ON THE ROCKS

A Newsletter of the Michigan Basin Geological Society

2018-2019 Edition 3 www.mbgs.org *November 2018*

ANNOUNCEMENTS

MBGS Membership Meeting, **November 14th, 2018**: Michigan Basin Geologic Society meeting will be hosted at Michigan State University in the Natural Science Building, East Lansing, Michigan**.** Joel Henry and Alyssa Olson, Golder Associates, will present "July 4th Fireworks as an Unconventional Source of Perchlorate Contamination in Groundwater". Reservations are not required. More information is included in the newsletter.

2018-2019 Membership Dues

It is time to submit the 2018-2019 MBGS membership dues. Annual membership is $25 for members and $10 for students. Please fill out the appropriate membership form (included) and mail in with payment.

MBGS Publications - There are two (2) new publications available! See details in the newsletter on page 7.

MBGS FIELD EXCURSION

SPRING 2020 - GEOLOGICAL EXCURSION BY RAFT ON THE COLORADO RIVER THROUGH THE GRAND CANYON *LEE'S FERRY TO WHITMORE WASH (PAGE, ARIZONA)*

A 7-day Grand Canyon rafting trip through Hatch includes: 188 miles of rafting from Lee's Ferry to Whitmore Wash, pre-trip stay at Cliff Dwellers Lodge, helicopter ride & return flight to Las Vegas or Marble Canyon, and meals, beverages, camping gear and dry bags provided by Hatch while on the river. Contact Mark Wollensak at wollensak@voyager.net to get more information or reserve your spot on this trip.

OTHER NEWS

LED FIELD LENS AND MBGS LANYARD AVAILABLE

The Michigan Basin Geological Society is offering geological field hand lens and lanyards. The field hand lens is a large 21mm lens with a 20X magnification. A pair of white LEDs provides illumination for all those darkened close-up viewing of rocks, minerals and fossils. A case is provided for the field lens with a key to remove the batteries. Batteries are included. The green lanyard has MICHIGAN BASIN GEOLOGICAL SOCIETY printed on one side of the 1" wide webbing. This lanyard is designed with a breakaway buckle clip and detachable keychain for versatile use and comfortable wearing. MBGS is offering the Lanyard/LED Hand Lens and Case combo for $15 each and the Lanyard alone for $5 each if picked up at a meeting or field trip. If you request to have your purchase mailed, standard costs for mailing container and postage will apply. Please contact Mark Wollensak at wollensak@voyager.net to order.

MBGS ONLINE STORE

The Michigan Basin Geological Society has an on-line store. Shop for shirts, hats, bags and other items. Check it out at: http://www.cafepress.com/mbgs.

Find us on Facebook

November MBGS Membership Meeting

Joel Henry and Alyssa Olson, Golder Associates

presenting

"July 4th Fireworks as an Unconventional Source of Perchlorate Contamination in Groundwater"

When: November 14th, 2018. Executive committee meeting at 5:00 PM at Claddagh Irish Pub, Eastwood Towne Center, (members welcome), membership meeting and presentation at 7:00 PM

Where: Michigan State University, College of Natural Science Building, Room 204, 288 Farm Lane, East Lansing, MI 48823, (517) 355-4470

