

CIRCULATING COPY

M I N N E S O T A S E A G R A N T

THE

# Lake GAME

LOAN COPY ONLY

YOUTH



by Barbara Liukkonen



Minnesota is well known as the Land of 10,000 Lakes. Our lakes are found in environments ranging from developed urban settings to remote, pristine waters. Lakes face a variety of threats such as overuse, pollution, and the introduction of exotic species. Minnesota's lakes serve many purposes so there are probably as many viewpoints on how lakes should be used or

managed as there are people and agencies in the state.

Minnesota's lakes are "public waters." That means we are all responsible for working together to better protect and preserve our water resources as they face increasing pressure from development and overuse.

## PURPOSE

In this activity students participate in a simulation in which they are asked to assume roles that represent a variety of individuals who use a lake or lake water. The game has been designed to help introduce youth to differing environmental values and to help them learn how to protect and improve our water resources.

The activity has been designed to fit the criteria for environmental education in Minnesota. It focuses on natural science within a social context, it addresses the issue of environmental valuing, and it identifies actions that students can take to protect and enjoy our environment.

## GOALS

The goals of this game are:

- to have youth realize how many people in the community depend on their lake for drinking water, recreation, and employment;
- to help youth better understand the economic complexity of decisions facing polluters of their lakes; and
- to help youth understand how they as individuals can change their own actions to minimize pollution of the lake.

