Michigan Geological Survey Report 17 from the K-12 Outreach Director, Peter Voice July 24, 2015

New Items:

1. May 29th – report 16 reported to the Director of the Michigan Geological Survey.
2. May 27th-29th – received multiple requests from WMU graduate students to help with CoreKids in the Summer and Fall. I have tentatively hired four of the students – Hannah Pankratz, Zaid Naseer Nad Nahim, Jonathan Haynes and Benjamin Hinks.
3. June 1st – Replied to Tom Howe with regard to a request for information to identify a rock sample from photographs – it appeared to be a hemispheroidal stromatolites in cross-section.
4. June 1st – Scheduled CoreKids event – Moorsbridge Elementary School, Portage (Mi Geologic History Module with emphasis on Dunes). 100 students.
5. June 1st – Scheduled CoreKids event – Moorsbridge Elementary School, Portage (Visit to the Van Buren State Park Dunes with class). 100 students.
6. June 4th – renewed memberships in National Association of Geoscience Teachers and National Science Teachers Association
7. June 10th – Scheduled CoreKids event, North Hill Elementary, Rochester, 96 students (Mi Geologic History Module).
8. June 12th – Exchanged emails with Linda Harrison and Breanne Lejeune about CoreKids brochures.
9. June 12th – received very positive feedback from two of the teachers at North Hill Elementary for the prior event.
10. June 15th – worked on scheduling event with Gilden Woods Early Care and Preschool. Event tentatively scheduled for Aug. 15. MGRRE tour with Mi. Geol. History module.
11. June 16th – conducted Rood Museum tour with hands-on activities for the Gilden Woods Early Care Group. 10 students and three adults.
12. June 16th – prepared cover letter for report to John Griffin (Michigan Section, American Petroleum Institute) and sent to him.
13. June 16th – prepared Dept. Newsletter item on Corekids – sent it onto Linda Harrison and Breanne Lejeune.
14. June 16th – exchanged emails and phone calls with Breanne Lejeune on photographing minors policy and possibility of photographing future corekids events.
15. June 23rd – Exchanged emails with Lisa Anderson (Illinois Geological Survey) about session proposals for North-Central GSA annual meeting. Lisa will work on the text of the proposal and submit it as session chair – I will be the co-chair.
16. June 24th – posted email to discussion listserv on sources of geologic information for highschool teachers – discussed surveys and mineral collecting groups. One participant in the conversation, Tammi Phillippe reached out to me to try to donate some of the teaching materials she had gathered over her career to young teachers. I replied and gave her Heather Petcovic's contact

information. Heather responded that she would be able to find homes for the material and would make arrangements with Tammi to get them.

17. June 30th –participated in the Michigan Geological Survey's Energy Policy Forum
    a. Provided opportunities to discuss CoreKids program with other participants
    b. Met briefly with John Griffin (MI Section, American Petroleum Institute) and discussed CoreKids activities and our annual report with him – received very positive feedback!
18. July 6th – exchanged emails and phone calls with Laura Cross, Kalamazoo Air Zoo
    a. Discussed upcoming July 9th event in terms of logistics
    b. Discussed photographing events – she will share the pictures taken at joint events over the past two years with us.
    c. Discussed possibility of meeting with her new boss, Kathleen Larson.
19. July 6th – exchanged emails with Breanne Lejeune about logistics for July 9th event – guest parking passes, reserving classroom space in Rood, discussed photographs.
20. July 6th – worked on scheduling staff for the July 23rd events for the Branch Co. District Library – emailed staff and confirmed event schedule with Linda Dull (Coldwater District Library).
21. July 7th – Lisa Anderson (Illinois Geological Survey Outreach Program) submitted our proposal for the 2016 North-Central GSA meeting. Text of the session proposal:
    a. Geoscience Outreach - 50 Years of Innovation

    The informal GO-MPS group (Geological Outreach at Museums, Parks & Surveys) is again sponsoring a session to highlight innovative engagement methods and projects. Abstracts that focus on changes in geoscience outreach over the last 50 years are of particular interest, but all outreach abstracts are welcome. The goals of this session are to learn more about geoscience outreach in the NC-GSA Section and to provide collaboration opportunities by building a community of outreach providers and those interested in outreach methods.

