

# Lake Superior

## GAME



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Lake Superior and the other four Great Lakes are America's fourth coast. The size of these lakes, and the resources associated with them, make the Great Lakes ecosystem vital to the economy and quality of life in the United States and Canada. This game teaches players about the hard choices that must be made every day if Lake Superior is to be preserved.

## BACKGROUND INFORMATION FOR GAME ORGANIZERS

Lake Superior is about 350 miles long and 160 miles wide. It is bordered by the states of Minnesota, Michigan, and Wisconsin, and the province of Ontario. Lake Superior is the headwater of the Great Lakes and the St. Lawrence Seaway.

The Great Lakes are huge. Together they hold about twenty percent of the fresh water on the earth's surface. Lake Superior is the largest of the lakes, containing about half of their total volume. In surface area, Lake Superior is the largest fresh water lake in the world. It covers 31,280 square miles, roughly the combined area of Massachusetts, Connecticut, Rhode Island, Vermont, and New Hampshire. Lake Superior is also the deepest of the Great Lakes with an average depth of 489 feet, a maximum depth of 1,333 feet. Lake Superior contains nearly three quadrillion gallons of water.

Lake Superior is valued for transportation. Ships are the most cost-effective way to move bulky and /or heavy cargoes over long distances. Major commodities moving across Lake Superior include grain and other agricultural products, western coal, iron ore, steel, limestone, and cement.

The water of Lake Superior is important for power generation, manufacturing, and mineral processing. Although much water is withdrawn each year for these uses, only a small amount (about 21,134 million gallons) is consumed (not returned to the lake). Compared to the amounts consumed from other Great Lakes, this is nearly insignificant. Water consumption has not traditionally been a concern for the Great Lakes, but a 1983 report from the International Joint Commission concluded that, if present trends continue, the outflow of water through the St. Lawrence River could be reduced by about eight percent by the year 2030 because of increased consumption.

The shores of Lake Superior are sparsely populated—about 14 people per square mile. The Great Lakes average 183 people per square mile; Lake Erie's average is 567 people per square mile. Municipal and domestic use of Lake Superior's water is minor compared to the other Great Lakes.

Lake Superior's water quality is vital to our economy. Throughout the region, an estimated 23 million people get their drinking water from the five Great Lakes. Contamination of the water puts these people at risk. Plus, if contaminants increase in the lake, fishing is reduced because the fish are considered less desirable.

It takes about 182 years for water in Lake Superior to be flushed out. Pollutants come from five major sources: 1) the atmosphere, 2) municipal and industrial discharges, 3) farmland and municipal runoff, 4) contaminated groundwater, and 5) contaminated sediments. More than one-half of the toxins entering Lake Superior come from the atmosphere.

## PURPOSE

Through this game, players will experience what it is like to make real-life decisions about pollution, values, and economics. Players assume roles that represent a variety of individuals who use Lake Superior. Players must make choices or do assigned actions appropriate to their roles. This game introduces them to differing viewpoints and helps them consider the challenges of preserving and enhancing this valuable ecosystem.

## GOALS

The goals of this game are:

- to help participants better understand the complexity of economic decisions facing polluters of Lake Superior.
- to help participants understand how they as individuals can change their own actions to minimize pollution of the lake.
- to have participants realize how many people in their community depend on and enjoy Lake Superior.

## PROCESS

The game takes about an hour to play, depending on the size of the group and the amount of discussion during play. It is ideally played by 10 to 30 people and may be used with upper-elementary to adult audiences.

Some roles describe activities that do not occur in every region around Lake Superior (e.g. agriculture, industry, tourism). They may be included to broaden the perspective of your game or replaced with more appropriate situations.

A bucket of water represents the lake. Participants assume the role of a lake user and make choices for actions appropriate to that role. The water becomes polluted and depleted as the game progresses. Participants make and respond to decisions made by individuals to pollute or protect the lake.

## PREPARING YOUR PLAYERS

Before playing the game you should:

- Hand out a map of Lake Superior and its drainage basin, accompanied by a worksheet (sample questions found on pages 5-16).
- Ask the players to complete the worksheet. Indicate that some of the questions have no right or wrong answers.
- Orient the players to the map by locating Minnesota, Wisconsin, Michigan, and Ontario. Explain that all water within the watershed boundary (theoretically) drains into Lake Superior.
- Mention other sources or reservoirs of water within the watershed, such as lakes, streams, wetlands, and groundwater. Stress that the reservoirs of water are interconnected: pollution of upstream inland lakes and rivers eventually affects Lake Superior. Include other facts or geographic information about Lake Superior if desired.
- When reviewing the answers to the worksheet, discuss differences in values. For instance, ask: How important is it to keep Lake Superior clean? Which is the most important use of lake water? Compare how economic constraints balance against the ideal of keeping Lake Superior clean.