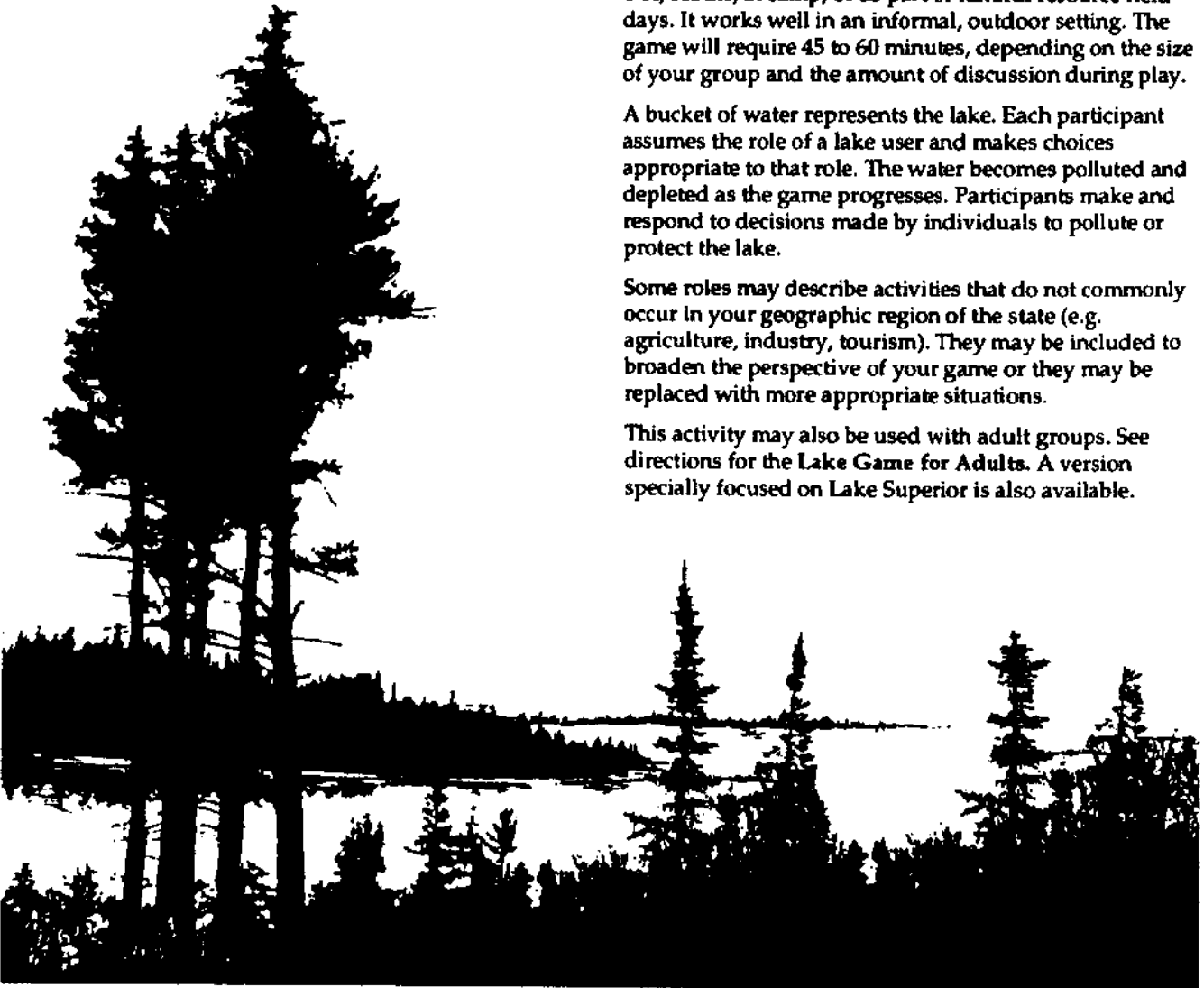
## PROCESS

The game can be played with a group of 15 to 30 upper elementary or secondary students. More students may be involved, but attention wanders when there are too many players. The game may also be used with youth groups in 4-H, scouts, at camp, or as part of natural resource field days. It works well in an informal, outdoor setting. The game will require 45 to 60 minutes, depending on the size of your group and the amount of discussion during play.

A bucket of water represents the lake. Each participant assumes the role of a lake user and makes choices 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.

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

This activity may also be used with adult groups. See directions for the *Lake Game for Adults*. A version specially focused on Lake Superior is also available.



## BACKGROUND INFORMATION FOR INSTRUCTORS

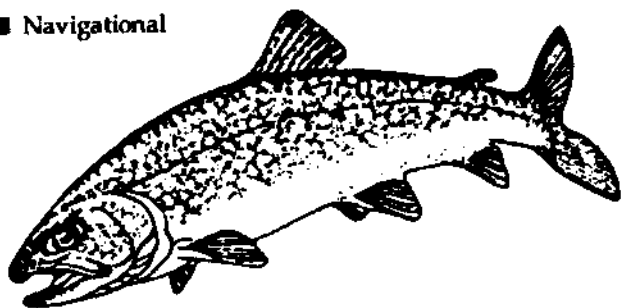
Minnesota is rich in water resources with nearly 92,000 miles of streams and over 15,000 lakes larger than 10 acres in size. That's more than 3.4 million acres of water plus approximately five million acres of wetlands. Our lakes range in size from less than 10 acres to the 3,000,000 acre Lake-of-the-Woods. One-half of the lakes in Minnesota are less than 50 acres in size (an acre is about the size of a football field). Over 98 percent of Minnesota's lakes are found in the northern and central part of the state. The most common lake name in Minnesota is MUD, which is (over-) used 261 times! The next most common names are LONG (256), RICE (122), BASS (83), and TWIN (72).

Most of the state boundaries are actually water: the Pigeon River and Lake Superior in the northeast; the St. Croix and Mississippi Rivers in the east and southeast; the Red River of the North along the western boundary; and the Rainy River and boundary waters in the north. Three of the major continental drainage basins have headwaters in Minnesota. Surface water leaving Minnesota may flow eastward through the Lake Superior Basin and the Great Lakes to the Atlantic Ocean, south through the Mississippi and Missouri Rivers to the Gulf of Mexico, or north through the Red and Rainy Rivers to Hudson Bay.

We are surface water exporters; no surface water enters Minnesota. Along with the surface water, we export pollution to downstream users in other states and in Canada.

