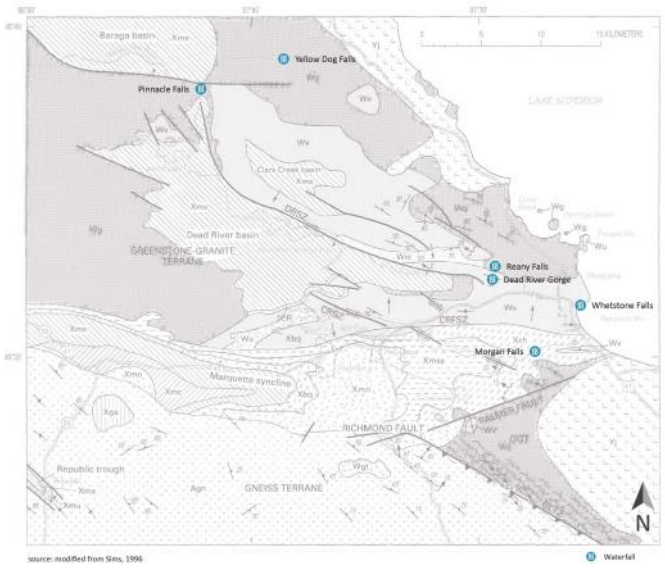


FIGURE 3a | REGIONAL GEOLOGIC / TECTONIC SETTING

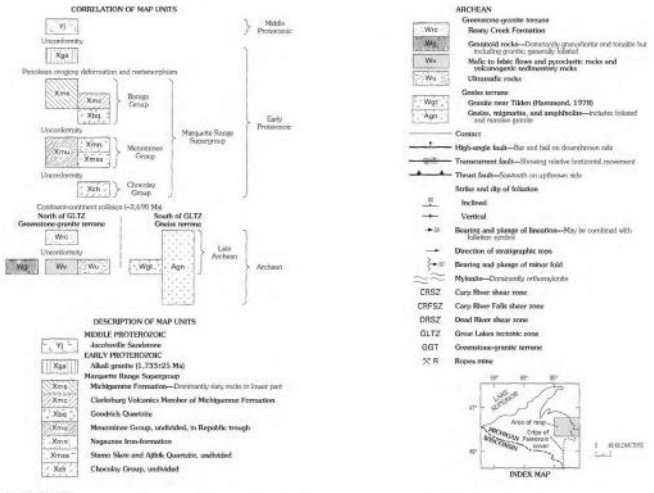


FIGURE 3b | LEGEND FOR FIGURE 3a

Two of the better depictions of the Marquette area's regional geologic setting have been developed by Sims (1996b) and by Puffett (1974). See Figures 3a/3b and Figure 4, respectively. Although not altogether different, these two models of the regional geology demonstrate the ongoing evolution of our understanding of the complex geology in and around Marquette. For simplicity's sake, the description of the regional geology by Puffett, using bedrock formation names that are most familiar, is summarized below. Figure 5 gives the stratigraphic nomenclature and general age relationships.

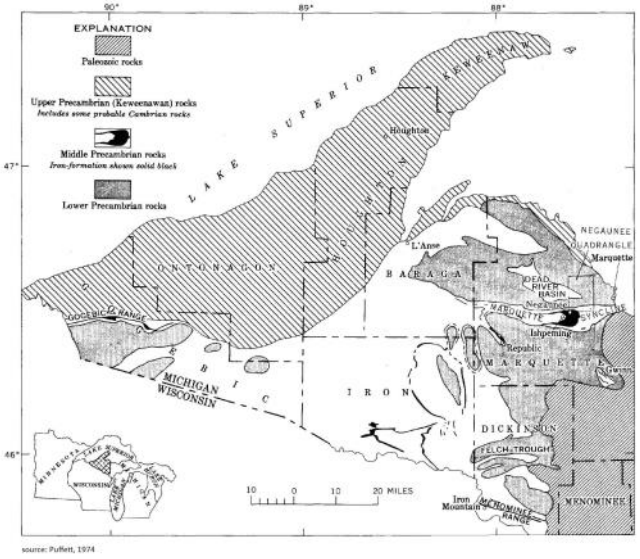


FIGURE 4 | REGIONAL GEOLOGIC SETTING

Marquette is located at the east end of the east-west trending Marquette Syncline, an assemblage of downfolded Middle Precambrian sedimentary and metasedimentary rocks of the Marquette Range Supergroup. The Marquette Syncline is bordered on the north and south by older uplifted Lower Precambrian (Archean) mafic to intermediate metavolcanic rocks (Kitchi Schist and Mona Schist) and younger Archean granitic rocks (Compeau Creek Gneiss and Dead River Pluton).

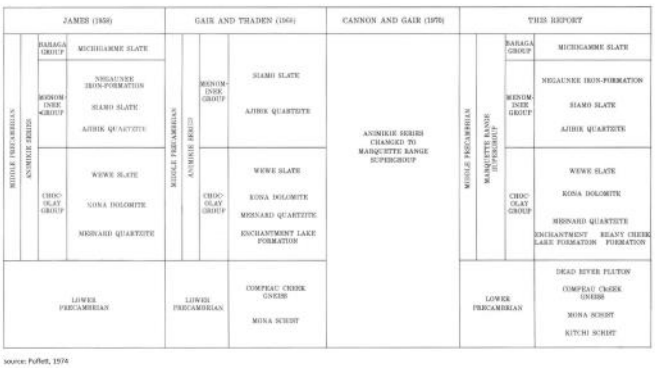


FIGURE 5 | STRATIGRAPHIC NOMENCLATURE

The Kitchi Schist is a foliated greenstone containing pebbles and boulders of pyroclastic rock. It is described by Puffett (1974) as mainly pyroclastic rock ranging from coarse agglomerate with accessory lapilli tuff to relatively fine-grained crystal tuff and crystal-lithic tuff. In some outcrops, the Kitchi Schist resembles a conglomerate, in others a breccia. It can also have a porphyritic appearance.

The Mona Schist consists primarily of greenstone and mafic and felsic schist, with the mafic schist being of basaltic to andesitic origin. The Mona Schist has been subdivided into several members by various researchers. Puffett's 1974 subdivision of the Mona Schist includes the Lower Member, the Nealy Creek Member, the Sheared Rhyolite Tuff Member, and the Lighthouse Point Member. The Lighthouse Point Member includes a felsic augen zone and undifferentiated greenstone.

Outcrops of the Mona Schist located within the Marquette city limits at Lighthouse Point and near the mouth of Whetstone Brook consist of foliated amphibolite schist (metabasalt) and chlorite-sericite schist of the Lighthouse Point Member. The layering observed in the schist at Lighthouse Point strikes generally E-W and dips approximately 70 degrees to the north and is interpreted to be metamorphosed highly flattened basalt pillows (Johnson and Bornhorst, 1999). The pillow structures are vividly evident in the outcrops near Whetstone Falls, as discussed below.

The Dead River Pluton has been described by Puffett (1974) as a non-foliated, generally porphyritic composite body of syenite, diorite, and granodiorite of uncertain age. The Dead River Pluton consists primarily of granodiorite porphyry with lesser amounts of hornblende diorite and coarsely porphyritic syenite. The Compeau Creek Gneiss was named by Gair and Thaden (1968) and includes primarily light colored foliated tonalitic and granodioritic rock with lesser amounts of chloritic, biotoitic, monzonitic/quartz monzonitic, and hornblendic varieties (Puffett, 1974). The Compeau Creek Gneiss is exposed at the Reany Creek waterfalls described herein (Reany Falls #1 - #4) and at Pinnacle Falls and Yellow Dog Falls on the Yellow Dog River.

