



***Final Report***

15<sup>th</sup> Annual

Minnesota Minerals Education Workshop

June 19-21, 2012

Winona State University

Winona, MN

Prepared by

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October 23, 2012

## Executive Summary

A record total of 96 participants attended the 15<sup>th</sup> annual Minnesota Minerals Education Workshop (MMEW) held June 19-21, 2012 at Winona State University. Attendees were largely K-12 earth science teachers from throughout Minnesota, but also included college educators, students, and non-teachers. The workshop involved 28 volunteers from various academic institutions, K-12 schools, state agencies, and mining and geo-engineering companies. The first day of the workshop was devoted to participants attending four out of 16 short course offerings on a variety of geologic and mineral resource topics. All participants attended a noon-hour talk by Karl Green of UW Extension in La Crosse on the topic of frac sand mining in western Wisconsin. Teachers were presented with educational resources at the end of the day, which included gifts of a book on fossils, a collection of MN rocks and minerals, and a jump drive loaded with a variety of teacher resources. Most registrants attended a barbeque picnic on the WSU campus and participated in a hike to a nearby overlook of the Mississippi River valley or a visit to the WU flume lab or a night of star-gazing with the WSU telescope.

The second and third days of the workshop were devoted to field trips highlighting the geology and mineral resources of the area around Winona. On Wednesday, two busloads of participants toured Mystery Cave near Forestville as well as sites in SE Minnesota illustrating karst topography, fossiliferous limestone, quartz sandstone formations, and glacial till deposits. On Thursday, sites were visited along the Mississippi River Valley between Trempeleau and Alma, Wisconsin that included overviews of the valley, a lock and dam operation, a coal-fired powerplant, and an aggregate quarry.

Financially and content-wise, the workshop was a great success. The final workshop costs came in over \$2500 under budget. The scholarship offer of free lodging at the WSU dorms was much more popular than we anticipated with 77 teachers accepting the offer. Consequently, the scholarship cost for the dorms (excluding instructors) was \$4410 compared with the initial estimate of \$3200. Feedback received in surveys completed by nearly all participants was again largely favorable and contained many helpful comments and suggestions for improving future workshops.

## Introduction

A list of participants, instructors, volunteers and sponsors is given in Appendix A. The workshop and short course schedule is provided in Appendix B. The information reported in this summary comes largely from responses to surveys given to all participants after each day of the workshop which is compiled in Appendix C. All 96 participants replied to general workshop questions and short course questions. However, only about half of the participants replied to questions about the field trip. This appears to have been due to quick dispersal of the participants at the end of the Thursday field trips, which ran late. The budget for the workshop is summarized in Appendix D.

## Participants

The total of 96 participants set a record for attendance in the 15 year history of the MMEW. The previous record was 83 for the 1999 Duluth workshop. Participants came from throughout the Minnesota, with over 40% of participants driving over 3 hours to attend the meeting. Eight participants came from neighboring states (WI, ND, and IA).

This was the first MMEW meeting for exactly half the participants (48), with many first timers commenting that they will definitely attend future meetings. A total of 36 participants had attended at least three previous MMEW meetings. Four people had attended at least 10 previous workshops!

About 85% of attendees teach in a public or private K-12 classroom with 56% having more than 10 years of experience. Most teach middle school (grades 5-8- 47%) and high school (grades 9-12 -29%). The most common discipline taught is earth science (41%), with a considerable number teaching life science (16%), physical science (12%), or general science (15%).

### Instructors and Volunteers

Twenty eight individuals from academia (19), K-12 schools (3), state agencies (3), and minerals industries (3) volunteered as instructors, field trip leaders, and/or meeting assistants during the workshop (Appendix A). Individuals who should be given particular recognition for their extraordinary efforts in making this workshop a success are:

- Steve Allard (WSU), who served as local chair for the meeting
- Nikki Schossow (WSU), who arranged all the local logistics (bus, food, lodging, ...)
- Marsha Patelke (NRRI/PRC), who worked to pull most of the teacher resources together
- Dean Moosavi (Rochester CC), who coordinated, previewed and edited the guidebook for the field trips
- Sally Frisby (Cotter HS), who played a key role in organizing Thursday field trip stops.
- Julie Ann Heinz (NRRI) who managed the record number of registrations

We thank all the volunteers listed in Appendix A for their time and efforts and their host organizations for allowing their involvement.

