



GLEAMS

Great Lakes Educators of Aquatic and Marine Science

Sweetwater Seascape

February 2007

From the Pilothouse

Elizabeth Hinchey Malloy, GLEAMS President



Greetings from the GLEAMS pilothouse! I thought it fitting to begin my maiden voyage President's column by expressing how thrilled I am to be on board as GLEAMS sets sail on a new year full of exciting adventures. I am proud to be representing a network of talented educators with many years of experience in Great Lakes education.

As a bit of background, I became a GLEAMS member soon after moving to the Great Lakes region in late 2004. Although I am relatively new to the society, I had been a long-time fan of one of its sister societies, the Mid-Atlantic Marine Educators Association (MAMEA). I was introduced to MAMEA in 1994 when I was invited to help organize one of their teacher workshops. That experience was memorable to me, a new graduate student in marine science, for many reasons. It was exciting to work with the MAMEA officers, who were experienced marine education specialists; it was rewarding to see broader impacts of my studies of estuarine worms as we created classroom exercises about "all things wet and muddy"; and it was inspiring to meet dedicated, creative teachers from all over the mid-Atlantic region who came to the workshop to learn new information and to share their skills with other educators. In following years, I became as MAMEA member and continued to benefit from the many opportunities that were offered to educators and scientists alike. So, you can imagine my joy when I learned of GLEAMS soon after moving to Chicago ten years later!

GLEAMS members should be very proud of their commitment to aquatic education. The education and training of future scientists is a one of the key recommendations of the U.S. Commission on Ocean Policy's *An Ocean Blueprint for the 21st Century* Final Report. By inspiring students in science, organizations like GLEAMS and NMEA are helping to meet this important goal. GLEAMS members represent a supportive network of educators who work together for the advancement of aquatic education. GLEAMS provides educators with information, methods and materials for including water-related content and activities into their curricula. GLEAMS members also learn of opportunities to network and connect with marine and aquatic science educators throughout the Great Lakes region and beyond. Visit the GLEAMS web site (<http://www.sheddaquarium.org/gleams>) to explore coming events.

I look forward to meeting and hearing from as many GLEAMS members as possible this year as GLEAMS visits various "ports." Best wishes for exciting voyages in education excellence!

-EKHM (hinchey.elizabeth@epa.gov)

GLEAMS NEWS

From Captain Beth: [What can GLEAMS members expect in 2007?](#)

The GLEAMS Board has been hard at work revitalizing the GLEAMS logo, web site, and recruiting brochures. Members will be presenting at upcoming meetings such as the International Association of Great Lakes Research, National Marine Educators Association, and National Science Teachers Association to promote GLEAMS and attract new members. A fall GLEAMS workshop is also in the planning stages...look for details in the next newsletter.

From Robin Goettel: [GLEAMS Mini-Grants](#) have been awarded to the following members for their proposed student activities:

- Debra Benyi, Joyce Elementary, Detroit
- Sr. Maureen Fallon, St. Scholastica Academy, Chicago
- Margaret Pasquale, MacKenzie High School, Detroit
- Martha Toledo, Portage Park School, Chicago

From Margaret Tower, IL Representative: She has been active in California and DC meetings of the committee on [ocean literacy](#), defining its principles and raising visibility of marine and aquatic education nationally. There is now an NMEA committee on OL!

From the Editor: [Future Sweetwater Seascapes](#) will be sent by e-mail. This will allow us to use more color, clickable links, and content that exceeds page sizes. Let Membership Secretary Jackie Adams (adams.jacqueline@epa.gov) know your email address. A printable version will be available at the GLEAMS web site, and we hope members will print copies to share with other teachers.

GLOBAL CLIMATE CHANGE: TIME TO TAKE NOTICE!

On February 2, 2007, the Intergovernmental Panel on Climate Change released its latest assessment. The findings concluded that it is *unequivocal* that the Earth's climate is warming; that current atmospheric concentrations of CO₂ far exceed the natural range of the last 650,000 years; and that it is *very likely* (>90%) that human heat-trapping emissions are the cause.

In the Great Lakes region the scenarios differ from those of the globe, because the projected impact of increased temperature and altered rainfall patterns means evaporation will exceed precipitation, resulting in lowered lake levels and effects opposite those of rising sea levels. Science estimates suggest that the new mean water level will be about one meter lower than current lake levels.