The Middle Precambrian Marquette Range Supergroup includes, in ascending order:

- The Chocolay Group consisting of the Enchantment Lake and Reany Creek Formations, the Mesnard Quartzite, the Kona Dolomite, and the Wewe Slate that is exposed at Morgan Falls near the Marquette Mountain ski area.
- The Menominee Group consisting of the Ajibik Quartzite, the Siamo Slate, and the Negaunee Iron Formation.
- The Baraga Group consisting of the Michigamme Formation (primarily black slate and greywacke), the Goodrich Quartzite, the Greenwood Iron Formation, the Clarksburg Volcanics, and the Bijiki Iron Formation (Bornhorst, 1999).

The Kona Dolomite includes crystalline dolomite, some of which is cherty; argillite and argillaceous dolomite; quartzite interbedded with ferruginous, sericitic slate; and chert breccia. Stromatolitic algal layers are common in some exposures. The Kona Dolomite is used locally as aggregate, road and stream bank stabilization material, as riprap, and for landscaping. The pink and salmon-colored varieties of the Kona Dolomite, including the curvilinear-banded stromatolitic layers, are also used as lapidary material for cutting, slabbing, polishing, jewelry making, as bookends, and for other lapidary-related applications.

The Negaunee Iron Formation occurs to the west and southwest of Marquette and is the principal host rock for the significant iron ore deposits that have been historically mined in the Marquette Iron Range of Michigan. Iron mining is still active at the Tilden open pit mine located in Tilden Township approximately 20 miles southwest of Marquette. According to Bornhorst (1999, after Gair, 1975), the Negaunee Iron Formation consists of carbonate iron formation (iron carbonate and chert with minor magnetite), oxide iron formation (hematite or magnetite and chert), magnetite-banded iron formation (laminated magnetite and chert), hematite banded iron formation (laminated hematite and chert), silicate iron formation (iron silicate minerals and chert), and combinations of these types. The origin of the iron minerals in the Negaunee Iron Formation is a complex process of primary sedimentary depositional, diagenetic, and metamorphic processes (Bornhorst, 1999).

Reany Creek Waterfalls

There are four waterfalls on Reany Creek just upstream from its confluence with the Dead River. Stagg (2017) calls these Reany Falls #1 - #4. The GPS location coordinates are as follows:

Reany Falls #1 – N46 34.418 W87 28.600

Reany Falls #2 – N46 34.412 W87 28.615

Reany Falls #3 – N46 34.414 W87 28.645

Reany Falls #4 – N46 34.422 W87 28.660

Figure 6: Parking Area for Dead River Gorge Waterfalls and Reany Creek Waterfalls. Note Power Plant Building and Dirt Road Leading to Dead River Gorge in Background. Photo by Dave Adler.

Directions: From downtown Marquette, take Washington Street west to U.S. 41/M28 west. Turn right (west) onto U.S.41/M-28. Turn right (north) onto Wright Street/County Road 492. In a little over ½ mile, turn left (northwest) onto

Figure 7: Compeau Creek Gneiss Bedrock Exposed at Reany Falls #1. View West. Photo by Dave Adler.

Forestville Road. Follow Forestville Road around until it ends at a fairly large circular parking area just below the McClure Hydroelectric Project powerhouse. See Figures 1 and 6. This is also the parking area for the Dead River Gorge waterfalls. Walk about 450 feet back up Forestville Road and you'll come to a bridge just above the confluence of Reany Creek and the Dead River. On your left will be a wooden sign that says Reany Falls. Take the trail on the south side of Reany Creek to see Reany Falls #2, #3, and #4. It's a short, easy hike of only about ¼ mile or so from the road to Reany Falls #4. Reany Falls #1 can be seen by climbing down the bank on the downstream side of the bridge.

Figure 8: Compeau Creek Gneiss Bedrock Exposed at Reany Falls #2. View West. Photo by Dave Adler.

Geology: Reany Creek flows down from the west through a steep, narrow rocky gorge just above its confluence with the Dead River. The bedrock in this area is the Compeau Creek Gneiss, described by Gair and Thaden (1968) as: foliated light colored tonalite and granodiorite, and small amounts of monzonite, quartz monzonite, and granite. Mainly pink or salmon. Faint streaky layering in many places. Widespread but small amounts of amphibolite and well-layered amphibolite gneiss.

The Reany Creek waterfalls are located near the southern margin of a large area of Compeau Creek Gneiss bedrock that extends northward and northwestward for several miles. The Compeau Creek Gneiss is exposed at each of the four Reany Creek waterfalls. See Figures 7 and 8. The bedrock exposed at Reany Creek is generally massive, light pink to salmon and gray colored granitic rock that doesn't show obvious foliation or gneissic texture, as is fairly typical of the Compeau Creek Gneiss exposures in the Marquette area. A good example of the weak foliation in the Compeau Creek Gneiss can be seen in the hand specimen in Figure 9. This specimen was collected at one of the Wright Steet waterfalls on the Dead River in Marquette located approximately two miles southeast of the Reany Creek waterfalls. The weakly developed gneissic texture is expressed by the linear assemblages of quartz grains trending from left to right in the specimen shown in Figure 9.

Figure 9: Compeau Creek Gneiss Showing Faint Foliation. Photo by Dave Adler.

Dead River Gorge Waterfalls

The Dead River Gorge is a popular spot among Marquette locals, Northern Michigan University students, and tourists, especially during the warm weather months (generally May through October). There are 10 waterfalls (as named by Stagg, {2017}) in the gorge, nine of which are accessible along an approximately one-mile long stretch of the trail along the northwest side of the Dead River. No special climbing skills or climbing gear are needed, although there are a couple of short stretches along the trail where a bit of scrambling comes in handy.

The hike through the gorge to see the waterfalls is relatively easy and is suitable for those of us who qualify as senior citizens at places like Bob Evans and Cracker Barrell. Each of the waterfalls is aesthetically pleasing. Some are quite spectacular. Bedrock is exposed along the river throughout the gorge. The gorge and surrounding forest are unencumbered by anthropogenic development.

The names and GPS coordinates of the Dead River Gorge waterfalls, as provided by Stagg (2017) are as follows:

Dead River Cascades – N46 34.193 W87 28.707

Dead Island Falls (Lower) – N46 34.171 W87 28.743

Dead Island Falls – N46 34.158 W87 28.730

Dead Pool Falls – N46 34.112 W87 28.708

Dead Pool Falls (Upper) – N46 34.100 W87 28.716

Dead Hook Falls – N46 34.039 W87 28.719

Dead Plunge Falls – N46 33.996 W87 28.819

Stony Mills Falls (Lower) – N46 33.887 W87 28.963

Stony Mills Falls – N46 33.839 W87 28.914

Stony Mills Falls (Upper) – N46 33.808 W87 28.899

Stony Mills Falls (Upper) is located just a short distance upstream from Stony Mills Falls, but is not easily accessible from the trail that takes you to the other nine waterfalls.

Figure 10: Dead River Cascades - View Upstream. Photo by Dave Adler.

Directions: The Dead River Gorge waterfalls are best accessed from the Reany Falls parking area described above. From the parking area, walk up the dirt road on the right side of the powerhouse (see Figure 6). The dirt road curves and then turns to the right at the top of the hill. Continue walking on the dirt road for a very short distance. You'll see signs for Dead River Falls on your left. Then you'll see a wooden sign on the ground with an arrow pointing to the left leading down a wooden stairway. Take the stairway into the gorge and onto the bluff overlooking the river. The first waterfall will be the Dead River Cascades just below the bluff (see Figure 10). Continue hiking upstream along the trail that parallels the Dead River to the other eight waterfalls that are accessible. The entire hike to the last accessible waterfall (Stony Mills Falls) is just under a mile. Stony Mills Falls is shown in Figure 11. To return, follow the trail back to the stairway above Dead River Cascades and proceed back to the parking area by the way you came.

Figure 11: Stony Mills Falls - View Upstream. Photo by Dave Adler.