In Minnesota all lakes and streams have a designated use. There are seven classes of water for the state, and each has a specific set of water quality standards. They are:

- Aquatic, Fish and Wildlife
- Recreation
- Industrial
- Limited Resource Value
- Domestic Water Supply
- Agricultural
- Navigational



All lakes and 99 percent of river miles in Minnesota are designated for fishable and swimmable use. All rivers are classified for agricultural, navigational, and industrial use. We often think of water quality in terms of human consumption, but there are many other uses that require protecting and preserving adequate supplies of high quality water.

The waters of Minnesota belong to all of us; they are to be "public waters." Property adjacent to lakes or streams may be privately owned so that access to the water may be denied, but the water itself is in the public domain. Thus, we are all responsible for Minnesota's precious water resources.

## PREPARATION/MATERIALS

Before playing the game...

1. You will need ...

- a large container nearly filled with clean water to represent your lake; aquariums, large buckets, wading pools, and clear plastic garbage bags suspended in a frame have all been used successfully;
- an extra bucket or sink for dumping water removed from the lake;
- an extra bucket of clean water for rain;
- a small container of water colored bright red with color to represent pollution;
- a similar solution of yellow food color;
- an eye dropper to dispense the pollution, one eye dropper full equals one unit of color;
- a plastic container with a perforated lid, filled with muddy water for the students to add "shakes" of turbidity to the lake;
- a roll of toilet paper;
- a clear container for withdrawing water; a plastic cup works well;
- play money, or a substitute, for the roles that involve paying instead of polluting (Note that not all roles have this option. The teacher can add requirements to pay as needed.);
- at least three fish made from plastic or plexiglass weighted to stand on the bottom of the lake (see Figure 1);
- a fishing pole to catch the fish;

- a tangle of yarn to represent Eurasian Water Milfoil;
- a die for Mother Nature to roll.

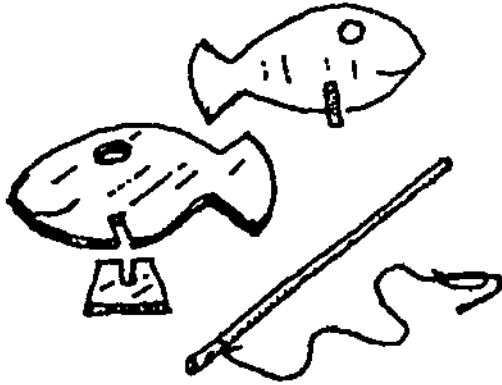


Figure 1

2. Silhouettes of fish may be cut from plexiglass or a plastic coffee can lid and inserted into a slit in another piece of plastic serving as a base (see 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 indelible red magic marker makes it more difficult to see the fish once the water becomes polluted. The fish should have a hole on their backs so they can be easily hooked with the fishing pole. The pole can be constructed from a short length of cord tied to a dowel with a bent paper clip as a hook.

3. For each role-playing option you choose, paste the student role on one side and the leader discussion text on the back of a tagboard card. Cards should be flexible and durable, with large text. Cover the cards with clear contact paper to make them waterproof.

4. You can number the cards with indelible pen in the order in which they are listed below. This playing order ensures some pollution of the lake before students remove drinking water and go fishing.

5. If you are using play money, clip it to the appropriate cards before handing them out. Or students can “borrow” money from the instructor, as they would from a bank, to pay for cleanup costs. Or you can make the handout card itself look like a check for the correct amount. Use a Clean-up Fund box, and after the game, check to see how much would be available for clean-up.

6. If possible, prepare a large-scale map of your lake, traced on plastic or chalked on the ground. Indicate cities with dots and township or county borders with lines, but don’t necessarily identify them by name. If roles have been assigned to specific locations, finding their “home” becomes part of the experience for students unfamiliar with the entire lake. The map should be large enough for students to sit around while they play.

## PLAYING THE GAME

1. Place the container representing your lake in the center of the map. Stand the fish on the bottom. If they tip over when water is added, leave them lying down.