This issue of *Sweetwater Seascape* contains an instructional activity envisioning such a change, and special attention is paid to climate change information for teaching. This is too important a topic to be excluded from the curriculum!

CLIMATE CHANGE ON-LINE

The science topic of this issue is global climate change. Here are some recent news items and instructional materials about the topic.



IPCC AR4 documents

<http://www.ipcc.ch/> has all documents related to the 2007 assessment. We recommend the 18-page Summary for Policy Makers as a starting place.

Union of Concerned Scientists

<http://www.ucsusa.org/> The UCS is a reliable source of science information. It describes itself as "the leading science-based nonprofit working for a healthy environment and a safer world. UCS combines independent scientific research and citizen action to develop innovative, practical solutions and to secure responsible changes in government policy, corporate practices, and consumer choices." The Global Warming section of its web site offers FAQs and links to state predictions for climate change impacts.

Paleoclimatology

The study of indicators of past Earth climates takes information from a number of sources: tree rings, coral banding, lake varves, ice cores... This NOAA web site reports on reconstructions of past sea levels, temperatures, etc, from proxy data.

<http://www.ncdc.noaa.gov/paleo/paleo.html>

EPA's What Can You Do?

<http://www.epa.gov/climatechange/wyacd/> has information for home, school, office, and on the road.

UNEP ATLAS OF OUR CHANGING ENVIRONMENT

<http://www.na.unep.net/OnePlanetManyPeople/powerpoints.html>
"One Planet Many People: Atlas of Our Changing Environment" provides a visual presentation of changes in the global environment, shown through remote sensing imagery produced over 30 years. A free collection of over 400 PowerPoint slides showing images from the atlas can be downloaded on 11 topics of change and 6 geographic regions.

The Great Lakes Information Network, **GLIN**, monitors reports on climate change for the region and provides access at <http://www.great-lakes.net/envt/refs/cchange.html>

Confronting Climate Change in the Great Lakes Region: Impacts on Our Communities and Ecosystems, distributed by the Union of Concerned Scientists and the Ecological Society of America, and written by leading university and government scientists in the Great Lakes region. Download or order the report, and state-by-state summaries, or view a PowerPoint presentation at <http://www.ucsusa.org/greatlakes/glchallenge.html>

GLERL's Water Level Photo Gallery has photos to demonstrate the drama of changes in lake levels as they now occur. <http://www.glerl.noaa.gov/seagrant/glwphotos/GLWLPhotoSite.html>

Weekly update of **climate science** and commentary: <http://www.co2science.org/scripts/CO2ScienceB2C/Index.jsp>

DON'T MISS THE BOAT!

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



Summer courses at Stone Laboratory on Lake Erie

The oldest freshwater biological station in the US is on Gibraltar Island in Lake Erie. It is OSU's field campus for a summer program of courses about Great Lakes and marine sciences. Ten one-week courses for educators and 8 for advanced high school students are offered for 3 credits each. **March 12** is the deadline for scholarship applications. Four courses are also eligible for COSEE Great Lakes scholarships. Applications and information at <http://stonelab.osu.edu>

Make a presentation at NMEA!

March 1 is the deadline for presentation proposals for the National Marine Educators Association annual meeting. Dive in and show this great organization how you are teaching about the oceans or Great Lakes. The conference is July 23-27 in Portland, Maine. Find information and presentation forms at the conference web site <http://gommea.org/downeast2007/>

NSTA listings of Summer Programs

Plan your summer with teacher enhancement programs listed in *NSTA Reports* and on the web at www.nsta.org/calendar

NEWS FROM COSEE GREAT LAKES

The *Greatest of the Great Lakes: A Medley of Model Lessons* will be ready in mid-March. Existing Great Lakes materials from regional Sea Grant education programs, chosen for classroom utility, quality, and topic coverage and aligned to science standards for your Great Lakes state. The CD + shipping is \$15. Make check payable to the University of Illinois and send to Robin Goettel, IL-IN Sea Grant, University of Illinois, 368 NSRC, MC-635, 1101 W. Peabody Drive, Urbana, IL 61801.