Geology: Bedrock is exposed at each of the Dead River Gorge waterfalls and at many areas along the river as you hike through the gorge. The bedrock has been mapped by Gair and Thaden (1968) as the Lighthouse Point member of the Lower Precambrian Mona Schist, believed to be the second oldest bedrock formation in the region. The rocks along the gorge are described as interlayered massive metabasalt and amphibolitic schist. The greenish gray to black metabasalt and schist tend to be strongly foliated. Veins of felsic rock intruding the metabasalt and schist are commonly observed. The intruding veins tend to be oriented parallel to the foliation. Younger (Keweenawan Series) dark gray to black diabase dikes also intrude the Mona Schist.

Puffett (1974) gives a total thickness of approximately 24,000 feet for the Mona Schist. Gair and Thaden (1968) give a thickness of 4,500-11,600 feet for the Lighthouse Point Member in the Marquette area. The mineralogy is primarily hornblende and plagioclase with lesser amounts of sericite, epidote, clinozoisite, pyrite and leucoxene.

Figure 12: Foliation in the Mona Schist at Dead Island Falls. Photo by Dave Adler.

The well-developed foliation in the Mona Schist is readily apparent at Dead Island Falls (see Figure 12). As shown in Figure 13, the Mona Schist takes on an almost slaty appearance at Dead Island Falls. This may be the

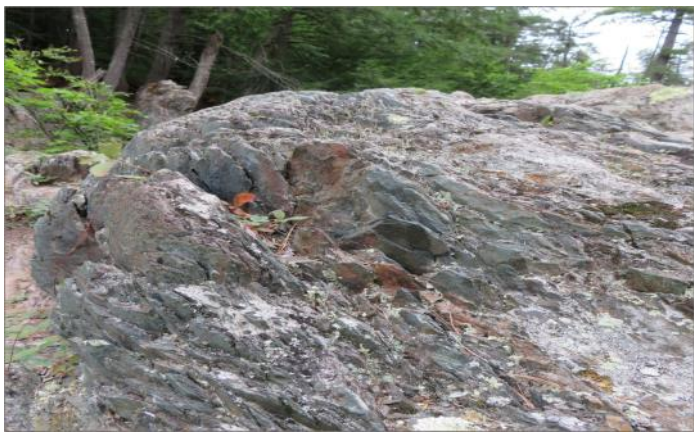


Figure 13: Foliation in the Mona Schist at Dead Island Falls. Photo by Dave Adler.

result of localized shearing of the schist rock mass. Figure 14 shows examples of felsic veins oriented parallel to the foliation, as observed at Dead Island Falls.

Figure 14: Felsic Veins Oriented Parallel to Foliation in the Mona Schist at Dead Island Falls. Photo by Dave Adler.

Figure 15: Scenery and Bedrock at Dead Pool Falls. Photo by Dave Adler.

Some of the best scenery and most interesting features of the Mona Schist in the Dead River Gorge are at Dead Pool Falls and Dead Pool Falls (Upper) located just above Dead Pool Falls. Dead Pool Falls (see Figure 15) is one of those picture postcard kind of waterfalls and is said to be a favorite spot for college students, some of whom enjoy diving off the rocks at the top of the falls into the pool below (not recommended). Just above Dead Pool Falls is Dead Pool Falls (Upper), a four-segment waterfall whose entirety is difficult to photograph. The two middle segments are shown in Figure 16. The large, well-rounded bedrock knob located at the top of Dead Pool Falls (Upper) is an ideal spot to relax, picnic, and observe some of the geologic features of the Mona Schist. As shown in Figures 17 and 18, the well-developed foliation and prominent felsic veining oriented parallel to the foliation occur here and are easily accessible for observation and examination.

Figure 16: Scenery and Bedrock at Dead Pool Falls (Upper). Photo by Dave Adler.

Figure 17: Foliation and Veining in the Mona Schist at Dead Pool Falls (Upper). Photo by Dave Adler.

Figure 18: Foliation and Veining in the Mona Schist at Dead Pool Falls (Upper). Photo by Dave Adler.

Another interesting geologic feature of the Mona Schist observed in the Dead River Gorge is linear assemblages of light-colored minerals (presumably feldspars) oriented sub-parallel to parallel with the foliation. A good example of these linear assemblages, shown in Figure 19, was observed at the water's edge between Stony Mills Falls (Lower) and Dead Plunge Falls. A number of theories regarding the origin of these metamorphic features have been offered, but, like many geologic features in ancient metamorphic terranes, general agreement of their mode of formation seems elusive.

Figure 19: Linear Assemblages of Light-Colored Minerals in Mona Schist. Photo by Dave Adler.

Morgan Falls

Morgan Falls is located at the confluence of Morgan Creek and the Carp River just outside the Marquette City limits. It is a beautiful waterfall that's accessible via an easy and scenic walk along one of Marquette's many bike paths. There are six additional waterfalls located on the Carp River upstream from Morgan Falls that are both attractive and offer exposures of different rock formations of the Marquette Range Supergroup. Unfortunately, the six waterfalls on the Carp River are difficult to access.

Figure 20: Entrance to the Main Bike Trail Leading to Morgan Falls. Photo by Dave Adler.

Directions to Morgan Falls: From downtown Marquette, take Washington Street west towards US 41 and turn left at South 7th Street. Follow South 7th Street (which becomes Grove Street) to County Road (CR) 553, also known as McClellan Ave. and turn left onto CR553. Go south on CR553 for about two miles and park in the Noquemanon Trail Network free parking area located on the east (left) side of CR553 just north of the Marquette Mtn. ski area. Parking in the ski area parking lot is not recommended.

Walk or bicycle south (towards Marquette Mtn.) along the west side of CR553 for about ¼ mile until you come to the entrance for the main bike path. It will look a lot like the scene shown in Figure 20. Proceed along the bike path for approximately 1.4 miles. It's an easy and pleasantly scenic walk through the woods. You'll see a wooden sign for Morgan Falls and a set of wooden stairs leading down to the falls on your left. Take the stairway down and follow the path over a wooden bridge where you can get a great view of Morgan Falls and the confluence of Morgan Creek and the Carp River. There are also some picnic tables here. The GPS location coordinates for Morgan Falls are as follows: N46 30.321 W87 26.272. The view of Morgan Falls from the picnic area is shown in Figure 21.

Figure 20: Wewe Slate at Morgan Falls. Photo by Dave Adler.

Geology: The bedrock exposed at Morgan Falls is the Middle Precambrian (Early Proterozoic) Wewe Slate of the Chocolay Group, which is part of the Marquette Range Supergroup, a broad grouping of the primarily sedimentary and metasedimentary rocks of the Marquette Syncline that were deposited unconformably on older Archean basement rocks. The Wewe Slate formation in the Marquette area consists primarily of light to dark gray, dull green, or salmon colored massive and laminated slate. The formation also includes sericitic quartzite, wacke, and conglomerate (Gair and Thaden, 1968). The dominant minerals in the slate are quartz, chlorite, and sericite. Leucoxene, magnetite, rutile and iron oxides are minor constituents. According to Gair and Thaden (1968), the Wewe Slate conformably overlies the Kona Dolomite and is overlain disconformably or with slight angular unconformity by the Ajibik Quartzite.

Pinnacle Falls and Yellow Dog Falls

The Yellow Dog River flows eastward from its origins in the McCormick Wilderness Area through a large watershed of mostly remote and undeveloped country (including the area known as the Yellow Dog Plains) before emptying into Lake Independence near Big Bay (see Figure 2). Along the way, there are several waterfalls, many of which are in remote and secluded wilderness locations. Two of the nicer and more accessible waterfalls on the Yellow Dog River are Pinnacle Falls and Yellow Dog Falls. A number of other waterfalls are located on Big Pup Creek and on Bushy Creek in the general area of Yellow Dog Falls.