## PREPARATION/MATERIALS

1. To set up you will need:

- a large map of Lake Superior. This could be traced on a plastic sheet on the floor or chalked on the ground. Indicate cities with dots and state/province borders with lines, but don't identify them by name. Locating their "home" is part of the experience for players unfamiliar with the entire lake. The map should be large enough so players can sit around it while they play. A map about 15 by 20 feet in size works well.
- a large bucket (5 gallons or larger) filled with clean water to represent the lake;
- an extra bucket or sink for dumping water removed from the lake;
- red food color to produce a solution that represents pollution (about two full eyedroppers of red food color in about one cup of water);
- an eyedropper to dispense the pollution (one full eyedropper equals one unit of color);
- four small vials or envelopes filled with mud or dust;
- clear container (about 500 ml) for withdrawing municipal water supplies;
- similar clear container filled with lightly colored water (about one drop of food color in five cups of water) to use as a standard for comparing the extent of pollution;
- play money, or a substitute, for roles that involve paying instead of polluting;
- at least four fish made to stand on the bottom of the lake (see Figure 1).



- a fishing pole to catch the fish;

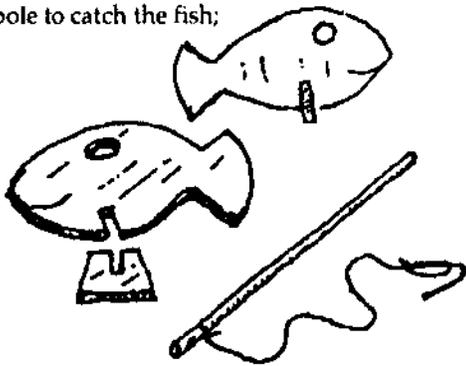


Figure 1

- a piece of Plexiglass or plastic with the word "shipwreck" on it;
- a Secchi disk for estimating water clarity (see item three below).

2. Silhouettes of fish may be cut from a plastic coffee can lid or Plexiglas and inserted into a slit in another piece of plastic serving as a base (Figure 1). The base may have to be weighted to allow the fish to "stand" on the bottom of the lake. Red plastic or clear plastic edged with an indelible red marker makes it more difficult to see the fish once the water becomes polluted. Each fish should have a hole in its back so it can be easily hooked. The pole can be constructed from a short length of cord tied to a dowel, with a bent paper clip as a hook.

3. A Secchi disk is a simple tool used to determine water clarity (transparency). The depth to which a Secchi disk is visible is directly related to the transparency of the water in a lake. For this game a Secchi disk can be cut from a white plastic coffee can lid. It should be a circle about two inches in diameter with a cord threaded through the center. (When used for scientific studies, Secchi disks normally measure 20 cm in diameter). The disk should be divided into four equal pie-shaped sections. Two opposite sections should be colored black with an indelible marker and two should be left white (Figure 2). The disk should be weighted so that it sinks when lowered into the bucket.

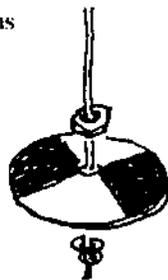


Figure 2

4. Prepare cards explaining individual roles, choices, and actions. Cards should be durable, with text large enough for players to read easily. The roles in this activity can be cut out and pasted onto tagboard.
5. If you are using play money that players use to "pay" for cleaning up pollution, it should be clipped to the appropriate cards.
6. Order of play can be determined alphabetically or by handing out numbers. Do not use the roles in the order in which they appear here.

## PLAYING THE GAME

1. Place the bucket representing Lake Superior in the center the map. Place three fish and the "shipwreck" sign at the bottom of Lake Superior.
2. Near Lake Superior, set up the pollution solution and eyedropper, the container for withdrawing water, the fishing pole, etc.
3. Distribute the role cards and assign a playing order. If you have a small group of players, eliminate some roles or assign students more than one role. If you have more than 35 students, create additional roles. Each role should require an action.
4. Encourage players to role play. They should try to step into the shoes of the person they are representing and act as that person would.
5. Have players find their "home" around the lake, read their card(s), and consider their decisions.
6. Have each player, in order, read his/her role and announce any choices out loud. You may or may not want to allow players to influence the decisions of others.
7. Have each player perform the appropriate action: pollute the lake, pay money, withdraw water, catch fish, estimate the extent of pollution, judge clarity, etc.
8. Discuss players' decisions as you play. Balance economic considerations against idealism. If no players opt to pollute, ask how realistic that is. Compare the high-priced, million-dollar decisions that they can't influence with what they can do as individuals to reduce or prevent pollution.
9. Remind players that the bucket is a simple model of Lake Superior. In reality, water is constantly being added through precipitation and runoff, and pollution is diluted or flushed out at Sault Ste. Marie. Stress, however, that water in Lake Superior is a limited resource - it isn't infinite.
10. Follow the game with a discussion of values and economics, and review what players can do to prevent/reduce pollution of Lake Superior. Although they may not be able to affect corporate decisions, they can choose to recycle, avoid littering, and support family actions that reduce pollution.
11. Consider playing the game more than once. The order of play often affects the decisions made.
12. Hint: you may want to "stack the deck" somewhat. Often players, especially students, are idealistic and choose not to pollute, despite the cost or consequences. You might want to ensure that some of the polluters with no choice precede the fishermen, SCUBA diver, and the municipalities that remove drinking water. This makes it harder to see the fish or shipwreck, and the "drinking water" is not very appealing.