A Tribute to the Great Lakes. COSEE Great Lakes is privileged to offer to educators our music CD of songs contributed royalty-free by three noted artists in the region: Pat Dailey, Alex Bevan and Lee Murdock. Teach and learn about the Great Lakes with songs listed at <http://coseegreatlakes.net/curriculum/tribute>. Request on school letterhead and send a check for \$5, payable to The Ohio State University, for one copy. Order from Ohio Sea Grant, Attn COSEE CD, 1314 Kinnear Rd., Columbus, OH 43212.

Lake Huron Exploration Workshop

COSEE Great Lakes presents its Lake Exploration on Lake Huron this year, Saturday, August 11 through Friday, August 17, 2007. Location will be Maritime Heritage Center of the Thunder Bay National Marine Sanctuary, Alpena, MI. Information and application at <http://coseegreatlakes.net/events>.

Tropical Marine Ecology Workshop

August 4-11, 2007, Curacao, Netherlands Antilles
Marine Immersion scholarships available. Led by Helen Domske with Erie2 BOCES, New York, An 8-day teacher workshop at a tropical reef. <http://tme07.blogspot.com/>

Visualizing Changes in the Earth System

Whenever people talk about the future they form a mental image of what things will be like. They think about themselves and the things they know about, and in their imagination build a new picture of what they can expect. As we consider the impacts of global warming on the Great Lakes, there are a number of ways of visualizing those changes. Some are very personal ways, some creative and amusing, and some that we see only as clouds in the crystal ball. In this set of activities, students will be led to imagine what the Great Lakes region will be like in years to come.

Activity A: What Great Lakes factors will increase and what will decrease as a result of global warming?

The Earth Systems approach emphasizes connections and interactions. As a pretest/posttest assessment of learning, this activity will show how much growth has occurred in such concepts through use of the materials in this volume. Knowing how natural events affect their lives, students can infer a wide range of impacts of global changes in the Great Lakes.

OBJECTIVES

After the completion of this activity, students should be able to:

- List and explain many potential impacts with global warming.
- Discuss various interpretations of the possible global warming impacts.

PROCEDURE

1. Gather or construct the materials listed. Before beginning the activity, create impact cards (factors or activities which could be affected by global warming). These impact cards should include both scientific impacts and social impacts (focus on things that can go up and down). Some possible global warming impact cards might include those listed on the next page.

Earth Systems Understandings

This activity focuses on ESU #4 (interactions). Refer to the introduction of this book for a full description of each understanding.

Scenario Reference

#1, How will water resources in the Great Lakes region be affected?

Materials

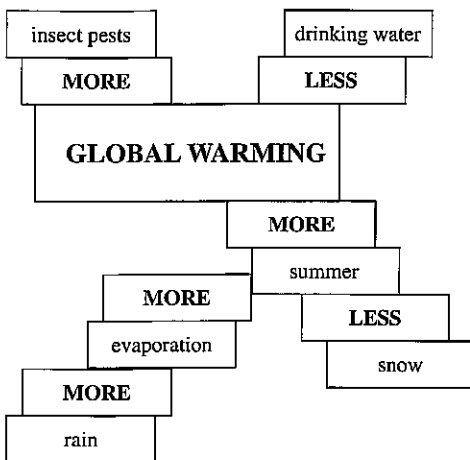
- blank wall, chalkboard, or bulletin board
- 1 card labeled GLOBAL WARMING (white or red)
- 20 cards labeled MORE (light color, such as yellow)
- 20 cards labeled LESS (same color as More cards)
- 35–40 impact cards with things that could change as a result of global warming (contrasting light color, such as green)

MAKE CARDS FOR THINGS THAT THE GREAT LAKES REGION MIGHT HAVE "MORE OR LESS" OF WITH GLOBAL WARMING, SUCH AS THESE FACTORS

- | | | |
|-----------------------|--------------------------|-----------------------|
| evaporation | income | crop production |
| snow | extinction | cooperation |
| drinking water | lake water (lake levels) | fish |
| severe storms | lakefront property | wetlands |
| insect pests | rain | tourism |
| recreation | toxic air pollution | forests |
| water pollution | electricity | drought |
| flooding | fear | debate |
| biological diversity | shipping | summer |
| winter | disease | air conditioning |
| ducks | soil moisture | weeds |
| fertilizer use | pesticide use | dredging of waterways |
| shoreline development | people | water diversion |

2. Make a large card that says **GLOBAL WARMING** and tape it in the center of a blank wall.

Make a stack for **MORE** cards and a stack for **LESS** cards. Spread the impact cards out over a large table so students can see most of the cards at one time.



