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.
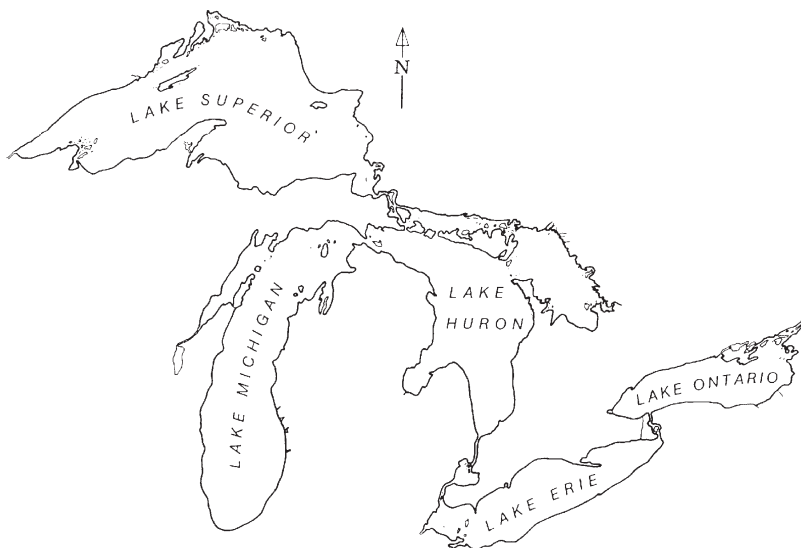
PROCEDURE

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.

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.

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?

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 that 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).

These Lakes Are Great

Lesson 1:
From Unit My Water, Your Water, Our Water

3rd-5th Grade

Subjects:	**Key Words/Concepts** click to view
Library / Technology, Philanthropy, Science and Social Studies	

Purpose:

Learners will discover individual and collective responsibility for maintaining the health of the Great Lakes Basin.

Duration:

Two to Three Forty-Five Minute Class Periods

Objectives:

The learner will:

- analyze content of the reading book, A River Ran Wild.
- apply knowledge gained from the reading to the Great Lakes.
- identify **citizen responsibility** for the Great Lakes Basin.
- develop concept of community capital as applied to Great Lakes Basin.
- identify reasons for maintaining water quality.
- demonstrate use of vocabulary associated with water quality.
- locate his/her nearest river, pond, lake, reservoir.

Materials:

- Book - *A River Ran Wild* (see **Bibliographical References**)

- Video- Outside Television: "*The Hudson Riverkeepers*"

- www.ijc.org Excellent resource. Ask for: *Lakes Agreement Information Kit*.
  International Joint Commission: Great Lakes Regional Office, United States Section or Canadian Section

Subject:	Kit includes a pamphlet on "What the IJC is and how it works," a bibliography of IJC reports under the Agreement, a brochure on toxic substances and on the Remedial Action Plan program, posters on "Our Fragile Ecosystem" and on RAPs, Water Quality and Water Quantity.
Level:	All ages
Cost:	Free

- District and/or school science texts appropriate for grade level: sections on water quality, pollution and conservation of water

- Journals

- Large map of the Great Lakes visible to all learners

- Poster board or large sheets of paper

- Markers, colored pencils or crayons

- Student copies of **Attachment One: *Guided Practice***

- Student copies of **Attachment Two: *Fishing for Facts***

Teacher Preparation:

Due to the technical nature of the content on water quality and the Great Lakes Basin, it is highly recommended that the instructor use the following websites to become familiarized with the content to be developed with the learners.

- Great Lakes Sea Grant Network
  http://www.greatlakesseagrant.org/
  This Web site will help the instructor to become familiar with the Great Lakes Water Quality Agreement. Also found here are excellent articles on the introduction of non-indigenous species introduced into the lakes such as the zebra mussel.

