

How well do you know the Great Lakes?

(Background and Teacher Activity)

BACKGROUND

Many people, including a large portion 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 climate change, pollution, and water use without a basic understanding of the lakes, this activity is designed to help visualize the differences in volume, shoreline length, human population distribution, and fish populations of the Great Lakes.

This lesson can be easily adapted for informal education settings. Informal educators will want to focus on the “Explain” portion of the lesson where learners construct the lakes with string.

Objectives: In this activity, learners will construct the five Great Lakes from string and use paper “water” and “fish” to show comparisons between the lakes.

After completing this activity, students will be able to:

- Compare and contrast the differences between the Great Lakes in water volumes, length of shoreline, human population distribution, and the amount of fish harvested from each lake.

Materials: Students will need a large working surface preferably on the ground so that all can gather around the lakes.

1 small area per group

Five strings, each tied into a circle, in the following lengths: 3.8 m, 3.0 m, 1.6 m, 0.9 m, 0.7 m (Add a piece of masking tape on each string with the length noted on it.)

1 set per base group

Lake labels

1 set per base group

Five lake population papers

1 set per base group

Pen or Pencil

1 per base group

100 blue squares to represent water

1 set per base group

100 fish papers

1 set per base group

Map of the Great Lakes

1 for each expert group

Copy of Great Lakes Data

1 for the teacher

Templates for materials are found at the end of the lesson instructions.

Subject/Grade Levels: Geography

As written this activity is appropriate for students in grades 4-8, but can easily be adapted for high school students and adult learners.



ALIGNMENT

National Geography Standards:

#3: How to analyze the spatial organization of people, places and environments on Earth's surface (grades 4, 8)

Great Lakes Literacy Principles:

#1a,b,d: The Great Lakes, bodies of fresh water with many features, are connected to each other and to the world ocean.

#6b: The Great Lakes and humans in their watersheds are inextricably interconnected.

TEACHER'S NOTES

Prior to the activity, prepare bags for base groups that contain the five labeled strings, lake name cards and lake population papers, as well as 100 blue water squares and 100 fish squares. The template sheets have 25 water drops and 50 fish per page.

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

- A. 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. To stay organized, label each string with a small piece of tape with the relative length number on it.
- B. Water Volume:** The 100 blue squares represent all of the water in the Great Lakes combined. To find how 100 squares should be distributed, look at the relative volume data in the volume category. It lists 54 for Lake Superior; this means that 54 of the squares should be in the Lakes Superior string model (over half of all the water in the Great Lakes is in Lake Superior).
- C. Human Population:** The total population data figures in the population section are rounded off to the nearest million. The students attempt to guess the numbers in this category. It is interesting to realize that Lake Superior has only approximately 0.6 million people living in its watershed. This is less than 2% of the total population of the Great Lakes watershed.
- D. Commercial Fishing Harvest:** The row labeled “relative amount of fish harvested” in the fishing section indicates the number of pounds of fish that would come from each lake if the total number of pounds from all the lakes was 100. As they did with water volume, students should distribute the 100 fish squares amongst the lakes.

ENGAGE

This lesson, as a whole, can be used as an engagement activity for an entire unit on Great Lakes science or geography. However, the following questions might be asked to specifically introduce this lesson:

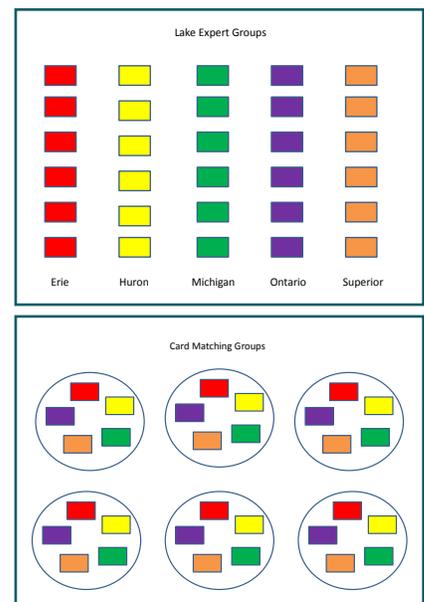
- Do you know the names of the five Great Lakes?
- Have you ever visited a Great Lake?
- What Great Lake would you consider “your” lake?
- What major cities are along the shores of the Great Lakes?
- Why do people visit the Great Lakes?

