



# Great Lakes Maritime Education Program for K-12 Teachers, Year 2

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16. Abstract Michigan Technological University has led an educational/outreach effort for the Great Lake Maritime Research Institute since 2006. Despite Michigan Tech's relative isolation and long distance from most locations in the Great Lakes Basin, every state in the Basin has been touched with some aspect of the outreach program.  The overall goal of the project is to increase K-12 teachers' understanding of shipping on the Great Lakes, and increase their ability to teach their students about Great Lakes Maritime Transportation in the core subjects of science, math, language arts, and social studies.			
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## **Great Lakes Maritime Education for K-12 Teachers, Year 2**

**Project period: 10/01/10 to 9/30/12**

**Final Report to Center for Freight Infrastructure Research & Education (CFIRE) at the University of Wisconsin Madison**

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### **Executive Summary**

The Center for Science & Environmental Outreach at Michigan Technological University (MTU) partnered with the Center for Freight & Infrastructure Research and Education (CFIRE) at the University of Wisconsin-Madison (<http://cfire.wistrans.org>) and the Great Lakes Maritime Research Institute ([www.glmri.org](http://www.glmri.org)) to conduct this project. The Center conducted two summer teacher institutes: *Great Lakes Maritime Transportation* from June 20-24, 2011 in Door County, WI and *Teaching Mathematics Through Navigation* from June 27-July 1, 2011 at Michigan Technological University in Houghton, MI. The summer institutes were attended by teachers from Michigan, Wisconsin, Ohio, and Maryland. Teachers earned two graduate credits for each of the summer institutes that included developing two lessons. In addition, the Center conducted a one-day teacher workshop in November 2010 at the Great Lakes Shipwreck Historical Museum & Lighthouse at Whitefish Point near Paradise, MI. Teachers earned one credit for completing the course requirements of the workshop and developing one lesson. A total of forty-eight new lessons have been created and are posted online. Teachers attending the two summer institutes estimate that they will teach 1400 students and 500 students, respectively, about Great Lakes maritime transportation and navigation this school year. Eight more Great Lakes maritime transportation education teaching chests were assembled and distributed to education/outreach schools, museum, and institutions in the Great Lakes region (bringing the total of chests distributed in all five Great Lake watersheds to 44 chests). Two \$100 presentation stipends were given to teachers who presented their maritime lessons at conferences in February and March 2012. The Great Lakes Maritime Transportation website was regularly updated with lessons ([http://wupcenter.mtu.edu/education/great\\_lakes\\_maritime/index.htm](http://wupcenter.mtu.edu/education/great_lakes_maritime/index.htm)). In addition, the Center disseminated a total of \$7500 in participant support stipends (up to \$500 each) to fifteen teachers attending the 2012 Great Lakes Maritime Transportation Teacher Institute that took place July 16-20, 2012 in the Eastern Upper Peninsula of Michigan. Special emphasis was placed on recruiting teachers from urban and under-represented populations.

**Project Objectives were to:**

1. Conduct a *Great Lakes Maritime Transportation Summer Teacher Institute* in Door County in summer 2011.
2. Conduct a *Teaching Mathematics & Navigation Summer Teacher Institute* at Michigan Technological University in summer 2011.
3. Provide two \$100 stipends to past participants to present at state conferences.
4. Regularly update *Great Lakes Maritime Transportation Education* website.
5. Assemble and disseminate EIGHT *Great Lakes Maritime Transportation Education* teaching chests to museums and education centers in the Great Lakes region. EIGHT chests assembled.

### **Additional \$7500 funding (August 2012)**

6. Distribute up to \$500 each to 15 teacher participants (total \$7500) for the 2012 Great Lakes Maritime Transportation Teacher Institute from July 16-20, 2012 in Michigan's Eastern Upper Peninsula, with special emphasis on recruiting teachers from urban and under-represented populations.

### **Introduction**

Few K-12 students or the public have a well developed understanding of maritime transportation on the Great Lakes. This lack of familiarity translates directly into a high demand for mariners. The maritime administration says about 10,000 replacements are needed in the graying officer corps, and a U.S. Coast Guard study predicts shipping trade will double or triple by 2020.

*(Shipping Industry Runs Short of Young Mariners... What to Do?*

<http://www.thinkmaritime.com/2009/02/24/shipping-industry-runs-short-of-young-mariners-what-to-do/> )

This project is designed to raise public awareness of the role that the maritime transportation plays in our lives, economy, harbor and community development, and the current challenges the maritime industry faces, including prevention of the spread of invasive species, dredging for harbor and channel maintenance, and/or impacts of climate change, in addition to the growing opportunity for maritime careers.

To meet this need for greater maritime knowledge and awareness, the investigator conducts summer teacher institutes, facilitates the creation of lessons accessible online by K-12 educators throughout the Great Lakes region and nationwide, and assembles and disseminates maritime education chests full of resources to support formal and informal education programs throughout the Great Lakes region.

### **Report**

This project is designed to address the lack of awareness and knowledge the general public has about the maritime industry, although there are many who enjoy "ship watching." To reach out to a varied audience, we have identified a number of programs and products that would reach a wide range of ages most efficiently across the Great Lakes region, using a variety of learning styles. Programs were successful and well received.

The *Great Lakes Maritime Transportation Teacher Institute* was conducted in Door County, WI from June 20-24, 2011 with 19 participants. The *Teaching Mathematics Through Navigation Teacher Institute* was conducted at Michigan Technological University from June 27-July 1, 2011 for eleven participants. One 2-day lesson-writing workshop on Great Lakes Maritime Transportation was held Nov. 5-6, 2010 at the Great Lakes Shipwreck Historical Museum & Lighthouse at Whitefish Point, MI. Two one-day workshops planned for Sturgeon Bay on Dec. 4, 2010 and at the Dossin Great Lakes Museum on Belle Isle in Detroit, MI on June 20, 2011 were cancelled due to lack of registrations. The *Great Lakes Maritime Transportation Teacher Institute & Teaching Mathematics Through Navigation Teacher Institute* agendas and evaluation summaries are in Appendix A & B.

