



**Great Lakes
Research Center**
Michigan Technological University



Ride The Waves with



Center for
Science &
Environmental
Outreach

Michigan Tech University

Great Lakes Watershed Floor Map Activity

Subject: Science, Social Studies

Grade: 6-8

Duration: 50-minute class period

Materials

Per group

- Great Lakes Floor Map
- MI Sea Grant Great Lakes watershed map w/ rivers illustrated for each state & province in the watershed.
- Meter sticks or measuring tapes (not included)
- Great Lakes Physical Features & Population Chart
- "Rivers" consisting of label with name and blue yarn tied on to each label
- Yarn (for locating watershed boundary)

Lesson Overview

Students become familiar with Great Lakes geography as they explore the concept of a watershed by mapping rivers and locating the Great Lakes watershed divide. Students discover that each river system is a sub-watershed of the Great Lakes Basin.

Essential Questions

Why is it important to know about watersheds?

Objectives

Students will be able to:

1. Define 'watershed.'
2. Explain why human activities within one watershed can potentially affect the entire Great Lakes Basin.
3. How do people have to work together to thoughtfully utilize the water resources in the Great Lakes Basin?

Advance Preparation

Spread the Great Lakes Floor Map out on the floor. Have the students gather around the edge of the map. (Tell students to take off their shoes so that the map stays clean, or have them kneel on map with their feet off the map.)

Introduction

Ask students what this is a map of? (Great Lakes) Have student place the *names of each Great Lake* in the middle of each lake. Continue by asking students what they already know about the Great Lakes. (Which Great Lake contains the most water? How much of the world's, and North America's or United States, water is in the Great Lakes? Where do the Great Lakes "begin"? Into which body of water do the Great Lakes empty?)

Procedure

Activity 1: Basic Geography and Mapping

1. Explain that all maps must show:
 - a) scale (distance legend)
 - b) orient you to the compass directions. [This map has a bar scale and a compass rose.]
2. Ask students where we are located on the map. Have one student place “You Are Here” sign. **Next pass out the labels for two countries, states/province, cities and national/provincial parks to students and have them place the labels in their proper locations.** Students are encouraged to consult the maps available or look up the rivers online to find their locations.
3. Population Comparisons in Great Lakes Basin
 - Ask students if they think the L. Superior watershed is heavily or lightly populated. Show students the map illustration on page 30 in “The Great Lakes: an Environmental Atlas and Resource Book” to show how few people live around Lake Superior. How do the populations of the other Great Lakes watersheds compare? Consult the table of **Great Lakes Physical Features & Population** on page 6 of this lesson: least populated watershed 700,000 (L. Superior) as compared to 9,820,620 for most populated L. Michigan watershed.
 - Identify where agricultural areas are? [ex. SW Michigan and western Michigan fruit growing area and where industry is located in basin: mining, shipping, forestry, tourism, chemicals, automobiles, etc.
4. Determine length and width of each Great Lake
Have students guess the dimensions of each lake, then measure their length and width. For example, for Lake Superior measure the length from Duluth to Wawa [~360 miles] and width from Munising to Rosspport, Ontario [~170 miles] using yarn and map scale. Repeat for other 4 lakes.

Activity 2: Determine the Boundary (Divide) of the Great Lakes Watershed

Ask students, “Where does all the water in the Great Lakes come from?” [Precipitation onto the lake, runoff from surrounding land, and a small amount comes from groundwater seepage upwelling into the lakes.]

1. Mapping Rivers

Pass out one piece of blue yarn (attached to a river name) to each student. Demonstrate how a river might look on a map by pointing out the headwaters and the mouth of the river, and meanders (curves). Rivers are not naturally straight. Rivers flow “downhill.” Then have each student place their river on the map with one end touching one of the Great Lakes. Again, encourage students to consult the maps available or look up the rivers online to find their correct locations.

2. Locate the Watershed Boundary

Once students have finished, have them stand around the map. Tell the students that these are just some of the rivers that flow into the Great Lakes. All of these rivers contribute a large amount of water to the Great Lakes system. Pick a point between two rivers and ask: if a raindrop falls here where will it run off to? (The drop may run off to one of the rivers and then flow into one of the Great Lakes.) Next, pick a point away from the rivers, at the edge of the floor map, and ask the same question: if a rain drop falls here where will it run off to? (This raindrop may flow into Atlantic Ocean, Gulf of Mexico, Hudson Bay or the Mississippi River, depending on location.)