EXPLORE

This lesson begins with a teaching strategy called a jigsaw. In a jigsaw, students are first assigned an EXPERT group (large group) and then reorganize into different BASE groups (smaller group) that will contain at least one member from every expert group.

1. Divide the class into five EXPERT groups. Assign each EXPERT group a lake to research and answer background questions; these students will be the experts on their assigned lake.

TEACHER'S NOTE: This task could be done by students individually as homework so that they come prepared to class the next day. Alternatively, expert groups could use class time with internet access to work together to answer the background questions before reorganizing groups.



EXPLAIN

2. Reorganize students so that each BASE group contains at least one expert on each lake. These new groups should have at least five students in them. Students should have their completed worksheets with them.
3. Provide each group with a bag containing the five measured strings, lake names, 100 fish squares, 100 water squares and five strips of paper for lake populations.
4. Facilitate the activity by having students demonstrate their hypotheses about the shoreline length, volume, human populations and commercial fishing harvest in each lake. Here is a possible script:

A. Shoreline: Arrange the five strings to form a model of the outline of the Great Lakes. Add in your lake name cards once the strings are assembled.

B. 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.

C. Human Population: The total population of people living in the Great Lakes watershed is approximately 32.8 million. Divide that number among the Great Lakes. For example, if your group thinks that about half of the people in the Great Lakes live in the Lake Superior watershed, then write 16 million on the strip of paper labeled Lake Superior Population. *Teachers - the goal is not necessarily to get the number correct, but to have students start thinking about where people are located around the lakes.*

D. Commercial Fishing Harvest: Distribute 100 fish squares among the lakes to represent the amount of fish harvested from each lake for human food. If your group thinks, for example, that the same amount of fish is harvested from each lake, then put 20 fish squares into each lake.

5. After base groups have assembled the “lakes,” have students share their hypotheses and then reveal the answers from Great Lakes Data.

TEACHER’S NOTE:
Instead of writing actual numbers on the strips of paper, the lakes could be ranked from 1-5 for highest population to lowest population.

EXTEND

Students answer geography questions after completing the class activity. Some questions will require the use of a map of the Great Lakes basin such as the one provided here.

Answers to Student Worksheet

1. Erie, Ontario, Huron, Michigan, Superior
2. From Lake Superior, a water droplet may or may not travel through Lake Michigan, but will move through Lake Huron, then Lake Erie and Lake Ontario before entering the St. Lawrence Seaway on a journey to the Atlantic Ocean.
3. Lake Superior
4. Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin
5. Lakes Erie, Huron, Ontario and Superior
6. St. Mary’s River
7. St. Clair River and Detroit River
8. No
9. Lake Ontario
10. St. Lawrence Seaway; to the Atlantic Ocean
11. Lake Huron
12. Lake Erie
13. 64 m or 210 ft
14. Deeper by 15 meters
15. Niagara Falls
16. a. between Lakes Huron and Erie b. Lake Erie c. Lake Michigan d. Lake Ontario
- 17a. St. Lawrence Seaway
- 17b. Niagara River

- 17c. Detroit River
- 17d. Lake St. Clair
- 17e. St. Clair River
- 17f. St. Mary's River
- 17g. Straights of Mackinac
- 17h. Lake Erie
- 17i. Lake Huron
- 17j. Lake Ontario
- 17k. Lake Michigan
- 17l. Lake Superior
- 17m. Lake Erie
- 17n. Lake Michigan
- 17o. Lake Superior
- 17p. Lake Huron
- 17q. Lake Erie
- 17r. Lake Ontario
- 17s. Lakes Michigan and Huron
- 17t. Answers will vary

Alternatively, search for additional sets of data about the Great Lakes such as average depth, fish populations, average water retention time, level of pollution, etc. to use with learners in the same manner as the topics addressed here.

How big is a crowd? is an activity that can be done as extension of this one. Students again create the lakes from string, but this time, investigate the relationships between area, population, fish production and pollution. This lesson can be found under Principle 6 at greatlakesliteracy.net.

EVALUATE

Have students rank the Great Lakes according to various characteristics. A half-sheet ranking table that can be used in a variety of ways (as an exit ticket, as a mini-quiz, or as an engagement activity used the day following the lesson) to formatively assess students is provided.

