



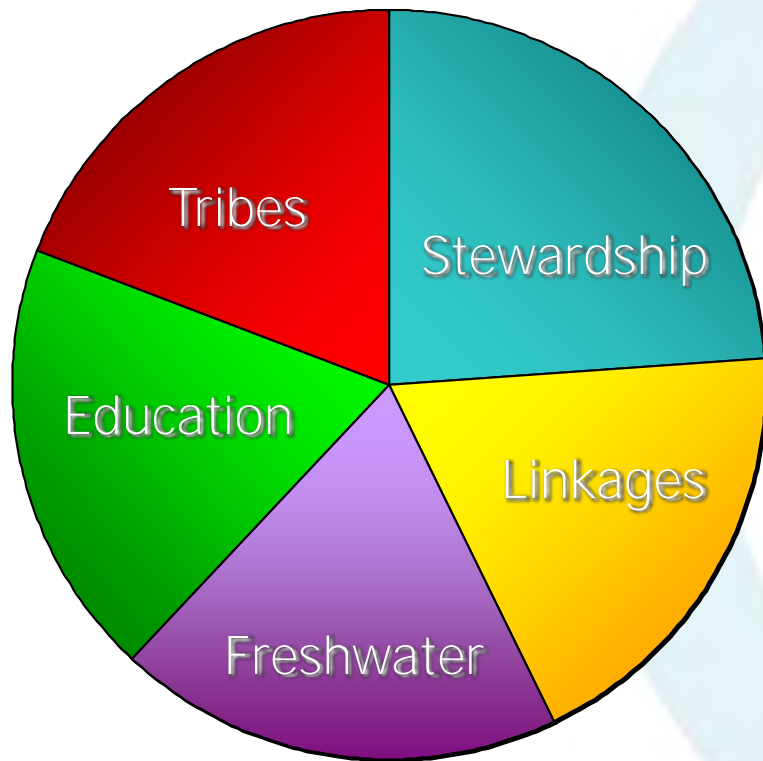
Greatest of the Great Lakes – A Medley of Model Lessons

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IL-IN Sea Grant

National COSEE goals

- Effective partnerships between research scientists and educators;
- Effective ocean sciences programs and best practices that build on existing resources;
- Vision of ocean education as a charismatic, interdisciplinary vehicle for fostering scientific literacy

COSEE Great Lakes Goals



- Inspire scientific literacy and environmental responsibility
- Link education and research communities
- Add freshwater component to the National COSEE Network
- Improve Great Lakes/ocean sciences education
- Improve Great Lakes/ocean sciences literacy among regional Tribes

COSEE Great Lakes Scope



- Involves educators, research scientists, students and the public
- More than 30 collaborators, including 4 other COSEEs
- Funded 2005-2010

