



Final Report

16th Annual

Minnesota Minerals Education Workshop

June 18-20, 2013

Hibbing Community College

Hibbing, MN

Prepared by

Jim Miller

University of Minnesota Duluth

2013 MMEW Co-chair

MCMRE Vice-chair for Operations

September 23, 2013

Executive Summary

A total of 74 participants attended the 16th annual Minnesota Minerals Education Workshop (MMEW) held June 18-20, 2013 at Hibbing Community College. This is the sixth highest attendance for the MMEW and is close to the 2011 MMEW held in Eveleth (76). Attendees were largely K-12 earth science teachers from throughout Minnesota, but also included college educators, students, and non-teachers. The workshop involved 23 instructors and volunteers from various academic institutions, K-12 schools, state agencies, and mining, exploration, and geo-engineering companies. An impressive slate of field trip stops were offered thanks to the involvement of 21 staff from local mining companies (Cliffs NR, US Steel, Magnetation, Essar Steel, and Hawkinson Construction), the MN DNR Hibbing office, and UMD's Coleraine Minerals Research Lab.

The first day of the workshop was devoted to participants attending four out of 17 short course offerings on a variety of geologic and mineral resource topics. All participants attended a noon-hour talk by Commissioner Tony Sertich on the history and mission of the Iron Range Resources Rehabilitation Board (IRRRB). Teachers were presented with educational resources at the end of the day, which included gifts of pen magnets, Mesabi Range maps, a collection of MN rocks and minerals, and a jump drive loaded with a variety of teacher resources. Most registrants attended a barbeque picnic at Hill Annex State Park and participated in a fossil hunt in the park.

The second and third days of the workshop were devoted to field trips highlighting the geology and mineral resources of the western Mesabi Range. On Wednesday, two busloads of participants toured UMD's Coleraine Minerals Research Lab, US Steel's KeeTac mine and taconite processing plant, MNDNR's Hibbing Drill Core Library, and Cliff's HibTac mine and reclamation areas. On Thursday, after a morning presentation by young employees of Essar Steel, participants visited the new Essar taconite plant under construction near Naswauk, then toured the new Magnetation operation near Bovey, and finally visited the Hawkinson Aggregate operation near Grand Rapids .

Financially and content-wise, the workshop was again a great success. The final workshop costs came in \$624 under budget. The scholarship offer of discounted lodging at the Hibbing Park Hotel totaled \$1920 and was applied to participants occupying 34 rooms. 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, as is the workshop and short course schedules. 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 B. 58 of the 74 participants replied to general workshop questions and short course questions. The budget for the workshop is summarized in Appendix C.

Participants

The total of 74 participants was the 6th largest attendance in the 16 year history of the MMEW. The other well attended workshops were 2012 in Winona (96), 1999 in Duluth (83), 2006 in Duluth (81), 2000 in St. Cloud (80), and 2011 in Eveleth (76). Participants came from throughout the Minnesota, with

almost 60% of participants driving over 3 hours to attend the meeting. Four participants came from neighboring states (ND and IA).

This was the first MMEW meeting for almost half the participants (45%), with many first timers commenting that they will definitely attend future meetings. A total of 15 participants had attended at least three previous MMEW meetings. One person has attended 14 previous workshops!

About 85% of attendees teach in a public or private K-12 classroom with 35% having more than 10 years of experience. Most teach middle school (grades 5-8- 49%) and high school (grades 9-12 -32%). The most common discipline taught is earth science (44%), with a considerable number teaching life science (19%), physical science (10%), or general science (10%).

Instructors, Volunteers, and Field Trip Leaders

Twenty three individuals from academia (19), K-12 schools (3), state agencies (3), and minerals industries (3) volunteered as instructors, planners, field trip assistants, and/or meeting assistants during the workshop (Appendix A). Over 22 individuals from local industries and state agencies contribute their time to putting together one of the most impressive field trip offerings ever organized by the MMEW (also listed in Appendix A). The individuals who should be given particular recognition for their extraordinary efforts in making this workshop a success are:

- **Marsha Patelke** (NRRI/PRC), who organized teacher resources and arranged catering
- **Julie Ann Heinz** (NRRI) who again managed the registrations and budgets with efficiency and cheerfulness
- **Cynthia Pogorels** (HCC) who help arrange the venue at Hibbing Community College
- **Julie Varichak** (Cliffs) and **Sarrah Mattila** (USS) for coordinating complementary field visits to their respective mining operations (HibTac and KeeTac)
- **Kevin Kangas** (Essar) who had a group of 5 new employees (mostly UMD grads) give an overview talk of the Essar Steel operation that wowed the participants