2. Arrange the pollution solutions, eye dropper, turbidity shaker, and the container for withdrawing water near the bucket. Retain the fishing pole, die, toilet paper, yarn, etc. until that particular role is read—they can be distracting and easily get wet as water is added or removed from the lake.

3. Distribute the role cards and explain playing order. Encourage students to role play and to act as they think the person described on their card would act. Have students sit around the map of the lake, read over their cards, and consider their decisions.

4. As each student’s turn comes, have her/him read the role aloud and what choice s/he has made, if a choice is indicated. Each role should involve an action of some sort. You may or may not want to allow students to influence others’ decisions.

5. Have students perform the appropriate actions—polluting the lake, paying money, withdrawing water, catching fish.

6. After the student has made her/his decision, the leader should read the text on the back of the card. This gives some background information and can stimulate discussion.

7. Also, discuss their decisions as you play—balance economic considerations against idealism. If no one opt to pollute, ask how realistic that situation is. Compare the multi-million dollar decisions that they may not feel they can influence, with what they can do as individuals to reduce or prevent pollution. Discuss how they really can have an impact on corporate decisions through letter-writing campaigns, boycotts, etc.

8. Review that the container is a simple model of your lake. In reality, water is constantly being added through precipitation and runoff and pollution is diluted or flushed out at the outflow. Stress, however, that water in your lake is a limited resource—it isn’t infinite.

9. Finish up with a review of which activities and choices polluted or depleted the lake water. Have students discuss which were acceptable and how they could alter their own or others’ behavior patterns to better protect their lake.





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## LAKE USER ROLES

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### **Erosion**

I am a careless tourist driving along the lake. I throw a burning cigarette out my window and start a major forest fire. Many trees are destroyed and erosion is increased.

[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, 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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### **Life-style Decisions**

I am a homeowner with a dirt road. 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 take a few minutes to dispose of it properly. [If you choose to dump it along the road, add two units of red 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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**Economics**

I run an industry on the lake, but none of the company officers live in the region. They don't care if they pollute the lake. [Add three units of red color.]

**Discussion:**

How could we convince the company that we don't want them polluting our lake? Your voice counts! By boycotting products, writing letters to elected officials, and focusing media attention on unresponsive industries, you can make a difference.

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**Recreational Activities**

I go fishing with my friend. When we clean our fish we dump the guts in the lake instead of wrapping them up and throwing them away. We think this is okay because they are biodegradable or birds will eat them. [Add one unit of yellow 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 with your garbage. If you're out camping, bury them in a hole at least one foot deep and 100 feet away from the water's edge.

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**Economics**

I am a logger who is cutting timber in the area. If I clear cut an area too close to a stream, it will cause erosion and streambank collapse, but I will earn \$1,000. The erosion would cause turbidity in the stream, damaging fish spawning grounds and polluting the lake. [Add five big shakes of turbidity.]

**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.

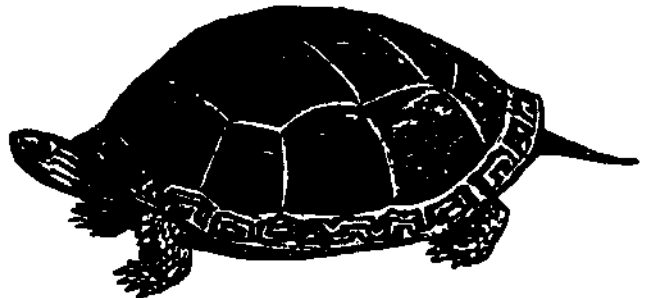
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**Life-style Decisions**

I live near the lake and I know I should take my solid waste to the landfill, but it is cheaper and easier to dump the garbage in my backyard. I have to choose whether to continue to use the creek in my backyard as a dumping ground for my household waste or to pay \$18 a month and haul my waste to the landfill. [Pay or add one unit of red 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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**Recreational Activities**

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 red 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. One gallon of gasoline can contaminate one million gallons of water. Some components of gasoline (benzene, for example) cause cancer in humans and other animals. Another source of gasoline contamination in the environmental, are the "last few drops" that fall out of the pump handle when people fill the tank on their car.