Cost: None

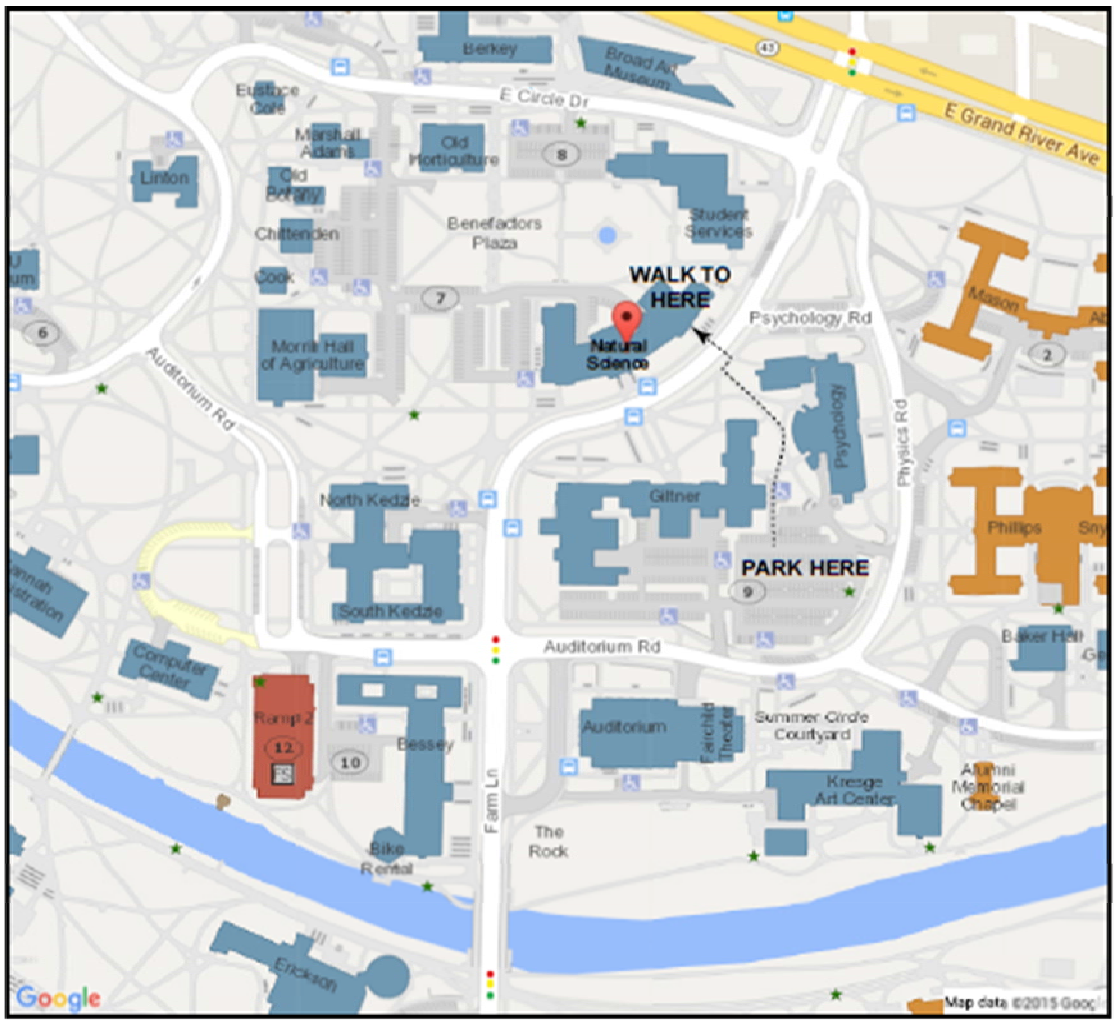
Abstract

The city of Evart, Michigan first detected perchlorate in one of its two municipal wellfields in 2015. After extensive investigations, the source of perchlorate was determined to be the annual Fourth of July fireworks displays at the County fairgrounds, located directly adjacent to and hydraulically upgradient from the wellfield. The annual 30-minute shows were found to have deposited approximately 5 to 10 kg of unreacted perchlorate downwind of the launch site each year, in an area directly above the unconfined sand and gravel glacial outwash aquifer used for municipal supply. Being highly soluble in water, most perchlorate was efficiently transported to the aquifer during recharge events. Soil and groundwater investigations mapped the rapidly-developed and fast-moving groundwater plume as it was drawn toward the nearest municipal well in about 11 months. To minimize pubic exposure to perchlorate, the City actively managed the wellfield and constructed an additional supply well. Perchlorate is not yet regulated by the Environmental Protection Agency or the State of Michigan under the Safe Drinking Water Act and is therefore not typically analyzed during routine water quality monitoring. Future regulation of perchlorate as a drinking water contaminant is likely to result in its unexpected detection in other municipal supplies.

Biography

Joel Henry is a Senior Hydrogeologist with Golder Associates in Lansing. He is a graduate of Bucknell University and Michigan State University, and his professional interests are the sustainability of water supplies and natural resources. Alyssa Olson is a Project Hydrogeologist with Golder Associates in Lansing and a graduate of Albion College, and works on wastewater treatment and groundwater remediation projects for oil, gas, and mining clients.