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

Workshop Planning

Because most of the planning for the workshop was conducted by PRC/NRRI staff, only two planning meetings were held in advance of the workshop – December 11, 2012 and January 8, 2013. 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 – Jim Miller, Marsha Patelke
Duties: arrange classroom needs, meals for short course and field trips, busses for field trips
Visit HCC on Nov. 27th for initial planning
- 2) Registration – Julie Heinz, Marsha Patelke, Jim Miller
Duties: compile registration list, process payment, distribute receipts, create nametags,
- 3) Field Trips – Jim Miller, Julie Varichak and other Range volunteers
Duties: develop trip content and route, prepare brief guidebook, leads trips
Site visit to HibTac and Hawkinson on April 30
Site visit to Magnetation on May 2
Site visit to Essar and KeeTac on May 13

- 4) Curriculum – Barb Lusardi, Jim Miller
Duties: plan short course schedule, recruit instructors, compile curriculum notebook
- 5) Promotion and Evaluation – Jim Miller, Kent Gordon, Lee Schmitt
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, Dennis Martin, Craig Pagel
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, grade lesson plans in September (15 submitted)
- 9) Special Events–Marsha Patelke and Jim Miller
Duties: Recruit keynote speaker (Tony Sertich), organize Tuesday evening activities at Hill-Annex State Park
- 10) Budgeting – Jim Miller, Marsha Patelke, Julie Heinz
Duties: work with registration committee and MCMRE treasurer to estimate workshop costs

Workshop Venue and Logistics

With the general agreement that the 2013 MMEW should be held somewhere in northern Minnesota, the decision was made by the MCMRE board to hold the workshop in Hibbing to highlight the current and new mining activity along the western Mesabi Range. After initial discussions with facilities coordinator, Cynthia Pogorels, of Hibbing Community College in October, Jim Miller and Marsha Patelke made a site visit on November 27th.

A total of six classrooms were used for the workshop classes. In addition, the Theatre in Building F was used for the welcoming talk and the field trip overview presentations. The large Commons area at the college entrance as used for the registration, continental breakfasts, morning and afternoon breaks, lunch buffet and the noon-hour talk by Commissioner Sertich.

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 at HCC was provided by the Hibbing Park Hotel. Catering for the barbeque picnic at Hill Annex was provided by the Sawmill restaurant out of Grand Rapids. Based on the survey (appendix B), the participants were generally pleased with the meals, particularly the “Range Food” offered for the buffet lunch and picnic dinner. Most complaints centered on the lack of healthy options for continental breakfasts and breaks and on the need to be more sensitive to special dietary needs.

The majority of participants stayed at the Hibbing Park Hotel, which is just several blocks from HCC. 34 rooms were occupied that took advantage of the \$20 per night discount provided by scholarship donations from the Iron Mining Association, Mining Minnesota, and the Aggregate and Ready Mix Association of Minnesota.

Transportation for the workshop was provided by Minnesota Coaches. Two 56 passenger coach buses were used for the field trips and a 48 passenger school bus was used for the Tuesday evening visit

to Hill Annex State Park. In addition, a pick-up truck rented from the NRRI was used to convey supplies to the college and to serve as a chase vehicle during the field trips.

Pre-Workshop Set-up - Monday, June 18

Workshop supplies (hard hats, vests, safety glasses, ...), course binders, and teacher resources were packed up at the NRRI on Monday morning into an trailer and pick-up truck that was driven to HCC by Jim Miller and Aubrey Lee. Marsha Patelke, John Heine, Jim Lundy, and Dean Moosavi assisted with the set-up in the mid-afternoon and early evening 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 (Short Courses) - Tuesday, June 19

The first day of the workshop had a full schedule of activities as shown in Appendix A. Participants began gathering at 7:30 AM in the Commons area, where they picked up their binders, name tags, and took in a continental breakfast. After a welcoming and brief overview of the workshop by Jim Miller in the Theatre, participants dispersed among four different 75-minute short courses on a variety of geological topics (Appendix A). After a 15-minute coffee break, a second set of four short course classes on geologic topics were offered. A lunch buffet was served in the Commons. Midway through the lunch, Commissioner Tony Sertich gave a powerpoint presentation entitled “What the heck is an IRRRB”. The talk was very well received with many questions directed to the commissioner. The two afternoon sessions of short courses focused mostly on mineral resources.

For each course, participants were asked in the survey (Appendix B) 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 B+.

Table 1. The short course imparted relevant geoscience content.