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**Lifestyle Decisions**

My friend and I go out for treats. On the way home my friend throws his garbage out the window. I tell him he shouldn't litter, but he doesn't care. I can choose to stop the car and pick up his garbage or leave it. **[If you leave the litter, add one unit of red color.]**

**Discussion:**

Each American throws away four pounds of solid waste a day. That equals 1460 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 would actually stop the car and pick up the litter?

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**Economics**

I own an industry near the lake. It would cost us \$10 million to clean up our effluent. 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 or continue to pollute the lake. **[Pay or add four units of red 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, but stopping pollution of the lake?

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**Economics**

I own a home with a well. My septic system is old and needs repair, but the upgrade will cost me \$500. I'd rather use the money for a vacation. I have to choose whether to pay to have the tank replaced, or continue to let my system pollute the lake. **[Pay or add one unit of yellow pollution and one torn up sheet of toilet paper.]**

**Discussion:**

Most cities have sewage treatment plants that take your household water and clean it before returning it to the environment. Country 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?

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**Government**

I represent the Highway Department. We salt the highway during the winter. This makes the road safer, but when the salt runs off in the spring it pollutes the lake. [Add two units of red 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 de-icer called urea. It is expensive but pollutes less than salt.

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**Economics**

I am in charge of a plant that uses water to make paper. Most of the water is supposed to be returned to the lake clean, but I know there is a problem with the equipment. 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 red 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 solve the pollution problem, without losing her job?

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**Life-style Decisions**

I want to build a sauna near the lake so we can jump in the water to cool off. Installing a drainage system to carry our soapy wastewater back up into our septic system will cost me an additional \$500. Nobody will ever know if I just bury the pipe and let it run into the lake. [Pay or add one unit of color.]

**Discussion:**

Even though no one may know you're draining your sauna into the lake, you'll be hurting yourself by lowering water quality. The amount of wastewater may be small but the added nutrients can increase algal growth and the soaps and oils from the sauna aren't good for the lake. Besides, you'll affect the water quality in front of your property—just where you want to enjoy the lake!

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**Wetlands/Erosion**

I own property away from the lake. I figure what I do with my own land is my business. I choose to drain a wetland to give me a better area for hiking and ski trails. This area used to serve as a holding area for spring meltwater. Now this water pours down a nearby creek, causing erosion and carrying sediment into the lake. [Add five big shakes of turbidity.]

**Discussion:**

Wetlands are valuable. They serve for flood protection, soaking up and retaining extra water during peak flow periods. They also serve as recharge areas by releasing that water slowly over time. They offer unique plant and wildlife habitat. In fact, there are many species you'll never see anywhere else. Importantly, wetlands also improve water quality by trapping or filtering out nutrients and other pollutants. We lose about 500,000 acres of wetlands every year in the U.S. to development.



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**Ethics**

I am a newspaper reporter. I have information about a company that is polluting the lake. Company officials have offered me \$10,000 not to tell. I have to choose whether to take the bribe or write the story. [If you take the money, add two units of red color.]

**Discussion:**

Is the pollution of the lake worth only \$10,000? How much would it have to be to get you to clam up about the story? \$20,000? Only \$500? Is your personal gain worth damage to the lake that ruins everyone else's use?

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**Water Cycle**

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 year in a row," remove one cup
- 6 = "very wet year - FLOOD," add six cups]

**Discussion:**

We can't expect the recharge to our lake to be the same every year. Recharge occurs through precipitation directly onto the lake surface and through runoff from precipitation over the land around the lake. That runoff can be by rivers or streams or right over the land surface. 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 consumptive use.