Great Lakes Watershed Floor Map Activity

With students standing at the head of their river(s), pass a ball of yarn (any color other than royal blue) around the Great Lakes. Tell students that this line represents the boundary that defines whether water will flow into the Great Lakes or towards another body of water outside the watershed. Tell them this imaginary line is called a **DIVIDE** and all the area inside the yarn represents the **GREAT LAKES WATERSHED**. It is a nice visual effect to have students lift up the map a couple inches along the watershed boundary to show 3-dimensionally how water flows downhill toward the Great Lakes.

All of the watersheds of the individual rivers around the Great Lakes combine to make up the Great Lakes Watershed.

Optional: Why are there “locks” between some Great Lakes? Water flows down hill and there are some significant “hills” in the Great Lakes system where locks have been constructed to help ships get over the “hills”, for example: St. Mary’s River between Lake Superior and Lakes Michigan/Huron, St. Clair/Detroit Rivers between Lake Huron and Lake Erie (no locks) Niagara Falls between Lakes Ontario and Erie, and between Lake Ontario and St. Lawrence River.

3. Identify Natural Characteristics of the Great Lakes Watershed

Review various facts/superlatives about the Great Lakes (see table of **Great Lakes Physical Features & Population** on page 6 of this lesson):

- Lake Superior—is deepest of Great Lakes (Max. = 1333 ft., Avg = 490 ft.)
- Lake Superior—is cleanest of Great Lakes
- Lake Superior—holds ½ of water in Great Lakes, 10% of fresh surface water in world.
- Great Lakes hold 20% of world’s fresh water and 95% of United States’ fresh surface water.
- Lake Superior holds 3 quadrillion gallons of water (enough to cover lower 48 states with 5 feet of water)!

4. Why Are Watersheds Important?

Tell students the watershed that they have just created is a close approximation of the actual Great Lakes watershed. Show them a map of the Great Lakes watershed. Ask students “In which Great Lake watershed does your school lie? [Identify which river’s watershed the school is within.]

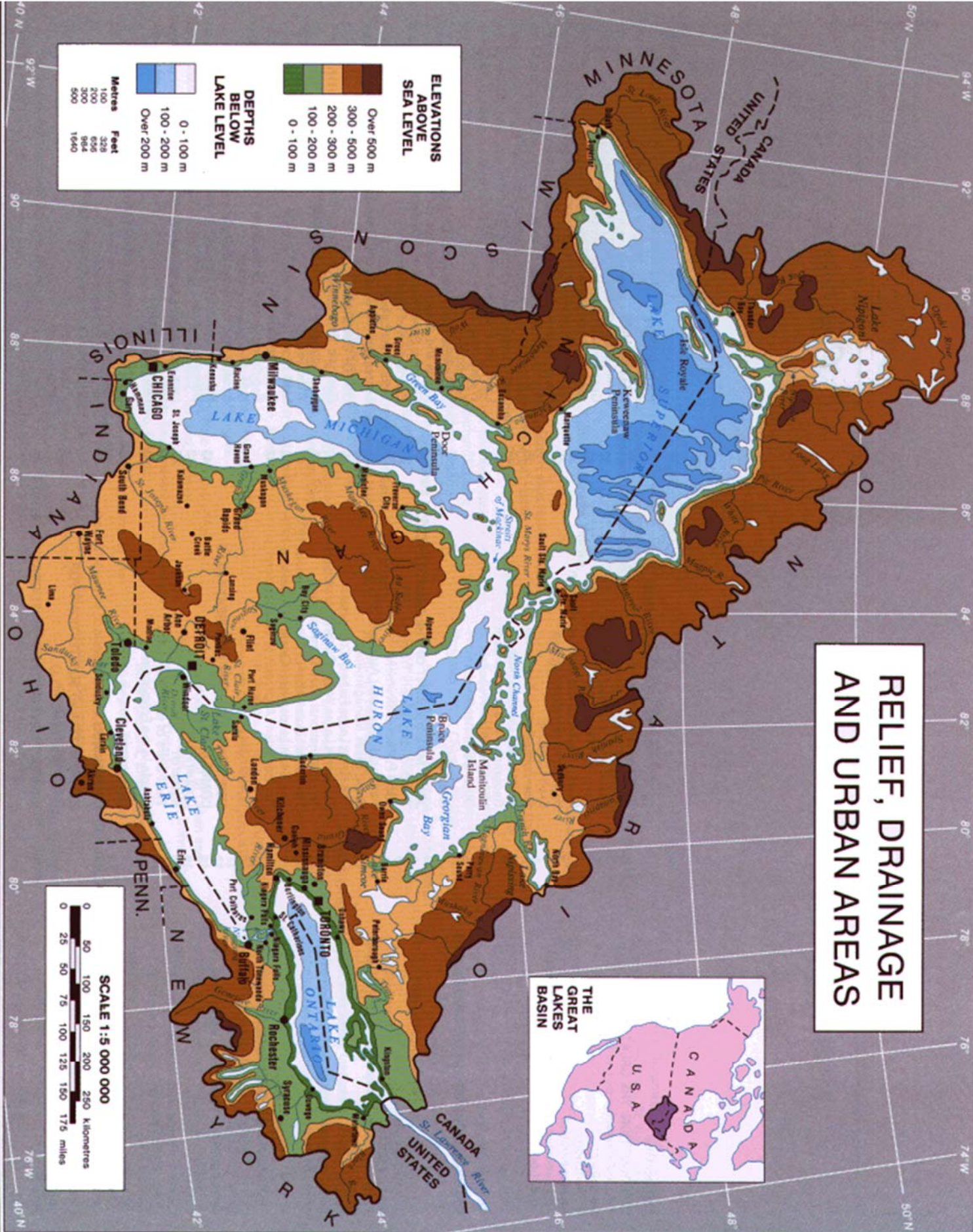
Ask students to trace the flow of water from Lake Superior to the Great Lakes. (Into the St. Mary’s River and then into Lakes Huron-Lake Michigan. Ask “Where does the water flow next?” following the water through each Great Lake, into the St. Lawrence River and into the Atlantic Ocean. Does the water from their school parking lot reach the Atlantic Ocean? {Yes!]