22. July 8th – exchanged emails with Allison VanDriessche (Western Middle School, Bay City) about possibility of doing a corekids event with her school next school year.
23. July 8th – Exchanged emails with Chris DeWolf (President, Michigan Earth Science Teachers Association) and Norma Bull (Big Rapids Rock and Mineral Club) about the possibility of a Survey/CoreKids presentation on August 6th on Ferris's campus for the club. I have entered it into the schedule.
24. July 8th – received notification from Lisa Appel about the Rouge River Festival for 2015 at Cranbrook. I will start working on registering for the event.
25. July 9th – Scheduled CoreKids Event with Kalamazoo Air Zoo. 25 students and 3 adults. Museum tour at Rood, Mi Geologic History Module with campus rock tour.
26. July 10th – exchanged emails with Allison VanDriessche (Western Middle School, Bay City) about scheduling CoreKids event at her school – tentatively scheduled for the week of Nov. 9. We also discussed Delta College's STEM Outreach program.
27. July 15th – Received notification from MESTA about presenter forms for the 2015 MESTA Annual Meeting. I put together a draft abstract on the hydraulic fracturing model and sent the draft for comment to Heather Petcovic.

28. July 20th – exchanged emails with Zakk Waber who would like to work with CoreKids in the Fall. I set up with Kathy the employment details.
29. July 20th – Heather Petcovic sent me the updated presenter form for the 2015 MESTA Annual Meeting.
30. July 21st – I sent the presenter form to Andrea Williams (President-elect, MESTA).
31. July 21st – Received email from Jay Kim with contact information for Beverly Smith – Covert Public Schools – I have not had the opportunity to reach out to her yet.
32. July 23rd – Scheduled CoreKids Outreach event, Branch Co. District Library System – still waiting on metrics of event.
33. July 23rd – received a box of Michigan Beach Stones pamphlets from John Esch (MI DEQ) – there were several more boxes in the old MGS publications storage that will be procured at a later date.
34. July 23rd – exchanged emails with Kathy Larsen, Kalamazoo Air Zoo about possibility of scheduling meeting next week to discuss collaboration as well as hand-off photos from previous joint events.

Prior Totals (July 1, 2014 to June 30, 2015)

Scheduled School Visits	**2638**
Branch Co. Library System	**234**
U of M Museum of Natural History	**602**
Kalamazoo Air Zoo	**25**
College Groups	**53**
MESTA Conference	**37**
MBGS Sept. 11 meeting	**50**
Cranbrook Institute of Science Rouge River Water Festival	**108**
MMS Annual Show (School Day)	**2454**
MSU National Fossil Day [note waiting on metrics information – value approximate]	**400**
Central Michigan Annual Show	**979**
KGMS Meeting	**43**
WMU Foundation Event Bronson	20
Gull Lake Sparks Series Event [note waiting on metrics information – value approximate]	9000?
Grosse Point North Fossil Day	200

WMU STEM-ulating Career Day	56
Southwood Elementary Science Fair	400
Other	33
DEQ Earth Day	2300
KGMS Annual Show	4,006
Total	**23,638**

Current Totals (July 1, 2015 and on)

Projected Totals of Upcoming Events

Kalamazoo Air Zoo	25
Total Projected:	
Branch Co. Library Program	50
Total Projected + Actual	**75**

a. **Past Outreach Events, July 1st, 2014 to June 30th, 2015**

i. July 3rd – University of Michigan Museum of Natural History Summer Camp
ii. July 8th – Kalamazoo Air Zoo Eco Explorers Camp – on main campus [Michigan Geologic Resources and the Sandbox]
iii. July 9th – Coldwater Branch, Branch Co. District Library [Natural Hazards: Volcanoes Module]
iv. July 10th – Bronson Branch, Branch Co. District Library [Natural Hazards: Volcanoes Module]
v. July 10th Sherwood Branch, Branch Co. District Library [Natural Hazards: Volcanoes Module]
vi. July 11th – Union branch, Branch Co. District Library [Natural Hazards: Earthquakes Module]
vii. July 16th – Kalamazoo Air Zoo Eco Explorers Camp – at Air Zoo
viii. July 17th – Coldwater Branch, Branch Co. District Library [Natural Hazards: Earthquakes Module]
ix. August 6th – Hydrogeology Field Camp MGRRE Tour