## LAKE USER ROLES

Below are examples of roles, decisions, and actions that can be used in the game. The roles are based on real-life situations, but do not necessarily reflect the circumstances of any particular individual or community. Each player should, in turn, should read the card out loud, announce, and perform the action chosen or required.



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### Erosion

I am a careless tourist from the U.S. driving along the North Shore of Lake Superior near Marathon, Ontario. I throw a burning cigarette out my window and start a major forest fire. Because many trees are destroyed, erosion is increased and ashes and mud pollute Lake Superior.  
**(Add mud and stir.)**

### Discussion:

Not only do fires destroy wildlife habitat, but they also destroy the trees and shrubs whose roots prevent erosion. Without roots to hold it back, soil is carried by runoff down slopes and into lakes and rivers. Besides the loss of valuable topsoil, erosion carries nutrients that are added to our lakes. This can cause algae blooms or excessive weed growth that make our lakes unattractive and unhealthy.

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### Economics

I run an industry at Houghton, Michigan, that dumps particles into the lake and causes the water to become cloudy. We can pay \$1/2 million dollars to clean up or we will continue to pollute the lake. **(Pay or add mud.)**

### Discussion:

Sometimes little things make a big difference in a lake. The addition of turbidity not only makes the lake less pleasant for us as humans, but it also damages plant and animal habitat. It decreases the amount of light that reaches deep into the lake which can affect the temperature and ability of predators to see prey. It can also cover spawning grounds and limit fish reproduction.

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**Life-style Decisions**

I am going to build a new dock at my cabin near Nipigon, Ontario. I know that treated lumber will last longer and save me money and time in the future, but the chemicals used to treat the wood may be bad for the lake. I have to choose whether to build a long-lasting, treated dock, or to protect the lake. (if you choose the treated lumber, add one unit of red color)

**Discussion:**

The chemicals used to treat lumber to make it resist rotting can be harmful for plants and animals in our lakes. What would be some options instead of using treated wood? Using non-treated wood like cedar or redwood, metal, or plastic materials are more expensive, but better for the lake.

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**Life-style Decisions**

I am a well owner near Silver Bay, Minnesota. I don't use water from the lake for my household supply so I don't care if the lake gets polluted. My septic system is old and needs repairs that will cost \$300. I'd rather use the money for a vacation. I have to choose whether to pay to fix it up, or let my leaky septic system pollute Lake Superior. (Pay or add one unit of color.)

**Discussion:**

Most cities have sewage treatment plants that take your household water and clean it before returning it to the environment. County homes rely on septic systems and drainfields filled with soil bacteria that eat up wastes before they get into lakes or wells. These work okay, if they are constructed properly and maintained, and if people are careful about how much water they use at home. How many of you have septic systems at home? How could you convince this neighbor to correct the problem with his septic system?

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**Life-style Decisions**

I work for the Canadian Department of Transportation in Wawa, Ontario. We salt the Trans-Canadian Highway during the winter. This makes the road safer for travel, but the salt runs off in the spring and pollutes Lake Superior. (Add two units of color.)

**Discussion:**

Although salting our highways does make them safer for winter travel, the salt can run off and enter our lakes and rivers where it can be harmful to plants and animals. We don't want to have more accidents, but we need to consider our environment. There are alternatives to salt. What are some of them? Minnesota is experimenting with an environmentally safer road deicer called urea. It is expensive, but pollutes less than salt and doesn't damage cars or roads as much. Would you be willing to trade lost lives for less pollution?

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**Economics**

I run the sewage treatment plant at Sault Ste. Marie, Michigan. We don't think our customers will pay the extra \$15 a month needed to clean-up our process. We continue to pollute the lake. (Add two units of color.)

**Discussion:**

Most treatment systems use (at the least) what is called secondary treatment of sewage before it is returned to the lake. Tertiary (third step) treatment produces even cleaner water, with fewer nutrients to affect the lake, but it is more expensive and many small communities have a difficult time financing improvements. How much would you be willing to pay? \$5 per month? \$10 per month? \$20 per month? How much would your parents be willing to pay?

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### **Economics**

I am a logger living near Grand Marais, Minnesota. If I clear-cut an area too close to a stream it will cause erosion, but I will be able to earn \$1,000. The erosion causes cloudiness and damages fish spawning grounds. (Add mud or give up \$1,000.)



### **Discussion:**

Many fish lay their eggs on clean gravel beds in streams and lakes. Fish eggs that are covered with silt may never hatch. We have to be able to harvest our forest products, but there are ways to do so without damaging our lakes and streams. Loggers should use "Best Management Practices" (BMPs) when they cut and haul trees. These BMPs include not driving equipment through streams and leaving a buffer strip of uncut vegetation near water bodies.