“What would happen if a gallon of motor oil is poured on the ground in the Great Lakes watershed—could that have an impact on the Great Lakes?” (Yes! Anything dumped within the Great Lakes Watershed has the potential to impact the Lakes.) Some pollutants flow out of pipes = point sources. Examples of point source pollutants are: wastewater from sewage treatment plants, industry, paper mills, etc. Other pollutants flow over land and are called non-point source pollutants. Non point source pollutants include: fertilizers, pesticides, paper mill wastes, mine wastes, etc.

Learning Assessment

1. What do all maps have on them? [a scale to indicate distance and a compass to indicate direction]
2. What did we learn by mapping the different rivers that flow into the Great Lakes? [all flow “downhill” from high to low elevation; all have a headwaters and a mouth that empties into the Great Lakes]
3. What is the divide for the Great Lakes Watershed? [the divide is the highest point between two watersheds, and determines whether a rain drop will flow into the Great Lakes Watershed or another watershed.]
4. Show the watershed divide for each Great Lake.
5. Which human activities that take place in a watershed can negatively impact the Great Lakes? [Potential pollutants are: (1) point sources: wastewater from sewage treatment plants, paper mills, mines, or other industry; and (2) nonpoint sources that runoff over the land and eventually into rivers and lakes include fertilizers, pesticides, human/animal wastes, etc.]