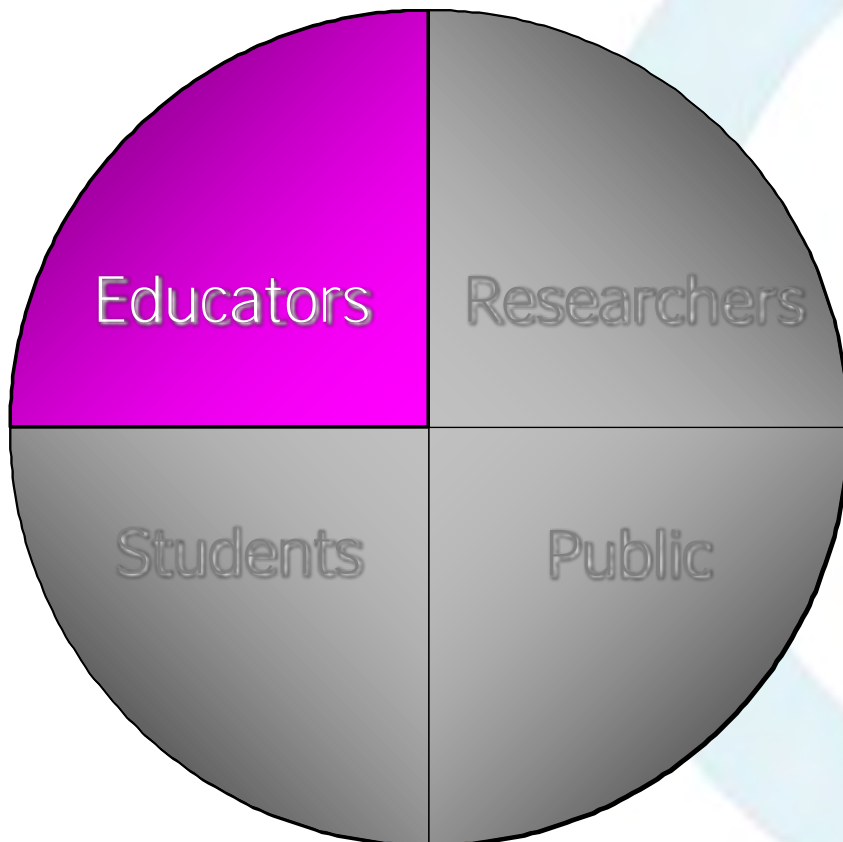
COSEE Great Lakes Objectives



Facilitate collaboration between scientists and educators:

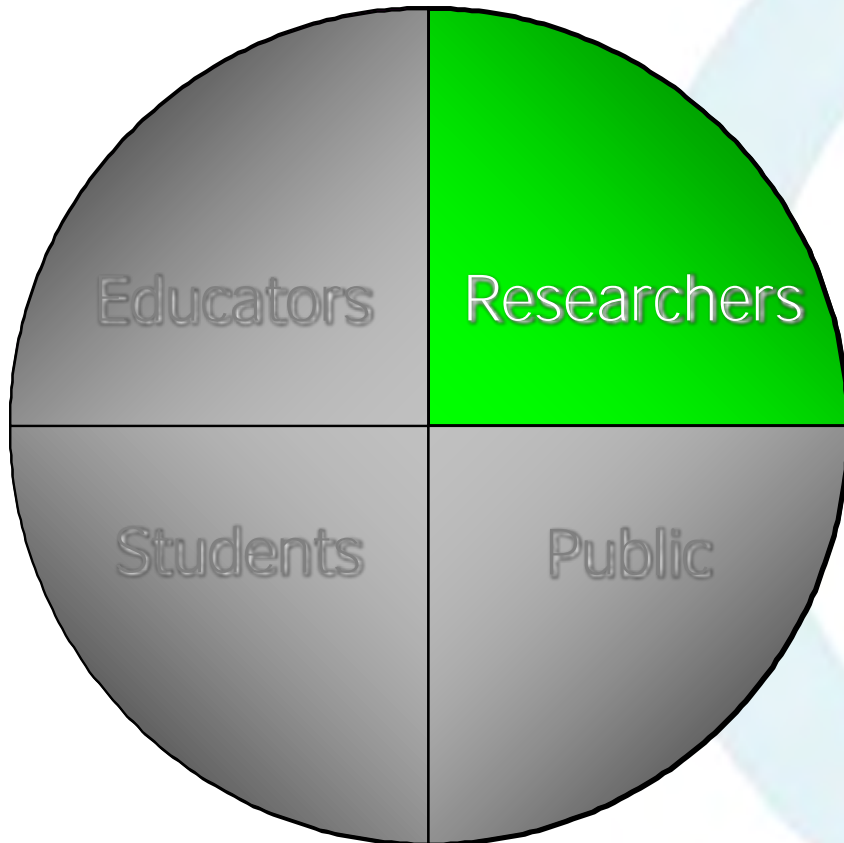
- enhance teacher capabilities in science
- assist scientists in education and public outreach

COSEE Activities by Group



- **Educators**
 - Lake Exploration workshops
 - Lake Guardian
 - Marine Immersion
 - Teachable Moments
 - Curriculum Development