Eight Great Lakes Maritime Education Chests were assembled and distributed to:

- Belle Isle Nature Zoo in Detroit, MI
- Dossin Maritime Museum in Detroit, MI
- Armitage Academy in Kenosha, WI
- Case Western Reserve University in Cleveland, OH
- Cuyahoga County Public Library, Parma-South Branch in Parma, OH
- Port of Milwaukee
- Dept. of Geological & Biological Sciences, Cleveland State University

Great Lakes Maritime Education Chest recipients were asked to complete a user survey on Survey Monkey to evaluate the chest contents, ranking the items of most educational benefit and programmatic usefulness. There was a 60% response rate. The most useful items in the chest are the Great Lakes floor map, ship cargo samples, NOAA #14500 map of the Great Lakes Waterway, children's literature, brochures from the Lake Carriers' Association, and the Great Lakes Environmental Atlas. The recommendations included providing a guide to show how to use various contents of the chest, presenting the chest at more science and social studies conferences so more educators learn about it, presenting it to pre-service teachers who will be more likely to incorporate into classroom science and social studies curricula in the future, better inform teachers of the location of the chests throughout the Great Lakes region, and create a website clearinghouse with links to webcams and maps that report ship positions, buoy data, etc., webquests that students could complete, etc.

## Dissemination of Study Results

### (1) Publications

Chadde, Joan. *Teachers Explore Great Lakes Maritime Transportations*. Summer 2011. Seaway Compass. <http://www.seaway.dot.gov/eCompass/Summer2011.pdf>

### (2) Conference Presentations

Chadde, Joan. *Status Report on Great Lakes Maritime Transportation Education Program*. Great Lakes Maritime Research Institute Annual Meeting. Sept. 23, 2011. Duluth, MN.

Daenzer, Tammy. *Introduction to Great Lakes Maritime Transportation at Michigan Science Teachers Association Annual Conference*. Lansing, MI. March 7-8, 2012.

Lindstrom, Laurie. *Nautical Archaeology – Mapping Using Trilateration & Triangulation Math in Action Conference: Strategies for Student Success*. Grand Valley State University Department of Mathematics & Regional Math Science Center. February 25, 2012

### (3) Use of material in classrooms

Teachers attending the summer teacher institutes were asked to quantify the number of students that they are likely to reach each year with their new lessons.

#### **2011 Great Lakes Maritime Transportation Teacher Institute = 19 teacher participants**

Number of Students	Response %	Response Count
15-25 students	17.6%	3 = 75
26-50 students	29.4%	7 = 350
51-75 students	17.6%	3 = 225
76-100 students	11.7%	2 = 200
101-125 students	11.7%	2 = 250
126-150 students	11.7%	2 = 300

**Total Number of Students Reached per Year: 1400 students**

#### **2011 Teaching Mathematics Through Navigation = 11 teacher participants**

Number of Students	Response %	Response Count
15-25 students	45.5%	5 = 125
26-50 students	45.5%	5 = 250
51-75 (3 classes)	0.0%	0
76-100 (4 classes)	0.0%	0
101-125 (5 classes)	9.1%	1 = 125.

**Total Number of Students Reached per Year: 500 students.**

**2012 Great Lakes Maritime Transportation Teacher Institute = 19 teacher participants**

Number of Students	Response %	Response Count
15-25 students	17.6%	3 = 75
26-50 students	35.34%	6 = 300
51-75 students	5.9.6%	1 = 75
76-100 students	0	0
101-125 students	17.6%	3 =300
>125 students	17.6%	3 =400

**Total Number of Students Reached per Year: 1150 students**

**Lesson plans developed by teachers participating in the November 2010 Great Lakes Maritime Transportation Workshop at the Great Lakes Shipwreck Historical Society Museum & Lighthouse at Whitefish Point and posted online.**

**ELEMENTARY**

1. *BIF\*'s Journey to Dearborn*, by Candace Kawatsu  
Grade 3 Social Studies (\*Banded Iron Formation)
2. *Oh Christmas Tree Ship, Oh Christmas Tree Ship* by Gary Lindstrom  
Grade 4: English Language Arts

**MIDDLE SCHOOL**

1. **Learn About the Great Lakes for Goodness Sakes** by Pamela J. Skokan,  
Grades 4 – 8, Social Studies and/or English Language Arts
2. *A Historical Look At Lifesaving As A Career* by Jody Lehman  
Grade 8, Careers Curriculum
3. *Shipwreck Sleuths: Becoming Marine Archaeologists* by Valerie Martin  
Grades 5-7: Science and Social Science
4. *What's So Great About The Great Lakes?* by Kathy Keeney  
Grades 6 – 8, Earth Science, Math, Geography, Language Art

**HIGH SCHOOL**

1. *Nautical Archeology – Mapping Using Trilateration & Triangulation* by Laurie Lindstrom,  
Geometry
2. *Surface Area of Lake Superior and Impact of Water Level on Shipping Income*  
By Donald E Hill, Algebra, Geometry, Advanced Algebra

**Lesson plans developed by teachers participating in the  
2011 Great Lakes Maritime Transportation Summer Teacher Institute and posted online.**

### **ELEMENTARY**

- 1. Pen Pals with a Great Lakes Ship**, by Lynn Maki  
1<sup>st</sup> Grade, Social Studies and Language Arts
- 2. Aquatic Invasive Species and Their Control**, by Patti Thunell  
2nd Grade, Language Arts, Social Studies and Science
- 3. Let There Be Light**, by Beth Messman  
3<sup>rd</sup> & 4<sup>th</sup> Grade, Social Studies, Art & Language Arts
- 4. Vanish Into Thin Air**, by Beth Messman  
3<sup>rd</sup> & 4<sup>th</sup> Grade, Social Studies and Language Arts
- 5. The Rouse Simmons: The Christmas Tree Ship**, by Patti Thunell  
3<sup>rd</sup> Grade, Language Arts and Social Studies
- 6. Michigan Shipping and Products**, by Sandra Carey  
3<sup>rd</sup>-4<sup>th</sup> Grade, Integrated Classroom
- 7. Most Wanted!** by Angela Adams  
5<sup>th</sup> Grade, Science and Writing
- 8. The Mighty Workhorse**, by Angela Adams  
5<sup>th</sup> Grade, Writing and Social Studies

