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Future Geoscientists Take the Field

by Sara Pearson, Dr. Autumn Haagsma, Dr. Libby Ives, and Ashley Quigley

This summer marked a major milestone for the Michigan Geological Survey as we launched our first internship program and expanded field-based opportunities for early-career geoscientists. These students and emerging professionals gained hands-on experience working directly on applied geoscience that supports Michigan's most pressing needs—from groundwater protection and resource mapping to environmental stewardship, carbon storage potential, and critical mineral assessments.

Through our new internship program, students from across the United States worked alongside MGS geologists to describe core, apply advanced analytical tools, refine mapping workflows, and contribute new subsurface data that benefits Michigan's communities. Seasonal Geoscientist Specialist Emily Ratvasky added her graduate-level expertise to surficial mapping and passive seismic surveys in the Upper Peninsula, demonstrating the depth of skills strengthened through immersive field-based work. At the same time, our Precambrian team trained four seasonal employees through the Earth MRI mine-waste characterization initiative, providing them with specialized field training and collaboration opportunities with the USGS.

These interns and seasonal staff represent the next generation of geoscientists—future professionals who will contribute to energy development, water security, natural resource management, environmental protection, and scientific innovation wherever their careers take them. Their experience at MGS underscores Michigan's important role in cultivating geoscience talent and providing the kind of real-world training that equips students for meaningful, high-impact careers.

This inaugural year demonstrates what is possible when the Survey has the resources to provide field-based experiential learning. With sustained funding, MGS can expand these opportunities, accelerate geologic mapping, and continue producing the critical information that supports informed decisions across the state. This summer was only the beginning—and with continued investment, the Survey can build on this momentum to strengthen geoscience capacity for Michigan, the nation, and the world.

in this issue >>>

Michigan Geological Survey EST. 1837

Summer interns and staff at MGRRE working on the Carbon Capture Utilization and Storage project. From left: Adeleye Adedokun, Amber Conner, Ashley Scott, Brayden Rowley, Mallory Price, Alex Kominek, Tangiha Majumder, and Dr. Autumn Haagsma.

MGS's First Cohort of Summer Interns

Answering the question: Are Michigan's Devonian rocks suitable as confining units for carbon sequestration?

Over the course of the internship, five talented students and emerging geoscientists, Adeleye Adedokun, Brayden Rowley, Mallory Price, Alex Kominek, and Tangiha Majumder, immersed themselves in hands-on research. Adeleye, Brayden, Mallory, and Alex teamed up conducting detailed core descriptions and mastering advanced analytical techniques including X-ray fluorescence (XRF), X-ray diffraction (XRD), and thin section petrography. Additionally, Tangiha focused on optimizing our mapping workflows and creating first-of-a-kind geological maps for Cambrian formations. Their work contributed to the characterization and interpretation of subsurface geology—laying the groundwork for future carbon storage initiatives in the state.

The interns concluded their experience by presenting their findings to the Survey team, showcasing not only their technical skills but also their growing expertise in geological analysis and communication.

We're proud of their contributions and thrilled to have launched this new chapter in our mission to advance geoscience in Michigan. Here's to many more summers of discovery and collaboration!

Hands-on Discovery in the Upper Peninsula

MGS's Upper Peninsula doubled in size for the summer, welcoming four seasonal employees.

Emily Ratvasky joined the team as a seasonal geoscientist specialist working with MGS geologist Dr. Libby Ives

WMU PhD Candidate, Ashley Scott, provides guidance to Brayden and Adeleye on the project.

Core review in the MGRRE warehouse.

Emily Ratvasky, deploying a Tromino seismograph as part of a passive seismic survey for determining Quaternary sediment thickness in northern Dickinson County, Michigan.

on surficial geology projects in the Upper Peninsula. Emily recently completed her M.S. in geology at Miami University. Her thesis focused on the carbon isotope systems and geomorphology of Pleistocene rivers in southern Ohio. At MGS, Emily is applying her geologic knowledge, GIS skills, and extensive field experience to the aggregate mapping project and passive seismic surveys to develop a better understanding of the depth to bedrock in areas covered by glacially deposited sediments.