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### **Economics**

I own a mining company at Nipigon, Ontario. It will cost us \$1 million to clean up our process. If we have to pay that much we will go out of business, and 300 people will lose their jobs. I have to choose whether to clean up and go bankrupt or continue to pollute Lake Superior. (Pay or add four units of color.)

### **Discussion:**

This game is like real life. Often the choices aren't this dramatic, but there are hard economic choices that have to be made when we want to reduce pollution. What kind of compromise could be worked out to avoid losing 300 jobs while stopping pollution of the lake?

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### **Life-style Decisions**

I live near Two Harbors, Minnesota. Although I know I should recycle used oil, I'm too lazy to dispose of it properly. When I change the oil in my truck, I hide the five quarts of old motor oil in my garbage. This pollutes Lake Superior. (Add two units of color.)

### **Discussion:**

In Minnesota it is illegal to dump used motor oil. Used oil runs off into ditches and can get into groundwater or lakes and streams where it is harmful to plants and animals (including humans). Used oil also contains heavy metals (from engine wear) that pose a health risk. By law, the place where you bought the new oil must accept used oil or post a notice of where you can recycle it.

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### **Life-style Decisions**

I live near Knife River, Minnesota and I know my solid waste should be picked up for proper disposal. But it's cheaper and easier to dump the garbage in my backyard than take it to the landfill. I have to pay \$18 a month for garbage pickup or continue to use the creek in my backyard as a dumping ground for my household waste. (Pay or add one unit of color.)

### **Discussion:**

Is it okay for him to use his backyard in whatever way he wants? Why not? If you lived next to him, how could you convince him not to dump there?



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### Life-style Decisions

I live near Grand Marais, Michigan. I like to dump the oil along my dirt road to keep down the dust. This can pollute the lake. When I change oil in my truck, I have to choose whether to dump it along the road or recycle it. (If you choose to dump it along the road, add two units of color.)

### Discussion:

In Minnesota it is illegal to dump used motor oil, but many people still don't know how to properly dispose of it. Used oil runs off into ditches and can get into groundwater or lakes and streams where it is harmful to plants and animals (including humans). The EPA estimates that 65% of the people who change their own oil do not dispose of it properly. How many of you know someone who pours used oil along the road? What is the proper way to get rid of it?

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### Life-style Decisions

I live in Sault St. Marie, Ontario. I am a very good lawyer who wins all my cases. I have been asked to defend a company that pollutes the lake. If I decide to take this case, I will make lots of money, but pollution of the lake will continue. (If you take the case, add three units of color. If you don't take it, stand up for applause.)

### Discussion:

Would earning \$10,000 from the case be worth continued pollution? Would \$5,000 be worth it? Would \$500 be worth the pollution? Is earning this huge fee worth the damage to the lake? We all need to start considering the ethical effects of what we want, related to the impact our actions have on our environment.

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### Ethics

I am 15 years old and live in Two Harbors, Minnesota. I am young enough to fish without a license and I don't think I have to obey fishing laws. I take more fish than the legal limit every time I go fishing. (Remove one fish from the lake.)

### Discussion:

Just because you don't need a license doesn't mean you don't have to follow the rules. DNR wildlife management officials have determined the appropriate limits for different species and different sizes to keep a viable (successful) fish population in our lakes.

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### Nature

I am Mother Nature. I supply water to the lake by rain. (Roll the die. Add water to the lake according to the following:

- 1 = "slightly dry year," add one cup
- 2 = "normal year," add two cups
- 3 = "slightly wet year," add three cups
- 4 = "drought year," add no water
- 5 = "second drought in a row," remove one cup
- 6 = "very wet year - FLOOD," add six cups

### Discussion:

We can't expect recharge to be the same every year. Recharge occurs through precipitation directly onto the lake surface and through runoff from rivers or over land around the lake. The land area that drains into a lake is called its "watershed" or drainage basin. Recharge can also occur from groundwater seeping into the bottom of the lake. Water leaves the lake through evaporation, rivers draining out, groundwater seepage, and diversions by humans. Much of the water that we divert is returned to the lakes after our use—that's called non-consumptive use. If the water doesn't get back to the lake, it is called consumption.

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**Government**

I represent the city of Duluth. We need 400,000 gallons of clean water from Lake Superior each day for our city water supply. **(Remove eight cups of water.)**

**Discussion:**

How many of you would want to drink that water? Many communities in Minnesota use surface water for their municipal water supply. Before the city could send that water out to homes, what will they have to do to it? What will that mean in terms of the cost of using water?