### **MIDDLE SCHOOL**

- 1. How Low Can They Go?**, by Amy Gustafson  
7<sup>th</sup> Grade, Science and Math
- 2. Predicting Future Trends in Great Lakes Shipping Using Representations of Data**  
by Laura Scribner, 7<sup>th</sup>/8<sup>th</sup> Grade, Math
- 3. How Fast, How Far?** by Dennis Simi  
8<sup>th</sup> Grade, Math
- 4. Where Are We Now?** by Dennis Simi  
8<sup>th</sup> Grade, Math
- 5. Introduction to Great Lakes Maritime Transportation** by Tammy Daenzer  
8<sup>th</sup> Grade, Science
- 6. Threats to the Great Lakes** by Tammy Daenzer  
8<sup>th</sup> Grade, Science

### **HIGH SCHOOL**

- 1. The Great Lakes St. Lawrence Seaway System** by David Rowe  
8-12 Grade, Science and Social Studies
- 2. Friend or Foe?**, by Amy Gustafson  
10<sup>th</sup> Grade, Biology
- 3. Quagga Quandary** by Deb Del Zoppo  
10<sup>th</sup> Grade, Biology
- 4. Hydrilla/Godzilla** by Deb Del Zoppo  
10<sup>th</sup> Grade, Biology
- 5. Invasive Species** by Troy Averill  
9-12 Grade, Math
- 6. Calculating Ballast** by Troy Averill, 9-12 Grade, Math



**Lesson plans developed by teachers participating in  
2011 Teaching Mathematics Through Navigation Teacher Institute and posted online.**

### **ELEMENTARY**

- 1. Marine Navigation Using a Compass Rose**, by Julie E. Junttila  
4<sup>th</sup> Grade, Social Studies and Math
- 2. The Route of the Edmund Fitzgerald**, by Julie E. Junttila  
4<sup>th</sup> Grade, Social Studies and Math
- 3. Learning Directions and Degrees of Movement** by Jeff Adamick  
5<sup>th</sup> Grade, Special Education Math

### **MIDDLE SCHOOL**

- 8. Learning Directions and Degrees of Movement** by Jeff Adamick  
6<sup>th</sup> Grade, Special Education Math

### **HIGH SCHOOL**

- 1. Using Vectors to Navigate (Day One)**, by Randall L. Elenbaas  
9-12 Grade, Geometry or Algebra 2
- 2. Using Vectors to Navigate (Day Two)**, by Randall L. Elenbaas  
9-12 Grade, Geometry or Algebra 2
- 3. Plotting a Course through the School**, by Randall L. Elenbaas  
11<sup>th</sup> grade Trigonometry
- 4. Finding Locations on a Chart with Polar Coordinate**, by Randall L. Elenbaas  
11<sup>th</sup> grade Trigonometry
- 5. Getting Your Fix: How to Determine One's Location Using Lines of Position**,  
by Serena Gay, 9-12 Grade, Geometry
- 6. Plotting and Adjusting Your Course: Using Vectors and Trigonometry in Navigation**,  
by Serena Gay, 9-12 Grade, Precalculus
- 7. Oblique Triangles**, by Nathaniel Heralde  
9-12 Grade, Geometry
- 8. Right Triangles**, by Nathaniel Heralde  
9-12 Grade, Geometry
- 9. Lines of Latitude and Longitude**, by Keith Johnson  
9-12 Grade, Math
- 10. Plotting Points in Baltimore Harbor**, by Fiel Angela Hose  
9-12 Grade, Math
- 11. Convert Decimal Degrees into Degrees, Minutes, Seconds**, by Fiel Angela Hose  
9-12 Grade, Math
- 12. Vector Resolution**, by Robert Madigan  
11-12 Grade, Physics
- 13. Dimensional Analysis**, by Robert Madigan  
11-12 Grade, Physics
- 14. Correcting for Magnetic Variation**, by Kevin Murphy, 11-12 Grade, Physics
- 15. Average Velocity and Speed on a Boat Trip**, by Kevin Murphy, 11-12 Grade, Physics
- 16. Calculating Time When Travelling by Water**, by Tiffany Scullion  
9-12 Grade, Introduction to Algebra
- 17. Wave Speed and Wind Height on Lake Superior**, by Tiffany Scullion  
9-12 Grade, Introduction to Algebra

**2012 Great Lakes Maritime Transportation Lessons**  
developed by 2012 Great Lakes Maritime Transportation Summer Teacher Institute Participants

**ELEMENTARY**

- 1. Aggregate Activities!** by Heather Keckes  
1<sup>st</sup> Grade, Science

**Lesson Overview**

We will explore the connections between mining aggregate materials and their uses and properties through hands on activities. We will identify specific properties of different rock particles and classify them into certain categories. We will also discuss the importance of mining earth materials, as well as how their properties aid in the use of each of these natural resources.

- 2. Great Lakes Geography,** by Lydia Pakenas  
Kindergarten, Social Studies & Language Arts

**Lesson Overview**

The lesson is intended to introduce kindergarten students to the location of the Great Lakes in context to where they live. Most live only miles away from the Detroit River. I want to use these lessons to build background knowledge of the many resources the Great Lakes offer.

- 3. Vessels on the Great Lakes,** by Lydia Pakenas  
Kindergarten, Social Studies & Language Arts

**Lesson Overview**

The lesson is intended to introduce kindergarten students to the location of the Great Lakes in context to where they live. Most live only miles away from the Detroit River. I want to use these lessons to build background knowledge of the many resources the Great Lakes offer.

