



GLEAMS

Great Lakes Educators of Aquatic and Marine Science

Sweetwater Seascape

November 2006

AHOY!

Welcome to the Great Lakes Educators of Aquatic and Marine Science newsletter! GLEAMS has been in dry dock for a while, but we've got a shiny new look and a revitalized commitment to a network that supports and promotes teaching about aquatic and marine science. The French Voyageurs who paddled their way through the Great Lakes in the 1700s called this water "*l'eau douce*," sweet water. Honoring their spirit and our heritage, this newsletter reaches out to educators of the ocean and our sweetwater seas, the Great Lakes.

We intend to paint with a dynamic brushstroke the multicoastal seascape that is changing before our eyes, that offers charismatic moments for teaching and at the same time commands our recognition that these seas are not only grand but fragile. The task of the teacher is tantamount to that of the captain – charting the course, steering the vessel, directing the crew, bringing home the precious cargo of learning. The ports we steer toward are not just Standards and tests, but also decision making skills and attitudes, fostering rich lives that serve individuals and the planet.

A challenging voyage, indeed. GLEAMS members accept it with pride. This newsletter is designed as a navigation aid, a compass pointing to new ideas and information, connecting educators with researchers and resource managers, and suggesting ways to enhance credentials. With each quarterly issue we will include useful Internet links, lists of opportunities for inservice and preservice education, information about a current topic that touches marine and aquatic environments, and a curriculum activity on that topic. We'll connect you with the Centers for Ocean Sciences Education Excellence [COSEE], a national network dedicated to enhancing collaboration between educators, scientists, students and the public with the goal of ocean science literacy. Our own COSEE Great Lakes offers North Coast programs with national connections.

Our communication must change with the times, however. Just as Internet searches replace the rack of encyclopedia volumes, the *Sweetwater Seascape* needs to reflect the electronic innovations that give us quicker access to current information. Our plan is to distribute this and the Winter 2007 edition of the newsletter in hard copy format, then move toward electronic distribution using html-based email copies that can more quickly link to additional resources and offer a degree of interaction with readers. We need your year-round email address for that. Send your email address now to



GLEAMS secretary Terri Hallesy [thallesy@uiuc.edu] so you don't miss any issues.

The value of this newsletter depends on feedback from readers. Feel free to contact the editor, Rosanne Fortner [fortner.2@osu.edu] with your suggestions and contributed material for future issues. Welcome aboard!

ON THE RADAR SCREEN



Some interesting events are coming up quickly! Mark your calendar and check with the organizers to make your interest known.

November 8, 2006 8:30am – 4 pm, includes field trip **Nab the Aquatic Invader** workshop, East Chicago Central High School, East Chicago, IN. For Educators (grades 4-10). Introduction to award-winning web site for students, and invitation to involvement in curriculum development and community activities. Earn \$300 stipend. CEUs and CPDUs provided at this free workshop. More information at <http://coseegreatlakes.net/events/> To register: Contact Terri Hallesy [thallesy@uiuc.edu] or 217-244-8809.

November 14, 2006, 7-8:30pm and November 15, 8:30am-4pm (must attend both days) **Waves and Beaches: Global and Local Perspectives.** Tom Ridge Environmental Center, Erie, PA. Workshop for educators of grades 4-10. \$35 stipend + lunch. Limited to 20 participants. Learn from David A. Cacchoione PhD, Senior Scientist Emeritus, USGS. Pennsylvania Act 48 credits (8) available. Download information at <http://coseegreatlakes.net/events/> To register contact Marti Martz [mam60@psu.edu], 814-217-9015.

December 3-9, 2006 **WHAT'S SO GREAT ABOUT THE GREAT LAKES?** Inland Seas Environment and Education, asynchronous on-line workshop produced by the College of Exploration for COSEE Great Lakes. Presentations, discussions, curriculum downloads, and free materials on a variety of Great Lakes topics. Excellent overview presentation available for use in classrooms. This is the first of 8 on-line workshops exploring the lakes over the next four years. Free registration at <http://www.coexploration.org/greatlakes/> Graduate credit is available for \$80 from University of Minnesota – Duluth. Ohio CEUs and Act 48 credits are being negotiated.