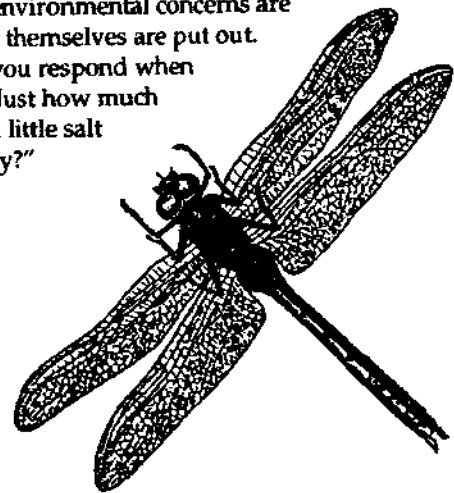
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**Government**

I am head of the parks and recreation department in the city. We have been losing sand from our public beach due to erosion. I have to find a source to replace it. I have found a cheap source of sand that is slightly contaminated with salt. Clean sand would cost so much that we would not be able to replenish our public beach this year and would have to close it down for the summer. I have to choose whether to purchase the cheaper, contaminated sand. [If you use the sand, add one unit of color.]

**Discussion:**

What do you think the public would say if you closed the beach? What about the local tourism industry? Many people think environmental concerns are fine until they themselves are put out. How would you respond when they asked, "Just how much damage can a little salt cause, anyway?"



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**Life-style Decisions**

I own lakeshore property and want to have a nice green lawn running down to the lake. 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 of 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.

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**Recreational Activities**

I have a motor boat that I use all over the state at different lakes. I went to Lake Minnetonka, near Minneapolis, and then came to boat here. I didn't wash off my trailer or boat and Eurasian water milfoil was on my propeller when I put my boat in this lake. [Add a tangle of yarn to the lake.]

**Discussion:**

Eurasian water milfoil was first discovered in Minnesota (in Lake Minnetonka) in 1987. By 1991, it had spread to 31 lakes in the state. It is a nuisance weed that is spread by people carrying it from one lake to another on their boats or trailers or in their live wells or minnow buckets. It grows rapidly and crowds out beneficial native plants. It doesn't provide good habitat and is a nuisance for boating, swimming, water-skiing, or fishing. Its spread can be slowed if people take a few extra minutes to make sure they are not transporting it to another lake.



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**Recreational Activities**

I am going to build a new dock. 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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**Ethics**

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 red color.]

**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 fee worth the damage to the lake?

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**Economics**

I own a dairy operation along the lake. My cows are free to wander down to the lake to drink and escape from the heat and bugs. Some people across the lake want me to restrict my "feedlot" and not let my cows in the water. To run fencing along my two acre frontage would cost me \$20,000 and I'd need to install pumps and line to get water for them to drink. If I paid that much for improvements, I'd have to close down my operation. [Pay or add two units of color.]

**Discussion:**

There are clearly no easy answers in this situation. Although the dairy herd is harming the lake, shutting down the operation is not an easy solution. The MPCA handles feedlot complaints and violations and will work with livestock operators to reduce or eliminate environmental damage. One question to ask about a lakeshore feedlot, "How does pollution from the feedlot compare with pollution from other sources such as septic systems, runoff, and lawn chemicals?"

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**Recreational Activities**

I am a great water skier. I like to ski near shore so people can see how good I am. This causes erosion of the shoreline. I have to choose whether to quit skiing near shore to protect the lake or to keep showing off. [If you continue to ski near the shore, add three big shakes of turbidity.]

**Discussion:**

Sometimes little things make a big difference in a lake. The addition of turbidity not only makes the lake less pleasant for us, 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 fish spawning grounds.