- 4. Comparing Two Towns,** by Donna Vincent  
2<sup>nd</sup> grade, Social Studies & Geography

**Lesson Overview**

The Overall theme/topic to be addressed is comparing the theme of place between two local communities by constructing maps and using critical thinking skills to see if it's possible for locks to be built at Tahquamenon Falls. This lesson plan connects to the curriculum at my school by dealing with local history of Newberry, MI and Sault Ste. Marie, MI and constructing maps. With this lesson I hope to accomplish the student using map symbols and legends correctly to an authentic learning experience.

- 5. Investigating the Relationship of Mass to Volume,** by Juanita Richardson  
3<sup>rd</sup> grade, Physical Science, Economics

**Lesson Overview**

Two materials can have the same mass and yet have different volumes.  
Science progresses by asking meaningful questions and conducting careful investigations.  
Scientists share their findings with other scientists to create a shared body of knowledge.

**6. Ships and Shipping**, by Juanita Richardson  
3<sup>rd</sup>-8<sup>th</sup> grades, Social Studies: Economy & Geography

**Lesson Overview**

Students will gain knowledge of the shipping industry using resources from the *Know Your Ships* guide and <http://www.boatnerd.com> website to locate freighters on the Great Lakes, know where they are going to and where they came from, and what cargo they are carrying, as well as the history of that ship.

**7-9. Great Lakes Cause & Effect: The Eastland v. The Tug Sport v. The Arthur J.**  
by Mary Lund, 5<sup>th</sup> grade, Social Studies

**Lesson Overview**

Students will examine cause and effect relationships related to the sinking of the Eastland, the Tug Sport and the Arthur J. Students will examine YouTube videos, historical publications, current newspaper articles, etc. as to clue words and phrases that identify the cause and effect of each of the three incidents. Students will create a triple Venn Diagram comparing the similarities and differences of the three incidents and briefly summarize their opinion as to the cause and effect of each incident.

**MIDDLE SCHOOL**

**1. The Physical Features of Canada** by Jonathan Hill  
7<sup>th</sup> Grade, Geography

**Lesson Overview**

Students will use a map of the Great Lakes basin, a textbook resource, and the teacher to locate the different physical features and natural resources found in Canada

**2. The Economy of the St. Lawrence Seaway**, by Jonathan Hill  
7<sup>th</sup> Grade, Geography

**Lesson Overview**

Students will use a map of the Great Lakes basin to make connections between resources and movement of goods. Students will discover the ways in which the Great Lakes affect the economy of Canada.

**3. Model Lock System**, by Barbara L. Maxwell  
Middle School Science or Social Studies

**Lesson Overview**

Students will construct a working lock system and successfully float a marshmallow “boat” through its opening.

**4. Great Lakes Graphing** by Chris Geerer  
6<sup>th</sup> Grade Science

**Lesson Overview:**

This lesson is on graphing skills, but starts with some Great Lakes shipping background to build interest and to lead into a barge building activity for the following week.

**5. Great Lakes Barge-Building** by Chris Geerer  
6<sup>th</sup> Grade Science

**Lesson Overview:**

Students are engaged in the engineering design processes through the design and construction of a Great Lakes barge using a 15 cm<sup>2</sup>.piece of foil. Students will measure the mass and volume of the barge and calculate its density with and without marbles (cargo). Great Lakes shipping is a springboard for both local content (Great Lakes literacy) and skills instruction (data analysis and engineering) is a win-win situation.

**6 & 7. Great Lakes Shipping Across The Country & Around The World and Great Lakes Floor Map** by Laura Mikesell, 6-8 grade, Earth Science

**Lesson Overview:**

This is a two-part, 2-day lesson. On Day 1, students utilize the Great Lakes Maritime Interactive Web Module independently on the computer. On Day 2, students work with the teacher and use the Great Lakes floor map to examine maritime shipping--- how/why it relates to them and the types of ships and goods that travel upbound and downbound on the Great Lakes. Students will demonstrate with hands-on authentic assessment their ability to interpret diagrams and data tables on shipping and receiving of goods on the Great Lakes.

**HIGH SCHOOL**

**1. Invasive Species**, by Barbara L. Maxwell  
9<sup>th</sup> – 12<sup>th</sup> Grade, Biology

**Lesson Overview**

Students will collect Zebra Mussels from a nearby lake and experiment with a variety of substances to kill them without harming indigenous wildlife.

**2. Ballast for Balance**, by Mike Clifford  
11<sup>th</sup> & 12<sup>th</sup> grade, Physics or Physical Science

**Lesson Overview**

Students will review the concept of momentum and assess the value of Great Lakes shipping for moving freight. The lesson will begin with problems focused on moment of inertia that lead into the lesson’s focus on *center of gravity* introduced with a demonstration and short PowerPoint.

Through class discussion of the demonstration students will be encouraged to come up with the solution of ballast tanks to stabilize a boat. The lesson will close with a discussion of *invasive species* in ballast water.

3. **Energy Into Steel**, by Michael Clifford  
11<sup>th</sup> & 12<sup>th</sup> grade, Physics or Physical Science

#### **Lesson Overview**

This lesson will take students through the energy transfers that take place during the production of steel. Students will do calculations of energy transfers and compare how much energy recycling steel can save. Energy transformation is an important concept. This lesson will also involve heat, temperature and efficiency. Energy calculations and transformation will be reviewed during this lesson while also informing students about steel production and the importance of recycling.

4. **Great Lakes Natural Resources**, by Robert Ziegler  
9<sup>th</sup> – 12<sup>th</sup>, Ecology & Language Arts

#### **Lesson Overview**

Students prepare reports on natural resources found in the Great Lakes region and their distribution via the Great Lakes. Reports should include information on the direct impact of the removal of these natural resources on the environment as well as the indirect effects that may involve other components of the ecosystem. Students will choose a specific natural resource to research.

5. **Invasive Species: Another Form of Environmental Pollution**, by Robert Ziegler  
9<sup>th</sup> – 12<sup>th</sup> Ecology

#### **Lesson Overview**

Students will research invasive species in the Great Lakes and prepare reports that will be presented to classmates for discussion.