COSEE Activities by Group



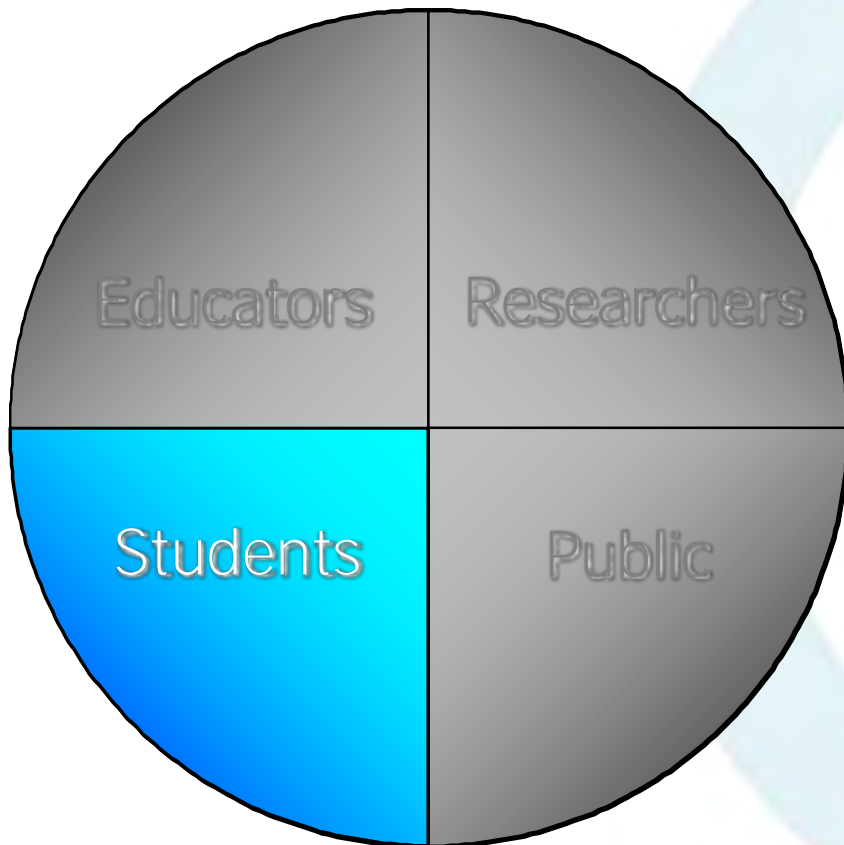
- **Research Scientists**
 - Lake Exploration workshops
 - Educator House-calls
 - School for Scientists

COSEE Great Lakes Objectives

Facilitate direct student connections to Great Lakes and ocean sciences



COSEE Activities by Group



- **Students**
 - O'LAKERS (Ocean/Lake-Aware Kids Engaged in Relevant Science)
 - Student Summits
 - Great Lakes Ecology Course
 - Great Lakes/ocean Sciences Careers

COSEE Great Lakes Objectives

Integrate Great Lakes and ocean sciences in curricula



Curriculum Objectives



- Enhance teacher accessibility to science
- Integrate research into existing high quality educational materials

Phase 1

Greatest of the Great Lakes



- Existing Great Lakes materials have been rigorously reviewed and tested
- Classroom activities on Great Lakes Overview, Life in the Water, Habitats, Climate and Weather, Hydrology, Coastal Processes, and Issues

Greatest of the Great Lakes

- 41 classroom activities (grades 4-10)
- Great Lakes science, issues, potential solutions
- Aligned to state and national science education standards and ocean literacy principles
- Wide variety of instructional modes--e.g., role playing, experiments, investigation
- Many learning skills - inquiry, data interpretation, hypothesis development, and decision-making

Free Sample Activities (Download)

- [How Big is a Crowd?](#)
(from the Great Lakes Overview section)
- [Who Can Harvest a Walleye](#)
(from the Life in the Water section)
- [Seeing Purple](#)
(from the Habitats section)
- [How the Great Lakes Modify the Growing Season](#)
(from the Climate and Weather Section)
- [Making Great Lakes Connections](#)
(from the Hydrology section)
- [Indoor Dunes](#)
(from the Coastal Processes section)
- [What are the Characteristics of Great Lakes Exotic Species?](#)
(from the Issues section)

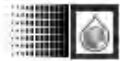
Invasive Species



- Role play
- Impact of invasive species on environment and economy
- Pathways of introduction

Toxic Pollutants

Toxic Chemicals in the Great Lakes—2 of Two Activities



Where Do All the Toxins Go? (External View)