- Environment Canada [Ontario] Great Lakes Water Quality Agreement
  http://www.on.ec.gc.ca/glwqa/sht-history-e.html
  To review the history of pollution in the Great Lakes Basin and what is currently being done about it. This Canadian site has multiple references.

- www.nationalgeographic.com/mapmachine This Web site is an excellent source for downloadable maps for student use. Obtain from your local library, media center or Public Broadcasting System the VHS produced by Outside Television entitled, "*The Hudson Riverkeepers*" by Robert Kennedy et al. (1998).

- U.S. Geological Survey
  http://interactive2.usgs.gov/learningweb/
  explorer/topic_water_links.asp
  Source for water glossary terms (http://water.usgs.gov/nawqa/glos.html) , activities, maps, etc.

Instructional Procedure(s):

Anticipatory Set:

*Use a large map that shows the Great Lakes. Ask the learners why these lakes are so important and make a list of the responses. Ask the learners if they know the definitions or give examples of pollution and conservation and how they can relate these terms to what they already know about our lakes, rivers and streams. Read and discuss **Attachment Two: Fishing for Facts**, as a class. Tell them that the true story they are about to read will describe how a once great, clean river became polluted and how Marion Stoddard and others practicing **philanthropy** helped save the river.*

- Read book, *The River Ran Wild*, and discuss the following questions:
  1. How does a river change over time? Is this good or bad?
  2. What factors did we discover about the Nashua River that we could see happening in the Great Lakes?
  3. Why do you think Marie felt that it was her **responsibility** to act philanthropically and accept **stewardship** for the river.
- Define terms appropriately: ecosystem, pollution, estuaries conservation, water quality, **philanthropy**, **stewardship**, **community capital**, selfish, **selfless**.

- Have the learners complete *Guided Practice* (**Attachment One**) to accompany the reading. Take home for parents to view and if needed, learners my complete at home.

- Discuss the responses learners wrote on the *Guided Practice* (**Attachment One**) sheet. Come to **consensus** with the class on each response.

- View the video, "*The Hudson Riverkeepers*," and have the learners compare how the Nashua River was cleaned and how the Hudson River is being cleaned. Make certain that the learners discuss the examples of **stewardship** and public action for the **common good**.

- Form **cooperative** groups and discuss how the concepts involved in **stewardship** and **philanthropy** can be connected to the saving of our Great Lakes ecosystems.

- Create a poster reflecting the slogan, "Give a Hoot, Don't Pollute," and write a caption for the poster.

Assessment:

- Assess **Attachment One: *Guided Practice*** for comprehension of story.

- Evaluate poster with a slogan.

- Instructor observation

- Class participation

- Instructor-designed assessment of content

School/Home Connection:

Take-home sheet is included as **Attachment One: *Guided Practice*** to be completed if needed at home. If completed at home, check for accuracy and show to parents.

Bibliographical References:

Cheery, Lynne. *A River Ran Wild*. An Environmental History (A Reading Rainbow Book). Harcourt. ISBN: 152005420

National Geographic's Map Machine
    www.nationalgeographic.com/mapmachine

Great Lakes Sea Grant Network
    www.seagrant.wisc.edu/greatlakes/glnetwork/exotics.html.

Environment Canada [Ontario] Great Lakes Water Quality Agreement
    http://www.on.ec.gc.ca/glwqa/sht-history-e.html

Kennedy, Robert et al. Outside Television: "The Hudson Riverkeepers." Outside Television Producers, 1998. Available at:
    www.PBS.org.

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Handout 1

Guided Practice

Directions: Put an "X" in front of the best answer.

1. The Nashua River runs in which two states?

   Michigan and Ohio   New Hampshire and Maryland
   Florida and Georgia   Massachusetts and New Hampshire

2. These two states are found in this part of the United States.
        East   West   Northeast   Southwest

3. This story is:

   A Fiction book   A Non-fiction book

4. Which statement is the most correct?

   The French settled the area 500 years ago.
   Almost 7,000 years ago native people settled the area.
   The Americans settled there before the native people.