6. **Soo Locks Exploration: The Place Where Michigan was Born**, by Dr. Delbur Reese  
10<sup>th</sup> – 12<sup>th</sup>, Life Science/Social Studies (Special Needs Students)

#### **Lesson Overview**

Students will explore the Soo Locks' colorful history that includes the early native Ojibway Indian residents of the area, via a scavenger hunt titled Locks Quest that challenges students to find the answers to 26 questions about the Soo Locks.

7. **Great Lakes Shipping Routes**, by Dr. Delbur Reese  
10<sup>th</sup> – 12<sup>th</sup>, Life/Earth Science (Special Needs Students)

**Lesson Overview:** This lesson will address the Great Lakes ecosystems, natural resources, water cycles, weather patterns, and the three states of matter in which water on Earth can be found. Students will name the Great Lakes, identify locations of major ports; and examine how human interactions affect the natural resources of the Great Lakes.

8. **Time, Speed, Distance and Great Lakes Freighters** by Deb Del Zoppo  
9<sup>th</sup> grade, Physical Science

**Lesson Overview:**

Students will calculate time, distance, and speed and explain how they relate to one another, and use these to estimate the arrival time into the Ludington Harbor of approaching freighters.

9. **Introduction To Great Lakes Ecology: Where In The World Are We?** by Deb Del Zoppo  
10<sup>th</sup> Grade Biology

**Lesson Overview**

Students will identify the location of each of the five Great Lakes, some notable geological feature of each Lake, and the states surrounding the Great Lakes, plus Canada. Students will explain how the Lakes are interconnected, with flow from one affecting another, and how they act as thermal regulators.

## **APPENDIX A**

A-1

**AGENDA**

**Great Lakes Maritime Transportation Institute  
~ June 20-24, 2011 in Door County, WI**

**Monday, June 20 – Green Bay, WI**

- 9:00 am Course Overview & Introductions  
9:30 Overview of Great Lakes Intermodal Transportation by Carol Wolosz, Exec. Director, Great Lakes Maritime Research Institute (GLMRI)  
10:30 Overview of Port of Green Bay by Chuck Larscheid, Director, Brown Co. Port & Sewerage Authority  
12:15 pm Benefit/Cost Analysis of Transportation Choices by Dr. Teresa Adams, CFIRE  
2:00 Tour NOAA Green Bay Weather Station (Teri Egger, meteorologist).  
3:15 Neville Public Museum tour: *On The Edge of the Inland Sea* exhibits  
4:00 Hands-On Mapping Old Green Bay Activity with Matt Welter, Neville Museum

**Tuesday, June 21 – Manitowoc, WI**

- 9:30 am Wisconsin shipbuilding history, tour exhibits; boat-building activity  
10:30 K-12 Lessons – Wendy Lutzke, educator, Wisconsin Maritime Museum  
Noon Tour of *SS Badger* (car ferry from Ludington, MI)  
1:30 pm Aquatic Invasive Species & Ballast Water Management by Susan Sylvester, WI DNR  
2:30-4:30 Invasive Species Curriculum – Wendy Lutzke  
5:00-6:00 Working Aboard Ship by Rick Brown, Mariner, Maritime Academy of Toledo

**Wednesday, June 22 – Sturgeon Bay, WI**

- 8:30 am Sturgeon Bay Coast Guard Station tour with Wayne J. Spritka, Station Master  
11:00 Shipping: Then & Now - Rick Brown, Maritime Academy of Toledo  
12:30 Navigation Through the Ages - Rick Brown, Toledo Maritime Academy.  
1:30-4:00 pm Bay Ship-building Company tour - dry dock & 1000-footer repairs  
7:00-9:00 Harbor Lady cruise on Sturgeon Bay canal (<http://www.harborlady.com/>).

**Thursday, June 23 - Door County, WI**

- 9:00 am Eagle Bluff Lighthouse Tour at Peninsula State Park  
11:00 am Coast Guard Marine Safety presentation by Chris Tantillo, U.S.C.G.  
1:00 pm *Maritime Archaeology* - Keith Meverden & Tamara Thomsen, maritime archaeologists, WI St. Historical Society.  
3:30 pm *Basic Navigational Concepts* - Rick Brown, Maritime Academy of Toledo

**Friday, June 24 – Sturgeon Bay, WI**

- 8:00 am *Great Lakes Bulk Carriers* by Joseph Fischer, President, Bay Engineering  
10:00 am Door County Maritime Museum & *John Purvis* tugboat tour  
1:00 pm *Lake Levels & Great Lake Compact* by Jim Lubner, Wisconsin Sea Grant  
2:00 pm Participants share lesson ideas  
4:00 pm Course evaluation



**2011 Great Lakes Maritime Teacher Institute ~ Teachers' Evaluation Comments**

1. A wonderful class. I look forward to more classes that bring depth to our understanding of the Great Lakes.
2. We loved it and hope you do a Michigan class next year. Thanks for making this happen.
3. I very much enjoyed the Institute. I was just in Port Huron with my father to celebrate my birthday. I'm sure he was getting sick of me saying, "Hey, look at that ship! At the class I just took, I learned that..." "Oh, there's the Coast Guard. Did you know that they..." I'm just as excited about getting to share some of what I learned with my students.
4. I would consider attending additional sessions as this was very informative.
5. Thank you for such a great opportunity. I can't wait to bring much of this information back to my school. I truly appreciate all of the time that each of the presenters took to help make this class be successful. A special thank you to Joan for all of her efforts as well. Thank You!
6. I want to thank all the people who were presentors, planners behind the scenes, organizers, and motel accomations, and restrauts and other food preparers.
7. Wow, what a week. My mind was spinning from all that I learned. I would like a group reflection time each day - a communal sharing time of the most important thing learned, etc.
9. Wonderful event, looking forward to more!
10. Overall, a great week. I feel this experience has build up my background knowledge of the Great Lakes and has provided me with activity ideas for my classroom. Well worth the time spent! Thanks for making it a wonderful week and lining up so many experts!
11. The sharing portion at the end of the week was extremely helpful. I appreciated the attention to details each day. This institute was planned very well!
12. The venue for the class was so good that I would recommend that you have it in Door County every year. I can't imagine that you would find a better place.