RELIEF, DRAINAGE AND URBAN AREAS



ELEVATIONS ABOVE SEA LEVEL

Over 500 m
300 - 500 m
200 - 300 m
100 - 200 m
0 - 100 m

DEPTHS BELOW LAKE LEVEL

0 - 100 m
100 - 200 m
Over 200 m

Metres

100	328
200	656
300	984
500	1640

Feet

100	328
200	656
300	984
500	1640

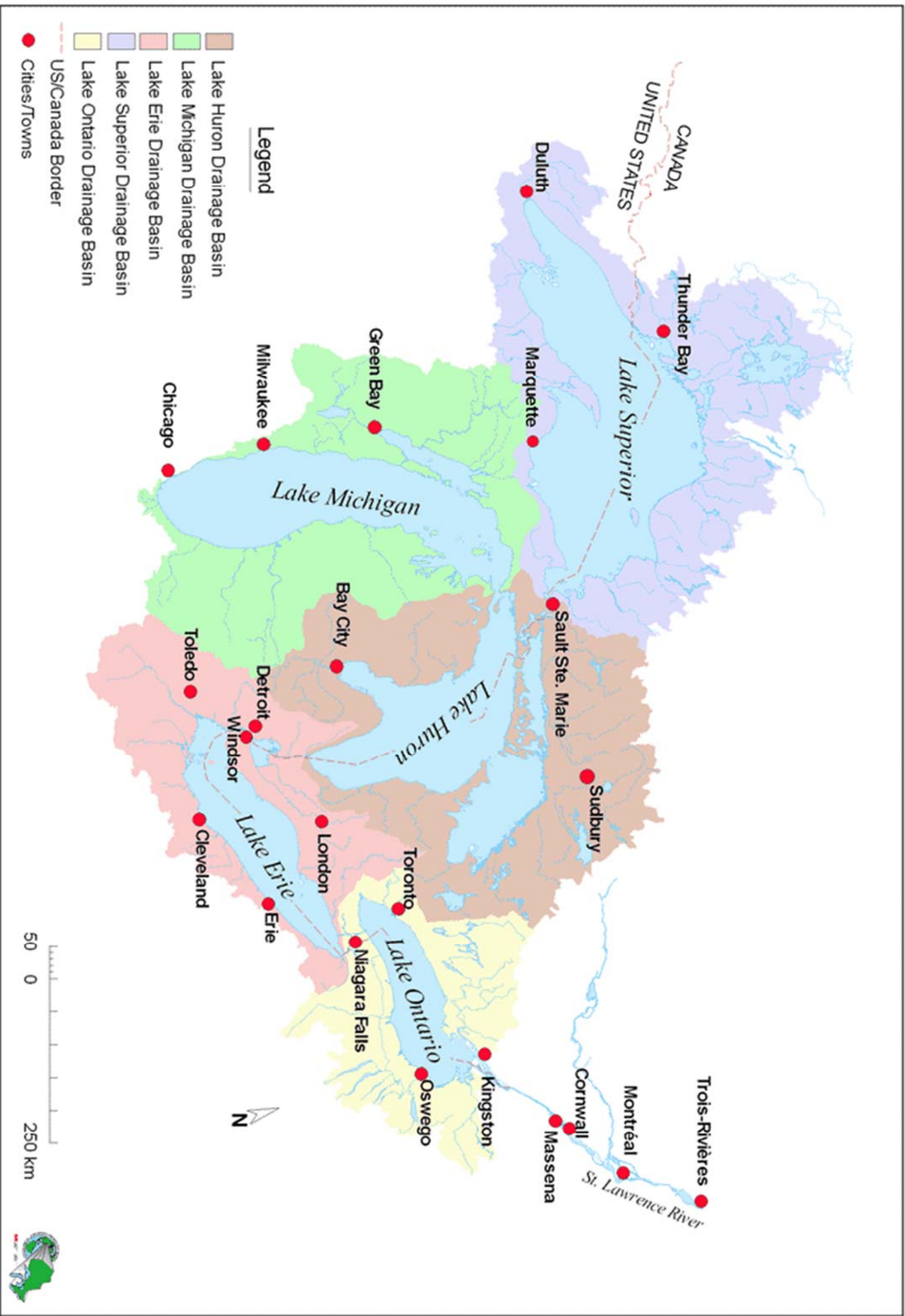
SCALE 1:5 000 000

0 50 100 150 200 250 Kilometres

0 25 50 75 100 125 150 175 miles



Great Lakes Drainage Basin - St. Lawrence River



Great Lakes Physical Features & Population

	Superior	Michigan	Huron	Erie	Ontario	Totals
Elevation^a (feet) (meters)	600 183	577 176	577 176	569 173	243 74	
Length (feet) (kilometers)	350 563	307 494	206 332	241 388	193 311	
Breadth (feet) (kilometers)	160 257	118 190	183 245	57 92	53 85	
Average Depth^a (feet) (meters)	483 147	279 85	195 59	62 19	283 86	
Max Depth^a (feet) (meters)	1332 406	925 282	570 229	210 64	802 244	
Lake Volume^a (miles ³) (km ³)	2,900 12,100	1,180 4,920	850 3,540	116 484	393 1,640	5,439 22,684
Lake Surface Area (miles ²) (km ²)	31,700 82,100	22,300 57,800	23,000 59,600	9,910 25,700	7,340 18,960	94,250 244,160
Drainage Area^b (miles ²) (km ²)	49,300 127,700	45,600 118,000	51,700 134,100	30,140 78,000	24,720 64,030	201,460 521,830
Total Area (land+water) (miles ²) (km ²)	81,000 209,800	67,900 175,800	74,700 193,700	40,050 103,700	32,060 82,990	295,710 765,990
Shoreline Length^c (miles) (kilometers)	2,726 4,385	1,638 2,633	3,827 6,157	871 1,402	712 1,146	10,210 ^d 17,017 ^d
Retention Time (years)	191	99	22	2.6	6	
Population U.S. (2000) Canada (1991)	519,728 181,573	9,820,620	2,651,045 1,191,467	8,133,932 1,664,639	2,907,919 5,446,611	24,033,244 10,000,000
TOTALS	701,301	9,820,6200	3,842,512	9,798,571	8,354,530	34,033 ,244
Outlet	St. Mary's River	Straits of Mackinac	St. Clair River	Niagara R. Welland Canal	St. Lawrence River	

Great Lakes Watershed Floor Map Activity

CITIES/PORTS, STATES, COUNTRIES

ILLINOIS

Calumet
Chicago
Waukegan

INDIANA

Burns Harbor
Gary
Indiana Harbor

MICHIGAN

Alpena
Brevort
Calcite
Charlevoix
Cheboygan
Detroit