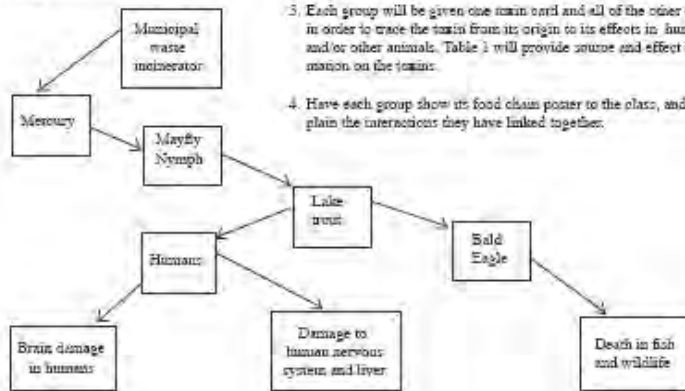
Bioaccumulation is the build-up of chemicals in an organism's body – the longer an organism lives, the more it absorbs. When an older, large lake trout is caught, the concentration of toxins in its body could be a million times that of the original concentrations in the water. **Biomagnification** results when toxins become increasingly concentrated as they pass through the food chain. When a fish feeds on zooplankton, for example, the fish takes up toxins in all of the plankton it eats. In the fish, many of the toxins accumulate in its fatty tissues. When a gull or an eagle feeds on the fish, the bird takes up all of the toxins the fish has accumulated from all the contaminated organisms it has ever eaten. Therefore, the higher up an organism is in the food chain, the greater the amount of toxins it is likely to consume.

Earth Systems Understandings

This activity addresses ESM 2 (interconnectedness), 3 (resource processes), and 4 (interactions).

Materials

- Each group will need:
 - Copy of Table 1.
 - Copy of human activities and industry cards (1 page).
 - 1 toxin card.
 - Copy of food chain cards (3 pages).
 - Copy of effects of toxin cards (1 page).
 - Scissors.
 - Posterboard or butcher paper.
 - Glue.



OBJECTIVES

When you have completed this activity, you should be able to describe how bioaccumulation and biomagnification of toxins in the food chain cause health disorders in humans and animals.

PROCEDURE

1. The teacher has prepared cards for the teams. Each of the eight themes (fish, mammals, etc.) is on a different color.
2. Work in groups of three to four people to make a poster. First assemble a reasonable food chain from the cards you have.
3. Each group will be given one toxin card and all of the other cards in order to trace the toxin from its origin to its effects in humans and/or other animals. Table 1 will provide source and effect information on the toxin.
4. Have each group show its food chain poster to the class, and explain the interactions they have linked together.

- Simulation and data interpretation
- Bioaccumulation and biomagnification of toxins in the food chain
- Health disorders in animals and humans

Habitat Conservation and Species Management



Seeing Purple: A Population Explosion

Trip at a Glance

Through a simulation, sampling, and estimation activity, students learn about the impact of purple loosestrife on a wetland due to its exponential growth. They learn about purple loosestrife's life cycle and appreciate how scientists determine population size in an ecosystem.

Destination

- Students will be able to
- Recognize purple loosestrife and tell how the seeds are dispersed.
 - Describe that purple loosestrife produces over 2 million seeds and have a concept of how much that really is.
 - Determine the population of purple loosestrife seeds for their wetland ecosystem through sampling.



Adventure Levels

Grades 3–8
(Mathematics aspect is more appropriate for grades 5–8.)

Areas of Interest

Mathematics and Science

Locale

Indoor, open area for spreading simulated purple loosestrife; desks or tables

Length of Stay

Three or four class periods

Invader Background Check

Purple loosestrife is an aggressive nonindigenous plant that rapidly disperses throughout wetland areas. It is an unwelcome intruder because it interferes with the growth of native species and fills in the spaces where the natives would normally grow. Purple loosestrife creates many problems through its competitive advantage that cause an imbalance in the wetland ecosystem.



Foreign Language

Population
Purple loosestrife
Sampling

Amenities Provided

Purple Loosestrife (*Lythrum salicaria*) Fact Sheet 24.1
Dot Worksheet 24.2
How Much Is Two Million Seeds? 24.3

- Sampling/estimation
- Purple loosestrife's impacts on wetlands
- Discover how scientists determine population size