DON'T MISS THE BOAT!

A number of opportunities for educators have deadlines that are approaching. Here are some notable ones for GLEAMS members:



On-line courses at Ohio State

Rosanne Fortner teaches two 2-credit courses [quarter system] in Winter Quarter '07 -- ENR 611D: Great Lakes Environmental Issues (#20701-0), and ENR 690D: Alien Species Education (#14913-9). Contact fortner.2@osu.edu for syllabi and content information. Courses are self-paced, with no face-to-face meetings. They may be taken for graduate or undergraduate credit. Registration is in progress now for start-up on January 3. Information about tuition and fees is at <http://www.ureg.ohio-state.edu/> and personal assistance is available from Andrea Trachsel [trachsel.1@osu.edu].

ARMADA Project

The University of Rhode Island's Office of Marine Programs is accepting applications for the ARMADA Project - Research and Mentoring Experiences for Teachers. The Project provides K-12 teachers an opportunity to actively participate in ocean, polar, and environmental science research and peer mentoring.

Selected Master Teachers (with five or more years teaching experience) are paired with leading scientists and participate in shipboard, field, or laboratory research with all expenses paid. They then develop ways to bring the products of their research experiences, including data, methodologies, and technology, into their classrooms. They share their experiences by mentoring new teachers in their school district and by presenting results at NSTA.

Application deadline is February 5, 2007. For information and application see the Project website www.armadaproject.org or contact Andrea Kecskes at 401-874-6211 or armada@gso.uri.edu.

NSTA listings of Summer Programs

It's not too early to plan for summer! Some teacher enhancement programs are already listed in *NSTA Reports* and on the web at www.nsta.org/calendar

COMING SOON FROM COSEE GREAT LAKES: GREATEST OF THE GREAT LAKES – A MEDLEY OF MODEL LESSONS!

COSEE Great Lakes is an excellent source of materials, contacts and opportunities for GLEAMS members. The 5-year program has a goal of enhancing marine education in Great Lakes classrooms, and at the same time bringing the inspiration and vital contributions of the Great Lakes to marine education nationally.

Our curriculum objectives are to:

- enhance teacher capabilities for accessing science information in Great Lakes/ocean sciences, and
- integrate ocean and Great Lakes research into existing high quality educational materials.

COSEE Great Lakes plans ultimately to develop a *Fresh and Salt* curriculum that will be useful on all the coasts. Phase 1 is the *Greatest of the Great Lakes*. Existing Great Lakes materials from regional Sea Grant education programs have been rigorously

reviewed and tested in schools over the years. Selected classroom activities on topics of Great Lakes Overview, Life in the Water, Habitats, Climate & Weather, Hydrology, Coastal Processes, and Issues constitute the Greatest of the Great Lakes. Selections meet teachers' needs for classroom utility, quality, and topic coverage. Teachers in the region worked over summer 2006 to align activities to State and National Science Education Standards, Ocean Literacy Principles, and Earth Systems Understandings.

The set will be available in Winter 2007, but in the meantime GLEAMS members can visit the sources of the materials and learn more about the project at <http://coseegreatlakes.net/curriculum/>. The gee-whiz Great Lakes introduction activity in this issue of Sweetwater Seascape is included in the GOGL Medley.

CATCH THE BIG ONES ON-LINE!

Listservs from national and regional organizations offer credible, current information about marine and Great Lakes topics in a quickly accessible format. The following are free listservs. Sign up now and bring your teaching to the cutting edge of science and issues!



GLIN Announce

The Great Lakes Information Network's most popular e-mail list shares announcements of Great Lakes news and events, legislative updates, reports and publications of interest, and other timely news of importance to the Great Lakes community. To subscribe, address an e-mail message to majordomo@great-lakes.net with the command `subscribe glin-announce` in the body of the message. No subject line is required. You will receive a confirmation when your subscription has been approved.