Other sample evaluation questions include:

- What was the most surprising thing you learned from this activity? Why? [*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. Likewise, students may be surprised at the large volume of water contained in Lake Superior.*]
- Which guesses were not close to the correct answers? What reasoning led your group to the wrong decisions? [*Answers will vary.*]
- Why do so many people live around Lake Erie? [*There are several reasons. One is that Lake Erie has a somewhat milder climate. Additionally early trade routes were along its shores and large population centers developed early in America's history.*]
- Why don't the length of coastline and the amount of water correspond? [*The depths of the lakes are very different.*]

ADDITIONAL RESOURCES

A variety of resources (websites, fact sheets, data sets, presentations, and additional lessons) about general Great Lakes topics can be found at greatlakesliteracy.net. Resources are organized by literacy principle.

Jointly produced by the Government of Canada and the U.S. Environmental Protection Agency, the *Great Lakes Atlas* provides a wealth of background information, maps and fact sheets on the Great Lakes. It can be accessed at <http://www.epa.gov/greatlakes/atlas/index.html>.

The Great Lakes Information Network is an up-to-date, online resource for Great Lakes information and issues. It can be accessed at <http://www.great-lakes.net/lakes/>.

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.

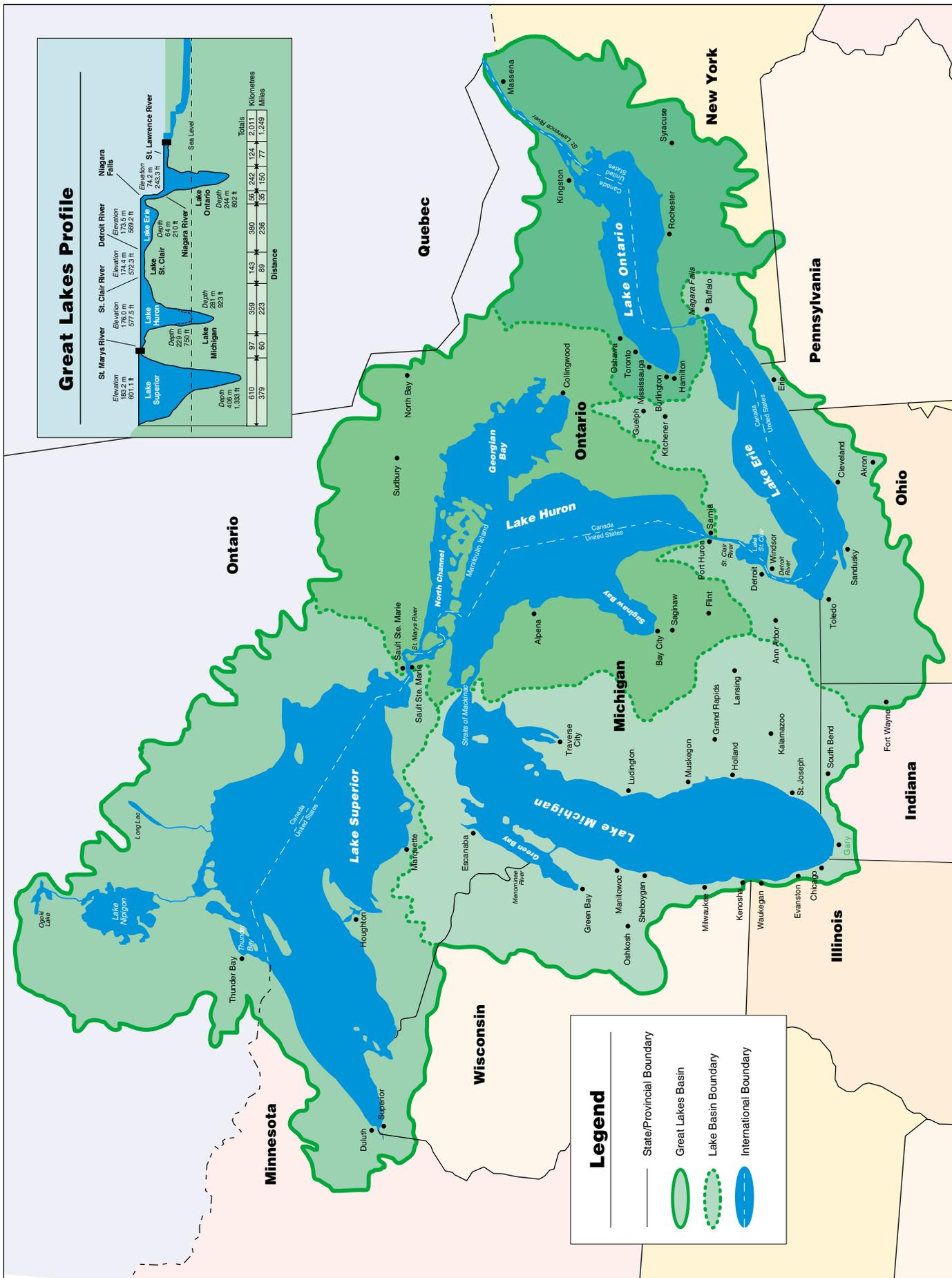
Great Lakes Facts Maps. Michigan Sea Grant College Program. 2000. Cooperative Extension Service, Michigan State University. East Lansing, MI.