Michigan State University –November 14th, MBGS Monthly Membership Meeting
College of Natural Science Building,Room 204,
288 Farm Lane, East Lansing, MI 48823, (517) 355-4470



Between 5pm & 6pm you can park in Lot 9 behind Giltner Hall and the Psychology Building (former Physics and Astronomy building) for free. Otherwise you can try your luck with the metered slots clustered around the Natural Science Building and the adjacent Student Services Bldg, no charge after 6. MSU Interactive Map: https://maps.msu.edu/

UPCOMING EVENTS

November 14th, 2018: MDEQ Air Permit to Install and Potential to Emit Workshop, Grand Rapids, MI https://www.michigan.gov/deq/0,4561,7-135-3308_3333-455880--,00.html

November 29, 2018: Michigan Section AIPG Meeting, Weber's Inn, Ann Arbor, MI, http://mi.aipg.org/default.htm

December 6, 2018: MI-AWWA in partnership with MWEA, 2018 Cyber Security in the Water Sector Workshop, https://mi-water.site-ym.com/events/EventDetails.aspx?id=1138503&group=

December 11th, 2018: MDEQ Environmental Compliance Workshop for the Automotive and Scrap Metal Industries, https://www.michigan.gov/deq/0,4561,7-135-3308_3333-480140--,00.html

December 11th, 2018: USEPA, Michigan Mapping Workshop, Livonia, Michigan, https://trainex.org/classdetails.cfm?courseid=1787&classid=7936

December 12th, 2018: MBGS Monthly Meeting. This will be a dinner meeting, family, friends and spouses welcome. Chad Kotke of the MDEQ will be present on the flooding in Houghton. Coral Gables - 2838 E Grand River Ave, East Lansing, MI 48823. Meeting starts at 5:30, buffet will be served at 5:45 - Ceasar salad, roasted sliced breast of turkey with stuffing, mashed potatoes, baked spinach lasagna, broccoli, rolls/butter, soft drink or coffee/tea. Presentation will be after dinner. There will be a cash bar. People can RSVP to Jennifer Trout jennifer.l.trout@wmich.edu.

March 15-17, 2018: Michigan Gem and Mineral Society Show, Jackson, Michigan

May 3-5, 2019: 60th Anniversary Rock and Mineral Show "Rockrama". Kalamazoo County Expo Center. Information is available at: www.kalamazoorockclub.org

May 19-20, 2018: AAPG Annual Conference and Exhibition, San Antonio, Texas https://www.aapg.org/events/conferences/ace

June 10-11, 2019: AIPG Michigan Section's Environmental Risk Management Workshop at the Ralph A. MacMullen Conference Center in Roscommon, Michigan. Call for Abstracts coming in November 2018.

October 11-13, 2019: Michigan Mineralogical Society, "The Show" Greater Detroit Gem, Mineral, and Fossil Show. Information is available at: www.michmin.org.

MDEQ Calendar of Training and Workshops
http://www.michigan.gov/deq/0,4561,7-135-3308_3333---,00.html

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2018-2019

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MICHIGAN BASIN GEOLOGICAL SOCIETY PUBLICATIONS 2018

The following list details the contents of each available CD-ROM.
This list is also available on-line at http://www.mbgs.org/publications.html
Prices include postage, handling and any applicable sales tax.
Orders for publications should be prepaid in U.S. dollars and addressed to:
MBGS — Publications, P.O. Box 14044, Lansing, MI 48901-4044

HISTORICAL PUBLICATIONS DISK 1

Nine out-of-print publications – Cost - $15

- The Stratigraphy of Manitoulin Island, Ontario, Canada, June 1954
- The Devonian and Silurian Rocks of Parts of Ontario, Canada and Western New York, June 1951
- The Traverse Group of the Northern Part of the Southern Peninsula of Michigan, June 1949
- The Devonian Strata of the London-Sarnia Area, Southwestern Ontario, June 1956
- The Ordovician Rocks of the Escanaba-Stonington Area, June 1950
- The Niagara Escarpment of Peninsular Ontario, Canada, June 1955
- Lower Paleozoic and Pleistocene Stratigraphy Across Central Wisconsin, May 1960
- Geology of Central Ontario, Canada, May 1965
- Classic Silurian Reefs of the Chicago Area, June 1998