EPA Climate Education

EPA now offers four listservs on climate change topics. Our favorite is the one for educators, but you may view the choices and subscribe at http://www.epa.gov/climatechange/news_listservs.html

Environmental News Network

ENN offers a daily synopsis of news across the full range of issues, with many listings including ocean updates and water related stories. Brief abstracts in the email list help you decide if you want to see the complete [linked] articles. Check out the on-line offerings and subscribe at <http://www.enn.com/>

EE-News

Distributed by the EETAP program of the North American Association for Environmental Education, EE-News is available to non-members as well. Weekly lists of resources, grants, teacher education programs, employment opportunities and the like are included. A short list at the top allows a quick overview if you don't have time for more. Subscribe by sending a blank email to:

ee-news-subscribe@naaee.org

ANS News

Aquatic Nuisance Species are the subject of this US Fish & Wildlife Service listserv. Check the scope of the topic and subscribe at <http://www.protectyourwaters.net/>



How Well Do You Know the Great Lakes?

Many people, including a large proportion of those who live close to the Great Lakes, do not have a basic understanding of the individual characteristics of and the differences between the lakes. Since it is difficult to understand many of the Great Lakes issues, such as global warming, pollution, and water use without a basic understanding of the lakes, this activity is designed to help visualize the differences in the volume, length of shoreline, human population distribution, and fish populations of the Great Lakes.

OBJECTIVES

In this activity, you will develop a perception of the differences between the Great Lakes in water volumes, length of shoreline, human population distribution, and the amount of fish harvested from each lake.

PROCEDURE

1. In this activity you will work in groups. You will be assigned to an expert group and a base group.

Expert Groups

There should be a total of five expert groups, one assigned to each lake. Each expert group studies one lake to become "experts" on that lake.

Base Groups

The base groups should have five (or more) people in them; in this group students from the different expert groups come together to share their knowledge. There must be at least one member from each expert group (in other words, a representative from each lake) in each base group so that every lake has a spokesperson.



Source

"How well do you know the Great Lakes?" by Heidi Miller, in GLIMCES, *Great Lakes Instructional Materials for the Changing Earth System*, Ohio Sea Grant Education Program, 1995.

Earth Systems Understandings

This activity relates to ESU 3 (science methods and technology) and ESU 4 (interactions).

Materials

Each base group (of five students) will need:

- A set of five labeled strings as described in step 1 of *Using the Data*.
- 100 squares of blue paper.
- Five strips of paper that will be placed next to the coastline of each lake (one strip for each lake).
- Twenty "fish" (they could be washers, corn kernels, or peanuts...).
- A pen or pencil.

Each of the five expert groups will need:

- Access to a map of the Great Lakes.
- A copy of the *Great Lakes data* (other resource books are optional).

Teacher's Note

Groups should each have a large working surface that all can gather around.

2. Gather in base groups. Discuss the following and make your group's best guess about the characteristics of the Great Lakes.
3. *Shoreline*: Arrange your labeled set of five strings to form a model of the outline of the Great Lakes.
4. *Volume*: Distribute 100 squares of blue paper among the lakes to represent all of the water contained in the lakes. For example, if your group thinks that the water is divided equally among the lakes, then put 20 blue squares into each lake.
5. *Human populations*: Cut five strips of paper, which will be placed along the shoreline of the lakes (one for each lake). The total population of people living in the Great Lakes watershed is 33.2 million. Divide that number among the Great Lakes. For instance, if your group thinks that about half of the people in the Great Lakes watershed live on Lake Superior, then they would write 16 million on a strip of paper and place it next to the Lake Superior coastline. The goal is not to get the number correct but to start thinking about where people are located around the lakes.
6. *Fish*: Try to predict the amount of fish taken from each lake for human food. Collect 20 “fish” from your teacher. These 20 fish represent all of the fish taken out of the Great Lakes. If your group thinks, for instance, that almost all of the total fish come from Lake Superior, then they should put 18 or 19 fish in that lake.
7. After the base groups have made their guesses, leave the lake models in place and move into expert groups. Your group is assigned to one of the lakes. Look at the actual data available on your lake so that when you move back to base groups you will be able to correct the guesses originally made.
8. Return to base groups to correct the models and discuss the review questions.