## **APPENDIX B**

## **B-1**

### **Mathematics and Navigation Teacher Institute June 27-July 1, 2011 at Michigan Technological University**

#### **Meeting Locations**

**Morning sessions** – Room 312 Dillman Hall (building 14) on Michigan Tech’s main campus.

**Afternoon and evening sessions** - aboard R/V Agassiz departing from Houghton County  
Marina

#### **AGENDA**

##### **Monday June 27**

8:00 am to 12:00 pm Finding Position, DED reckoning

1:00 pm to 5:00 pm Practical Exercises on Portage Lake (aboard R/V Agassiz weather permitting)

##### **Tuesday June 28**

8:00 am to 12:00 pm Charts and Charting using navigation instruments

1:00 pm to 5:00 pm Practical Exercises on Portage Lake (aboard R/V Agassiz weather permitting)

##### **Wednesday June 29**

8:00 am to Noon Compass, Speed, Time and Distance

1:00 pm to 5:00 pm Practical Exercises on Portage Lake (aboard R/V Agassiz weather permitting)

##### **Thursday June 30**

8:00 - 10:00 am Visual Aids and Electronic Instruments (312 Dillman)

10:30 am – Noon Navigation experiences on the Great Lakes, marine careers, and navigation issues -- Bill Hanrahan, Captain, Isle Royale National Park

10:00 pm to 2:00 am Nighttime Navigation Keweenaw Waterway (aboard R/V Agassiz)

##### **Friday July 1**

10:00 am to 3:00 pm **Navigation on Keweenaw Bay to Pequamming** (aboard R/V Agassiz)  
Course Wrap-Up & Evaluation

## **B-2**

### **2011 Navigation & Math Summer Teacher Insitute ~ Teachers' Evaluation Comments**

1. It was a great course. I enjoyed every moment. Professor Roblee was very thorough.
2. Good Course
3. Fun experience
4. I had fun, it was great to be out on the boat and apply our class work to the real world.
5. Dr. Roblee was an excellent teacher.
6. I loved everything about it!
7. Great fun and an experience of a lifetime. I looked forward to every day of this 5-day institute. My claasmates as well as my professor were phenomenal. Overall the institute was a well designed curricular program.

## **APPENDIX C**

## C-1

### AGENDA

#### **Great Lakes Maritime Transportation Institute Great Lakes Maritime Transportation Teacher Institute in Eastern U.P. of Michigan AGENDA ~ M-F, July 16-20, 2012 (as of 7-14-12)**

##### **Day 1: Monday, July 16 (Houghton to Marquette, MI)**

- 10 am - Meet Jennifer Huetter, District Mgr Public Affairs, at Iron Industry Museum in Negaunee.  
Tour Cliffs' Natural Resources Tilden Iron Ore Mine & Processing facility.
- 1 pm – Tour Iron Industry Museum
- 2 pm – Visit Cliffs' Natural Resources ore dock, Marquette harbor
- 3:30 pm – Harbor Gentrification & Economic Development by Fred Stonehouse, historian, author,  
Marquette city commissioner and Vice-Chair Michigan Ports Collaborative
- 7:30-9 pm - Course Overview, Schedule, Requirements & Great Lakes floor map

##### **Day 2: Tuesday, July 17 (Marquette to Sault Ste Marie, MI)**

- 7:00 am – Breakfast in “Ancestors” Hospitality Room (2<sup>nd</sup> floor). *Intermodal Transportation* by Carol Wolosz, GLMRI Exec. Dir. and *Shipping on the Great Lakes* by Joan Chadde
- 8:30 am – Depart Marquette (pick up picnic lunch from Babycakes). Drive to Munising.
- 9:45 am – Glass-bottom Boat Tour in Munising Harbor
- 1 pm – Drive to Whitefish Point Museum
- 2:30-4:30 pm - Whitefish Pt Lighthouse & Shipwreck Museum
- 5 pm – Drive to Sault Ste. Marie
- 6:30 pm – Dinner at Freighters at Ojibway Hotel
- 8 pm – Soo Locks Visitor Center & Park (open 9 am – 9 pm) *on your own*

##### **Day 3: Wednesday, July 18 (Sault Ste Marie, MI)**

- 8:00 AM Army Corps: water levels, lock operation, homeland security (Kevin Sprague, area engineer)
- 10:00 U.S. Coast Guard Vessel Traffic Service
- 1 pm Tour of Valley Camp freighter museum
- 3-4 pm - *Intro to Maritime Jobs* by Rick Brown, The Maritime Academy of Toledo
- 4:30 pm - Soo Locks Boat tour (Dock #2 at 515 E. Portage Ave.)

##### **Day 4: Thursday, July 19 (Sault Ste Marie, to Manistique, MI)**

- 8:00-10:30 am Drive 2.5 hrs to Port Inland.
- 10:30 am Tour Port Inland limestone quarry & port
- 1 pm – Tour of Seul Choix Lighthouse
- 3:00 pm – Tour Fayette Historic State Park (former iron smelting site). Last tour at 3:30 pm.  
Park in handicap lot.; activities on picnic tables by water.
- 4:30 – *Boats & Ships on the Great Lakes* Presentation by Rick Brown, Maritime Academy of Toledo
- 5:30 – Maritime boat-building & Lake Bathymetry activities
- :30-8:30 pm – More maritime activities. Return to hotel.

##### **Day 5: Friday, July 20 (Manistique to Marquette, MI)**

- 8:00 am *Navigation & the Great Lakes* by Rick Brown, The Maritime Academy of Toledo
- 11:30 – Taking it back to the Classroom
- Noon - Group discussion & wrap-up: *What are the “big ideas” that your students need to know?*
- 1 pm – Course ends. Return to Marquette.