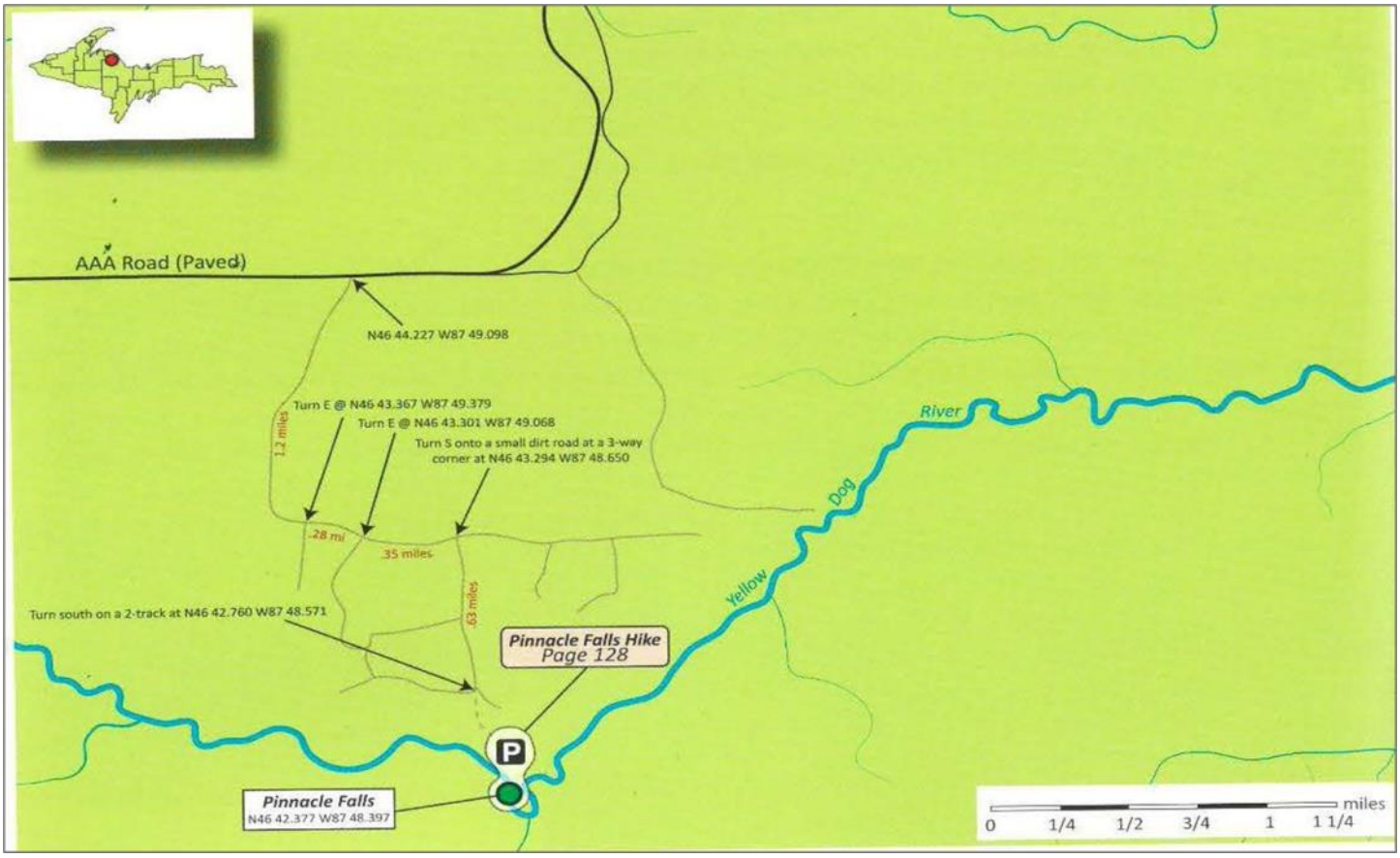


Figure 22: Route to Pinnacle Falls Parking Area Via AAA Road. Source: Stagg, 2017.

Directions to Pinnacle Falls: From downtown Marquette, take Lakeshore Blvd. northward towards Presque Isle Park and turn left (west) onto Hawley Street which becomes Big Bay Road/CR550. Follow CR550 for about 25 miles or so to CR510 and turn left onto CR510 heading south/southwest. After passing the Thomas Rock Overlook scenic area (highly recommended), CR 510 turns sharply to the south at its intersection with AAA Road. Stay straight and proceed southwest on AAA Road (paved) towards the Eagle copper/nickel mine. Shortly after AAA Road turns to the west and straightens out, you'll see a dirt road on your left with a white and black sign that says MJ VanDamme Inc. at GPS coordinates N46 44.227 W87 49.098. Turn left (south) onto this dirt road and proceed south past a gravel pit operation for about 1.3 miles. The road will bend to the left before forking. Bear left at the fork, proceed another 0.3 miles, and turn right. Proceed another 0.6 miles southward to the parking area for Pinnacle Falls. Walk down the trail for about 1/2 mile until you reach Pinnacle Falls at GPS coordinates N46 42.377 W87 48.397.

Pinnacle Falls isn't as tricky to find as it may sound. See the map on Figure 22. There are several wooden signs, most with orange lettering, guiding you to the parking area after you turn off AAA Road. The trail to the falls does get fairly steep in one stretch, but nothing more than a little stamina is required as you return to the parking area after visiting the falls.

Directions to Yellow Dog Falls: Yellow Dog Falls is easier to find than Pinnacle Falls. From downtown Marquette, take CR550 towards Big Bay to CR510 as described above for Pinnacle Falls. When you get to the juncture of CR510 and AAA Road, stay left on CR510 and proceed southward until you reach the bridge over the Yellow Dog River. The total driving distance on CR510 from CR550 to the bridge is about 6.5 miles. Park in the parking area on the far (south) side of the bridge. There is a well-marked trailhead with signs. The ½ mile hike through the woods to Yellow Dog Falls is easy. The trail is well maintained. The GPS coordinates for Yellow Dog Falls are N46 43.720 W87 42.403.

Geology: Both Pinnacle Falls (Figure 23) and Yellow Dog Falls (Figure 24) are located within the large area of Archean granitoid rock (granodiorite, tonalite, and granite) that extends from Marquette to the north-northwest and is commonly referred to as the Compeau Creek Gneiss. As

Figure 23: Pinnacle Falls on the Yellow Dog River. Photo by Dave Adler.

Figure 24: Yellow Dog Falls on the Yellow Dog River. Photo by Dave Adler.

shown on Figure 3a, Pinnacle Falls is located near a regionally prominent east-west trending high angle fault that separates the Compeau Creek Gneiss from the younger (Early Proterozoic) Michigamme Formation of the Baraga Basin to the northwest. Yellow Dog Falls lies within a large body of Compeau Creek Gneiss bordered by the Baraga Basin on the west and younger Jacobsville Sandstone on the east along the Lake Superior shoreline.

Figure 25: Pegmatite Vein Crosscutting Compeau Creek Gneiss at Yellow Dog Falls. Photo by Dave Adler.

Figure 26: Compeau Creek Gneiss at Yellow Dog Falls. Photo by Dave Adler.

The bedrock at Pinnacle falls is not all that well exposed. The bedrock exposures at Yellow Dog Falls are better and more accessible. The rock exposed at Yellow Dog Falls includes felsic intrusive rocks, some of which exhibit gneissic foliation; remnants of the Archean country rock (Mona Schist or Kitchi Schist) that was intruded by the Compeau Creek Gneiss; and numerous crosscutting granitic and pegmatitic vein and dike-like features. Examples of these geologic features are shown on shown on Figures 25 and 26.

Whetstone Falls

The unnamed waterfall near the mouth of Whetstone Brook in Marquette seems to have gone unnoticed by most, if not all of the Michigan waterfall guidebooks. Although it is located less than ½ mile from the heart of downtown Marquette, this waterfall doesn't attract crowds. Whetstone Falls isn't all that large in terms of vertical drop, nor perhaps as spectacular as some of the other waterfalls in the area, but it is aesthetically pleasing, close to a nice stretch of sandy Lake Superior beach, and is easy to get to. There are also some very interesting geologic features to be seen near Whetstone Falls.