Teacher's Notes

5. Instead of writing actual numbers on the strips of paper, the lakes could be ranked from 1-5 for most population to least population.
7. You may either give them the correct percentages or have the students figure them out.

Answers

1. Students may find the amount of fish taken and the amount of people living on Lake Erie surprising because of the lake's relatively small size.
2. Answers will vary.
3. There are several reasons, one is that Lake Erie has a somewhat milder climate, early trade routes were along its shores, and large population centers developed early.

REVIEW QUESTIONS

1. What was the most surprising thing about this activity? Discuss why.
2. Which guesses were not close to the correct answers? What reasoning led the group to its wrong decisions?
3. Why do the majority of the people live around Lake Erie?

4. Why don't the length of coastline and the amount of water correspond?
5. How did the groups work out differences in opinion in order to come to common agreement?

Answers

4. The depths of the lakes are very different.
5. Answers will vary.

EXTENSIONS

1. As a class or individually, make up a question pertaining to the Great Lakes (for instance: "Which lake (on a map of the Great Lakes) is Lake Huron?" or "Which of the Great Lakes has the largest human population living in its watershed?") and ask the question to a variety of people either around the school or in the community. This may lead to interesting discussions concerning the possibility that the voting public may make uninformed decisions.
2. Try to find an additional set of data about the Great Lakes such as average depth, fish populations, average water retention time, level of pollution, etc. to present to the class or to lead the class through, as with the other data sets.

USING THE DATA

These notes should help with interpreting the *Great Lakes Data* chart and with setting up the experiment.

1. *Shoreline*: In order to make strings that depict the relative lengths of shoreline of the Great Lakes, use the relative length data in the shoreline section. Any unit of measurement may be used as long as it is used consistently. The measurement units will depend on the amount of space available for the lesson. For instance, if the lesson will be taught outdoors, a large unit of measurement may be used, such as meters. In this case, the Lake Superior string would be 3.0 meters long. Make sure each string is labeled with a piece of tape.
2. *Water Volume*: The student groups each have 100 blue squares, which represent all of the water in the Great Lakes combined. To find how 100 squares should be distributed, look at the relative volume section in the volume category. It lists 54 for lake Superior. This means that 54 of the squares should be in the Lake Superior string model (over half of the water is in Lake Superior).
3. *Human population*: The total population data figures are rounded off in the section *Population* to the nearest million. The students attempt to guess the numbers in this category. It is interesting to realize that Lake Superior has only .6 million people living near it. This is less than 2 percent of the total population of the Great Lakes watershed.
4. *Fish*: The row labeled *percentage* in the fish section of the chart indicates the number of pounds of fish that would come from each lake if the total number of pounds from all the lakes was 20. Each base group of students should be given (or make) 20 "fish" so that they can make their best guess as to how the fish should be distributed in their string bordered "lakes."

		Great Lakes Data					
		Superior	Michigan	Huron	Erie	Ontario	Total
Shoreline (with Islands)	(miles)	2,726	1,638	3,827	871	712	10,210
	relative length	3.0	1.6	3.8	0.9	0.7	10.0
Volume ^a	(cu. miles)	2,900	1,180	850	116	393	5,439
	(km ³)	12,100	4,920	3,540	484	1,640	22,684
	relative volume	54	22	15	2	7	100
Human Population in Watershed	U.S. & Canada (2000)	673,000	12,052,743	3,000,000	11,400,000	5,600,000	32,725,743
	population to nearest million (approx.)	0.7	12.1	3.0	11.4	5.6	32.8
Annual Commercial Fishing Harvest	U.S. (lbs)	2,459,256	7,541,800	4,819,119	3,929,459	70,260	18,819,894
	Canada (lbs)	1,489,000	0	10,472,000	23,089,000	914,000	35,964,000
	Total	3,948,256	7,541,800	15,291,119	27,018,459	984,260	54,783,894
	Relative percentage of fish harvested	7	14	28	49	2	100
	Number of fish species	45	78	87	100	90	

^a Measured at Low Water Datum.

Note: The total shoreline is greater than the sum of the lakes because connecting channels are included.