### Workshop Planning

Four planning meetings were held at the NRRI between November 2011 and February 2012, with many volunteers phoning in. At the onset, ten subcommittees were established and volunteers recruited to handle the various tasks needed to plan and organize the workshop. These committees and the principal volunteers were:

- 1) Meeting Site Logistics – Steve Allard, Nikki Schossow  
Duties: arrange classroom needs, meals for short course and field trips, busses for field trips
- 2) Registration – Julie Heinz, Marsha Patelke  
Duties: compile registration list, process payment, distribute receipts, create nametags,
- 3) Field Trips – Dean Moosavi, Sally Frisby, Howard Hobbs, Jim Lundy, Julie Bartley, Toby Dogwiller  
Duties: develop trip content and route, prepare brief guidebook, leads trips
- 4) Curriculum – Barb Lusardi , Devon Brecke  
Duties: plan short course schedule, recruit instructors, compile curriculum notebook
- 5) Promotion and Evaluation – Jim Miller, Kent Gordon, Lee Schmitt, Steve Allard

Duties: develop promotional flyer, send out email notices to past participants, MESTA members, and other potential participants; develop workshop and field trip surveys to evaluate effectiveness and solicit feedback

6) Website – Jim Miller

Duties: manage and update MMEW website

7) Teacher Resources –Marsha Patelke, Cheryl Sill, Dennis Martin

Duties: collect min samples, educational material, posters, tote bags, jump drives,

8) Continuing Education Certificate and College Credit – Jim Miller

Duties: arrange for college credits from UMD, grades lesson plans in August

9) Special Events–Steve Allard, Jennifer Anderson, Candace Karies-Beatty, Lee Beatty, Nikki Schossow

Duties: Recruit keynote speaker, organize Tuesday evening activities: picnic, hike, flume lab, and telescope viewing

10) Budgeting – Jim Miller, Steve Allard

Duties: work with registration committee and MCMRE treasurer to estimate workshop costs

### Workshop Venue and Logistics

Holding the 2012 MMEW in Winona was initially discussed by the Vice Chair of Operation, Jim Miller and Prof. Steve Allard of Winona State University in July of 2011, when Dr. Allard visited the Precambrian Field Camp in Ely. Agreement by the WSU geology faculty to host the MMEW came after a visit Jim Miller made to Winona on September 28<sup>th</sup>. He gave a presentation about the history of the MMEW and discussed what hosting the workshop would entail.

A total of eight classrooms were used for the workshop in the geology building (Pasteur Hall) and the adjacent Science Laboratory Center. In addition, the large auditorium in the Science Lab Center was used for the welcoming talk, the noon-hour talk, and the field trip overview presentation. The Science Lab Center Atrium served as the location for the registration table, continental breakfasts, morning and afternoon breaks, lunch buffet, and evening picnic.

Meals provided for the participants included 3 continental breakfasts, 1 lunch buffet, 2 bag lunches, and 1 barbeque picnic. In addition, snacks and refreshments were set out during morning and afternoon breaks. All catering was provided by the WSU food service. Based on the survey (appendix C), the participants were generally pleased with the lunches and dinners, though many complained about the lack of variety for continental breakfasts and breaks and the lack of recyclable dinnerware.

Dorm lodgings provided at the New West Dormitory was a convenient three blocks walk to the workshop classrooms. Based on survey comments, participants were very pleased with the new, clean accommodations. The only complaint about the dorms was that they were too cold. Ironically, the outside weather during the workshop was sunny, humid, and in the 90's.

Transportation for the workshop involved use of WSU vans to transport people to and from the Garvin Heights overlook on Tuesday evening and contracting two coach buses from a local bus company for the two field trip days.

Pre-Workshop Set-up - Monday, June 18

Workshop supplies (hard hats, vests, safety glasses, ...) and teacher resources were packed up at the NRRI on Monday morning into a rental van that was driven down to Winona by Marsha Patelke and Laurie Severson. A group of early arriving volunteers, including Patleke, Severson, Bartley, Brecke, Frisby and Moosavi, and several WSU faculty and students met at WSU in the midafternoon to set out teacher resource materials (handouts, posters, maps, mineral hardness kits, fossil books, jump drives, ...) and to fill the workshop binders with short course handouts. Some instructors arrived later in the afternoon to prepare their classrooms.

Workshop Day 1 - Tuesday, June 19

The first day of the workshop had a full schedule of activities as shown in Appendix B. Participants began gathering at 7:30 AM in the Science Center Atrium, where they picked up their binders, name tags, and took in a continental breakfast. The full day ended with a picnic dinner, a hike up to the Garvin Heights overlook or a visit to the WSU flume lab, and a view of the night sky at the WSU observatory.