Three of the four seasonal employees are working with the MGS Precambrian team. This summer, the group has been focused on fieldwork for the Earth MRI Mine Waste Characterization grant that MGS received in 2024. The team received training from the USGS to take composite samples of mine waste piles and tailings from non-fuel legacy mines that have been reported to contain critical minerals. The overarching goal is to use this data to characterize the mine waste volume estimates, geochemical composition, bulk mineralogical composition and contained mineral commodities of these sites.

Carlos Hernandez (far left) is a recent graduate with a Bachelor of Science degree in Geological Engineering from Michigan Technological University. He is currently looking for permanent, full-time work related to his degree in the Marquette area. Marlayna MacKay (upper right) has a Bachelor of Science degree in Earth and Environmental Science from the University of Michigan. She has also been working for MGS on the Triage Project and will begin her Master of Science degree at Western Michigan University this fall. Anthony Bennett (lower right) has a Bachelor of Science degree in Engineering Physics at Miami University in Oxford, Ohio. He is currently working on his Master's degree in Geological Sciences at Michigan State University studying the 2021 M8.2 Chignik, Alaska earthquake.

Overall, internship and seasonal roles have been a win for students and for MGS, advancing natural-resource understanding and workforce development.

MGS Prioritizes Its Commitment to K–12 and Public Engagement

Lisa Wininger

We are strengthening our long-standing commitment to K–12 education and public engagement by expanding the CoreKids programming and community outreach efforts. Through hands-on activities, classroom visits, public events, and accessible earth science education, MGS is helping Michiganders build a deeper understanding of the state's natural resources and the vital role they play in everyday life. This renewed focus on statewide engagement sets the stage for welcoming our first full-time Education and Outreach Manager, who will lead these efforts and support Michigan's next generation of Earth science learners.

Lisa Wininger was selected as the first full-time Manager of Education and Outreach for MGS in May 2025. Lisa is a graduate of the University of California Davis with a B.S. in Environmental Sciences. She also received an M.S. in Urban Planning and M.S. in Education.

Lisa's most recent professional experience was with NASA's Office of STEM Engagement where she worked with Minority Serving Institutions to successfully obtain STEM research funding and to implement new and expanded research initiatives. She oversaw recruitment and placement of students in NASA internships and supported multiple education and outreach activities such as the USA Science and Engineering Festival, EAA AirVenture, and Earth Day on the National Mall.

As a MiSTEM Regional Director, Lisa coordinated STEM education and activities for a six-county region in northern Michigan. She was selected as an Albert Einstein Distinguished Educator Fellow and completed a one-year fellowship at NASA headquarters in Washington D.C. Lisa was a public-school educator for twenty years, teaching grades two through eight, and was also an adjunct community college instructor.

She resides in Kalamazoo County and volunteers at Tillers International, Plainwell Aviation and STEM Academy, and is a licensed therapy dog handler for her two Newfoundland dogs, Gemma and Pippa.

From Core to Global Headlines:
MGS Repository Featured in Forbes Magazine

by Sara Pearson

Our core repository—the Michigan Geological Repository for Research and Education (MGRRE)—recently served as the backdrop for a national feature in Forbes magazine, spotlighting Michigan Potash & Salt Company and the extraordinary potash discovery made possible through Dr. William (Bill) Harrison's decades of dedication to core preservation at Western Michigan University. The article, "How An Unassuming Geologist Cracked The Global Fertilizer Cartel," (https://www.forbes.com/sites/christopherhelman/2025/05/30/how-an-unassuming-geologist-cracked-the-global-fertilizer-cartel/) highlights Geo-preneur Ted Pagano and his drive to bring the world's richest potash deposit into production. Bill and WMU are prominently recognized in the opening of the story, underscoring our institution's impact on national security, economic resilience, and food security.