x. Aug. 12th- University of Michigan Museum of Natural History Summer Camp
xi. Aug. 14th –Aug. 16th – Michigan Earth Science Teachers Association Annual Meeting
xii. Sept. 11th – M.B.G.S. Monthly meeting at MGRRE.
xiii. Sept. 12th – The Cranbrook Institute of Science Rouge River Water Festival
xiv. Oct. 10-12. Michigan Mineralogical Society Annual Show
xv. Oct. 14: Classroom visit by K.G.M.S. President using CoreKids Core Pumps; Star Elementary School, Plainwell MI
xvi. Oct. 18: MSU/MESTA joint National Fossil Day Event
xvii. Oct. 23. Gobles Elementary School Science/Job Fair
xviii. Oct. 24th – school day visit, Central Michigan 49th annual Rock Show
xix. Nov. 4. K.G.M.S. Club Meeting at MGRRE
xx. Nov. 7th – Friendship Village, Bronson
xxi. Nov. 7-8. Gull Lake Community Schools Foundation – Sparks Series, Science and Engineering Fair.
xxii. Nov. 19: U-M, Museum of Natural History Geology Day
xxiii. Nov. 21st – Grosse Pointe High School Fossil Day
xxiv. Dec. 5th – Greater Heights Academy [MI Geologic History Module]
xxv. Dec. 5th – Southwood Elementary (Kentwood, MI) [MI Geologic History Module with emphasis on Fossils]
xxvi. Dec. 10th – Western Middle School (Fossil Module)
xxvii. Jan. 5th and 6th – Vicksburg Middle School (6th grade -- Fossil Module)
xxviii. Jan. 12th and 16th – Gull Lake Middle School (6-7th grade – Module TBD)
xxix. Jan. 13th and 14th – Vicksburg Middle School (8th grade – Earthquakes Module)
xxx. Jan. 15th – Plainwell Middle School (6th grade – MGRRE tour + modified Michigan Geologic History Module)
xxxi. Jan. 17 – WMU STEM-ulating career day
xxxii. Jan. 21st -- EF Rittmueller Middle School (6th grade – MI Geologic History, 7th grade – Climate Change)
xxxiii. Jan. 28th – Western Middle School (Earthquake Module)
xxxiv. Feb. 3rd – Morley Stanwood Middle School (6th grade – MI Geologic History)
xxxv. Feb. 9th – Walden Green Montessori School (Middle School – MI Geological History)
xxxvi. Feb. 12-13th – Berkshire Middle School
xxxvii. Feb. 12th – STEM Night, Southwood Elementary School
xxxviii. Feb. 19th – Discover Elementary School (Kentwood – MI Geological History Module)
xxxix. Feb. 20th and 27th – Gull Lake Middle School (Earthquakes Module)
xl. March 4th – Washington Writers Academy Family Literacy Night (modified MI Geologic History Module)
xli. March 17th – U-M, Museum of Natural History Geology Day
xlii. March 18th - U-M, Museum of Natural History Geology Day

xliii. March 18th – North Hill Elementary, Rochester, MI (MI Fossils Module)
xliv. March 18th – Mattawan Middle School (modified Michigan Geologic History Module)
xlv. March 23rd and 24th – Western Middle School (Hydrogeology Module)
xlvi. March 24th – Cub Scout Troop (MGRRE tour and Michigan Geologic History Module)
xlvii. Apr. 22nd – DEQ Earth Day Event
xlviii. May 1st -3rd – KGMS Annual Show.
xlix. May 6th – U of M Museum of Natural History (MI Geologic History Module)
l. June 1st and 2nd – Moorsbridge Elementary School (modified Michigan Geologic History.
li. June 10th – North Hill Elementary School, Rochester, MI (MI Geological History Module) – working on rescheduling
lii. June 16th - Gilden Woods Early Care and Preschool; Rood Museum Tour