After a welcoming and brief overview of the workshop by Steve Allard and Jim Miller in the Science Center auditorium, participants dispersed among four different 75-minute short courses on a variety of geological topics specific to SE Minnesota (Appendix B). After a 15-minute coffee break, a second set of four short course classes on geologic topics were offered. A lunch buffet was served and then participants congregated in the Science Center auditorium to hear a talk by Karl Green (UW-LaCrosse Extension) on the topic of Frac Sand resources and mining in SW Wisconsin. The two afternoon sessions of short courses focused mostly on mineral resources.

For each course, participants were asked in the survey (Appendix C) why they choose the short course topic. They were also asked to rank the degree to which they agree (strongly agree, agree, are neutral, disagree, strongly disagree) with the following statements:

- the course imparted relevant geoscience content
- the course provide content that could be applied to the classroom
- the instructor was prepared, knowledgeable, and engaging

Scoring the degree of agreement on a scale of 4 (strongly agree) to 0 (strongly disagree), a “GPA” score was calculated for each statement for each course (Tables 1-3). Viewed in this way, statements 1 and 2 on relevant content and applicability to the classroom (Tables 1 & 2) averaged B+. Participant’s views on the quality of the instructors (Table 3) averaged a score of A-.

**Table 1. The short course imparted relevant geoscience content.**

	Course A	Course B	Course C	Course D
<b>Session 1</b>	Fossils of the Midwest <i>J. Bartley</i> <b>3.54</b>	Gigapan in the Classroom <i>C. Kairies-Beatty &amp; L. Beatty</i> <b>3.23</b>	Glacial Geology of SE MN <i>Howard Hobbs</i> <b>3.28</b>	Paleozoic Geology of SE MN <i>Jim Miller</i> <b>3.69</b>
<b>Session 2</b>	Dinosaur Trackway <i>Lee Beatty</i> <b>3.45</b>	Impact Rocks in MN <i>J. Anderson &amp; Mark Jirsa</i> <b>3.61</b>	Climate Change <i>Tim McAulay &amp; Valerie Gamble</i> <b>3.53</b>	MN Roadside Geol of SE MN <i>Richard Ojakangas</i> <b>3.41</b>

<b>Session 3</b>	Rock and Mineral ID <i>Jennifer Anderson</i> <b>3.52</b>	Mineral Resource Stewardship <i>Jim Miller</i> <b>3.84</b>	Construction Aggregate <i>Christina Morrison</i> <b>3.00</b>	Groundwater Quality <i>Jim Lundy</i> <b>3.52</b>
<b>Session 4</b>	Mineral Uses <i>Ken Reid</i> <b>3.50</b>	Earth Resource Lesson Sharing <i>Devon Brecke</i> <b>3.50</b>	Mineland Reclamation-S MN <i>Paul Eger</i> <b>3.31</b>	Speleology 101 <i>Greg Brick</i> <b>3.28</b>
<b>Average GPA – 3.45</b>				

**Table 2. The short course provided content that I could apply to my classroom.**

	Course A	Course B	Course C	Course D
<b>Session 1</b>	Fossils of the Midwest <i>J. Bartley</i> <b>3.57</b>	Gigapan in the Classroom <i>C. Kairies-Beatty &amp; L. Beatty</i> <b>3.25</b>	Glacial Geology of SE MN <i>Howard Hobbs</i> <b>2.82</b>	Paleozoic Geology of SE MN <i>Jim Miller</i> <b>3.44</b>
<b>Session 2</b>	Dinosaur Trackway <i>Lee Beatty</i> <b>3.15</b>	Impact Rocks in MN <i>J. Anderson &amp; Mark Jirsa</i> <b>3.39</b>	Climate Change <i>Tim McAulay &amp; Valerie Gamble</i> <b>3.13</b>	MN Roadside Geol of SE MN <i>Richard Ojakangas</i> <b>3.03</b>
<b>Session 3</b>	Rock and Mineral ID <i>Jennifer Anderson</i> <b>3.55</b>	Mineral Resource Stewardship <i>Jim Miller</i> <b>3.89</b>	Construction Aggregate <i>Christina Morrison</i> <b>3.00</b>	Groundwater Quality <i>Jim Lundy</i> <b>3.61</b>
<b>Session 4</b>	Mineral Uses <i>Ken Reid</i> <b>3.43</b>	Earth Resource Lesson Sharing <i>Devon Brecke</i> <b>3.57</b>	Mineland Reclamation-S MN <i>Paul Eger</i> <b>3.23</b>	Speleology 101 <i>Greg Brick</i> <b>2.72</b>
<b>Average GPA = 3.31</b>				