This recognition is far more than a media moment—it is powerful validation of the purpose behind building and maintaining MGRRE. Bill has long understood that the subsurface holds answers to questions we have not yet imagined, and that carefully curated geological samples can lead to discoveries of global consequence. Today, that foresight is paying off. Potash is essential for fertilizer production, and U.S. farmers—especially across the Midwest—depend heavily on imports, primarily from Canada. A significant domestic supply located a mile and a half beneath Michigan is a major advancement for American agriculture. Food security is national security, and strengthening domestic fertilizer supply strengthens the nation.

Michigan Potash & Salt is using a modern, low-impact approach that minimizes surface disturbance—drilling geothermal-style wells to dissolve the potash (a natural salt) deep underground and pump the brine to the surface for processing. This efficient method illustrates how technology, engineering, and geologic science work together to unlock critical resources responsibly.

We could not be more proud of our core repository, our dedicated team, and the legacy that Dr. Harrison continues to build. Bill and his wife, Linda Harrison, have devoted their lives to preserving and sharing Michigan's geological data, and their commitment made this remarkable discovery possible. His leadership continues to shape Michigan's economy, strengthen America's agricultural independence, and demonstrate the enduring value of preserving and understanding our geological resources.

Photos featured in the Forbes article taken at MGRRE by Jamel Toppin for Forbe. Left: Ted Pagano, CEO of Michigan Potash and Salt. Top: Potash cores from the rock archives stored at MGRRE.

Advancing Michigan's Groundwater Science

Dr. Khalid Haji Omar

The Michigan Geological Survey is building the scientific capacity to develop the data and tools Michigan's decision makers need to understand groundwater from a non-regulatory perspective. With a new full-time hydrogeologist, MGS is expanding its ability to map aquifers, assess groundwater availability, and improve knowledge of a resource that remains underexplored across much of the state. Water is central to Michigan's identity and economy, yet many communities lack the information needed for long-term planning. By investing in hydrogeologic expertise, MGS is advancing the unbiased science that supports informed, community-driven decisions about groundwater use and protection.

MGS welcomed Dr. Khalid Haji Omar back to the survey. Khalid brings extensive experience in engineering and hydrogeology. A proud WMU alumnus, he rejoined the MGS in June to lead Michigan's long-term, statewide Water Data Gap and the Regional Water Study projects.

He earned his B.S. in Geology from Salahaddin University in 2008, followed by an M.A. in Geology from Western Michigan University in 2017. He completed his Ph.D. in Geofluids and Hydrogeology at Oklahoma State University in 2023.

Khalid has served as a Hydrogeologist and Project Manager with the Groundwater Directorate, City of Duhok. During his master's program, he joined MGS team through the Michigan Mapping Coalition Program, where he worked on glacial core analysis.

During his doctoral studies, he developed an innovative dolomite filtration technology-a novel method for removing toxic metals and metalloids from petroleum-produced water and brines. This technology was patented in 2023. Following his doctoral program, he joined iM3NY (now owned by Musashi Energy), one of the largest lithium-ion cell manufacturers in New York, as an Environmental Health and Safety (EHS) Engineer.

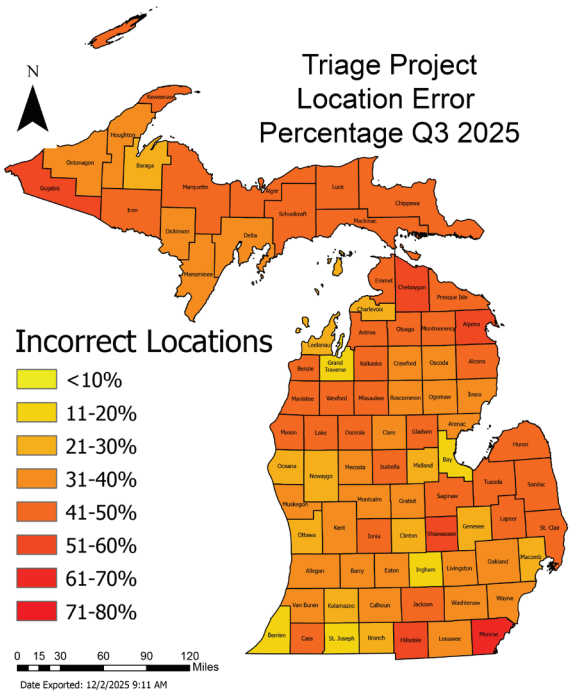
His research interests include the fate and transport of contaminants in porous media, innovative water treatment technologies, groundwater flow and 3D reactive transport modeling, critical mineral harvesting, and diagenesis and mineralogy carbonate rocks."