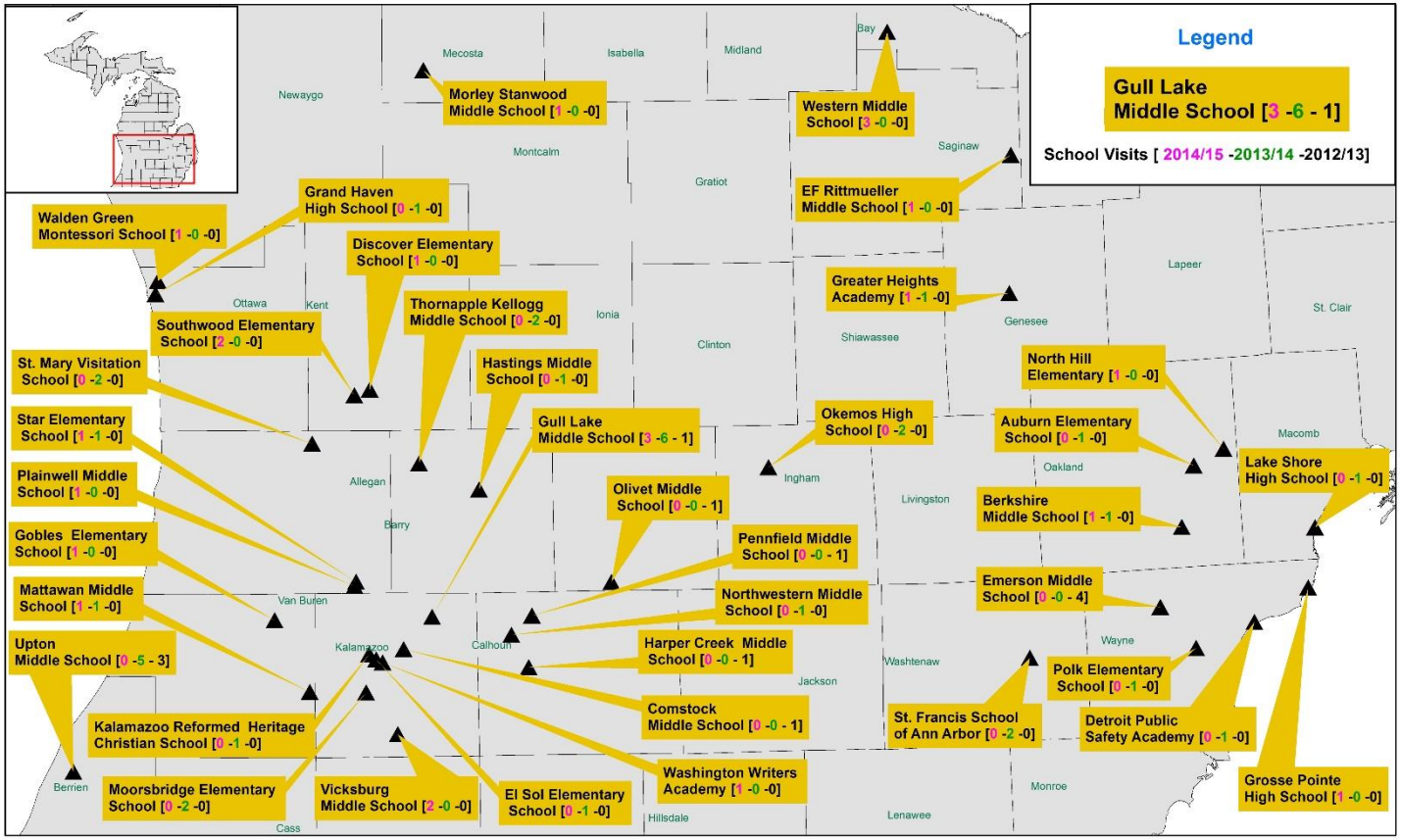
b. Past outreach events July 1, 2015 and on

i. July 9th – Kalamazoo Air Zoo – Campus visit
ii. July 23rd – Branch Co Library events

c. Upcoming Events

i. August 6th – Presentation to the Big Rapids Rocks and Minerals Club
ii. August 17th - Gilden Woods Early Care and Preschool – MGRRE Tour
iii. Week of Nov. 9th – tentatively scheduled Western Middle School visit – Mi Geol. History Module

Distribution of Scheduled School Visits and MGRRE Tours



MESTA ANNUAL CONFERENCE PRESENTER FORM

MESTA 2015 Conference
10/10 (Saturday) Okemos High School, Okemos, MI

***Presenter #1*:**

Name: Peter Voice

Position/Title: Director of K-12 Outreach and Instructor

Home Address: **1102 Mount Royal Dr. 3-B Kalamazoo, MI 49009**

Home Phone: **269-387-8696**

E-Mail Address: **peter.voice@wmich.edu**

School Name & Address: **Michigan Geological Survey/Western Michigan University**