3. If used as a pretest, tell students only that global warming is likely to result in lower water levels and changes in the seasons. [As a posttest, this step needs no introduction.]

Invite students to come forward one table or row at a time and select an impact card which they feel is the direct result of a previously mounted card. They should then select either a **MORE** or a **LESS** card (whichever they think to be correct for the impact that they selected). The student then tapes these to the wall, connecting them with the previously mounted card to indicate that it is the sequence of impact. For example, the first student may decide that **GLOBAL WARMING** (taped to the wall) leads to **MORE INSECT PESTS**, or **LESS DRINKING WATER**. Students must be able to justify the position of the cards they add, and their choice of **MORE** or **LESS** impact.

4. As students use these cards, it will become apparent that there are various interpretations of the impacts. For instance, more weeds and insect pests would probably invade the region, and soil moisture would probably decrease if global warming occurred. However, annual temperatures would be higher and growing seasons longer. The net result could be either more or less crop production. Much would depend on the fertility of northern soils; where and when precipitation falls; and which crops are grown. Have the class discuss all interpretations.
5. To assess student understanding, it may be helpful to have each student select a chain of at least eight cards, diagram them in a portfolio, and give a possible explanation for the links illustrated.

REVIEW QUESTIONS

1. List and discuss potential scientific and social factors which may be affected with increased global warming.
2. How can the variety of interpretations of global warming impacts lead to uncertainty among policy makers? How do policy makers deal with such dilemmas?

EXTENSIONS AND ALTERNATIVES

This activity can also be used at various stages of a unit. For instance, it can introduce a new topic and relate it to previous ones or it can be a culminating activity to draw all aspects of a study together. In addition, it would be an interesting evaluation to take a Polaroid photograph of the concept map created at the beginning of a unit and compare it with the map produced at the end. Some teachers use this as a group activity among 4–6 students. Instead of sheets of paper, they use 3x5 cards. This avoids the problem of students having to wait for their turn at the board, and it also results in many different maps that can be compared in group discussion. Groups can prepare a written or oral presentation of their maps, analyzing the thinking about interrelationships that produced the array.

Answers to Review Questions

1. Accept a large variety of answers for this question. Jobs would be created to help develop new crop seeds that could tolerate warmer, dryer conditions. Farmers would need to adjust their crops and farming practices to respond to the changing conditions. Recreation facilities would need to change their structure for the longer summer season, lowered water levels and warmer temperatures. Fishers and manufacturers of fishing gear would need to be flexible because spawning grounds for fish would decrease and new species would become abundant. Companies that use toxic chemicals may need to adjust their procedures because increased temperatures and incidence of severe storms would cause airborne pollutants to travel further. The lowered lake and river levels would also greatly impact the shipping industry because boats would either be unable to pass through certain areas or would be required to carry a lighter load. This would have repercussions on the companies that use this method to transport goods.
2. Because scientists disagree on what the effects of global warming will be and the severity of these effects it is not simple for policy makers to make decisions on related issues. They are forced to make difficult decisions based on differing hypothetical projections. The effects of global warming are also not straightforward; agriculture, for instance, in some areas may be improved but in other areas it will be damaged. For most changes, there would also be some groups that will come out the winners and others will be the losers. These uncertainties make decision making difficult.

[This activity is adapted from "More or Less," produced by Zero Population Growth.]

Activity B: What will people see on the long walk to the water's edge?

Teacher's Note

In this activity, students listen to the story that asks them to imagine that they have spent a lifetime visiting the Great Lakes; they are then asked to draw pictures of or describe the changes they have noticed in the Lakes during their lifetime.