The area is still not used or settled.

5. What is the most important thing I learned from the story?

We should find some way to help conserve our resources.
Our government will always pass laws to stop pollution.
It is not necessary for us to help stop pollution.
Industry in the area did not pollute the river.

Directions: Fill in the chart

Who	What was the river like when they found it?	How did they use the river?
Native Americans		
Settlers to1960s		

Directions: Write your answers with your very best spelling and in sentences.
What did Marie Stoddard do to help the river?

Describe Marie with just one of our philanthropy words.

Handout 2

Fishing for Facts

Water is the most common substance on Earth. It is found as ground water, in oceans, seas, rivers, lakes, ponds and streams. There are two forms of water. The water found in the seas and oceans has salt. Lake, river, stream and pond water has no salt. There is one exception. **Estuaries**, where ocean meets fresh water have both salt and fresh water. When **tides** come in, the water is saltier and when tides go out, there is less salt in the water.

Water pollution is one of our greatest environmental problems. Our waterways are not as clean as they should be. Our water worldwide has become polluted because of pesticides and other chemicals running off the land into our water. Sometimes people and industry pollute accidentally but sometimes this dumping is done purposefully. In our area of the United States and the nation of Canada we depend on the Great Lakes and the waterways, rivers, smaller lakes, streams and underground water supply. We need clean water for our homes, schools, recreation, transportation, business and industry. The Great Lakes and all the surrounding land are called the **Great Lakes Basin**.

Many of us have learned the names of the Great Lakes by using the word **HOMES**. Each letter stands for a Great Lake: Huron, Ontario, Michigan, Erie and Superior.

Today we know that chemicals like PCB hurt the fish and birds. Fish like perch and walleye developed tumors. Salmon and trout had

so much of the chemicals in them that people are still warned not to eat too much of these sport fish from the Great Lakes. The bald eagle became an endangered species because they ate fish containing the pesticides.

The shells of their eggs became weak and their young did not hatch. Because of efforts to stop poaching, reducing chemicals in the water and protecting nesting sites, the eagle has been restored and is now protected, not endangered. However, there are new threats. Ships going through the St. Lawrence Seaway brought unwanted species that hurt native species. The lamprey eel, sculpin fish and zebra mussels are three of these unwanted and harmful species.

Because citizens became alarmed and took voluntary action for the common good, many organizations and conservation clubs were formed. **Conservation** is the way we attempt to manage, use wisely and protect our natural resources. Businesses, industry and governments also saw the need to stop pollution and they also took action. The United States government now has the Environmental Protection Agency. Canada and the United States have a Joint Commission to protect the Great Lakes. Each state that shares one of the Great Lakes has a Department of Environmental Quality. Grassroots service movements have been formed in communities to monitor and protect our Great Lakes Basin. Yearly river cleanups like the Rouge River Project involve youth and community volunteers to restore this once great river. Youth take active roles in letter writing campaigns, water quality testing, and other service projects to insure the health of the water. They are making a difference by preserving this heritage for the future.

Academic Standards:

State/Country: [▲▼] (View Standards)

Philanthropy Framework:

Strand	Standard	Benchmark
I. Definitions of Philanthropy	DP 01. Define Philanthropy	E 1. Define philanthropy as the giving and sharing of time, talent, or treasure intended for the common good.
I. Definitions of Philanthropy	DP 01. Define Philanthropy	E 4. Define and give examples of selfishness and selflessness.
II. Philanthropy and Civil Society	PCS03. Philanthropy and Economics	E 5. Recognize the wise use of resources as *stewardship*.
II. Philanthropy and Civil Society	PCS03. Philanthropy and Economics	E 7. Define and describe private property and common resources.
III. Philanthropy and the Individual	PI 01. Reasons for Individual Philanthropy	E 3. Define stewardship and give examples.