Presenter #2 **(if co-presenting)**

Name: **Heather Petcovic**

Position/Title: **Associate Professor**

Home Address: **5295 Stapleton Drive, Kalamazoo, MI 49009**

Home Phone: **269-277-1021**

E-Mail Address: **heather.petcovic@wmich.edu**

School Name & Address: Mallinson Institute for Science Education and Department of Geosciences, Western Michigan University

PRESENTATION TITLE:
A Demonstration Model of Hydraulic Fracturing: A Hands-on Analog to Fracturing Shale
Presentation Description (please word this as you wish it to appear in the conference program):

The Michigan Geological Survey and the Department of Geosciences at Western Michigan University has developed an analog model for hydraulic fracturing in a vertical well. Hydraulic fracturing has become a contentious socio-scientific issue in the past decade, even though it has been in use as a standard well-completion technique here in Michigan for over 60 years. The development of high-volume hydraulic fracturing and the increase in utilization of hydrocarbons from unconventional reservoirs has made this technique much more common. An inexpensive hands-on model that makes use of everyday materials

was developed to illustrate the process by which hydraulic fracturing is performed. The model serves as one component of a module (Shale Energy and Hydraulic Fracturing) from the WMU CoreKids program and has been used as a K-12 classroom demonstration. It is also used in a lesson on hydraulic fracturing in a college earth science content course for future elementary teachers.

We use an artificial stratigraphy to illustrate the layered nature of sedimentary rocks in a basin similar to the Michigan Basin. The lowermost layers of the model consist of cemented sand and gravel, and the uppermost consist of plastic and foam. A layer of agar gelatin occupies the middle layer of the model. Agar gelatin gels at room temperature and is sufficiently transparent to observe the fractures that develop during the hydraulic fracturing procedure. The non-agar layers are designed to be impermeable, illustrating that the fracturing medium only interacts with the target agar layer. A mixture of glycerin and colored sand is used as an analog to the hydraulic fracturing fluid. Well bores are created using plastic tubing and drinking straws. The glycerin acts as the injectant and carries the proppant (sand) into the agar layer. The hydraulic fracturing fluid is injected under pressure (with a syringe) into a pre-set well-bore into the agar layer. The hydraulic fracturing process develops wing-shaped fractures in the agar. These fractures form this morphology as the well-bore is designed to only allow the hydraulic fracturing fluid out into the agar through a set of vertically aligned perforations in the well casing.

One of the more interesting properties of the agar is that it can be removed from the model. After removal, the students can slice the agar along the fracture planes. The students can observe that the sand (proppant) lines the surface of the fracture. The proppant in current hydraulic fracturing practice is used to hold open the fractures that develop in the shale – otherwise the ductile nature of the shale will act to seal up the generated fractures. In using the mode in the classroom, we have found that children and adult students alike enjoy the (somewhat messy) hands-on aspect and gain an appreciation of the mechanics of hydraulic fracturing.

Appropriate Level(s): (check) Elementary **Middle School X** **High School X**

NGSS Performance Expectation(s): (http://www.nextgenscience.org/search-standards)

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

<u>Audio/Visual Requests:</u> Our resources are limited. If at all possible, please bring your own audio visual equipment (laptop, LCD projector, slide projector, extension cord, or overhead projector). If this is NOT possible, we will try to provide what you request. Check the items you will need.

TV/VCR OVERHEAD PROJECTOR SCREEN SLIDE PROJECTOR

<u>Room Requirements (Check):</u>

Black Out Shades **Demo Table**

Water x **Lab Table for Participants x**

Sinks x **Computer Lab w/ Internet Connection**

Other: _____

Enter any limit to the number of people you can accommodate: _____30_____

Sessions are scheduled to be 60 minutes long. If you would like more than one session, duplicate this form for each session.

If your presentation requires more time, please check here _____ to request a double-block (110 minutes).

Presenters receive complimentary registration for Saturday's classroom sessions + lunch.

Please return this form by August 31st
to current MESTA President Elect

Andrea Williams
5096 Spinning Wheel Drive
Grand Blanc, MI 48439

You may also scan the completed form and send as an email attachment to

andrea.williams@wbsd.org