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**Recreational Activities**

I own a resort on the south shore of Lake Superior, near Grand Marais, Michigan. My septic system is old and doesn't work well. I know it is polluting the lake, but it will cost me \$5,000 to repair it. If I pay that much to repair the system, I will have to charge tourists \$75 per night for a room and I don't think they will pay that much for one night. **(pay or add two units of color.)**

**Discussion:**

Would you pay this much to stay at a resort for one night? Would you pay more if you knew they had spent money to protect the Lake? Would you pay extra for other products if the company was supporting the environment? Recycled paper and some other recycled products cost more - are you willing to pay? Do you think companies are willing to pay extra?

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**Water Use**

I work for the city of Silver Bay, Minnesota. We need 200,000 gallons of clean water from Lake Superior each day for our city water supply. **(Remove four cups of water.)**

I represent the city of Two Harbors, Minnesota. We need 200,000 gallons of clean water from Lake Superior each day for our city water supply. **(Remove four cups of water.)**

I represent the city of Grand Marais, Minnesota. We need 100,000 of clean water from Lake Superior each day for our city water supply. **(Remove two cups of water.)**

I work for the city of Sault Ste. Marie, Ontario. We need 200,000 gallons of clean water from Lake Superior each day for our city water supply. **(Remove four cups of water.)**

**Discussion:**

Each American uses about 100 gallons of water a day for drinking, cooking, bathing, washing dishes and clothes, and flushing the toilet. Just one flush uses 5-8 gallons of water per minute. How long was you shower this morning? Just letting the water run while you brush your teeth can waste 5-10 gallons. If we all conserved, much less water would have to be treated for safe distribution and then cleaned again as wastewater.



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**Economics**

I am in charge of a paper mill in Ontonagon, Michigan. We use 500,000 gallons of water each day to make paper. The water is supposed to be cleaned and returned to the lake, but I know there is a problem and chemicals are contaminating the water. If I report the problem, I will lose my job. If I don't report it, pollution of the lake will continue. (Give up job or add two units of color.)

**Discussion:**

Most people can't really afford to give up their jobs—even if they really believe in protecting the lake. How could she/he solve the pollution problem, without losing her job?

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**Economics**

I own an industry in Ashland, Wisconsin, but none of the owners live here. We aren't very responsible and don't care if we pollute Lake Superior. (Add three units of color.)

**Discussion:**

How could we convince the company that we don't want them polluting our lake? Your voice counts! Recently in Utah, a group of 6th graders began talking to neighbors about cleaning up a nearby hazardous waste dump. They wrote letters that got state laws changed and raised money for cleanup. Kory Hansen, one of the 12-year-old "pollution busters" summed it up, "Kids can make a difference."

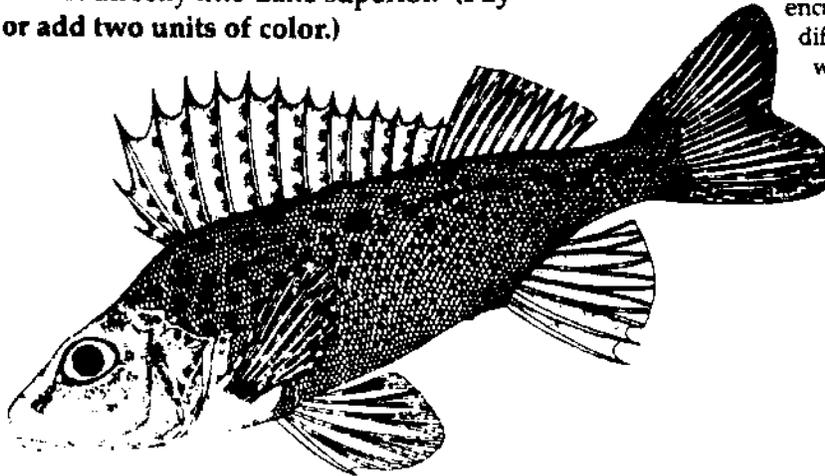
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**Economics**

I am a ship owner from Thunder Bay, Ontario. My ship has made the trip from Lake Erie with ballast tanks full of exotic species. I can pay \$1,000 to filter the water before dumping the ballast tanks or I can save money and dump ballast directly into Lake Superior. (Pay or add two units of color.)

**Discussion:**

When ships are traveling from foreign ports with no cargo, water is carried in their ballast tanks to make them more stable. This water can carry pollution and foreign species of plants and animals. Exotic, or non-native, animals are getting to be problems in Lake Superior. The river ruffe, a fish like a yellow perch, was discovered in the St. Louis Harbor in 1987 and is crowding out other desirable fish. Zebra mussels clog water intake pipes and encrust ships, docks, and buoys. They are very difficult and very expensive to remove. One way to avoid bringing in new species is for ship captains to exchange their water at sea or in deep water.