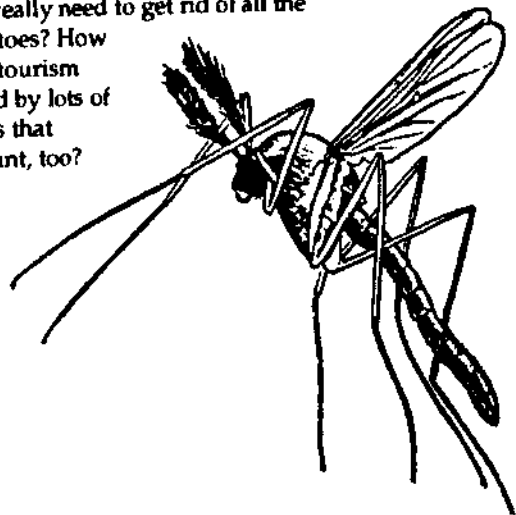
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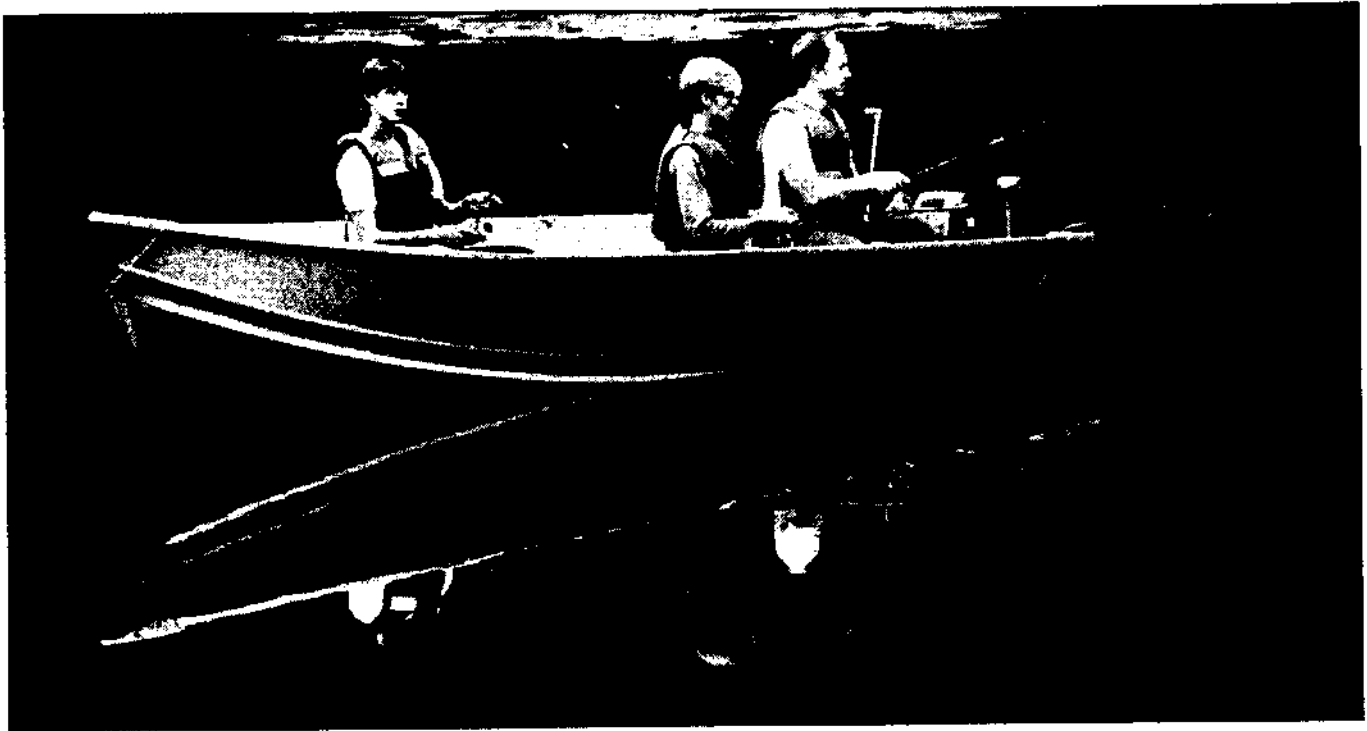
**Government**

I am in charge of mosquito control for the city. Every year we spray near the lake. I have been asked to increase the area we spray to kill more mosquitoes. Some people don't want any spraying. I have to choose whether to spray more, less, or the same as in past years. [If more, add two units of red color; if less, add no color; if the same, add one unit of red color.]