**Table 3. The instructor was prepared, knowledgeable, and engaging.**

	Course A	Course B	Course C	Course D
<b>Session 1</b>	Fossils of the Midwest <i>J. Bartley</i> <b>3.73</b>	Gigapan in the Classroom <i>C. Kairies-Beatty &amp; L. Beatty</i> <b>3.46</b>	Glacial Geology of SE MN <i>Howard Hobbs</i> <b>3.28</b>	Paleozoic Geology of SE MN <i>Jim Miller</i> <b>3.94</b>
<b>Session 2</b>	Dinosaur Trackway <i>Lee Beatty</i> <b>3.75</b>	Impact Rocks in MN <i>J. Anderson &amp; Mark Jirsa</i> <b>3.57</b>	Climate Change <i>Tim McAulay &amp; Valerie Gamble</i> <b>3.27</b>	MN Roadside Geol of SE MN <i>Richard Ojakangas</i> <b>3.67</b>
<b>Session 3</b>	Rock and Mineral ID <i>Jennifer Anderson</i> <b>3.61</b>	Mineral Resource Stewardship <i>Jim Miller</i> <b>4.00</b>	Construction Aggregate <i>Christina Morrison</i> <b>3.14</b>	Groundwater Quality <i>Jim Lundy</i> <b>3.74</b>

<b>Session 4</b>	Mineral Uses <i>Ken Reid</i> <b>3.61</b>	Earth Resource Lesson Sharing <i>Devon Brecke</i> <b>3.53</b>	Mineland Reclamation-S MN <i>Paul Eger</i> <b>3.46</b>	Speleology 101 <i>Greg Brick</i> <b>3.16</b>
<b>Average GPA = 3.56</b>				

Participants were also asked to make general comments on the short courses (Appendix C). These rankings and additional comments have been delivered to the individual instructors, which they can use to improve their presentations should they chose to offer them again.

Following the afternoon short course sessions and a snack break, participants were asked to fill out the first parts of the evaluation surveys and then proceed to the resource room to pick up their teacher resources which could be loaded in MMEW-logoed tote bags. In addition to a variety of posters, fliers and magazines, this year participants were given a 2GB jump drive loaded with various teacher resources and lesson plan ideas. Also distributed were mineral hardness kits donated by the AIPG, a tackle box loaded with 10 common Minnesota rocks and minerals collected by the MNDNR, and a book on fossils. A survey of participants' satisfaction with the resources, filled out the next day, indicated significant approval of the loaded jump drive idea and the tote bags rather than boxes as used in the past. (Appendix C). Participants also provided many other ideas for resources that might be offered in the future.

Participants re-gathered in the Science Center auditorium at 4:30 PM for a logistical overview and a brief Powerpoint presentation introducing the geology to be seen on the upcoming field trips. This presentation and copies of most other Powerpoint shown during the short courses have been posted on the MMEW website. (<http://www.d.umn.edu/prc/MMEW/index.html>)

A majority of the workshop participants attended the evening picnic and special activities (Appendix B). The "hike" to Garvin Heights overlook became a "drive" for most due to the high temperatures and humidity. Survey replies indicate that the participants enjoyed the events though some complained that the evening activities made for too busy of a day.

#### Workshop Day 2 - Wednesday, June 20

The objective of this trip was to visit sites that illustrate the geology of SE Minnesota. The sites visited were located southwest of Winona. The main focus of the trip was a half-day visit to Mystery Cave near Forestville. Because of the large size of the group, the two buses traveled in opposite directions through the stops. The schedule was as follows:

##### **Bus A**

- Mystery Cave (Forestville)
  - Cave Tour
  - Outcrop Examination
  - Disappearing Root River

##### **Lunch (Mystery Cave, Forestville)**

- DNR Display (Fountain)
- Fossil Collecting (Spring Valley)
- Old Gray Till/St. Peter SS (Utica)
- Karst Collapse (Lewiston)

##### **Bus B**

- Karst Collapse (Lewiston)
- Old Gray Till/St. Peter SS (Utica)
- Fossil Collecting (Spring Valley)
- DNR Display (Fountain)