## 2012 Great Lakes Maritime Teacher Institute ~ Teachers' Evaluation Comments

### Which parts of this Teacher Institute will you be able to use in your curriculum?

- Mining, Invasive species
- I can use the information about the history and the use of resources in the economy.
- Information on pollution and invasive species. Plus info on maritime employment will be shared with our business instructor and used during our career day.
- The Lighthouse and the Great Lakes Ship Wrecks.
- As I continue to shape and develop our Advanced Bio class to be exclusively focused on Great Lakes issues, I intend to also inform students of the job opportunities available in the shipping industry.
- Lighthouses and optics, steel manufacturing and thermal energy, or the locks and pressure or buoyancy.
- I believe that developing a mini unit incorporating middle school science GLCE's and many aspects of the institute is appropriate. Mining, geology and responsible use of the earth is of particular use to me and corresponding that with the economic needs of mining make students think twice before taking a side. I like the geography portion of the Great Lakes and understanding the roles the freighters take transporting goods.
- Importance of shipping (form of transportation), student inquiry: where, why and, how about iron ore, limestone etc., career opportunities, identification of ports around Michigan and Great Lakes.
- All.
- The mining and how ships get to Michigan and the natural resources, etc. that are shipped on the Great Lakes.
- transportation, products, mining in Michigan
- I will be able to use the mining information, The Great Lakes and locks information and the shipping information.
- There are many parts that can be implemented in my classroom. I have great pictures to show about the Great State of Michigan. There are pictures to show for the different industries in Michigan (Midwest) that ties into the Grade 4 Social Studies Curriculum with focus on how important the Great Lakes shipping industry is to this region. There were hands-on activities modeled during the Institute. With the many places we visited, there is a wealth of information to give to students about career opportunities in the Maritime Industry.
- Information on mining in Michigan ties with geosphere GLCEs; shipping activity on the lakes ties with hydrosphere GLCEs; weather predictions for mariners ties with atmosphere GLCEs. I especially like the Great Lakes literacy standards - would like to rewrite my curriculum around them!
- Website with interactive games, ideas for lessons.
- Environmental issues, economics, listening and speaking skills, language arts persuasive writing and so much more. The experience was awesome and really motivated me. The presenters were all great.
- All the materials, information, pictures, and videos

**What did you like the BEST about this Teacher Institute?**

- The variety the workshop provided
- The variety of locations visited and the behind the scenes tours
- The amount of info and knowledge I personally gained about the Great Lakes as well as information I can add to my ecology curriculum.
- The field trip to the Soo Locks Boat Tour, and the Port Inland limestone quarry and port tour.
- The behind the scenes look at The Locks. Without a doubt, very cool. All the "back stage" access to all our stops was wonderful.
- touring the factories, mines, and the locks.
- I really liked the outdoor field trip activities. We were able to cover many aspects of mining, ship traffic, economics and geography into this week. I liked meeting with the Army Corps of Engineers and the Coast Guard. I especially liked our trip to White Fish Point and the Glass Bottom Boat Tour! Awesome!
- Learning the history and importance of Great Lake shipping while visiting many beautiful landmarks. White Fish Point and the Glass bottom ship wreck tours were two of my favorite places to visit.
- The tours of the various sites.
- I really enjoyed the tour we had at the mine and also the tour at the Soo Locks. I also enjoyed the map activity we had the last day (learning how to pinpoint where a ship is). Sharing ideas with other teachers about everything I learned was great too.
- The behind the scene learning at the mines and the Soo Locks
- The best part of the institute was the exposure to the upper peninsula. The distance from the Detroit area makes it seem like another world. The drive was really not that bad. It has motivated me to visit other places in Michigan.
- I liked actually going to all of these places and seeing them in action. All of the speakers were fantastic and gave a wealth of information.
- Awesome access to mining sites and the Soo Locks gave great insight into how the whole system works...solidifying it in my mind so I can teach it well to kids. New respect/interest in shipping on the lakes, as well.
- Visiting the various sites.
- The hands on experience of the tours and discussions.
- Joan and Carol were an awesome team.
- All was new and rewarding.



## **APPENDIX D**

**D-1**

**Great Lakes Maritime Transportation Education Treasure Chest ~ Lending Sites**

	<b>Contact Person</b>	<b>Site</b>	<b>Great Lake</b>	<b>State</b>
1	Beth Landers Tel: 440-3502730	Lake Co. Soil & Water Cons. District 125 E. Erie St. Painesville, OH 44077	Lake Erie	Ohio
2	Wendy Lutzke Tel: 866-724-2356 Ext.115	Wisconsin Maritime Museum 75 Maritime Dr., Manitowoc, WI 54220	Lake Michigan	Wisconsin
3	Tami Schacknies Tel: 269-471-7725 Ext.1124	Berrien Co. Intermediate School District 711 St. Joseph Ave. Berrien Springs, MI 49103	Lake Michigan	Michigan
4	Meaghan Black Education Specialist Tel: 989-356-8805 Ext. 25	Thunder Bay National Marine Sanctuary 500 W. Fletcher St. Alpena, MI 49707	Lake Huron	Michigan
5	Rachel Randolph Museum outreach coordinator Tel: 906-492-3747	Great Lakes Shipwreck Historical Society 18335 N. Whitefish Pt. Rd. Paradise, MI 49768	Lake Superior	Michigan
6	Christine Gerlach Education Specialist Tel: 219-395-1885	Indiana Dunes National Lakeshore 1100 N. Mineral Springs Rd. Porter, IN 46304	Lake Michigan	Indiana
7	Tammy Barrientos Director Tel: 989-964-4117	Saginaw Valley State University Regional Math/Science Center 7400 Bay Rd., University Center, MI 48710	Lake Huron	Michigan
8	Thom Holden / Mary George Tel: 218-720-5260 X. 35272	Lake Superior Maritime Visitor Center 600 Lake Ave. South, Duluth, MN 55802	Lake Superior	Minnesota (2)
9	Loret Roberts Tel: 906-482-0331	Western UP Center for Science, Mathematics & Environmental Education PO Box 270, Hancock, MI 49930	Lake Superior	Michigan
10	Carolyn Rock Park Interpreter Tel: 920-823-2400	Whitefish Dunes State Park 3275 Clark Lake Rd. Sturgeon Bay, WI 54235	Lake Michigan	Wisconsin
11	Carrie Fries Tel: 906-226-2006	Marquette Maritime Museum 300 Lakeshore Blvd. Marquette, MI 49855	Lake Superior	Michigan
12	Dante Centuori Tel: 216-696-2098	Great Lakes Science Center 601 Erieside Ave., Cleveland, OH 44114	Lake Erie	Ohio
13	Art Sulzer, Director Tel: 202- 366-2625	Maritime Academy Charter School Ship Operations Cooperative Program 2 Peter Gamble Lane, Glen Mills, PA 19342	Lake Ontario	Pennsylvania
14	Joann Arasim Tel: 517-373-1905	Michigan Historical Museum 702 W. Kalamazoo, Lansing, MI 48909-8240	Lake Huron Lake Michigan	Michigan
15 16	Gary Goren Tel: 989-354-3101	Alpena-Montmorency Area Educ. Services Dist. 2118 US-23, Alpena, MI 49707	Lake Huron - 2	Michigan ( 2)
17	David Hales Social Studies Consultant Tel: 734-334-1311	Wayne Co. RESA 33500 Van Born Road, Box 807 Wayne, MI 48184-2497	Lake Erie & Detroit River	Michigan
18	Rene Marrazon, Supt. Tel: 419-244-9999	Maritime Academy of Toledo 1000 Monroe St., Toledo, OH 43604	Lake Erie	Ohio
19	Carol Kubert Administrative Support Tel: 586-228-3465	Macomb ISD 44001 Garfield Rd. Clinton Township, MI 48038	Lakes Erie Lake Huron	Michigan
20	Tim Sweet	Clintonville Public School District	Lake Michigan	Wisconsin