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### **Recreational Activities**

I have come to vacation at Grand Portage, Minnesota and fish on Lake Superior. I have paid \$250 for a charter boat trip and will catch fish if the lake is not too polluted. **(try to catch fish—15 seconds will be allowed.)**

### **Discussion:**

Would you want to eat fish that came out of water polluted like our lake? When pollutants get into our lakes they can build up in sediments, in insects, and in small fish. When bigger fish eat them, pollutants accumulate in their flesh (particularly fatty tissue). This is called "bioaccumulation" and is a problem in larger fish. The Minnesota Department of Health has issued guidelines for eating fish from 260 lakes in Minnesota. They have found that there are health risks from mercury and PCBs that have bioaccumulated in fish and recommend that people limit the number and size of fish they eat from certain lakes.

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### **Recreational Activities**

I live in Marquette, Michigan, and like to SCUBA dive. I paid \$2,000 for SCUBA equipment. I can't enjoy my dive if the lake is too cloudy and I would have wasted my money. **(Try to read the word(s) at the bottom of the bucket.)**

### **Discussion:**

Cloudiness is called turbidity and makes using the lake very unpleasant. Did you know there are several shipwrecks that are popular places for scuba divers in Lake Superior? Along the shore of Michigan's Upper Peninsula, there are some underwater state and national parks, and one is proposed for the North Shore, near Split Rock Lighthouse.

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### **Economics**

I own a company in Marquette, Michigan. We want to send water to Nebraska and Kansas and will pay \$4 million if you let us take the water. You will hardly miss it, and you could clean up a lot of pollution with \$4 million. All the people who live around the lake must vote whether to let us divert water. **(If the group votes to let you divert the water, remove four cups of water)**

### **Discussion:**

Since the 1800s people have had schemes to divert water and send it as far away as the arid southwestern United States. One problem is engineering, another is cost, but the major problem has been getting everyone to agree on whether water should be diverted at all. The waters in the Great Lakes belong to the people in the U.S. and Canada. How should we decide whether to allow water to be diverted? There are five Great Lakes diversions already: Canada has two into Lake Superior, two divert water to bypass Niagara Falls, and at the Chicago River water is diverted into the Mississippi River basin.

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### **Education**

I am a research scientist from the University of Minnesota in Duluth. I paid \$20,000 to use the research submarine to study fish that live near the bottom of Lake Superior. If the water is too cloudy I won't be able to see the fish and I will have wasted my research money. **(Check water clarity with the secchi disk.)**

### **Discussion:**

If you can see the secchi disk at the bottom of the bucket, it is clear enough for your study.

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**Life-style Decisions**

I have a cabin near Ontonagon, Michigan. I only live there for three months each year and don't think it is worth paying \$500 to get my septic system fixed. I cause some pollution of Lake Superior. **(add one unit of color.)**

**Discussion:**

If you were this person's neighbor, what could you do to convince them to spend the money on their system to reduce pollution to Lake Superior. Do you know about the laws and regulations that apply to land use near the shore of Lake Superior? What kind of laws should apply? Should people be forced to clean up their pollution of the lake even if they don't want to? Why or why not?

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**Economics**

I own a commercial fishing company in Bayfield, Wisconsin. If I catch fish that exceed the guidelines for safe fish consumption, I cannot sell them to the public and my company will go bankrupt. **(Compare the color of a glass of water from the bucket to the standard color. If the color in the lake is darker than the standard, the fish are too contaminated to sell. If the lake is less polluted than the standard, try to catch a fish.)**

**Discussion:**

Guidelines have been set to protect the most sensitive groups of people that might suffer health problems from eating too many fish contaminated by pollutants in lake water. These groups include children, pregnant women, and nursing mothers. Many health problems show up in exposed children later in their lives. Much of the pollution that affects fish in Lake Superior comes from airborne pollution - that is, it blows in from other parts of Minnesota and western states. Some of it even comes from the industrial Ohio River valley. 90% of the PCBs that enter Lake Superior are deposited from the atmosphere.

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**Economics**

I run a fish hatchery in Nipigon, Ontario. My job is to stock fish in Lake Superior. If the lake is too polluted, the fish won't survive, so there is no point in stocking. **(Compare the color of water from the bucket to the standard color. If the water from the lake is darker, it is too polluted to stock fish. Otherwise, add a fish.)**

What should environmental managers do when they realize there is no point in stocking more fish because they will not survive or reproduce? In Minnesota, the DNR stocks many lakes besides Lake Superior and they calculate the carrying capacity and estimated survival rates before stocking. Other states have similar stocking programs.

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**Life-style Decisions**

I live in Silver Bay, Minnesota, and can choose to spend five minutes a day making sure that my family recycles our cans, newspapers, and glass. **(If you choose not to recycle, add one unit of color. If you do, stand up for applause.)**

**Discussion:**

Each person in Minnesota throws away 600 pounds of paper, 60 pounds of aluminum cans, and 200 glass containers each year. Recycling would not only save space in our landfills or prevent air pollution from incineration, but it would also reduce the amount of natural resources that are used up making new products. People in Minnesota are getting better about recycling. How many of you recycle?