HISTORICAL PUBLICATIONS DISK 2

Four out-of-print publications – Cost - $15

- Copper Country Field Trip, Michigan, June 1947
- Geology of Mackinac Island and Lower and Middle Devonian, South of the Straits of Mackinac, June 1959
- Tectonics, Structure and Karst in Northern Lower Michigan, August 1983
- Geology of the Pictured Rocks, Upper Peninsula, Michigan, July 1991

HISTORICAL PUBLICATIONS DISK 3

Six out-of-print publications – Cost - $15

- Pleistocene and Early Paleozoic of the Eastern Part of the Northern Peninsula of Michigan, June 1948
- Stratigraphy and Structure of the Devonian Rocks in Southeastern MI and Northwestern OH, June 1952
- Lower Ordovician and Upper Cambrian of Wisconsin , May 1990
- Guidebook to the Precambrian Geology and Metallogeny of the Central Upper Peninsula of Michigan, September 1991
- Diamond Bearing Kimberlite and Related Geology in the Upper Peninsula of Michigan, April - May 1993
- Karst Geology of Northeast Lower Peninsula, Michigan, April 1995

HISTORICAL PUBLICATIONS DISK 4

Six out-of-print publications – Cost - $15

- Silurian Rocks of the Northern Peninsula of Michigan, June 1957
- Cambrian Geology of Parts of Dickinson and Iron Counties, Michigan, June 1958
- Geologic Features of Parts of Houghton, Keweenaw, Baraga and Ontonagon Counties, Michigan, May 1961
- Correlation Problems of the Cambrian and Ordovician Outcrops Areas, Northern Peninsula of Michigan, June 1967
- The Geology of Manitoulin Island, June 1968
- 1970 Field Excursions - Pleistocene, Devonian, Precambrian, May 1970

HISTORICAL PUBLICATIONS DISK 5

Five out-of-print publications – Cost - $50

- Oil & Gas Fields Symposium, Volume 1, April 1969, 200 pp., maps, illus., second printing with updates
- Oil & Gas Fields Manual of the Michigan Basin, Volume 2, 1992, 520 pp., maps, illus.
- Glacial Geology of Southwestern Michigan, September 1989
- Geology of the Lake Erie Islands and Adjacent Shores, 1971
- Glacial Geology of Southwestern Michigan, Landforms of the Lake Michigan Lobe, Southwestern Michigan, September 2001

HISTORICAL PUBLICATIONS DISK 6

Eight out-of-print publications – Cost - $15

- Guidebook for Ordovician Stratigraphy of the Cincinnati, Ohio and Richmond, Indiana Areas, June 1953
- Guidebook for Ontario Geological Excursion to Kettle Point –Owen Sound- Waubaushene, June 1946
- Guidebook for the Stratigraphy of the Silurian Rocks in Western Ohio, May - June 1963
- Guidebook for Cambrian Stratigraphy in Western Wisconsin, May 1966
- Geology of the Manitoulin Area, Special Papers #3, September - October 1978
- Middle Devonian Cratonic Carbonates and Shales in Southwestern Ontario, November 1987
- The Richfield Challenge, A Review of the Richfield Developments in Michigan, 1952
- A Theory of Rogers City and Dundee Relationships in Central Michigan, Tom Knapp Masters Thesis, 1947

HISTORICAL PUBLICATIONS DISK 7

Six out-of-print publications – Cost - $15

- Silurian Rocks of the Southern Lake Michigan Area, 1962
- Studies of the Precambrian of the Michigan Basin, 1969
- The Geology of the Marquette District: a Field Guide, May 1977
- Ordovician and Silurian Geology of the N. Peninsula of Michigan, 1980
- Special Paper #4: Ordovician and Silurian Rocks of the Michigan Basin and its Margins, 1985
- Upper Keweenawan Rift-Fill Sequence, Mid-Continent Rift System, Michigan, September 1988

HISTORICAL PUBLICATIONS DISK 8

Four out-of-print publications – Cost - $15

- Niagaran Stratigraphy: Hamilton, Ontario, 1972
- Silurian Reef-Evaporite Relationships, 1974
- Special Papers #1: Middle Devonian Stratigraphy and Depositional Environments in the Michigan Basin, 1974
- Sedimentology and Paleogeography of the Pennsylvania Strata of Grand Ledge, Michigan, May 1989
- Paleozoic Geology of the Central Upper Peninsula of Michigan, August 2014