Triage Hits the Mark!

by Sophie White

MGS's Triage project has hit a major milestone: 100% completion of the original project goal to enter and validate existing records and historical water well scans of all 83 counties in the Wellogic database. Working with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Drinking Water and Environmental Health Division (DWEHD), the Triage Project staff and others at the Michigan Geological Survey have made a monumental impact for all residents of Michigan and their water resources. In just over 5 years, we have verified the locations of nearly 700,000 water wells with 35% of the locations needing to be corrected, some locations were previously located miles away from the correct latitude and longitude. We have also entered over 400,000 new water well records to EGLE's Wellogic database from historical pdf scans, expanding the available geologic and groundwater data in Michigan by over 1/3. Having verified reliable geologic and groundwater information for the entire state is instrumental for everyone from the individual homeowner to environmental agencies across the state. MGS staff will continue to validate and enter new wells and historic data through the projects completion at the end of this year.

The figure below shows the percentage of incorrect well locations by county tallied during the project.



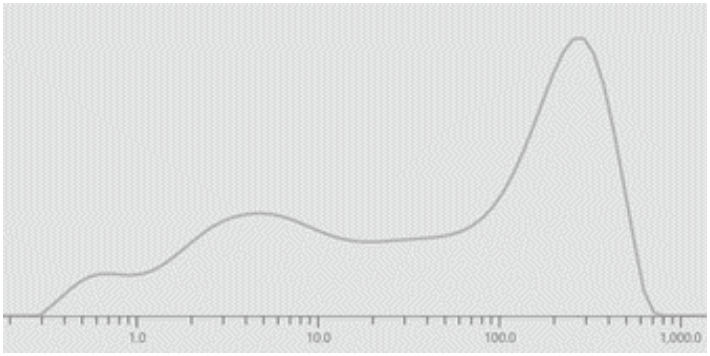
The Light Side of Sedimentology:
Grain Size from a New Angle

by Trent Adams

As part of the Michigan Department of Natural Resources Good Neighbor Authority program and with the help of Dr. Pat Colgan and his geology students at Grand Valley State University, the MGS team has been completing laboratory grain size analyses on geologic samples collected from recent drilling in the Peacock quadrangle in Lake County, MI. This information helps our geologists classify and delineate different types of Quaternary sediments in the subsurface and with creating a geologic map of the project area.

Sediment samples from Peacock quadrangle, collected in 2-foot increments down to 100 feet below the surface.

Perhaps the most interesting aspect of the grain size analysis is the methodology. Instead of using a mechanical sieve shaker or hydrometers, we are using the Malvern® Mastersizer® 3000, an instrument that employs laser diffraction to measure grain size distribution.



Volumetric grain size distribution curve of size classes (µm) in a sediment sample.

How it Works—Laser Diffraction Analysis

A sediment sample is dispersed in water and exposed to a laser beam. As light interacts with particles, it scatters in patterns depending on their size. Larger particles deflect light at smaller angles, while smaller particles scatter light more widely. Detectors capture this scattered light, and software calculates grain size distributions.

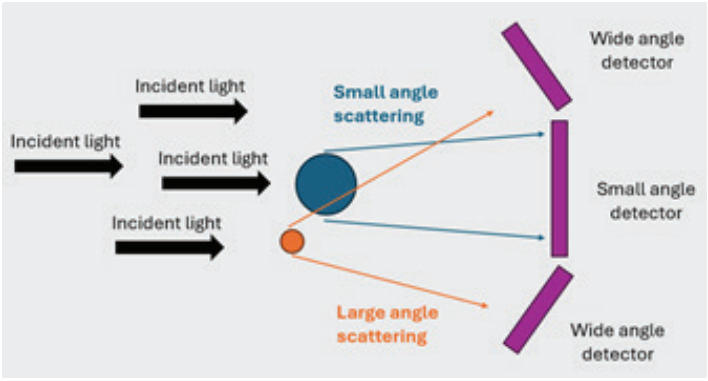


Illustration showing how particle size dictates the scatter angle of incident light.