	Library Media Specialist Tel: 715-823-7215 ext.3233	105 S. Clinton Ave. Clintonville, WI 54929		
21	Ruth Mancina Tel: 989-752-2861 Ext.315	Castle Museum of Saginaw Co. 500 Federal Ave. Saginaw, MI 48607	Lake Huron	Michigan
22	David Boughton Maritime Educ. Specialist (Marti Martz) Tel: 814-217-9015	Pennsylvania Sea Grant c/o Tom Ridge Environmental Ctr 301 Peninsula Drive, Suite 3 Erie, PA 16505	Lake Ontario	Pennsylvania
23	Rachel Maki Tel: 218- 492-4400 ext. 19	Northern Lights Community School	Lake Superior	Minnesota
24	Terry Toby, Site Manager Tel: 218-226-6372 <a href="http://www.mnhs.org/splitrock">www.mnhs.org/splitrock</a>	Split Rock Lighthouse, MN Historical Society 3713 Split Rock Lighthouse Rd. Two Harbors, MN 55616	Lake Superior	Minnesota
25	Carol Ward Park Naturalist Tel: 216-881-8141 x3001	Cleveland Lakefront State Park 8701 Lakeshore Blvd. Cleveland, OH 44108	Lake Erie	Ohio
26	Dean Haen, Director Port of Green Bay Tel: 920-492-4950	Brown Co. Port & Solid Waste Dept. 2561 So. Broadway Green Bay, WI 54304	Lake Michigan	Wisconsin
27	Marie Nelsen, Secretary Tel: 231-873-6340	Hart Schools 302 W. Johnson St., Hart, MI 49420	Lake Michigan	Michigan
28	Sasha Tetzleff <a href="http://www.sanduskymaritime.org">www.sanduskymaritime.org</a> Tel: 419-624-0274	Maritime Museum of Sandusky 125 Meigs St., Sandusky, OH 44870-2834	Lake Erie	Ohio
29-30	Betty Nowak Tel: 414-286-8131	Port of Milwaukee 2323 S. Lincoln Memorial Drive Milwaukee, WI 53207	Lake Michigan	Wisconsin (2)
31	Lisa Appel Tel: 248-645-3223	Cranbrook Institute of Science 39221 Woodward Ave. Bloomfield Hills, MI 48303	Lake Erie	Michigan
32	Jane Wonders Tel: 920-236-0532	CESA 6 PO Box 2568 801 Elmwood Ave. Oshkosh, WI 54942	Lake Michigan	Wisconsin
33	Joan Voigt	Wild Rose Fish Hatchery – WI DNR N5871 State Road 22 Wild Rose, WI 54984	Lake Michigan	Wisconsin
34	Stacy Tapp	Racine Unified School District Mitchell Elementary School 2713 Drexel Aven., Racine, WI 53403	Lake Michigan	Wisconsin
35	Mike Reed (313) 852-4056	Belle Isle Nature Zoo 176 Lakeside Dr., Detroit, MI 48207	Lake Erie/Detroit R.	Michigan
36	Tobi Voigt (313) 833-0481	Detroit Historical Society Dossin Great Lakes Museum 5401 Woodward Ave., Detroit, MI 48202	Lake Erie/Detroit R.	Michigan
37-41	Kathryn Kwiatkowski Ctr for Sci & Math Educ. Tel: 216-368-5075	Case Western Reserve University Guilford House 412, 10900 Euclid Ave. Cleveland, OH 44106-7158	Lake Erie	Ohio
42	Tamera Steele	Armitage Academy 6032 - 8th Ave., Kenosha, WI 53143	Lake Michigan	Wisconsin
43	Susannah Hamm 440-885-5362	<a href="http://www.cuyahogapubliclibrary.org">Cuyahoga County Public Library</a> <a href="http://www.cuyahogapubliclibrary.org">Parma-South Branch, 7335 Ridge Rd.,</a> <a href="http://www.cuyahogapubliclibrary.org">Parma, OH 44129</a>	Lake Erie	Ohio
44	Jay Reynolds	Cleveland State University Biological-Geological Sciences office Cleveland, OH 44106-7158	Lake Erie	Ohio
	<b>TOTAL</b>		6-Superior 14-Michigan, 7-Huron 15- Erie; 2-Ont	21-MI, 2-PA 9-WI, 1-IN, 9-OH, 3-MN



**CFIRE**

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