Directions to Whetstone Falls: From the intersection of Washington Street and S. Lakeshore Blvd. in downtown Marquette, go south on S. Lakeshore Blvd. for approximately 0.4 miles until you come to the bridge where S. Lakeshore Blvd. crosses over Whetstone Brook. You can park in the free parking areas along S. Lakeshore Blvd. in this area. If the lots are full, try parking in the larger parking lot at the nearby Fairfield Inn & Suites hotel (808 S. Lakeshore Blvd).

The popular Marquette bike path runs parallel to S. Lakeshore Blvd. just a stone's throw to the east (towards Lake Superior). Whetstone Falls is located about 75 feet downstream of the bridge where the bike path passes over Whetstone Brook. There's an easy trail that you can access from the south end of the bike path bridge. The path begins at a light post and a steel post marker with the inscription IOHT 38. It's easy to find and access. The GPS coordinates for Whetstone Falls are N46 32.204 W87 23.643. The view upstream of the falls will look something like that shown in Figure 27.

Figure 27: Whetstone Falls on Whetstone Brook in Marquette. Photo by Dave Adler.

Geology: The bedrock at Whetstone Falls and the surrounding vicinity is the Lower Member of the Archean Mona Schist, described by Gair and Thaden (1968) as mainly schistose and massive metabasalt, actinolitic and chloritic schist, and ellipsoidal greenstone. These are among the oldest rocks that can be observed in Michigan. If you continue approximately 200 feet further down the trail, you'll come to the mouth of Whetstone Brook. Look up the Lake Superior coastline to your left (northwards) and you'll see the old, inactive iron ore dock in downtown Marquette. The still active ore dock is located 3 miles to the north near Presque Isle Park. If you look downcoast to the right, you'll see a quiet and very nice sandy Lake Superior beach that's frequented mostly by locals and is usually uncrowded.

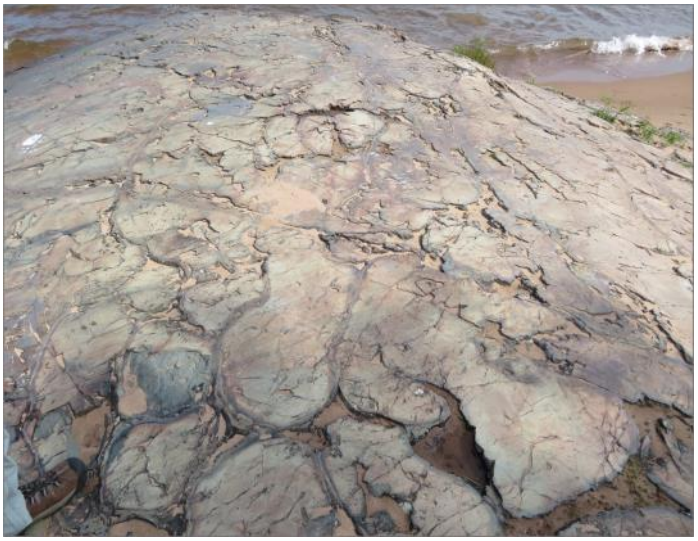


Figure 28: Ellipsoidal Pillow Basalt Structures in the Lower Member of the Mona Schist at Whetstone Brook. Photo by Dave Adler.

There's an outcrop of low-lying rounded gray and tan/brown metabasalt at the mouth of Whetstone Brook that has some of the best examples of remnant pillow basalt structures preserved in the Archean Lower Member of the Mona Schist. The ellipsoidal tops of the basalt pillows or pillow lavas are extremely well defined here. Some good examples can be seen in Figures 28 and 29. These remnant pillow structures are indicative of ancient subaqueous extrusions of basaltic lava that have retained some of their original extrusive igneous structure for eons.

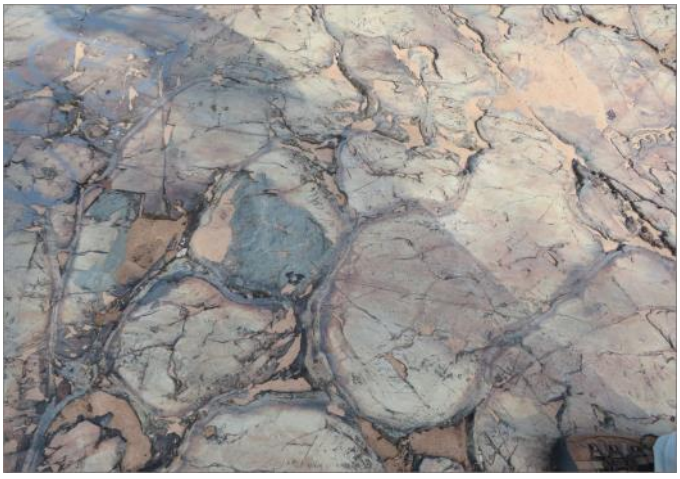


Figure 29: Pillow Lava Structures in the Mona Schist Metabasalt near Whetstone Falls. Photo by Dave Adler.

Figure 30: Well-Developed Foliation in the Mona Schist Metabasalt near Whetstone Falls. Photo by Dave Adler.

Now return up the trail along Whetstone Brook past the waterfall and back onto the bike path. Just south of the bridge where Whetstone Brook crosses under the bike path and just east of the bike path (towards the beach) are several interesting outcrops that can be accessed by a network of primitive trails. At one of these outcrops, shown in Figure 30, the very well-developed foliation in the Mona Schist can be observed. Contrast this foliation with the pillow lavas preserved in the same rock at essentially the same location as seen in Figures 28 and 29. Even more striking is the outcrop shown in Figure 31 where some spectacular pillow structures can be observed in profile view. The excellent outcrop shown in Figure 31 is located just to the south and east of the bike path bridge over Whetstone Brook. Anyone wishing to lead a geology field trip or teach field geology couldn't pick a better spot to conduct a lesson on Archean igneous and metaigneous rocks.

Figure 31: Remnant Pillow Lava Structures in the Mona Schist Metabasalt near Whetstone Falls. Photo by Dave Adler.

Closing

The 17 waterfalls covered in this field trip guide are relatively easy to find and access. There are 50 or more other waterfalls in and around Marquette that you can visit and explore. Some are easy to find and easy to access. Some are more of an adventure, which can add to the fun and enhance the experience. As always, proceed safely, keep an eye out for the safety of those around you, and respect private property.

The complex geology and tectonic history of Marquette and the surrounding region have only been touched on in a general and cursory manner in this field trip guide. Those wishing to know more are encouraged to consult the references below, as well as numerous other sources of information available in the public domain.

And lastly: Have fun, enjoy, and be safe.

Acknowledgments

The author is grateful to Jenny Hamel, Mark Petrie, and Phil Stagg for their invaluable contributions to this field trip guide. Jenny has a Bachelor of Fine Arts degree in graphic design from Finlandia University in Hancock, Michigan and a Master of Science degree in environmental sustainability from the University of Oklahoma. Her areas of expertise include environmental sustainability and graphic design. Jenny is the Sustainability Coordinator for the Mannik & Smith Group, Inc. in Canton, Michigan.

Mark Petrie is a Certified Professional Geologist (CPG) who served with the Michigan Department of Environment, Great Lakes, and Energy Remediation and Redevelopment Division in Marquette for 34 years before retiring as District Geologist in 2019. Mark provided valuable input for this article by way of advice, companionship, navigation skills, and sharing his extensive experience and knowledge of the Marquette area's waterfalls and geology, especially the excellent pillow basalts exposed near Whetstone Falls.

Phil Stagg's detailed and comprehensive Waterfalls of Michigan guidebook series has been a great resource for finding and exploring Michigan's many waterfalls, especially Book 2 • Central that covers Marquette, Menominee, and Dickinson Counties. Phil was kind enough to grant permission to use an excerpt from Book 2 for Figure 22 of this field trip guide. Additional information regarding the four volume Waterfalls of Michigan series is available at www.mifalls.com.