- Mystery Cave (Forestville)
  - Cave Tour
  - Outcrop Examination
  - Disappearing Root River

### Workshop Day 3 - Thursday, June 21

The objectives of this field trip day were to visit coal powerplant, lock and dam, and mineral resource along the Mississippi River between Trempealeau and Alma, Wisconsin, as well as view the landscape development of the valley. The dual field trip schedule was:

#### **Bus A**

Hwy 43 Aggregate Quarry (Winona)  
Dairyland Power Plant (Alma)

#### **Bus B**

Lock and Dam (Trempealeau)  
Perrot State Park (Trempealeau)  
Buena Vista Overlook (Alma)

#### ***Lunch (Buena Vista Park, Alma)***

Buena Vista Overlook (Alma)

Lock and Dam (Trempealeau)

Perrot State Park (Trempealeau)

Dairyland Power Plant (Alma)

Hwy 43 Aggregate Quarry (Winona)

The main complaint of the 2<sup>nd</sup> day field trip was getting back late when many participants had made plans expecting to be back by 3PM, as advertised. Better time management was often noted.

### Continuing Education and College Credits

All workshop attendees were given a certificate of participation, which stated the total contact hours for the workshop - 18. These certificates can be used by teachers to receive continuing education credits for the teaching licenses. In addition, 20 participants signed up for 2 college credits from UMD. To qualify for the credits, teachers were required to develop a lesson plan that links into material that they learned from the workshop. The deadline for submitting the lesson plan was September 7<sup>th</sup>. Over 70% of survey respondents indicated that teachers appreciate the option to acquire college credits for the workshop.

### Budget

Total expenses for the 2012 MMEW (excluding lodging scholarship expenses) were \$18,198, which is approximately \$2500 below anticipated costs (see Appendix D for financial summary). The main savings were realized by lower than much lower than anticipated costs to reimburse instructors for travel expenses. (\$6740 est, \$1290 actual). Many instructors stayed in the dorms at \$19/night and most did not request reimbursement – a testament to the volunteer spirit engendered by this endeavor. The only expenses underestimated were for the need to rent a van to transport material between Duluth and Winona, the greater cost of printing the binder material, and the extra teacher resources purchased.

### Future Workshops

The evaluation survey also asked participants about factors that would affect their attendance at future MMEW meetings. Here are some of the highlights of the survey:

- 1) When asked to identify two important factors in choosing a workshop location, 47% of respondents chose “interesting geology” and 16% chose “involvement of local expertise”. Affordable accommodations were each chosen by 12% of the participants. Local mining activity was chosen by 7% of participants.

- 2) When asked what part of the state to hold a future MMEW, 34% chose Duluth/North Shore, 32% chose SW Minnesota, and 16% chose the Iron Range/northern MN . The Twin Cities and St. Cloud were chosen by 1% and 8%, respectively.
- 3) When asked if late June was an acceptable time for the workshop, 94% of respondents agreed or strongly agreed. Asking to identify the ideal time slot for them, 56% indicated late June and 16% had no preference.
- 4) Over 90% of participants agreed or strongly agreed with statements that a one-day short course and two-day field trip structure to the workshop was.
- 5) 81% of respondents strongly agreed that a \$40 registration fee is reasonable and 70% indicated that their schools did not contribute to the cost of their attendance.
- 6) 65% of respondents strongly agreed or agreed that the offer of free lodging had affected their decision to attend the workshop
- 7) In asking how participants prefer to be notified about the workshop, 75% said email, 13% said being notified by the MN Earth Science Teachers Association listserv. No one preferred to be contacted by normal mail.

### Summary

With the assistance of dedicated and talented group of instructors, field trip leaders and meeting assistants, the 2012MMEW was a success on many levels. Still, thanks to teachers not being shy about voicing their opinions, we learned about many things that we can do better going forward. In no particular order of importance, these include:

- The best presenters were those who did not lecture with only a PPT for the entire time
- Better time management on the field trips
- Do less on the field trips so there is more time to enjoy, explore, and learn
- Allow more time for collecting on the field trips
- Healthier food
- Bring back the Egg Cartons!
- Continue to get funding for housing. Most school districts don't pay for staff development
- No improvement needed – this was the best MMEW ever!

Respectfully submitted,



Jim Miller  
2012 MMEW Chair

### Attachments:

- A. Participants, Instructors and Volunteers
- B. Workshop Schedule
- C. Participant Survey
- D. Financial Summary