REFERENCES

Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data. Coordinated Great Lakes Physical Data. May 1992. Agencies represented include: U.S. Department of the Army, Department of Commerce, and Department of the Interior; Environment Canada, Department of Fisheries and Oceans, and Natural Resources Canada.

Great Lakes Facts Maps, Michigan Sea Grant College Program. 2000. Cooperative Extension Service, Michigan State Univ., E. Lansing, MI.

The Life of the Lakes, Michigan Sea Grant and Michigan State University (Revised, 2003).

Protecting Gulf shrimp. The Ocean Conservancy secured a moratorium capping federal shrimp permits at 2003 levels in the overfished Gulf of Mexico. The shrimp fishery has historically been "overcapitalized." That is, it has too many boats in the fishery causing negative environmental and economic impacts. Shrimpers, for instance, discard four pounds of unwanted fish (what we call "bycatch") for every one pound of shrimp they catch. The moratorium, which went into effect October 26, 2006, effectively ends the "open access" nature of the fishery and is the crucial first step toward a comprehensive solution to conservation problems that have plagued the Gulf. [Source: *The Ocean Conservancy* livingoceans@oceanconservancy.org]

Coral Reef update from the Environmental News Network 10/30/06.

Scientists estimate over 27 percent of the world's coral has been permanently lost and at current rates of destruction, another 30 percent will disappear over the next three decades. Belize lost nearly half of its reef, a World Heritage Site, in 1998 when global warming and the "El Nino" weather phenomenon combined to cause the highest sea temperatures ever recorded worldwide. "Even a slight increase in water temperature disrupts the relationship between the coral animal and the [zooxanthellae] algae," said Richard Aronson a marine scientist at the Dauphin Island Sea Lab in Alabama.

"The coral actually pukes out 90 or 95 percent of the algae and those that are left are ill," said Aronson, who studies the bleaching of coral reefs worldwide. With no algae to sustain them, the coral basically starves to death, he said. The coral can recover by taking up new algae from the surrounding water but if temperatures stay high and the coral stays "stressed", it can become vulnerable to disease and die. [Source: *Reuters*]

Global fishery collapse predicted

Dr. Boris Worm of Dalhousie University, with 11 others, reports in the journal *Science* for 11/3/06 a new study suggesting that overfishing could lead to a global collapse of the fishery as soon as 2048. The study is based on a meta-analysis of numerous scientific and management studies from 1950-2003 in all 64 major world fisheries, in combination with data from the United Nations FAO. The scientists recommend rapid change in fisheries regulations to prevent the collapse. However, the *New York Times* contacted US officials, who responded that the data don't match what the US is seeing, especially in this country. [Source: *New York Times* 11/3/06]

Oregon coast dead zone dissipating

An ocean dead zone off Oregon that killed fish, crabs and sea worms in an area bigger than Rhode Island last summer lasted nearly three times longer than any of its predecessors before dissipating with autumn's change in the weather. This year's dead zone off Oregon ran for 17 weeks, compared to the previous high of six weeks in 2004, and saw oxygen readings near zero that left the ocean bottom littered with dead invertebrates. This is the fifth straight year the dead zone returned. It covered 70 miles of the central Oregon Coast. Southerly winds in recent weeks have flushed out the oxygen-depleted waters that were stuck along the Continental Shelf, and put an end to the condition known as ocean upwelling that triggered the dead zone, Jack Barth, professor of physical oceanography at Oregon State University, said from Corvallis. [Source: *ENN News* 10/30/06]



What better place to get a perspective on marine and aquatic education than the BRIDGE that brings resources, information, ideas and people together for learning! The Bridge, linked to its parent organization the National Marine Educators Association at <http://www.marine-ed.org>, is a supersite that provides one-stop shopping for ocean science learning, and a place where our North Coast is recognized as an equal in that mission. The Bridge is a COSEE partner as well, connecting with that network. Here's an overview of some of the editor's favorite parts of the site.

Data Tip of the Month

Each month there is a classroom activity using real data to explore a science question. The one I looked at on 11/3/06 was about Sea State, and it went like this: "Being able to accurately forecast the conditions at sea, or sea state, has been the goal of explorers, sailors, and fishermen for thousands of years. Now, through the use of ocean observing systems, we can not only predict, but pinpoint, exactly what the sea state will be like before leaving the dock."