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Rare Earths from US Extractions

Rare earth elements (REEs) are a set of 17 elements, the lanthanides and scandium and yttrium, that are rarely concentrated in large ore deposits in nature and are difficult and expensive to mine, separate and purify. In the past 40 years there has been huge growth and advancement in the technology and electronics that use REEs due to their diverse chemical, electrical, catalytic, magnetic, and optical properties. The domestic production of REE's has decreased, and now China produces more than 80 percent of the global supply. The lack of a domestic supply of these critical elements has been identified as a vulnerability to U.S. economic security. From research in science and engineering, Wayne State University has a multidisciplinary research team that is seeking alternative sources of rare earth elements to alleviate this vulnerability through economical extraction methods from traditionally overlooked domestic feedstocks. The project is called Rare Earths from U.S. Extractions (REUSE) and its goal is to develop a domestic REE supply chain by evaluating sources, investigating techniques to efficiently extract and separate REEs, and to develop a sustainable method of handling hazardous and nonhazardous waste from the process. Matthew J. Allen, Ph.D., Wayne State University's chair and professor of chemistry in the College of Liberal Arts and Sciences, and Timothy M. Dittrich, Ph.D., Wayne State University's College of Engineering assistant professor of civil and environmental engineering, are the faculty members leading the REUSE project.

One promising source of REE's is coal and its byproducts, such as fly ash. Fly ash is the ash left after coal is burned. In the U.S there are over 1 billion tons of fly ash in landfills. A traditional use of fly ash is as an additive to concrete aggregate, however, it is unknown whether fly ash after it has been acidified for the recovery of REEs, may be suitable for use in concrete. One of the REUSE research team's studies focuses on characterizing acidified fly ash after various amounts of REE extraction, with the goal of determining how much REEs may be extracted without eliminating the functionality of the fly ash in concrete. They will characterize particle size and roughness of acidified fly ash particles by using scanning electron microscopy imaging before and after exposing the ash to a range of pH extractions (0-8 M hydrochloric acid). Raw and hydrothermally modified coal fly ash will be included. Using image analysis, they will quantify changes in fly ash particle surfaces from the acid leaching steps. A future study will include mechanical testing of concrete cores made using the same acidified fly ash.

Article by Rahima Tufail, SA-10535

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. 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.

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:

Crystal Vasilon, CPG-12124; Cody Stoddard, ECP-0824; Christina Weaver, ECP-0844; Joseph Swarz, ECP-0850; Rabia Azam, ECP-0855; Brandon LaJoie, ECP-0856; Andrew Riley, ECP-0857; Christopher Svoboda, ECP-0858; Christopher Beckett, MEM-3330; Liana Jones, SA-10151; Jenna Thompson, SA-11119; Malcom Berry, SA-11122; Lauren Jaskot, SA-11123; Matthew Carlson, SA-11125; Lydia Walsh, SA-11127; Alba Dajlani, SA-11128; Brendan Harville, SA-11129; Rosalie Pruccoli, SA-11132; Hannah Miller Young, SA-11135; Clarissa Gordon, SA-11136; Jtannar Wiens, SA-11137; David Gilkey, SA-11139; Carlos Hernandez II, SA-11142; Kai Trobisch, SA-11143; Brandon Tulban, SA-11146; Nathaniel Turner, SA-11147; Ariana Roman, SA-11149; Benjamin Feld, SA-11150; Maxwell Stange, SA-11151; Donovan Vitale, SA-11158; Mark Kaminski, SA-11159; Avianna Jackson, SA-11162; Katherine Langfield, SA-11163; Josiah Eising, SA-11164; Cody Hubbard, SA-11165; Sara Alqamshouai, SA-11166; Jack Hawes, SA-11167; Noah Richendollar, SA-11170; Elaine Aro, SA-11247; Eric Balthis, SA-11248; Autumn Beyer, SA-11249; Teagan Cox, SA-11250; Emily Johnson, SA-11251; Samuel Johnson, SA-11252; Katharine Laage, SA-11253; Izzi McGuire, SA-11254; Elric Rinehart, SA-11255; and Stephani Wiegan, SA-11256.

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.

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.

My name is Ashley Miller and I have worked as an environmental geologist with the Mannik & Smith Group (MSG) for a little over 5 years. Prior to working in consulting, I taught middle school math and science in Ohio, where I fell in love with earth science and all things geology. In order to pursue an MS in Geology, I left the classroom and relocated to the UP to attend Michigan Tech. My master's work focused on using publicly available information to constructing hydrogeologic models to model fate and contaminant transport. Shortly after graduation in 2016, I joined MSG working out of our Canton and then Hancock, Michigan offices.

In my current role, my work focuses on environmental remediation serving clients by developing and implementing sampling and analysis plans for site investigations and feasibility studies. My work also includes managing field and construction oversight projects, database management, data analysis, modeling, and report generation.

I currently live in Chassell with my dog Wyatt. When I'm not working, I'm out enjoying everything the UP has to offer including gravel biking, ultramarathon training, cross country and downhill skiing, backpacking and exploring.

I am a Geologist working for Wood Resilient Environments, based in Novi, Michigan since June 2018.

I am an avid outdoorsmen, amateur woodworker, and a wannabe classic car enthusiast. I am the proud husband of a Detroit-based artist. Sarah and I began our journey together in high school and are now entering our fourth year of marriage. We own two pet rabbits (Beedo and Maizy) and they practically run our house-hold.

I am looking forward to this position within AIPG and hope to help the organization in every way I can.

ASBOG Exam Update

Twelve individuals took the ASBOG FG exam at Central Michigan University on Friday, October 1st. Registration is now open for the next exam, which will be administered on March 18, 2022. Relevant dates for taking the exam this March are:

- January 14, 2022 – apply to CMU
- January 24, 2022 – register with ASBOG
- March 18, 2022 – FG exam at CMU

Additional details are available at: se.cmich.edu/asbog and will be provided in the next edition of *Geologically Speaking*.

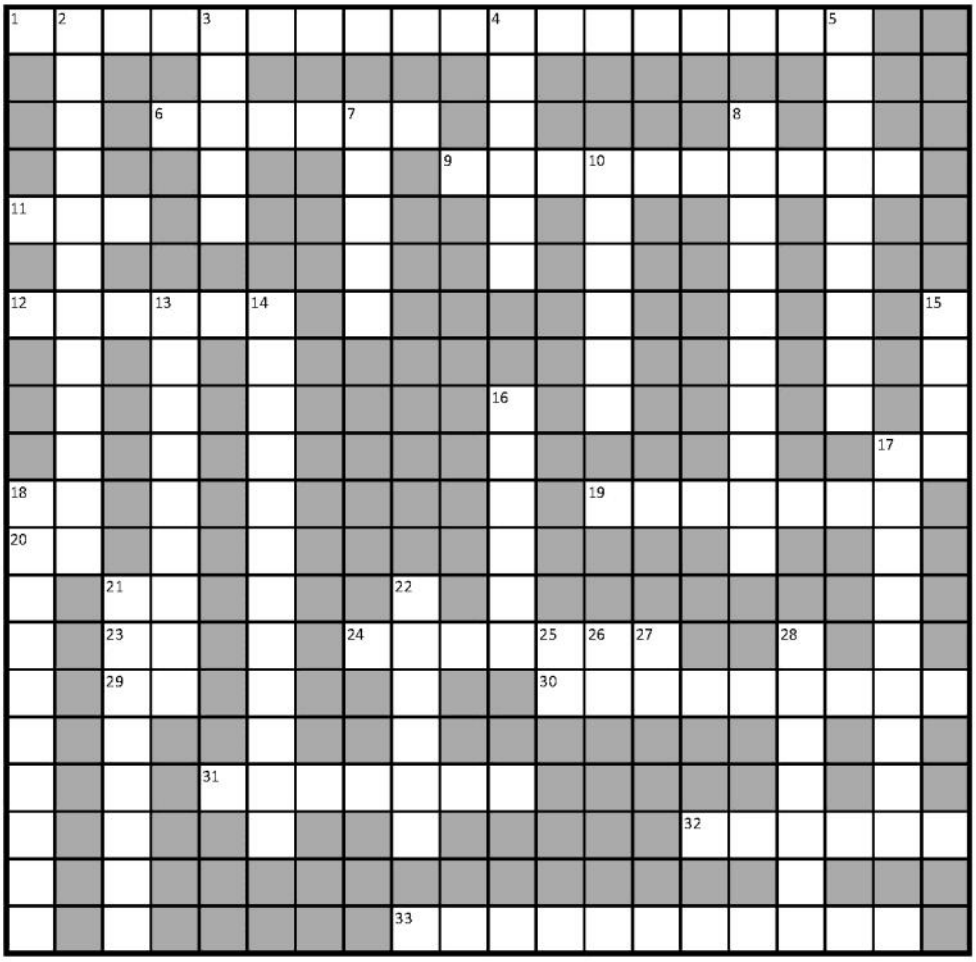
Member Input Sought

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.