	Course A	Course B	Course C	Course D
Session 1	Rock and Mineral ID <i>Rick Ruhanen</i> 3.44	Glacial Geol of Northern MN <i>Mooers & Larson</i> 3.23	Mesabi Range Geology & History <i>Mark Jirsa</i> 3.47	Heavy Equipment Simulator <i>Mary Brandt</i> 3.06
Session 2	Plate Tectonics & the Rock Cycle <i>Jim Miller</i> 3.75	Ground Water Quality <i>Jim Lundy</i> 3.31	National and State Science Standard <i>Dean Moosavi</i> 2.71	Mining-related Careers <i>Mo Benda</i> 3.29

Session 3	Population and Natural Resources <i>Dick Ojakangas</i> 3.06	Duluth Complex Geol/Res/Env <i>Phil Larson</i> 2.92	Taconite Mining Sequence <i>Jeff Price</i> 3.25	Laurentian Vision <i>D. Jordan & J. Plummer</i> 3.00
Session 4	World's Oil and Climate Change <i>Dick Ojakangas</i> 3.08	Successful Non-ferrous Mining <i>Paul Eger</i> 2.90	Aggregate Resources <i>Christina Morrison</i> 3.45	Economics of Mining <i>Rick Sandri</i> 3.17
Average GPA – 3.19				

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

	Course A	Course B	Course C	Course D
Session 1	Rock and Mineral ID <i>Rick Ruhanen</i> 3.31	Glacial Geol of Northern MN <i>Mooers & Larson</i> 2.77	Mesabi Range Geology & History <i>Mark Jirsa</i> 3.00	Heavy Equipment Simulator <i>Mary Brandt</i> 2.78
Session 2	Plate Tectonics & the Rock Cycle <i>Jim Miller</i> 3.64	Ground Water Quality <i>Jim Lundy</i> 3.38	National and State Science Standard <i>Dean Moosavi</i> 2.57	Mining-related Careers <i>Mo Benda</i> 3.14
Session 3	Population and Natural Resources <i>Dick Ojakangas</i> 3.18	Duluth Complex Geol/Res/Env <i>Phil Larson</i> 2.08	Taconite Mining Sequence <i>Jeff Price</i> 2.88	Laurentian Vision <i>D. Jordan & J. Plummer</i> 3.50
Session 4	World's Oil and Climate Change <i>Dick Ojakangas</i> 3.96	Successful Non-ferrous Mining <i>Paul Eger</i> 2.90	Aggregate Resources <i>Christina Morrison</i> 3.55	Economics of Mining <i>Rick Sandri</i> 3.17
Average GPA = 3.11				

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

	Course A	Course B	Course C	Course D
Session 1	Rock and Mineral ID <i>Rick Ruhanen</i> 3.63	Glacial Geol of Northern MN <i>Mooers & Larson</i> 2.82	Mesabi Range Geology & History <i>Mark Jirsa</i> 3.53	Heavy Equipment Simulator <i>Mary Brandt</i> 3.44
Session 2	Plate Tectonics & the Rock Cycle <i>Jim Miller</i> 3.89	Ground Water Quality <i>Jim Lundy</i> 3.46	National and State Science Standard <i>Dean Moosavi</i> 3.29	Mining-related Careers <i>Mo Benda</i> 3.57
Session 3	Population and Natural Resources <i>Dick Ojakangas</i> 3.47	Duluth Complex Geol/Res/Env <i>Phil Larson</i> 2.73	Taconite Mining Sequence <i>Jeff Price</i> 3.38	Laurentian Vision <i>D. Jordan & J. Plummer</i> 4.00
Session 4	World's Oil and Climate Change <i>Dick Ojakangas</i> 3.33	Successful Non-ferrous Mining <i>Paul Eger</i> 3.20	Aggregate Resources <i>Christina Morrison</i> 3.73	Economics of Mining <i>Rick Sandri</i> 3.50
Average GPA = 3.44				

Participants were also asked to make general comments on the short courses (Appendix B). 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 adjacent to the commons area 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 testing kits, mineral hardness kits donated by the AIPG, a tackle box loaded with 10 common Minnesota rocks and minerals collected by the MNDNR, and a pen magnet. A survey of participants' satisfaction with the resources, filled out the next day, indicated significant approval of the distributed resources (Appendix B). Participants also provided many other ideas for resources that might be offered in the future. One suggestion by several participants was to offer MMEW T-shirts.

Participants re-gathered in the Theatre at 4:30 PM for a logistical overview and a brief Powerpoint presentation introducing the geology and mineral resources of the Western Mesabi Range. 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 event at Hill Annex State. Survey replies indicate that the participants overwhelming enjoyed the food and fossil hunt.

