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The Great Lakes Basin
Michigan State University Cooperative Extension Service
Michigan SeaGrant
Issued October 2000
8 pages

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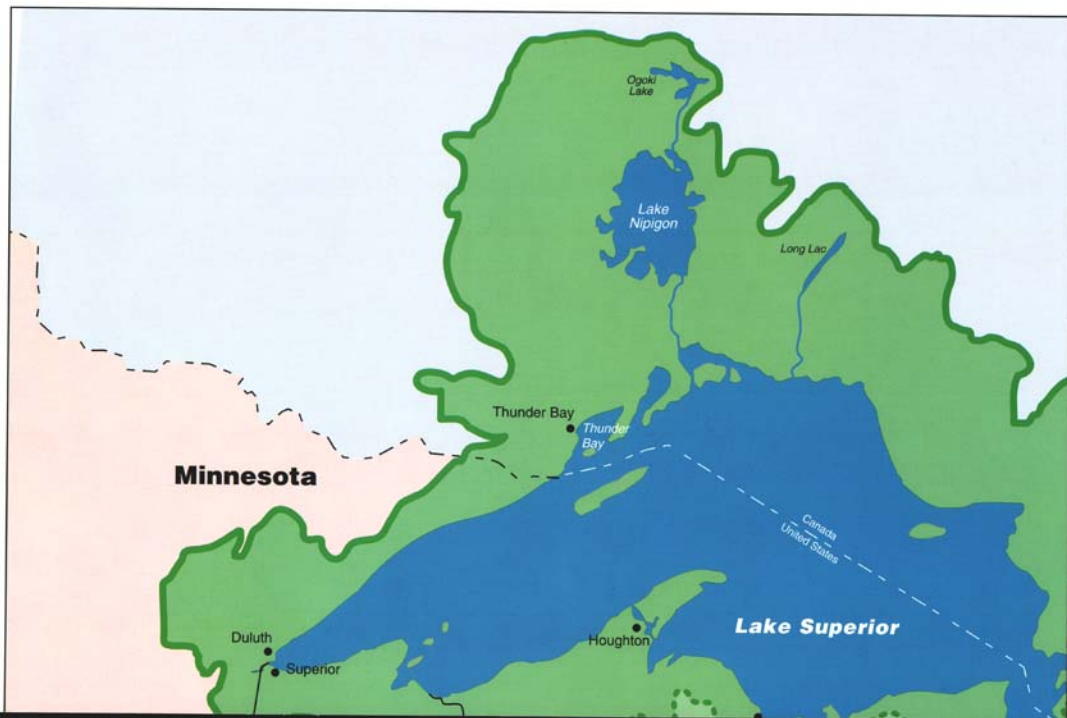
The Great Lakes Basin



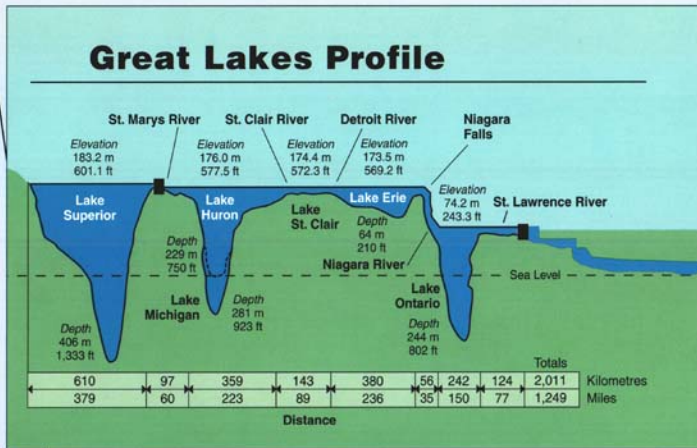
Great Lakes Basin Statistics

Volume	5,473 m ³ /22,809 km ³	Outlets	St. Lawrence River (east) Chicago Sanitary & Ship Canal (west)
Water Surface Area	94,676 mi ² /245,759 km ²	Population	33,910,373
Drainage Basin Area	196,520 mi ² / 510,160 km ²	U.S.	27,476,773
Shoreline Length	10,054 mi/16,170 km (including islands)	Canada	6,433,600