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*.

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 billionare
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 vulcanologist and priest
22. Sentence end
25. Remedial Investigation
26. Antimony
27. ___, Phone home
28. A big wave

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

AIPG Michigan Section

11th Environmental Risk Management Workshop

Best Practices for Groundwater Remediation and Management

SPONSOR INVITATION

The American Institute of Professional Geologists (AIPG) Michigan Section is extending an invitation to sponsors for the 2022 Environmental Risk Management Workshop to be held **June 14-15, 2022**, at the **Ralph A. MacMullen Conference Center** in Roscommon, Michigan.

The 11th in a series of one-of-a-kind training events hosted by the AIPG Michigan Section focuses on providing quality technical information and case studies. These environmental workshops bring together a wide range of topic expertise from consulting, regulatory, academic, and owner perspectives. We focus on practical application and case studies for environmental professionals.

This unique workshop forum creates excellent opportunities for

Networking
Knowledge Sharing
Collaborative Problem-Solving
Innovative Product Introduction
Field Demonstrations

Leadership and Break Sponsorships are available at various levels!

This year the AIPG Michigan Section is featuring exhibitors during one of the presentation sessions giving exhibitors at the Michigan and Superior Glacial Lobe levels an opportunity to speak about their services for 2-3 minutes. We would also like to dedicate one entire track to demonstrations during the day as well as featuring opportunities for attendees to see and perhaps try technologies or products.

Our topic is about the **Best Practices for Groundwater Remediation and Management** at the workshop. Hazardous substances in groundwater pose a vastly complex set of challenges. Questions about the hydrogeologic setting, contaminant properties and characteristics, risks to possible receptors, and remedial and management options are raised. The standard approach more than 30 years ago was to pump and treat contaminated groundwater to remediate and mitigate the risk. Thanks to innovations applied by scientists and engineers at sites worldwide, whether adapted from other industries or original concepts, there are many more approaches being applied today as each site with groundwater contamination poses a unique set of circumstances and challenges.

Groundwater is a vital natural resource, and trillions of dollars and entire careers are spent on tackling issues related to groundwater contamination. We have learned that thoughtful and intentional approaches or strategic remediation and management are needed to address contaminated groundwater. Strategic remediation and management include a holistic approach to evaluating the aquifer system, it's uses, and groundwater governance when determining what the risks are and how best to remedy them. Calculation of the environmental footprint of remedial alternatives, especially with the environmental, social, and corporate governance is an important consideration for organizations.

For more information about the program theme and topics of interest for demonstration, please see our Call for Abstracts. Abstracts are due January 17, 2022. **The deadline for field demonstration presentation descriptions is April 1, 2022**.

Submit your field demonstration descriptions to:

AIPG.MI.Section@gmail.com.

Sponsors may register and pay online at our Eventbrite website or contact Sara Pearson at pearsons@michigan.gov for alternative payment instructions.

NOTE: We are optimistic that we will be able to hold this event in person and are planning to do so following any CDC recommended guidelines in place. In the event that we cannot due to pandemic concerns, we will offer full refunds for sponsorships or an opportunity to sponsor the event virtually if there is interest in still proceeding by participants. The virtual event, if necessary to protect the health and wellness of our participants, would be live on Whova and Zoom platforms.

Sponsorship Signup Deadline: May 15, 2022

https://aipgmichiganworkshop2022.eventbrite.com

AIPG Environmental Risk Management Sponsorship Categories

2022 AIPG Michigan Section Environmental Risk Management Workshop Sponsorship			Free Workshop Registration	Overnight Accommodations at the RAM or Hotel	6ft. Display Table in Sponsor Room	2-3 Minute Presentation to Attendees at Workshop	Ad in AIPG Michigan Section Publications for 1 Yr.	Advertisement in Workshop Materials
Leadership Sponsors	$$	#Available						
Michigan Glacial Lobe	$1600	6	X(2)	X(2)	X	X	X	Full Page
Superior Glacial Lobe	$1100	6	X	X	X	X	X	1/2 Page
Huron Glacial Lobe	$600	10	X	--	--	--	X	1/4 Page
Break Sponsors								
Tuesday Morning Registration Snacks	$150	1	--	--	--	--	--	--
Tuesday Lunch	$250	1	--	--	--	--	--	--
Tuesday Afternoon Break	$150	1	--	--	--	--	--	--
Tuesday Dinner	$350	2	--	--	--	--	--	--
Tuesday Evening Mixer	$350	4	--	--	--	--	--	--
Wednesday Morning Breakfast	$200	1	--	--	--	--	--	--
Wednesday Morning Break	$150	1	--	--	--	--	--	--
Wednesday Lunch	$250	2	--	--	--	--	--	--
Wednesday Afternoon Ice Cream Social	$200	1	--	--	--	--	--	--

Signup as a Sponsor at :

https://aipgmichiganworkshop2022.eventbrite.com

Registration for attendees opens in March 2022.

Questions? Contact Co-Chairs: Sara Pearson (pearsons@michigan.gov) or Tammy Rabideau (tammy_rabideau@mascohq.com).

AIPG Michigan Section Announces the

11th Environmental Risk Management Workshop

Best Practices for Groundwater Remediation and Management

CALL FOR ABSTRACTS

The American Institute of Professional Geologists (AIPG) Michigan Section is calling for abstracts for the 2022 Environmental Risk Management Workshop to be held **June 14-15, 2022**, at the **Ralph A. MacMullen Conference Center** in Roscommon, Michigan.

The Michigan Section is looking forward to hosting this event in person in 2022! We provide high quality technical training that focuses on practical application and case studies for environmental professionals. We bring together a broad base of topic expertise and perspectives from the consulting, regulatory, academic, and industry sectors. This unique workshop forum promotes collaboration and partnership to solve complex environmental problems in a peer-to-peer learning format.

This year our goal is to start a conversation about the **Best Practices for Groundwater Remediation and Management** at the workshop. Hazardous substances in groundwater pose a vastly complex set of challenges. Questions about the hydrogeologic setting, contaminant properties and characteristics, risks to possible receptors, and remedial and management options are raised. The standard approach more than 30 years ago was to pump and treat contaminated groundwater to remediate and mitigate the risk. Thanks to innovations applied by scientists and engineers at sites worldwide, whether adapted from other industries or original concepts, there are many more approaches being applied today as each site with groundwater contamination poses a unique set of circumstances and challenges.

Groundwater is a vital natural resource, and trillions of dollars and entire careers are spent on tackling issues related to groundwater contamination. We have learned that thoughtful and intentional approaches or strategic remediation and management are needed to address contaminated groundwater. Strategic remediation and management include a wholistic consideration of the problem evaluating the aquifer system, it's uses, and groundwater governance when determining what the risks are and how best to remedy them. Calculation of the environmental footprint of remedial alternatives, especially with the environmental, social, and corporate governance is an important consideration for organizations.