Workshop Day 2 (Field Trip 1) - Wednesday, June 19

The objective of this trip was to visit the two major taconite mining operations on the Western Mesabi Range (HibTac and KeeTac) and two state facilities that support and partner with the mining industry (MNDNR Drill Core Library and UMD-NRRI Coleraine Minerals Research Laboratory). The CMRL visit involved a tour of the various laboratories by Dick Kiesel and a ppt overview of current and future research projects being conducted at the lab by Dave Hendrickson. The group next visited US Steel's KeeTac operation with split groups doing a mine pit tour and a plant tour. The tours were expertly guided by John Reed, Tim Kalisich, and Sarrah Mattila. From here, we made a stop at the MNDNR's Drill Core Library where Barry Frey gave an overview of the purpose and content of the library. The day ended with a tour of Cliffs Natural Resources HibTac mine where the geology of the iron formation was described by Jared Lubben and the reclamation activities were highlighted by Julie Lucas. Participant surveys indicate a general enthusiasm for all the field trip stops, especially the KeeTac and HibTac visits.

Workshop Day 3 (Field Trip 2) - Thursday, June 20

The main objective of this day was to visit some new iron ore operations (Essar Steel and Magnetation) and a large aggregate operation (Hawkinson Construction). Prior to leaving for the day, Kevin Kangas of Essar along with five new employees gave an overview of the plans for the Essar Steel plant currently under construction. The new employees (4 of 5 being UMD graduates) gave a great presentation that had the participants buzzing. A driving tour of the new Essar plant was timed well to coincide with a brief rain storm. The tour next visited the new Magnetation plant near Bovey. The tour by plant

manager, Danilo Bibancos, included a visit to the tailings basins, where old tailing are being dredged, and to the brand-new processing plant. The day ended with a tour of Hawkinson Construction's large aggregate pit outside Grand Rapids by Paul and Mark Hawkinson. Special note was made of the fact that some of the property is on school trust land.

Continuing Education and College Credits

All workshop attendees were given a certificate of participation, which stated the total contact hours for the workshop - 24. These certificates can be used by teachers to receive continuing education credits for the teaching licenses. In addition, 15 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 6th and grades were posted on September 9th. Over 70% of survey respondents indicated that teachers appreciate the option to acquire college credits for the workshop.

Budget

Total expenses for the 2013 MMEW (excluding lodging scholarship expenses) were \$19,373, which is \$624 below anticipated costs (see Appendix C for financial summary). Despite greater than expected food costs and unplanned costs for travel to check field trip locations, and overall savings was realized by lower than anticipated costs support vehicles, printing costs, travel reimbursement to instructors. With a commitment by the Iron Mining Association of MN, Mining Minnesota, and Aggregate and Ready-Mix Association of Minnesota to jointly pay for up to \$4000 for lodging scholarship, the total scholarship cost of \$1920 came in well below the estimated maximum. Splitting this cost three ways, each association contributed \$640 for the scholarship.

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, 44% of respondents chose "interesting geology" and 27% chose "involvement of local expertise". Affordable accommodations and local mining activity were each chosen by 9% of participants.
- 2) When asked what part of the state to hold a future MMEW, the top choice was SW Minnesota (21%), followed by Duluth/North Shore (17%), the Iron Range/northern MN (13%), and St. Cloud (13%).
- 3) 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.
- 4) 63% of respondents strongly agreed that a \$40 registration fee is reasonable and 73% indicated that their schools did not contribute to the cost of their attendance.
- 5) 56% of respondents strongly agreed or agreed that the offer of discounted lodging affected their decision to attend the workshop
- 6) In asking how participants prefer to be notified about the workshop, 80% said email, 11% said the MMEW website, and 9% said being notified by the MN Earth Science Teachers Association listserve. No one preferred to be contacted by normal mail.

Summary

With the assistance of dedicated and talented group of instructors, local field trip leaders and meeting volunteer, the 2013 MMEW was a success on many levels. Still, thanks again 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:

- Would have been nice to have a bit more info and activities which could be applicable and able to be implemented in a classroom
- I liked the short courses, but they weren't as good as the previous years. I look forward to this and appreciate these 3 days
- Love the MMEW! One of the best courses I've taken in the summer!
- I would have enjoyed a little more "raw geology" - a stop at some glacial features, rock outcrops, etc... for about 1/4 of the field day -
- Loved the variety of traditional dishes reflecting the local cultures. Nice touch!
- Could have a bit more healthy options. Perhaps more fruit.
- Like the combination of classroom + field trips - very pleased with # of locations visited + background covered on field trips
- Format is fantastic!

Respectfully submitted,



Jim Miller
2013 MMEW Chair

Appendices:

- A. Schedule, Participants, Instructors, Volunteers, Field Trip Leaders, Sponsors
- B. Participant Survey
- C. Financial Summary