HISTORICAL PUBLICATIONS DISK 9

Five out-of-print publications – Cost - $15

- Geology and the Environment: Man, Earth and Nature in Northwestern Lower Michigan, 1973
- Special Papers #2: The Belle River Mills Gas Field: Productive Niagaran Reefs Encased by Sabkha Deposits, Michigan Basin, 1977
- Geohydrology of Carboniferous Aquifers of the Michigan Basin, September 1994
- Sedimentology, Paleogeography and Geochemical Weathering of the Pennsylvania Strata of Grand Ledge, Michigan, September 1994
- Geological and Historical Field Trip to the Keweenaw Peninsula: A Tribute to Douglass Houghton: “Michigan’s Pioneer Geologist,” Field Guidebook, September 2016

A DIGITAL PUBLICATION

Northeast Lower Peninsula Geological Field Conference, 2004, T.J. Black and M.S. Wollensak, 133 pp, illus., maps, digital presentations and posters (available on CD-ROM only). Cost - $10

- Road Log and Stop Descriptions by T.J. Black, D. Baxter and M.S. Wollensak
- Methane Gas Venting at Hemlock Lake, by T.J. Black
- The Glaciated Landscape in the Grand Traverse Bay Region of Michigan and the Nature of the Greatlakean Advance of the Laurentide Ice Sheet in Michigan, USA, poster by S.C. Lindstrom
- Thunder Bay Marine Sanctuary Sink Hole Investigations, poster by T.J. Black
- Evaluation of Relationships Between Hydrogeologic Environment and Petroleum Hydrocarbon Remediation in Quaternary Glacial Sediments, presentation by Lisa M. Botcher and Arden D. Davis
- Log Curve Amplitude Slicing of the Traverse Group in the Pentwater Field, Oceana County, Michigan, by Albert S. Wylie, Jr.
- Traverse Group Stratigraphy in the Michigan Basin - A Detailed Review, by Albert S. Wylie, Jr.

SPECIAL OFFERS

- Stratigraphic Lexicon for Michigan, 2001, prepared by MBGS and published by DEQ, **Cost - $4.**

- Robert E. Mosher Geological Studies A lifetime of geological research on Silurian Rocks with John T. Sanford. The disks are organized chronologically and include field work in North America and Europe. 2007, 2 CDs **Cost - $35.**

- Historical CD Set - #1– #9 and 2004 NE LP Geological Field Conference (detailed above) for a special purchase price of **$125 (best price for all).**

Site Name	UCAR – Weather Education
Site URL	https://scieducar.edu/atmosphere
Description	"The UCAR Center for Science Education (UCAR SciEd) serves the geoscience community by amplifying and complementing the work of the National Science Foundation's National Center for Atmospheric Research (NCAR) and University Corporation for Atmospheric Research (UCAR) member universities by reaching our audiences: K-12 educators, university faculty, students, and the public through excellence in educational programs and experiences."

Site	The EPA EnviroAtlas GIS
Site URL	https://community.esri.com/community/education/blog/2018/02/09/teaching-with-the-epa-enviroatlas
Description	The EnviroAtlas offers a web-mapping interface and lesson activities on dozens of environmental themes in the USA and the ability to stream data layers into ArcGIS Online for further analysis.

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1	ANNUAL STUDENT MEMBERSHIP DUES for 2018-2019	10.00	$ 10.00
		SUBTOTAL	$ 10.00
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		FREIGHT	$ -
			$ 10.00
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Mike Pozniak
Mike.Pozniak@arcadis-us.com
517 337-0111

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1	ANNUAL MEMBERSHIP DUES for 2018-2019.	25.00	$ 25.00
		SUBTOTAL	$ 25.00
		TAX	$ -
		FREIGHT	$ -
			$ 25.00 PAY THIS AMOUNT

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MICHIGAN BASIN GEOLOGICAL SOCIETY

FIELD EXCURSION SPRING 2020

A GEOLOGICAL EXCURSION BY RAFT ON THE COLORADO RIVER THROUGH THE *GRAND CANYON* - LEE'S FERRY TO WHITMORE WASH PAGE, ARIZONA

DATE: May 2020, actual dates and length of trip (9-10 days total) to be determined in late 2018. Anticipate starting the trip at the start of the 3rd week in May.