We are setting out to discuss the innovations in strategic groundwater remediation and management and best practices at the 2022 AIPG Michigan Section's Environmental Risk Management Workshop.

The following are some topical concepts for which we are seeking abstracts:

- **Innovative Groundwater Remediation Approaches:** in-situ/ex-situ methods, complex hydrogeologic settings, treatment trains, tools for calculating environmental footprint
- **Managing Risks due to Groundwater Contamination:** land and resource use restrictions, point of use treatment, alternate water sources
- **Data Collection and Analysis:** data collection tools, groundwater modeling, GIS applications
- **Contaminant Fate and Transport:** hydrogeochemical evaluations, phase separation, receptor identification
- **Groundwater Governance:** groundwater management policies, long-term aquifer use planning, groundwater resource inventory needs
- **Emerging Contaminants:** Per and poly-fluoroalkyl substances (PFAS), identification of new contaminants, remediation with commingled plumes
- **Closure:** Best approaches to closure, risk communication, long term management of contaminants, life cycle cost analysis of remediation alternatives (Cost to Closure of remedial actions)
- **Research Needs:** Accessibility to information, type of data, groundwater research projects

In addition to abstracts for case studies, the Michigan Section is calling for demonstration/short course abstracts that provide in-depth opportunities for learning. The short courses will be two hours, longer than the standard case study presentations. Standard presentations are 30-40 minutes in length. Abstracts for outdoor demonstrations are also welcome.

Submittal Deadline: January 17, 2022

Complimentary registration and accommodations for up to two speakers for selected abstracts.

AIPG Michigan Section Guidelines for Abstract Submittal

Important: The following guidelines provide details on the style and format of abstracts. The AIPG Michigan Section appreciates your interest and submittal of quality abstracts. Thank you.

Abstracts shall be no more than one page in length, and all text shall be 12-pt Times New Roman font with single spacing one-inch margins.

The abstract title shall be centered at the top of the page and be in bold 14-pt Times New Roman font. Directly below the title, list the presenter's names and organization(s) followed by the author's names.

Writing style should NOT be in first person. Rather, please use third person and the correct verb tense (e.g. present, future, past). The abstract should include the nature of the work and its relationship to the workshop theme and Environmental Risk Management, justification for the work, key/data findings and conclusions. Leave one blank line between paragraphs and other headings and text. Use right and left justification of all margins and do not indent paragraphs.

Please do NOT indicate in the abstract that particular information will be discussed during the presentation. The abstract should stand on its own merit and not point to the presentation that will be made at the workshop.

Please add a notation in the header of the abstract indicating topic category selecting from those listed in the text description on the front page of this flyer.

Information on Authors

Please include the following:

Names of Presenter(s):
Last Name, First Name and Initial
Place of Employment, Job Title
Email address and Work/Mobile Phone Number(s)

If there are more than two presenters, please list the two key presenters first.

Names of Other Authors:

(Please include the information below for all key authors. If there are more than four authors, add the additional authors on a separate page.)

Name of Author(s):
Last Name, First Name and Initial
Place of Employment, Job Title
Email address and Work/Mobile Phone Number(s)

Presenter Biographies

Additionally, please include a brief author biography for each presenter with the abtract submission on separate pages.

Abstracts Due: January 17, 2022
Selection Notification: February 28, 2022

Submit to AIPG.MI.Section@gmail.com

Questions? Contact Co-Chairs: Sara Pearson (pearsons@michigan.gov) or Tammy Rabideau (tammy_rabideau@mascohq.com). Thank you.

Note: We are planning for this to be an in-person event following appropriate precautions and guidance provided by the CDC that are in place at the time of the event. Our primary goal is to ensure the safety of our attendees. We are looking forward to hosting this event and hope to see you there!

AIPG 2022 National Annual Conference

Call for Abstracts and Student Poster Contest

Submit by May 9, 2022

AIPG is currently accepting abstracts for oral presentations and poster presentations for the 59th American Institute of Professional Geologists' National Conference that will be held in Marquette, Michigan, on the beautiful shores of the world's largest freshwater lake.

This year's meeting theme is "Geology: The Cornerstone of our Future". Geology plays a significant role in today's society and will become ever more important in the years to come. Our reliance on basic resources and building materials such as sand and gravel for roads, limestone for concrete, iron for structural purposes, and other base metals for electronics and other applications will not diminish; rather, it will become a greater concern as existing deposits are depleted or rendered inaccessible.

The ever-increasing number of applications of rare earth elements has created a greater demand on extraction and several of these elements will be needed in ever greater quantities to assist in the transition to a reduced carbon emission future. Geologists will be needed to identify, quantify, and yes, help with extraction of these mineral deposits.

A reliable source of clean freshwater is a basic necessity for life, and the onset

of climate change is impacting these resources. Changing climate patterns mean that widespread areas may become stricken with drought. This will mean that significant depletion of groundwater aquifers and surface water reservoirs will occur in these areas as withdrawals exceed natural replenishment. This is already affecting agricultural practices and driving migration of human populations to areas where this precious resource may be found, resulting in conflict and/or political unrest. In addition, anthropogenic activities have contaminated some water resources and have made these resources locally unusable or require expensive treatment.

The national conference provides opportunities to present and learn from experts in various geology and geoscience fields, with networking opportunities throughout the conference. Earn CEUs too!

How To Submit an Abstract

To have your abstract considered for an oral presentation or poster presentation, please complete the Abstract Submittal Form by the deadline of **May 9, 2022**. Abstracts must be in Word format, single-spaced, 12 point Times New Roman or Arial, and should not exceed one page. No tables or pictures will be accepted. You will be notified by **May 23, 2022,** if your abstract has been accepted. Technical presentations will be scheduled for Monday, August 8th. Posters will also be presented on Monday, August 8th. Authors who wish to publish a paper in AIPG's *The Professional Geologist* (TPG) can contact AIPG for additional information at aipg@aipg.org.

AIPG will review, edit, and publish a digital pdf of the conference abstracts on their website and in the conference app. A printed program will also contain all accepted abstracts.

An author who submits an abstract must have the intention of attending, registering, and presenting at the conference once the submission is accepted for either an oral presentation or poster presentation. Repeated or consecutive last-minute cancellations by presenters may result in future submissions being denied.

Abstract Categories

Agriculture
Alternative Fuels
Climate Change
CO2 Sequestration
Deforestation & Wildfires
Drought & Flooding
Education
Great Lake Coastal Management
Groundwater
Hydraulic Fracturing
Hydrology
PFAS (Per- and Polyfluorinated alkyl Substances)
Mining
Mining Resources

Emerging Contaminants	Oil & Gas
Engineering Geology	Rare Earth Minerals
Environmental Geology	Remediation
Energy	Surface Water
Geologic Hazards	Water/Management/Quality/ Resources/Protection
Geothermal Energy	Other

Earn PDHs/CEUs for attending!!

Submit an Abstract

Student Poster Contest

Students - Present and Win Cash Prizes!

Students can submit an abstract for a poster presentation and enter the poster contest to win cash prizes! **Submit your abstract using the button above**.

The two categories for the student poster contest are:

Undergraduate Cash Prize - 1st Place: $500, 2nd Place: $200, 3rd Place: $100
Graduate Cash Prize -1st Place: $600, 2nd Place: $250, 3rd Place: $100

- To be entered into the student poster competition you must be a student member of AIPG. Go to **www.aipg.org** to join for free.
- Poster contest categories (undergraduate and graduate) will be based on the student's enrollment at the time the abstract is submitted.
- AIPG reserves the right to reduce the number of prizes if there is an insufficient number of qualified entries.

American Institute of Professional Geologists
National Headquarters
1333 W. 120th Ave., Suite 211, Westminster, Colorado 80234
(303) 412-6205 fax (303) 253-9220
aipg@aipg.org | www.aipg.org

58 Years Serving our Members and the Geosciences

Upcoming AIPG Conferences!

- **August 6-9, 2022 National Conference – Marquette, Michigan**