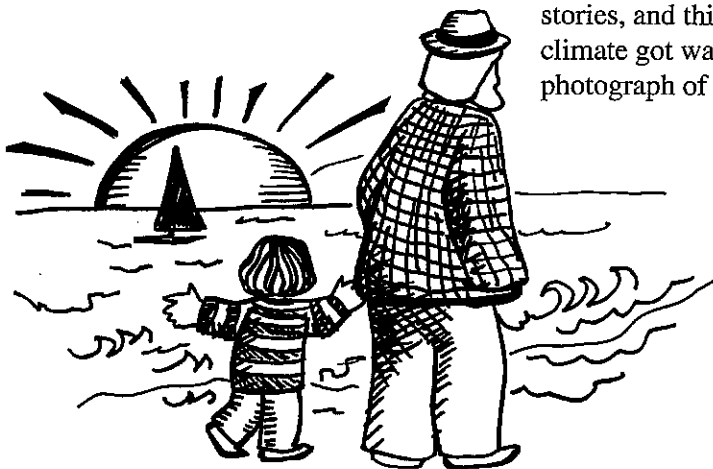
When your grandparents first bought land on the shore of the Great Lakes, it was very beautiful. The forest reached almost to the beach, and ended in some low rolling sand dunes you used to run across with your bare feet flying. From the dunes to the water's edge was barely a skip or two; then your toes could wiggle in the cool water as it swished over the smooth, rounded stones. Along the beach you searched for lucky stones and interesting driftwood to put in the treasure box under your bed.

In the corner of the lot was a low area where some cattails grew, and the water was quiet and warm. Tiny fish swam there, and a green heron came every morning to find a mouthful for breakfast. A big frog once startled you with its lightning leap and a splash into the water when you came too near.

It was great then when the water was so close you could hear it from your open window at night, and the beach seemed only a step away. Whatever your grandparents paid for that place, it was worth it.

So now the old place welcomes you back with your own grandchildren. You've told them stories about how it was; the image is so vivid in their minds as they run toward the beach. Follow them.

On the porch swing that night, your daughter wants to hear what her children saw, and what YOU saw today. Tell her the two stories, and think about how things have changed since the climate got warmer. She might appreciate a picture, your mental photograph of then and now.





The BRIDGE brings resources, information, ideas and people together for learning, like its parent organization the National Marine Educators Association <http://www.marine-ed.org>. Two recent Data Tips have provided regional and global activities demonstrating climate changes with human impacts:

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."

October 2002: **Return of El Niño**. Another El Niño event in fall and winter 2006-7 brought a mild start to the Great Lakes winter. Follow a previous El Niño event in 2002 and see how the El Niño event this year compares to previous ones.

OTHER CURRICULUM MATERIALS ON CLIMATE CHANGE

EPA Climate Change Kit for High School

Climate CHECK is a free, Excel-based kit that teaches high school students about the science, drivers, and impacts of climate change and provides them with knowledge, tools, and resources to increase climate-change awareness and to help them reduce greenhouse gas emissions at their school. Students estimate greenhouse gas emissions using built-in calculators and school-specific "activity data," and develop and implement a mitigation action plan. Click on <http://www.epa.gov/climatechange/wycd/school.html>, 2. High school

Activities for the Changing Earth System (ACES)

Curriculum activities for middle and high schools, funded by NSF in 1990. Activities relate to mechanisms for and evidence of climate changes, and are easily updateable through links. Free use of pdfs at <http://earthsys.ag.ohio-state.edu/ACES/>

GLIMCES

Great Lakes Instructional Materials for the Changing Earth System [GLIMCES] is the source of the Visualizing activity inserted in this issue. Other topics in the book of activities relate to forests, wetlands, fish spawning, agriculture, toxins, and shipping as affected by climate change. <http://earthsys.ag.ohio-state.edu/project/pubs/GLIMCES.html>

To see how the more-or-less activity works, and get other resources, sign in at <http://www.coexploration.org/coseegreatlakes/>, enter the Great Lakes Room and check the resources for December 6. This was the site for our on-line **College of Exploration conference** in December. It is archived and open for visitors.

Lesson plans for northern Canada

http://www.climatechangenorth.ca/section-1p/C1_Lesson_plans.html

Journey North

Track arrival dates of spring, migrations, other seasonal phenomena <http://www.learner.org/jnorth>

US Department of Energy

Teacher's Guide to Climate Change and Global Warming, <http://hdgc.epp.cmu.edu/teachersguide/teachersguide.htm>

CLIMATE CHANGE IN THE NEWS

2007 may be warmest year yet

AP, January 4, 2007. Britain's Meteorological Office predicts 60% chance of record-breaking global temperatures, along with extremes of drought, storms.

Doomsday Clock inches toward midnight

The Bulletin of the Atomic Scientists announced on January 16 that it was moving the hands of the Doomsday Clock up to 5 minutes to Midnight, based on deteriorating global nuclear situations and for the first time, CLIMATE CHANGE (www.thebulletin.org).