Why Geologists Care

Traditional sieve shakers and hydrometers are slower and limited in size range. Sieve shakers measure coarse sandy samples well but not fine silt and clay, while hydrometers are good for fine particles but less so for coarse sand. Laser diffraction excels at measuring samples with both coarse and fine particles, with the exception of gravel.

In a nutshell, instead of having to change methods based on particle size, we can rely on a single method for almost all samples.

Why Methodology Matters

Understanding particle size is crucial for geologists. It affects sediment transport, deposition, soil stability, and groundwater flow. To achieve our mission to provide high quality results based on the best available science, we use laser diffraction so that we have the best data, empowering us to better interpret complex geological conditions and produce accurate geologic maps useful to the public.

Drilling Deeper:
How MGS Is Rebuilding Michigan's Geologic Picture

by Nathan Erber, PhD

Surficial geologic maps in Michigan provide fundamental data used by resource planners and communities to make informed decisions regarding land use and groundwater resources. Geologic maps aid groundwater resource planning, ensuring reliable water supplies for farming and rural and urban communities, provide critical data for selecting suitable sites for roads, bridges, and urban expansion, and help communities identify flood prone areas and assess land surface stability to mitigate risks in land use planning. However, given the unprecedented challenges (urban expansion, groundwater demand, critical resource needs, etc.) that communities and managers face, more than the best available statewide scale (1:500,000) surficial geologic map is needed (Figure 1).

Modernization of Michigan's surficial geologic map requires a multifaceted approach that delivers more than just a map depicting the upper most geologic material. To accomplish this the MGS employs several techniques to understand and conceptualize the subsurface in three dimensions. These techniques include surface observations, drilling from the surface to bedrock, geophysical techniques, water well records, soil data, aerial imagery, and digital elevation models (DEMs) derived from high resolution light detection and ranging (LiDAR). Direct observation of the subsurface is impossible, therefore the collection of cores through drilling is of paramount importance because it allows direct observation and sampling of subsurface sediments. This is why the MGS invests significantly in drilling programs associated with all detailed surficial geologic mapping projects. Under the 2024-2025 STATEMAP project, MGS conducted fieldwork in Muskegon, Kent, and Montcalm counties, including 21 borings totaling 5,619 feet (approximately a 6-month level of effort) and the collection of 1,409 surficial samples across the counties in 2024 and 2025 with additional drilling planned for Montcalm County in 2026.

The cores collected in these projects serve several key functions. They provide a tangible sample of the subsurface that can be observed, sampled, and tested. Cores also serve as a validation point for geophysical measurements and stratigraphic correlations to other cores and water well logs. They are used to make correlation of the surface and subsurface geology in maps, cross-sections (Figure 1), and 3D frameworks. An additional benefit is that cores are cataloged and archived at the Michigan Geologic Repository for Research and Education (MGRRE) as a public resource that may be used to answer future questions..

While the 2024-2025 work represents a major step forward, roughly 80 percent of Michigan remains unmapped at this level of detail. Continued progress will require sustained investment, modern tools, and ongoing collaboration with state, federal, and local partners. MGS is building the next generation of surficial maps that provide a clearer understanding of the complex surficial deposits and the resources they contain.