FEE: Estimated at $3,200 each (rafting trip only) for MBGS Members. Each participant will be responsible for round trip air travel (to Page, AZ and return from Las Vegas, NV), lodging, possibly surface travel and food outside of rafting trip.

LEADERS: ***Dr. Katherine McCarville, Pd.D.***, Professor of Geosciences, Upper Iowa University, Fayette, IA

REGISTRATION: A preliminary signup list is now being assembled for those interested in this trip. Email Mark Wollensak at wollensak@voyager.net to get your name on the prelim list. A non-refundable (but transferrable) down payment of $500 will be required at the time our river expedition outfitter sets the firm dates for the trip (late 2018). There is a maximum of 30 participants.

OUTFITTER: **Hatch River Expeditions, Flagstaff, AZ**
www.hatchriverexpeditions.com/grand-canyon-motorized-rafting-expeditions
A 7 day Grand Canyon rafting trip through Hatch includes: 188 miles of rafting from Lee's Ferry to Whitmore Wash, pre-trip stay at Cliff Dwellers Lodge included, Helicopter ride & return flight to Las Vegas or Marble Canyon included. Meals, beverages, camping gear and dry bags are provided by Hatch while on the river.

TRIP BACKGROUND: The Michigan Basin Geological Society (MBGS) is returning to raft the Colorado River through the Grand Canyon in May of 2020. This is a repeat of the 2005 trip taken except this trip will be led by a highly experienced Dr. Kata McCarville, Upper Iowa University. Many repeat stops are anticipated to be visited such as Lava Canyon, Redwall Cavern, Nankoweap Grainery and Havasu Canyon. New stops are also anticipated. The Grand Canyon is the first on the list of the Seven Natural Wonders of the World.

GEOLOGICAL BACKGROUND: The geology of the Grand Canyon area includes one of the most complete and studied sequences of rock on Earth. The nearly 40 major sedimentary rock layers exposed in the Grand Canyon and in the Grand Canyon National Park area range in age from about 200 million to nearly 2 billion years old. Most were deposited in warm, shallow seas and near ancient, long-gone sea shores in western North America. Both marine and terrestrial sediments are represented, including fossilized sand dunes from an extinct desert. There are at least 14 known unconformities in the geologic record found in the Grand Canyon. *Wikipedia*

MICHIGAN BASIN GEOLOGICAL SOCIETY

FIELD EXCURSION SPRING 2020

A GEOLOGICAL EXCURSION BY RAFT ON THE COLORADO RIVER THROUGH THE *GRAND CANYON* - LEE'S FERRY TO WHITMORE WASH PAGE, ARIZONA

PHYSICAL REQUIREMENTS: We anticipate this trip will be challenging for some to adjust to the environmental conditions, including heat, cold, elevation, weather, water and sand. If you have factors that could make a trip more difficult including age, weight, lack of conditioning, and heart or other diseases, consider talking to a doctor before committing.

Here are some minimum requirements you must be able to meet to safely enjoy your journey:

- Able to fit into a Type 5 Life Jacket (max chest size 58");
- Ability to hold onto the raft while going through whitewater. Ropes are provided throughout the raft for hand holds;
- Capable of climbing onto and off of the raft. There will be about a 2 foot step up/down from the raft to the beaches. Please note that some surfaces may be wet and slippery;
- Comfortable walking on uneven, rocky terrain. Trails in Grand Canyon are not regularly maintained. Each day will have up to two hikes. Some hikes will start upstream from where we get picked up at a later time downstream. In these instances, the hike must be completed within the time allotted and returning to the starting point is not possible. Some hikes may be through a stream against moving water. One hike anticipated is approximately 3 miles on rough terrain and within narrow rock canyons. Also sand beaches are the norm for camp sites so make sure you are comfortable walking across the sand inclines;
- Able to carry your own personal gear to and from camp. The maximum weight for personal gear is 25 pounds.