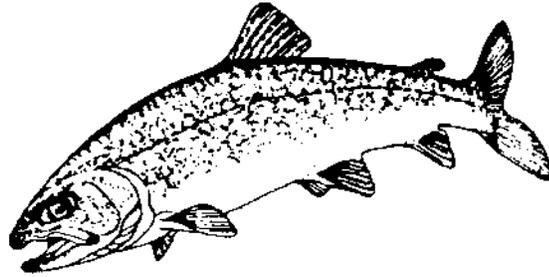
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### Recreational Activities

I own a resort near Wawa, Ontario. Tourists will stay at my resort as long as Lake Superior is clean and they can catch fish, but if the lake is too polluted they won't stay and I will go broke. (Compare the color of water from Lake Superior to the standard color. If the water from the lake is darker than the standard, it is too polluted and people won't stay at the resort.)

### Discussion:

How many of you would be willing to pay money to stay at a resort where you couldn't catch fish? What could this resort owner do about the problem?



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### Economics

I live in Wawa, Ontario. I have to choose whether to spend an extra \$120 a year for my electric bill to clean up pollution from smoke-stacks that cause acid rain. If I choose not to spend the extra money, I will cause indirect pollution of Lake Superior. (Pay or add one unit of color.)

### Discussion:

Many electrical generating plants in Minnesota burn coal. Coal contains an impurity called sulfur. Sulfur dioxide and nitrous oxides (from automobile exhaust) combine with moisture in the atmosphere to form acid rain. Acid rain is a problem for our aquatic and forest resources as well as for man-made materials. "Scrubbers" can be installed on power plants to reduce sulfur emissions, but they are expensive. How much would you pay to reduce acid rain?

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### Government

I live in Duluth, Minnesota. I don't think our laws protect Lake Superior. I could write to my Congressman, or I could watch "Cheers." If I watch TV, nothing will be done to help the lake. (If you choose TV, add one unit of color.)

### Discussion:

Your voice in Washington D.C. can make a difference. Governors from states around the Great Lakes have joined together to support laws protecting the lakes. The International Joint Commission and the Great Lakes Commission also work to support research and legislation for the Great Lakes.

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### Nature

I am an osprey that lives near Marathon, Ontario. I catch fish from the lake for food. If the lake has been polluted or if people have taken too many fish from the lake, I can't catch my supper and I will die. (Try to catch fish - 15 seconds will be allowed for fishing.)

### Discussion:

Humans aren't the only ones who depend on Lake Superior for food and habitat. Ospreys are predators who rely on fish as a main source of food. Pollutants that build up in the fish they eat can be bioaccumulated in ospreys, eagles, and other fish eating species. This can have long term effects on their ability to reproduce and raise healthy offspring.



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**Recreational Activities**

I am a resident of Superior, Wisconsin. I am a fisherman who recently spent \$300 for equipment to fish for lake trout. I can catch a fish if there isn't too much pollution in the lake. **(Try to catch fish. Thirty seconds will be allowed for fishing.)**

**Discussion:**

Some kinds of chemical pollution hurt the ability of fish to reproduce. Other kinds build up in fish tissue and make them unsafe to eat. Each year, health agencies around Lake Superior warn people about unsafe fish. Should you ignore the warnings and keep fishing? Since you've already spent a lot of money on special equipment to fish Lake Superior, what can you do to stop pollution and make sure your money wasn't wasted?

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**Life-style Decisions**

I am a sixth grader from Silver Bay, Minnesota. I was given \$20 for a birthday present. I can spend it all on a new tee-shirts and ice cream or I can give part of it to an environmental fund that will help protect Lake Superior. I choose to spend my money on myself or Lake Superior. **(If you chose yourself, add one unit of color.)**

**Discussion:**

Even a few cents, when put together with money from friends and neighbors, can make a difference. Does your church, club, or school ever do environmental projects? If not, what can you do to help organize a cleanup or fund raising project?

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**Economics**

I head the Board of Directors of an electric power company in Duluth. We would like to clean up our emissions by building scrubbers on our towers, but it will cost \$1 million. I don't think the public will agree to pay more for electricity. If I won't pay for the clean up, our power company will cause acid rain and pollute Lake Superior. **(Pay or add one unit of color.)**

**Discussion:**

You may ask for the people around the lake to vote on whether they would pay higher rates.

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**Ethics**

I live in Sault St. Marie, Michigan. While riding home, one of my friends threw his garbage on the ground. I told him he shouldn't litter, but he didn't care. I can choose to pick up his garbage or leave it on the ground. **(If you leave the litter, add one unit of color. If you pick up the litter, stand up for applause.)**

**Discussion:**

Each American throws away four pounds of solid waste a day. That's 1,460 pounds a year. Minnesota's garbage would fill the Metrodome to the roof, twice a week! How many of you avoid littering? How many would tell a friend not to litter? How many actually stop their bike and pick up the litter?