ENN News

- Warming to raise seas for 1000 years (Reuters, Jan. 26) www.enn.com/today.html?id=12106
- Norway Wants U.S. Politicians to See Warming Arctic (Reuters, Dec. 28) www.enn.com/today.html?id=11933
- Government Sees Polar Bears As 'Threatened' (AP, Dec. 28) www.enn.com/today.html?id=11928
- Indian, Chinese Team to Map Glacier Melt in Himalayas (Dec. 22, AP) www.enn.com/today.html?id=11909
- Report Says ExxonMobil Cultivates Global Warming Doubt (Jan. 4, Reuters) www.enn.com/today.html?id=11966

SEA NOTES – RECENT NEWS FROM THE SALTY SEAS

Ocean Policy Report Card not so Stellar

"The report card (www.jointoceancommission.org) assesses the nation's collective progress in 2006 toward fulfilling the recommendations of the U.S. Commission on Ocean Policy and the Pew Oceans Commission, which have joined together as the Joint Ocean Commission Initiative [JOICI]. The United States received an average grade of C- for the six subjects measured in the report card, up slightly from the D+ assigned for 2005. State leadership and fisheries management earned grades of A- and B+, respectively. States emerged as important champions for oceans." *Marine Technology Reporter*, Feb. 6.

Magnuson-Stephens Act Reauthorized

The basic law regulating fishing practices in American waters from 3 to 200 miles offshore was reauthorized in the final moments of the 109th Congress. "The revised law establishes timetables for the rebuilding of depleted species and gives impartial scientists a much greater say in setting catch limits and charting recovery programs. Current law allows the nation's regional fishery management councils — mostly dominated by fishermen with a direct financial interest in exploiting the fish stocks they are supposed to protect — to set harvest limits... It also includes a one-sentence directive to the secretary of commerce to ask the National Research Council, part of the National Academy of Sciences, 'to conduct a study of the acidification of the oceans and how this process affects the United States.'" (Dec. 24, *NY Times* Editorial)

Bush Budget for Oceans

The 2008 Budget Request calls for \$143 Million for research, vessels, an ocean monitoring network and restoration/protection of coasts and oceans, including efforts to end over-fishing. At ocean.ceq.gov/about/docs/jsost_chartcourse_083006.pdf

ON THE RADAR SCREEN

Mark your calendar for coming events!



February 24 and March 24, 2007

9 am – 2:30 pm, Educators of grades K-8 & 6-12, respectively.

Shedd Aquarium Spring workshops.

February program: Classroom Habitats. From aquariums to worm bins, teachers gain hands-on experience in creating their own classroom habitat along with IL State standard specific lesson plans to complement them back in the classroom. March program: What's in the Water? Discover how to incorporate water sampling and water quality tests into your science curriculum in or out of the school classroom. Gain experience with basic to advanced tools of water sampling. 5 CPDUs for each workshop. \$40 per workshop. Register by the Monday before the workshop with forms on the Education link at www.sheddaquarium.org.

April 22, 2007. Earth Day

Examine ideas for activities and events at <http://www.earthday.net/>. Many of this year's activities focus on climate change.

May 12, 2007

9 am- 3:30 pm, Educators of Grades 4-6. \$10, 6 CPDUs

Lake Michigan Fishes. Illinois DNR ENTICE workshop, at the Shedd. Learn about native and exotic fishes of Lake Michigan, their characteristics, adaptations and habitats. Examine fish at the Aquarium and during a seining expedition to Lake Michigan.

<http://dnr.state.il.us/lands/education/entice/index.htm>

ABOUT GLEAMS AND NMEA



GLEAMS is the Great Lakes regional chapter of the National Marine Educators Association, committed 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. 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. Future issues of *Sweetwater Seascapes* and notice of events/opportunities will be emailed only.

A FEW GOOD EDUCATORS NEEDED!

This spring we will hold another round of elections to fill vacancies in the state representative positions for the GLEAMS Board (see list below). Contact Secretary Terri Hallesy (thallesy@uiuc.edu) if you want to be on the ballot!

--Rosanne W. Fortner, Editor, 2/14/07

GLEAMS Officers 2006-7

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Sweetwater Seascapes
c/o Rosanne Fortner, Editor
113 Paula Circle
Oak Island, NC 28465

Address Correction Requested