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

Great Lakes Data

| | | Superior | Michigan | Huron | Erie | Ontario | Total |
|--|---|-----------|------------|------------|------------|-----------|------------|
| Shoreline (with islands) | miles | 2726 | 1638 | 3827 | 871 | 712 | 10,210 |
| | relative length | 3.0 | 1.6 | 3.8 | 0.9 | 0.7 | 10.0 |
| Volume* | cubic miles | 2900 | 1180 | 850 | 116 | 393 | 5439 |
| | km ³ | 12,100 | 4920 | 3540 | 484 | 1640 | 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 the 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 amount of fish harvested | 7 | 14 | 28 | 49 | 2 | 100 |
| | number of fish species | 45 | 78 | 87 | 100 | 90 | |
| *Measure at Low Water Datum. | | | | | | | |
| Note: The total shoreline is greater than the sum of the lakes because connecting channels are included. | | | | | | | |

The Great Lakes Basin



LAKE
SUPERIOR

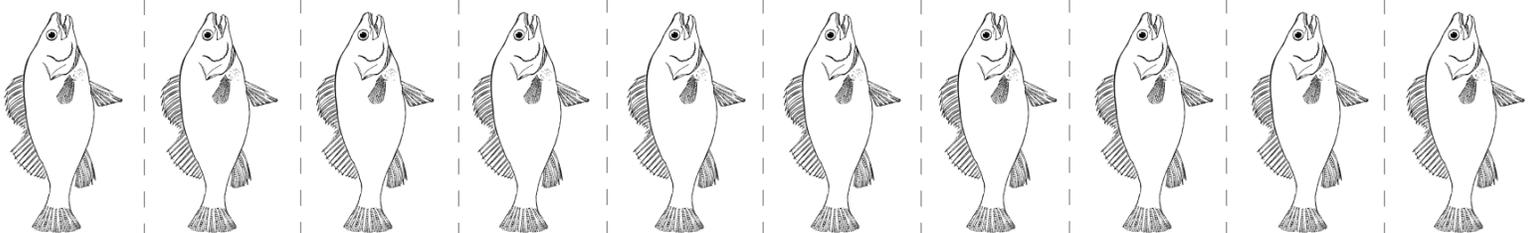
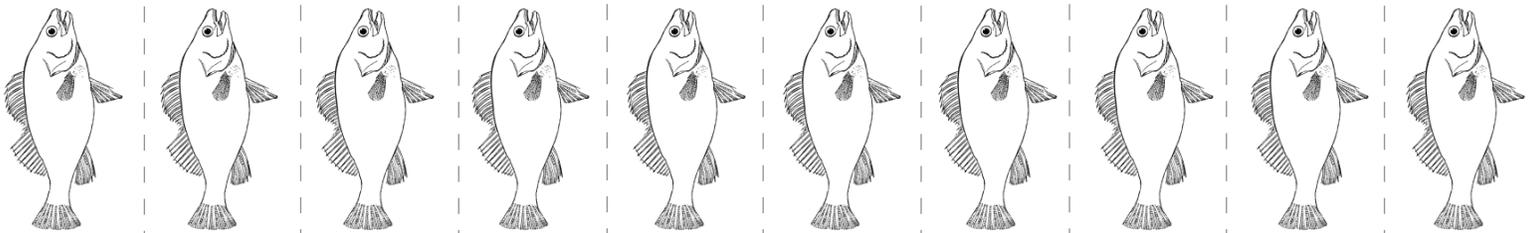
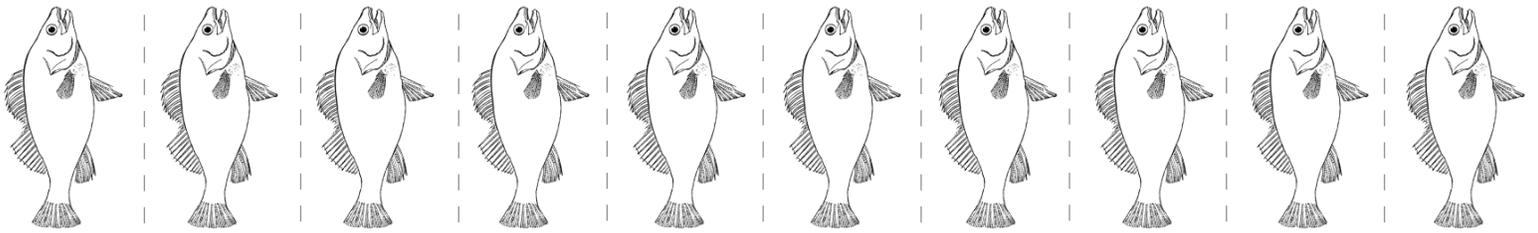
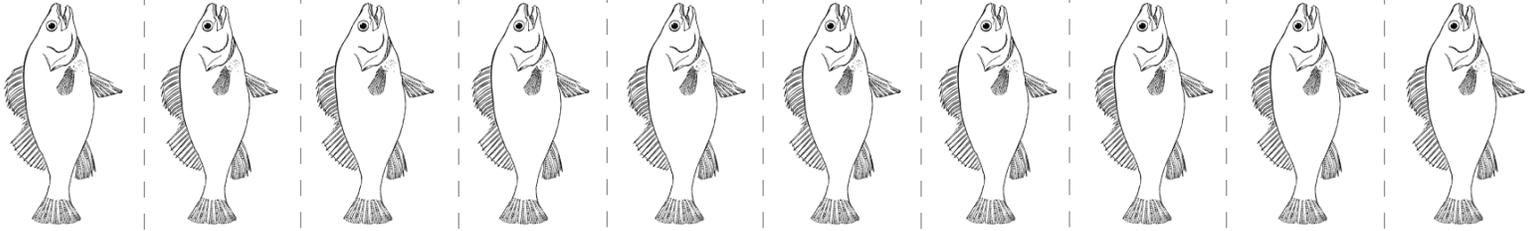
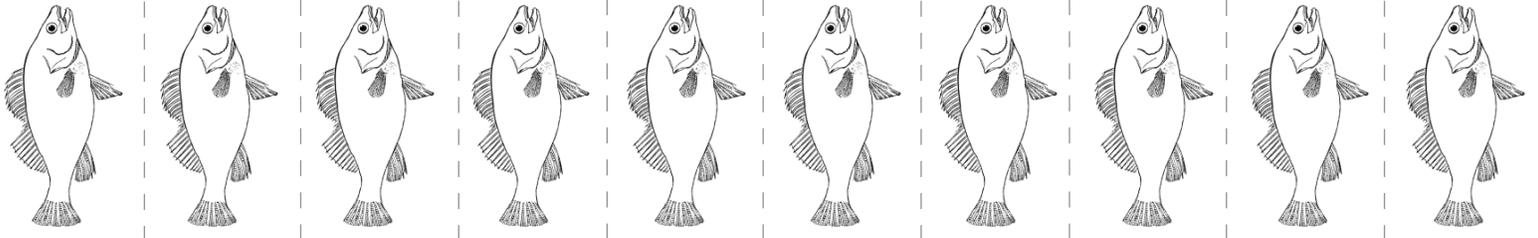
LAKE
HURON

LAKE
MICHIGAN

LAKE
ERIE

LAKE
ONTARIO





Lake Erie Population

Lake Huron Population

Lake Superior Population

Lake Ontario Population

Lake Michigan Population

Student Activity:

Name _____

How well do you know the Great Lakes?