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**Recreational Activities**

I live near Thunder Bay, Ontario. When my friend and I go fishing, we dump the fish guts in the lake when we clean them. We think this is okay because fish or birds will eat them. **(Add one unit of color.)**

**Discussion:**

In Minnesota it is illegal to dump fish guts into the water. Although they are degradable, they stink and attract pests (flies, gulls). Dumping the guts makes using the area unpleasant for others and can pass along disease to other fish. You should take the guts home to either compost or dispose of them with your garbage. If you're camping, bury them in a hole at least a foot deep, 100 feet away from the water's edge.

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**Recreational Activities**

I live in Houghton, Michigan. We have a fishing boat and often spill gasoline into the lake when we are filling the tank. I don't think it matters because the lake is so big that a little gasoline won't hurt it. **(Add two units of color.)**

**Discussion:**

That little bit spilled into the lake shouldn't hurt, right? What if everybody spilled "just a little bit?" Gasoline is easily dispersed through the lake and affects many plants and animals. Some components of gasoline (benzene, for example) cause cancer in humans and other animals. Another source of gasoline contamination in the environment, are the "last few drops" that fall out of the pump handle when people fill the tank on their car. Filling gas tanks carefully only takes a little thought.

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**Life-style Decisions**

I live by Marathon, Ontario. I choose to drain a wetland on my land. This area used to control water running down to the lake. Now this water pours down a nearby creek and carries mud into the lake. **(Add mud.)**

**Discussion:**

Wetlands do many things. They serve as flood protection, soaking up and retaining extra water during peak flow periods. They also recharge areas by releasing that water slowly over time. They offer unique plant and wildlife habitat. There are many species you'll never see anywhere else. Wetlands also improve water quality by trapping or filtering out nutrients and other pollutants.

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**Life-style Decisions**

I live in Bayfield, Wisconsin, and want to have a nice green lawn. I can choose to use chemicals on my lawn or pull the weeds by hand. Chemicals could pollute the lake, but would save me work. **(If you choose to use chemicals, add one unit of red color.)**

**Discussion**

The best kind of lakeshore environment—for water quality, for animals, and also for people—is one that includes vegetation other than mowed grass. Buffer strips of weeds, aquatic plants, shrubs, or trees help protect the lake by preventing runoff soil and nutrients or chemicals, and by providing habitat for animals. One of the worst things lakeshore owners can do to their lake is use fertilizer or herbicides (chemicals to kill weeds) on mowed lawns next to the lake.

# LAKE SUPERIOR WORKSHEET

1. Who uses the water in Lake Superior and for what?
2. What do you feel are the three most important uses of water from Lake Superior (in order)?
3. What is unique, or special, about Lake Superior?
4. What is the most damaging source of pollution to Lake Superior today?
5. Who should decide if water can be diverted from the Lake Superior basin? Should the same person or group decide how much water is taken and where it goes?
6. How does Lake Superior affect the economy of our region? List at least five businesses or industries that depend on Lake Superior.
7. Who is responsible for keeping Lake Superior clean?

Minnesota  
Wisconsin  
Michigan  
Duluth  
Knife River  
Two Harbors  
Silver Bay

Grand Marais  
Grand Portage  
Ashland  
Bayfield  
Superior  
Apostle Islands  
Sault Ste. Marie

Grand Marais  
Marquette  
Houghton  
Ontonagon  
Isle Royale, Ontario  
Thunder Bay  
Nipigon

Marathon  
Wawa  
Sault Ste. Marie  
Michipicoten Island.

## FOLLOW THROUGH

1. With younger players, try playing the game using an alternate payment system such as penny candy instead of play money. This may cause players to really feel they have a stake in their decisions. Play money has little intrinsic value to young people, and it may be very easy for them to part with it.
2. If you are using this game in a classroom setting, have students do some research and report on the major causes and areas of pollution in Lake Superior.

## WORKSHEET ANSWERS

Most of the questions have no RIGHT or WRONG answers. The questions are intended to provoke thought. Players will have very different answers for some of the questions. A few questions have "correct" answers, although interpretations may vary.

1. Users include residents, tourists and visitors, animals, and industry. Uses include domestic activities (washing, cooking, and drinking), transportation, industry, recreation and tourism, fishing, research, and wastewater treatment.
2. Any three uses.
3. Any features, including its size, beauty, depth, storms, clarity, clean water, history, etc.
4. Answers may reflect value judgments, but current thought has it that the most pressing concern is atmospheric deposition to the lake such as acid rain, mercury, organic contaminants like PCBs, etc.
5. A decision-making body could include representatives from three states and Ontario, both federal governments, people from out side the basin, etc. The question gets at the problem of identifying who "owns" the resource.
6. Any five industries, including shipping, industrial processing, recreation and tourism, water supply, wastewater treatment, commercial fishing, and real estate.
7. Everyone!

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Minnesota Sea Grant is a statewide program that supports research, extension, and educational programs related to Lake Superior and Minnesota's water resources. Offices are located on the St. Paul and Duluth campuses of the University of Minnesota.

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# Map of Lake Superior and Drainage Basin