Drummond Island
Ecorse
Escanaba
Essexville
Frankfort
Gladstone
Grand Haven
Harbor Beach
Holland
Houghton
Ludington
Mackinaw City
Manistee
Marine City
Marquette
Marysville
Menominee
Monroe
Munising
Muskegon
Ontonagon
Port Gypsum
Port Huron
Port Inland

MICHIGAN (CONTINUED)

Presque Isle
Presque Isle (U.P.)
River Rouge
Saginaw
St. Clair
St. Joseph
Traverse City
Trenton
Wyandotte

MINNESOTA

Duluth
Silver Bay
Taconite Harbor
Two Harbors

NEW YORK

Buffalo
Dunkirk
Ogdensburg
Oswego
Rochester
Tonawanda

OHIO

Ashtabula
Cleveland
Conneaut
Fairport Harbor
Huron
Kelleys Island
Lorain
Marblehead
Sandusky
Toledo

Great Lakes Watershed Floor Map Activity

<p><u>ONTARIO</u> Bath Bowmanville Bruce Mines Clarkson Courtright Goderich Hamilton Heron Bay Marathon Meldrum Bay Michipicoten Nanticoke Oakville Oshawa Owen Sound Parry Sound Picton Port Colborne Port Credit Port Lambton Port Stanley Prescot Sarnia Sault Ste. Marie Serpent Harbour Thessalon Thunder Bay Toronto Windsor</p>	<p><u>QUEBEC</u> Cote St. Catherine Montréal Pointe Noire Port Cartier Sept-Îles Valleyfield</p> <p><u>WISCONSIN</u> Ashland Green Bay Manitowoc Marinette Milwaukee Port Washington Superior</p> <p><u>STATES & PROVINCES</u> Wisconsin Michigan Ohio Illinois Pennsylvania New York Ontario Minnesota Indiana Quebec</p>
<p><u>COUNTRIES</u> UNITED STATES CANADA</p>	<p><u>GREAT LAKES</u> Lake Superior Lake Michigan Lake Ontario Lake Erie Lake Huron</p>

Great Lakes Watershed Floor Map Activity

LAKE SUPERIOR RIVERS

Agawa River

Magpie River

Nipigon River

Ontonagon River

Pic River

Pigeon River

St. Louis River

Tahquamenon River

White River

LAKE HURON RIVERS

French River

Magnetawan River

Mississagi River

Muskota River

Saugeen River

Severn River

Spanish River

Vermillion River

LAKE ERIE RIVERS

Ashtabula River

Buffalo River

Cuyahoga River

Maumee River

Sandusky River

Thames River

LAKE ONTARIO RIVERS

Genesee River

Oswego River

Trent River

LAKE MICHIGAN RIVERS

Des Plaines River

Fox River

Manistique River

Menominee River