EXPERT GROUP QUESTIONS

Use these questions to guide your research on your Great Lake.

Some internet sites you might search include:

| | |
|---------------------------------|--|
| Great Lakes Fact Sheets | http://www.epa.gov/glnpo/factsheet.html http://www.epa.gov/greatlakes/atlas/gl-fact1.html |
| Introduction to the Great Lakes | http://glin.net/teach/geog/intro/intro_1.html http://www.great-lakes.net/lakes/ |

1. What Great Lake are you researching?
2. Where is your lake in relation to the other four Great Lakes?
3. What state or states does your lake touch?
4. What waterways connect your lake to other lakes or an ocean?
5. What countries does your lake touch?
6. What are the major cities on your lake?
7. What is the surface area of your lake?
8. What is the length of the shoreline of your lake?
9. How deep is your lake?
10. At what elevation is your lake?
11. How much water is in your lake (volume)?
12. What kind of fish can be found in your lake?

Name _____

BASE GROUP QUESTIONS

1. Write the names of the five Great Lakes in order from smallest volume to largest volume.
2. Describe a path that a drop of water might take to reach the Atlantic Ocean.
3. What lake does Minnesota touch?
4. Circle the names of the Great Lakes states.

| | | | |
|------------|----------|----------|--------------|
| New York | Michigan | Illinois | Pennsylvania |
| New Mexico | Maryland | Oklahoma | Ohio |
| California | Indiana | Texas | Washington |
| Minnesota | Iowa | Florida | Wisconsin |
5. What lakes touch both Canada and the United States?
6. What river is between Lake Superior and Lake Huron?
7. What rivers are between Lake Huron and Lake Erie?
8. Is Lake St. Clair a Great Lake?
9. To what lake is the Georgian Bay attached?
10. What river leaves Lake Ontario? Where does it go?
11. What lake has the shortest shoreline?
12. What lake is the shallowest lake?
13. What is the maximum depth of Lake Erie?
14. Is Lake Ontario deeper or shallower than Lake Huron?
15. What is the waterfall that connects Lake Erie and Lake Ontario?
16. For each city, write down the lake that it is closest to:
 - a. Detroit –
 - b. Cleveland –
 - c. Milwaukee –
 - d. Rochester –

Name _____

BASE GROUP QUESTIONS (CONT'D.)

17. Identify the Great Lake or other natural feature.
- a. I am the link between Lake Ontario and the Atlantic Ocean.
 - b. I am a river between Lake Erie and Lake Ontario.
 - c. I am the most downstream link between Lakes Huron and Erie.
 - d. I am the body of water between Lakes Huron and Erie.
 - e. I am the most upstream link between Lake Huron and Lake Erie.
 - f. I am the river between Lake Superior and Lake Huron.
 - g. I am the straits between Lake Michigan and Lake Huron.
 - h. I am the shallowest lake.
 - i. I am the lake with the longest shoreline.
 - j. I am the lake with the smallest surface area.
 - k. I am the only lake entirely in the US.
 - l. I am the deepest lake.
 - m. I am the warmest lake.
 - n. I am the lake with the largest population around it.
 - o. I am the lake with the most water in it.
 - p. I am the lake that contains Manitoulin Island.
 - q. I am the lake emptied by the Niagara Falls.
 - r. I am the lake at the lowest elevation.
 - s. We are the lakes at the same elevation.
 - t. I am the lake to which your school is closest.

How well do you know the Great Lakes?

Name _____

| Rank the Great Lakes from . . . | Erie | Huron | Michigan | Ontario | Superior |
|--|-------------|--------------|-----------------|----------------|-----------------|
| the western most lake (1) to the eastern most lake (5). | | | | | |
| the deepest lake (1) to the shallowest lake (5). | | | | | |
| the lake with the longest shoreline (1) to the lake with the shortest shoreline. | | | | | |
| the lake with the largest volume of water (1) to the lake with the smallest volume of water (5). | | | | | |
| the lake with the largest population living in its watershed (1) to the lake with the smallest population living in its watershed (5). | | | | | |
| the lake that sustains the largest commercial fish harvest (1) to the lake with the smallest commercial fish harvest (5). | | | | | |

How well do you know the Great Lakes?

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