The Great

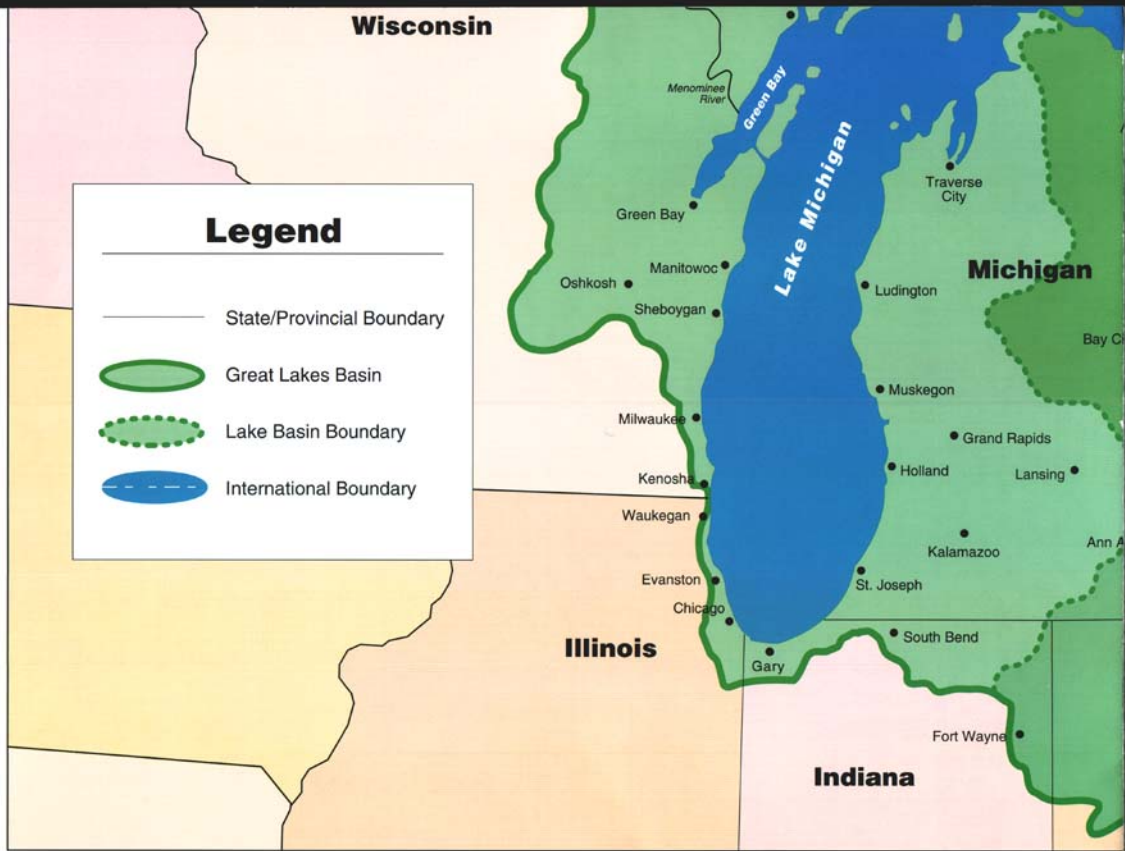


Lakes Basin



Ontario

Sudbury ●



Legend

- State/Provincial Boundary
- Great Lakes Basin
- Lake Basin Boundary
- International Boundary



From the rugged cliffs surrounding Lake Superior to the majestic dunes of Lake Michigan to the awe-inspiring Niagara Falls, the Great Lakes basin is full of wonders. The more than 11,000 miles/18,000 kilometers of shoreline have earned the Great Lakes the title of "the nation's fourth seacoast."

The Great Lakes — Superior, Michigan, Huron, Erie and Ontario — are known for their beauty and also for the wealth of resources within and around them. The lakes contain one-fifth of the world's surface freshwater, and they have often been called "sweetwater seas." The Great Lakes cover the entire continental United States with almost 10 feet of water. They are large enough to influence the regional climate, cooling summers and tempering winters, as well as increasing amounts of rain and snow in the region. A world-renowned fishery, thousands of acres of forests, major mineral and metal reserves, and rich agricultural land provide a balance of economic opportunity within the basin. In addition, the lakes and their surroundings provide many recreational opportunities and an appealing place to live and work.

Shoreline Use

United States

26.5%
6.7%
1.5%
65.3%*

Residential
Commercial/Industrial
Agricultural
Other

Canada

18.6%
2.7%
8.2%
70.5%**

* U.S. "other" classification includes public, beaches, forests, barren lands.

** Canadian "other" classification includes transportation and communications, recreation, extraction, water, wetlands, forestry, grassland, barren and unknown.

Geology

The Great Lakes began to form about 500,000 years ago, during the Great Ice Age. During this time, huge masses of ice, called glaciers, moved across the continent, at some points covering all of the land that now makes up the Great Lakes basin. These glaciers were up to 2 miles thick and could pick up huge boulders and level hills as they moved over them. At the beginning of the Great Ice Age, the Great Lakes did not exist. Instead, several rivers and streams were connected to the Mississippi River. As the glaciers moved into some of these streambeds, the ice pushed against the sides, greatly widening and deepening them. Soon the streambeds were the size of lakes. As the climate

The Great Lakes shoreline is the United States' fourth seacoast.

warmed and glaciers began to melt and retreat, meltwater filled these new lake basins. About 10,000 years ago, the lakes began to take their present shape.