The activity relates to how wind, water and pressure systems interact to drive waves, and it uses information from data buoys. Students record data from the Gulf of Alaska, Gulf of Mexico, San Francisco, and Cape Canaveral, and complete a downloadable worksheet to derive Beaufort Scale measures and predict the sea state. Discussion items and extension links complete the lesson.

Data Tips are archived by subject area. A recent lesson related to the Great Lakes appeared in January 2006: **Iced In**. ["The winter of 2003-2004 was bone-chillingly cold for many regions of the United States especially the Great Lakes, a major shipping gateway. See how ice formation in the Great Lakes can influence wintertime shipping traffic."]

A tip related to the coral news at left appeared in April 2006: **Coral Bleaching – A White Hot Problem**. "Corals can survive in water temperatures up to 35 °C, however the optimal growth temperature for corals is around 25 °C. Researchers have determined that, for any given area, water of 1 °C above the expected summertime maximum is stressful to corals. If an area experiences this it is called a coral bleaching HotSpot." Students review data from Puerto Rico in 2005-6 to predict reef health.

Ocean Science Topics

Information, science sources and lesson plans are linked in this section to topics in biology, chemistry, physics, marine geology and atmosphere. Try a search on Biology > Invertebrates > Molluscs to get a Zebra Mussel activity, the truth about giant squids, a fact sheet on oysters, or a picture of the nudibranch of the week! A chemistry search yields information on the search for pharmaceuticals from the sea, and why the ocean is salty. Explorers can learn in this section about Minnesota's award winning Water on the Web [more about that in a future *Sweetwater Seascape*].

Guiding Students: This section has information on colleges, careers, science fairs, and summer programs for students.

Resource Center: Find organizations, marine literature, national projects, and regional resources [including Great Lakes] here.



ABOUT GLEAMS AND NMEA

GLEAMS is the Great Lakes regional chapter of the National Marine Educators Association, an organization that was formed through the 1970s commitment of individual educators on all coasts to "making known the world of water." The Great Lakes Educators of Aquatic and Marine Science is a network of people in the Great Lakes region whose common goal is to encourage education about the world of water, both freshwater and marine. Our emphasis is on the Great Lakes, which comprise our nation's inland seas and fourth coast. Information in our publications can be shared with others. Our goal is to serve your needs in classroom teaching and informal education.

GLEAMS members hail from all Great Lakes states and various National Marine Educators Association chapters. Members include formal and informal educators in science, education and communication professions. We receive a discount on NMEA membership, and joining that parent organization brings you subscriptions to *Current: The Journal of Marine Education*, and a quarterly NMEA News.

GLEAMS aims to provide educators with information, methods and materials for including water related content and activities in their curricula. **GLEAMS** also provides its members with opportunities to network and connect with marine and aquatic science educators throughout the Great Lakes region and beyond. All members receive COSEE Great Lakes [\[http://coseegreatlakes.net\]](http://coseegreatlakes.net) information on Great Lakes professional development, curriculum, shipboard learning experiences, marine science excursions, and more! We invite you to visit the GLEAMS Internet site linking you to classroom materials, professional development opportunities, agencies and organizations that provide education resources, connections to scientists who can provide technical content. <http://www.sheddaquarium.org/gleams/>. There you can apply for a minigrant and learn about regional opportunities that might involve you or your students.

To join or renew your membership in GLEAMS, send a \$10 GLEAMS check to treasurer Lori Kramer at 628 Sanbridge Circle East, Worthington, OH 43085. Remember to include your email address as well as your home address.

With email contact you can receive future issues of *Sweetwater Seascapes* and quicker information about events and opportunities, and we can include more photographs and visual material to make the stories more interesting! As newsletter editor, I welcome your input of suggestions and actual words to use. Send to fortner.2@osu.edu and watch for the next issue of *Sweetwater Seascapes* in February '07!

--Rosanne W. Fortner 11/3/06

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Address Correction Requested