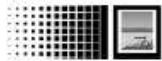
Human Health and Safety



summary <p>Students learn about bacteria as an indicator of beach water quality for swimming. In groups they solve hypothetical problems associated with beaches. Then students write persuasive essays on the issue.</p>	subjects <p>Environmental Science, Human Health, Social Studies, Language Arts</p>
time <p>4-8 90 minutes</p>	standards <p>IL Science: 12.B.2a, 13.B.2a, 13.B.2f Social Studies: 17.B.3b, 17.C.2c Language Arts: 3.C.2a, 3.C.3a IN Science: 6.B.5, 7.A.14, 8.3.A Language Arts: 4.5.A, 5.5.A, 6.5.5, 7.5.A, 8.5.4 MI Science: 5Q, 11.5, E.4, SCI 11.5, MS.6 Social Studies: 50C, 11.4, LE.5 Language Arts: ELA.2, MS.1 NY Language Arts: 8.5.1, C.4.2, C.4.1</p>
objectives <ul style="list-style-type: none">• Discuss the effect of harmful bacteria on swimming conditions at beaches.• Diagram three reasons for beach contamination.• Explain solutions for beach health problems.• Write a persuasive essay about beach health.	
prerequisite <p>Garbage Investigation, Litter Tag</p>	
vocabulary <p>Bacteria: single-celled organisms, free-living or parasitic, that break down the wastes and bodies of dead organisms, making their components available for reuse by other organisms. Sewage overflow: sewage that is discharged into waterways. Stormwater: water that accumulates on the ground during a rain event.</p>	
setting <p>INDOORS : OUTDOORS Classroom or beach</p>	materials <ul style="list-style-type: none">• Prescription for Healthy Beaches (on CD)• Journals• Pencils• Clipboards (if outside)

- Problem solving/Stewardship
- Diagram 3 reasons for beach contamination
- Write a persuasive essay about beach health

Watershed Stewardship



Hydropoly: A Decision-Making Game

Activity: Students play a board game to hone their decision-making skills. Through the various choices posed in the game, they are asked to consider both economic and environmental well being in making decisions.

Grade Level: 4-8
Subjects: Science, social studies
Setting: Classroom and/or outside
Duration: 1 hours
Key terms: Land Use, Wetland

OBJECTIVES

After participating in this activity, students will be able to:

- Discuss land-use practices that affect Great Lakes wetlands
- Make decisions and recognize personal priorities with regard to wetlands
- Describe some of the economic factors that often drive land use

SUMMARY

Every day we make choices. We decide simple things like what to wear, what to eat, or how much time to allow for homework. Some decisions, however, require us to think critically and consider the potential consequences of our actions. Through the various land-use choices posed in the game Hydropoly, students must consider both the economic and environmental consequences of their decisions. This type of decision-making helps prepare young people for situations they'll encounter throughout their lives.

BACKGROUND

Coastal and inland communities in the Great Lakes region face difficult land use decisions every day. Land use refers to how land within a community is used—whether for houses, businesses, agriculture or natural areas. Local leaders must decide where to build houses and what type of industry to support. Communities must also consider another important factor—the health of the environment. A healthy environment that allows for natural areas, open green space,

and clean water attracts residents and enhances quality of life.

Protecting wetlands is another way to enhance our natural environment. Wetlands provide important ecological benefits—such as water filtration, habitat and flood control—that need to be considered in land use decisions. Yet wetland benefits are frequently overlooked. Financial gain and economic concerns often override environmental issues. Despite this historic trend, some communities are recognizing that a healthy environment is closely tied to a healthy economy. We could call this principle "economics"—the healthy marriage of ecological protection and economic growth.



- Decision making
- Problem solving
- Land use/wetlands
- Economic and environmental impacts of decisions

Phase 2

Fresh and Salt Curriculum



- Reviewed by teachers and scientists
- Matched with parallel ocean topics
- Introduced at national and state science teacher conferences

Recruit scientists to review for technical accuracy

Recruit classroom teachers for pilot testing

c	Jan-May 2008	May-Aug 2008	Spring/Summer 2008	Sept 2008-May 2009	
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Recruit nonformal educators in pilot tests

Recruit classroom teachers to align to standards

Summer 2009	Jun-Nov 2009	Dec 2009-Mar 2010	End of Mar 2010	Apr-Dec 2010
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Product ready for distribution

You can get involved in *Fresh and Salt*

- Align activities to education standards
- Pilot test these activities

To learn how to become involved in this COSEE Great Lakes curriculum project, contact Terri Hallesy at thallesy@uiuc.edu



COSEE opportunities for scientists and educators:

- <http://coseegreatlakes.net>