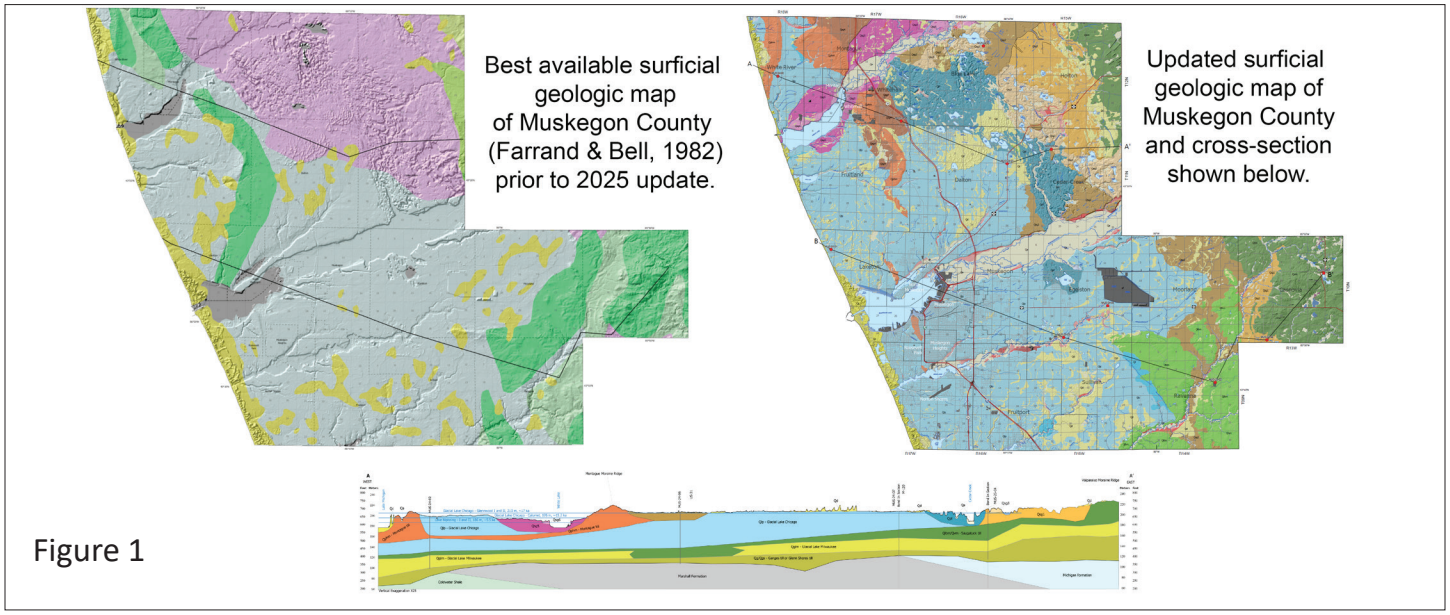


Figure 1

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New Core Repository Moves Into Construction Phase

MGS is moving forward with construction of a new, purpose-built home for the Michigan Geological Repository for Research and Education (MGRRE). With the design phase now complete, the project will deliver a modern warehouse and dedicated laboratory space to support the state's expanding geological research needs. Office locations for MGS staff are still under evaluation and may be situated elsewhere on campus.

This long-awaited upgrade comes at a pivotal moment for the survey. Rapid growth in mapping, research, and statewide data collection has pushed the current leased facility beyond capacity. The new building—funded through $6 million from the Michigan Department of Education and the Department of Environment, Great Lakes, and Energy (EGLE) and $2 million in low-interest financing from Western Michigan University—will provide just enough funding for the infrastructure needed to preserve and manage Michigan's core and sample archives for the next decade.

Located in WMU's Business, Technology, and Research Park near the College of Engineering and Applied Science, the facility's placement will strengthen collaboration with engineers, researchers, and nearby consulting firms. The design, developed with architects from Fishbeck, includes core storage featuring a condensed industrial-size mobile racking system, enhanced research space, and capabilities that support both academic and applied geoscience work.

Design meetings began in March and will continue through the summer, with construction bids expected to go out in the fall. MGS is also working with WMU to secure additional support to increase potentially increase warehouse capacity and add a dedicated training room to serve larger groups and expand workforce-development activities.

The new MGRRE facility marks a major milestone for Michigan's geologic research community—ensuring that high-quality data, well-preserved samples, and modern research capability continue to advance science and support informed decision-making across the state.

We are looking forward to moving into our new repository in late 2026!