Even today the lakes change slightly as the earth's crust slowly rebounds from the weight of the glaciers, so scientists periodically take new measurements of the lakes' elevation above sea level. The most recent of the measurements occurred in 1985, and the resulting elevations were used in the Great Lakes Profile.

Ecology

The Great Lakes ecosystem is quite diverse. The ground cover ranges from dense coniferous and northern hardwood forests in the north to grasslands and prairies farther south. Near the lakeshores are coastal marshes, wetlands and dune communities. More than 3,500 species of plants and animals live in the basin, including some that are found nowhere else in the world. Mammals include the black bear, fox, moose, coyote, gray wolf, elk, white-tailed deer, bobcat, beaver and Canada lynx. Amphibians and reptiles include more than a dozen species of frogs, turtles and the poisonous eastern massasauga rattlesnake. Many species of birds frequent the lakes and the coastal wetlands of the basin, including the great blue heron, bald eagle and snowy owl. The Great Lakes fishery consists of a blend of such native species as lake trout, lake whitefish, lake herring, lake sturgeon, yellow perch, walleye and bloater chubs, and non-natives such as alewife, coho and chinook salmon, and rainbow trout.

History and Development

The first human inhabitants of the Great Lakes basin arrived more than 10,000 years ago, just as the lakes were taking their present form. The first groups to inhabit the area are called Paleo-Indians; they were mainly hunters. They were eventually succeeded by the group that anthropologists call the Old Copper Culture, a people who hunted and fished and began to practice agriculture. As their name suggests, they worked metal to form weapons, tools and jewelry, and they may have been the first people anywhere in the world to use copper extensively. The Old Copper Indians were succeeded by the so-called Woodland Culture. The Woodland Indians were the first to practice agriculture extensively in the Great Lakes region. Their descendants would form the Ojibwe (Chippewa), Menominee, Potawatomi and other Great Lakes tribes.

The first recorded contact between these cultures and Europeans came in 1615 when the Frenchman Samuel de Champlain and his crew "discovered" Lake Huron. Champlain was looking for the Northwest Passage, a

supposed route through the New World to the Pacific. The group did not find the riches of the Orient, but their discovery of the Great Lakes opened up a whole new realm of economic activity.

Soon after they arrived, the French began the first major resource extraction from the Great Lakes region — fur. Fur-bearing animals, particularly beaver, were popular and abundant, and the lakes provided a cheap and easy way to transport the goods east. The French realized the importance of good relations with the Native Americans and established trade that became economically and militarily profitable. The British also joined in the fur trade and eventually pushed the French out of the area in the French and Indian War.

Once the Great Lakes were recognized as important, fighting over the region was inevitable. At the end of the American Revolution, the Great Lakes became part of the boundary between the newly formed United States and British North America. The United States gained control over all of the land in the Great Lakes states and portions of Great Lakes waters. In the War of 1812, the Americans and the British again fought over control of the Great Lakes. Today, 1,270 mi/2,040 km of the U.S./Canadian border runs through lakes Superior, Huron, Erie and Ontario, part of the longest unfortified international border in the world.

Once the Great Lakes region was open for settlement, people came from all over the western world. In the 1800s, war, famine and religious persecution plagued Europe, and many people went looking for a new land — the United States. Those who chose to settle in the Midwest were mostly farmers, and the majority were of German, Scandinavian or Dutch descent. This massive influx of immigrants had a major effect. Human settlement required that land be cleared for towns and agriculture. The forests in the basin were seen as important for supplying the rest of the country with lumber. The opening of the Erie Canal in 1825 provided a cheaper, easier and more timely route for shipping lumber. The combination of all these developments helped this period earn the nickname "The Big Cut." The "Big Cut" resulted in a great increase in stream bank erosion and in warming cool waters so important as fish habitat.

At about the same time, the commercial fishing industry began its ascent. Commercial fishing began in earnest in the 1820s and expanded greatly over the rest of the century. As more efficient fishing equipment became available and the industry continued to expand, over-

harvesting fish became a problem. Added to this were exotic species, such as the sea lamprey, entering the lakes and decimating certain fish populations. During the last half of the 20th century, the fisheries began to recover slowly, fostered by careful planning and management.

The wealth of natural resources in the Great Lakes basin continues to be important to the cultures and economies of its people, influencing work, home and play. These resources require protection and management to conserve them for future generations.

Economy

The economy of the Great Lakes basin is also one of North America's most diverse. The area has many resources, including fertile land, forests, minerals and fish. In addition to this natural wealth, the Great Lakes provide the means to ship raw materials and products to the rest of the country. A look at various aspects of the Great Lakes economy shows its importance on a multinational scale.