Recommended Pre-Trip Conditioning Activities:

- Find and hike local trails that have elevation gain and loss;
- Use the incline feature on machines at your local gym (or take the stairs wherever you go);
- Walk and hike on uneven terrain to prepare for rocky trails;
- Purchase hiking shoes or cross training shoes and hiking sandals and break in ahead of time to avoid blisters; and
- Get in the habit of drinking water throughout the day – it's good for you every day, but mandatory on the river!

MICHIGAN BASIN GEOLOGICAL SOCIETY

FIELD EXCURSION SPRING 2020

A GEOLOGICAL EXCURSION BY RAFT ON THE COLORADO RIVER THROUGH THE *GRAND CANYON* - LEE'S FERRY TO WHITMORE WASH PAGE, ARIZONA

Biography: Dr. McCarville (Kata) has roots in the midwest but grew up in California. She studied geology at UCLA as an undergraduate, and worked as a uranium miner in Wyoming after graduation. She took a masters degree in geology Colorado School of Mines, working on uranium deposits in the Red Desert basin of Wyoming, and then worked for a number of years in computing and networking at universities and for engineering consulting firms. As a Bush Foundation Leadership Fellow, she did her doctoral work in avian paleontology of Fossil Lake, Oregon, at the South Dakota School of Mines. Her work resulted in an innovative interpretation for the locality.

Kata got started with Grand Canyon geology while working with John Warme on a number of projects. She has led or co-led numerous Grand Canyon geology rafting trips (including the 2005 MBGS trip), and organized and led many other geology field trips. Born at the confluence of the Missouri and Mississippi Rivers, she is a river rat. She's spent time on and along the Colorado, Green, Platte, Snake, Mississippi, and many of Iowa's rivers.

Kata is a member of the faculty at Upper Iowa University in Fayette, Iowa, where she coordinates the Environmental Science degree program. She teaches a wide variety of courses in geosciences and geography, and chairs the Department of STEM. Her interests span the earth and environmental sciences and often cross disciplinary boundaries. Her current research centers on the role of disturbance in prairie ecosystems, and the origins of the Iowan Erosion Surface. She enjoys mentoring students, and has supervised student projects in trumpeter swan restoration, wildland fire education, fish species in Grand Canyon, squirrel nest-tree selection preference, assessment of a local shooting range for lead contamination, and GIS-based studies of the distribution of algific talus slopes that serve as refugia for Pleistocene species, among others.

An advocate for diversity in STEM, Kata serves as UIU Campus Director for the Louis Stokes Alliance for Minority Participation in STEM disciplines, and as Co-Principal Investigator on an NSF-funded project called STEM-Pros: Growing More STEM Professionals in the Heartland.

MICHIGAN BASIN GEOLOGICAL SOCIETY

FIELD EXCURSION SPRING 2020

A GEOLOGICAL EXCURSION BY RAFT ON THE COLORADO RIVER THROUGH THE *GRAND CANYON* - LEE'S FERRY TO WHITMORE WASH PAGE, ARIZONA

PROPOSED ITINERARY:

Day 1: Travel by plane to Page, Arizona (or arrive previous day). Hatch will pickup participants at the Page, AZ airport (or hotel) for transportation to Cliff Dwellers Lodge. We anticipate sightseeing in afternoon which may include Glen Canyon Dam, Navajo Bridge, Marble Canyon, Horsehoe Bend and the Navajo Sandstone. A group dinner in evening at the Cliff Dwellers Lodge. A speaker is being arranged following the dinner.

Day 2: Depart Lodge to Lee's Ferry. Load raft and begin rafting trip on Colorado River in the Grand Canyon. Day 1 on River.

Day 3-8: Days 2 -7 on River. Stops and/or hikes may include Redwall Cavern, Nankoweap Grainery, Carbon Creek/Lava Canyon, Phantom Ranch, Elves Chasm, Havasu Canyon and Lava Falls. Camping will be on sand bars along the river suitable to accommodate 2 rafts of participants. Anticipate one party night "Margarita Night" on the river.

Day 8: Day 7 on River. Arrive at Whitmore Wash for helicopter ride out of canyon to Whitmore Landing. Fly out of Whitmore Landing International Airport for Las Vegas or Marble Canyon. Lodge in Las Vegas or Marble Canyon/Page.

Day 9: Depart for Home.