Agriculture: Agriculture dominates the southern portion of the Great Lakes basin and is a leading industry in every Great Lakes state and province. Twenty-five percent of Canadian agricultural production and 7 percent of U.S.

production occur here. Corn is the dominant crop in the basin, followed by soybeans and hay. Dairy and livestock production are also important. The Great Lakes region also prospers in smaller "niche" markets. Wisconsin leads in dairy and cheese production, and New York is fourth. Michigan is the national leader in tart cherry production, with Traverse City known as the "Cherry Capital of the World." Michigan is also the

No. 1 producer of navy beans. Illinois ranks second in the country in exporting soybeans and soybean products, Minnesota is third, Indiana is fourth and Ohio is fifth. Ontario's production is approximately 25 percent of Canada's gross domestic product (GDP) in agriculture. Ontario is particularly strong in several areas of the food industry, producing 77 percent of Canada's GDP in the cereal and flour industry and 72 percent of its sugar and confectionery industry. In the beverage industry, Ontario produces 64 percent of the country's distillery industry output.

Fisheries: After years of careful management and the application of new scientific knowledge, the Great Lakes fisheries are beginning to thrive again. More than 2 million anglers fished the Great Lakes in 1996, and they added more than \$1 billion (U.S.) to the region's economy.

The Great Lakes could cover the entire continental United States with almost 10 feet of water.



In 1996, more than 63 million pounds (28,350,000 kg) of fish were caught commercially in the basin, bringing in more than \$43 million (U.S.). The main species caught for commercial sale are lake whitefish, walleye, smelt and yellow perch.

Forestry: Forests cover 55 percent of the land in the Great Lakes region. This is almost 20 percent of U.S. timberland. Pulp and paper mills that process timber can be found throughout the region. The basin is also a leading Christmas tree producer, with Michigan alone producing 4 million trees in 1998.

Recreation/Tourism: The Great Lakes provide many opportunities for outdoor recreation, including boating, fishing, diving and beachcombing. Along their shorelines are 10 national parks and lakeshores in the United States and Canada, hundreds of state and provincial parks and 13 underwater preserves and parks — areas on the lake bottoms where shipwrecks and other valuable historic and geologic resources are protected. These parks host more than 70 million visitors each year. Recreational fishing in the Great Lakes is also a key economic sector.

Industry: The Great Lakes region has a diverse range of industries, from steel and paper mills to chemical companies to auto manufacturing. The largest concentration of steel production in North America is in the metropolitan area surrounding southern Lake Michigan. Fifty-eight percent of all cars manufactured in the United States and Canada are made in the Great Lakes basin.

Shipping: Shipping has always been an important segment of the Great Lakes economy. The shipping industry brings in revenues and creates jobs in its own right and is an essential component of many other economic sectors. More than 301 million tons were shipped out of major U.S. ports on the Great Lakes in 1996. The three main commodities shipped on the Great Lakes are coal, iron ore and grain.

Natural Resource and Environmental Issues

Water Quality: Residential and municipal uses of the lakes, combined with runoff from agriculture and industry, add pollutants to the Great Lakes. Some of these

pollutants can stay in the water for hundreds of years. Poor water quality caused by increased loadings of heavy metals, phosphorus and other nutrients can lead to degraded health in aquatic organisms and aesthetic problems. Pollution is usually most severe in waters near large urban areas and in rivers, harbors and connecting channels. In recent years, the U.S. and Canadian governments have listed 43 places on the lakes' shorelines as areas of concern, where beneficial uses have been impaired and environmental standards are not being met. One of these — Collingwood Harbour on Georgian Bay in Ontario — has been delisted because beneficial uses are now restored.

Aquatic Nuisance Species: Aquatic nuisance species are plants and animals that become established in habitats where they are not native. Once there, invading species often compete with native species for resources and can have damaging environmental and economic effects. Two of the most common and troublesome aquatic nuisance species currently in the Great Lakes basin are the sea lamprey and the zebra mussel.

Wetlands: Wetlands help to replenish and purify groundwater, prevent flooding and erosion, and support a wide diversity of plant and animal life. People have been filling in coastal wetlands and converting the land to industrial, agricultural or residential areas — a practice that can promote erosion and endanger the habitat of plants, fish and wildlife.

Urban Sprawl: Metropolitan areas in the Great Lakes basin continue to expand as people move outside the cities. Vast amounts of agricultural land and open space have been converted into residential and new urban areas, and loss of habitat threatens native wildlife. Longer work commutes increase pollution. In response to this problem, coastal planners and natural resource managers are encouraging sustainable development to create a balance between urban growth and ecological protection.



The Michigan Sea Grant College Program is a joint effort of the University of Michigan and Michigan State University, funded by the National Oceanic and Atmospheric Administration, to conduct research, outreach and education on Great Lakes and marine issues. MICH-SS-00-406

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October / 2000 Extension Bulletin E-1865