**Discussion:**

Chemicals approved for mosquito control are safe if applied correctly. But some may have long-term effects on birds and other animals. Do we really need to get rid of all the mosquitoes? How is local tourism affected by lots of bugs? Is that important, too?





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### **Recreational Activities**

I am a fisherman who just spent \$700 on equipment. I can catch a fish if there isn't too much pollution. [Try to catch fish. 15 seconds will be allowed for fishing.]

### **Discussion:**

Would you want to eat a fish that came out of water polluted like our lake? When pollutants get into 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. The Minnesota Department of Health has issued guidelines for eating fish from 260 lakes in Minnesota. There are health risks for young children and pregnant women who eat fish contaminated with mercury and PCBs.

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### **Government**

I am in charge of the sewage treatment plant for a city on the lake, but I don't think people who live in the city will agree to pay higher rates for wastewater treatment. Rates only \$3.00 a month higher would help prevent pollution of the lake. [Take a vote. If the majority say they would pay more, add no color. If they vote no, add three units of yellow color and two sheets of torn up toilet paper.]

### **Discussion:**

Most treatment systems do secondary treatment of sewage before it is returned to the lake. Tertiary treatment produces even cleaner water, with fewer nutrients to affect the lake. 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?

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**Government**

I represent a city on the lake. We need 400,000 gallons of clean water from the lake each day for our city water supply. [Remove four cups of water; show everyone how polluted the water is.]

**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. Now 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 want to get rid of the weeds in the water near my beach. I could cut the weeds or use a chemical weed killer. Chemicals would be easier and would take a lot less time, but could cause problems in the lake. I have to choose whether to cut the weeds or use chemicals. [If you choose chemicals, add two units of red color.]

**Discussion:**

Using chemicals in the lake to kill weeds is not as easy as it seems. You must have a permit from the DNR to use chemical herbicides. When chemicals are applied at the wrong rate or at the wrong time of day they can harm fish and other animals. Wind or current can cause the chemicals to travel away from where you want them to work. If there are weeds in the rest of the lake, they'll continue to come back to your beach area. Besides, emergent vegetation (the weeds that stick out of the water) can help reduce bank erosion and can actually help improve water quality.

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**Government**

I work for the Department of Natural Resources. I am in charge of controlling purple loosestrife, an aquatic plant that is taking over in our region's wetlands. I have to choose whether to use crews to remove the weed by hand (not as effective and very time-consuming) or use a herbicide to poison the weed. If I use a crew, the weed may spread farther, but using herbicides improperly could pollute the lake. [If you choose to use herbicide, add one unit of color.]

**Discussion:**

Purple loosestrife is a serious threat to our wetlands and lakeshore areas. A single plant can produce up to 10,000 seeds annually. Currently only one herbicide is approved for chemical control, and when used correctly, it is safe and effective. However, any chemical may cause problems if it is mishandled and some environmentalists want to ban all pesticides. Is allowing the spread of loosestrife an acceptable trade-off for eliminating any risk from pesticide use?

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**Life-style Decisions**

I don't live by the lake, but I know that when I waste electricity it increases air pollution that affects the lake. I have to decide whether to conserve electricity at home. [If you continue to waste electricity, add one unit of red 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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### Life-style Decisions

I live by the lake and can choose to spend five minutes a day making sure that my family recycles our aluminum cans, newspapers, and glass. Do I choose to recycle? [If you choose not to recycle, add one unit of red color.]

### 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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### Life-style Decisions

I live along the lakeshore. I cut down all my trees and paint my house with hot pink and green stripes. I like the effect, but some people says it makes boating past my property less enjoyable for other people. [Add one unit of yellow color.]

### Discussion:

Although painting the house a bright color wouldn't actually pollute the lake, it does make the area less pleasant for people who don't happen to like pink. Should people be able to do whatever they want to with their own property? Why? Why not? In Minnesota, the DNR has shoreland regulations on how close buildings may be to the water, how large or tall they can be, and how wastewater is treated near the water.

### OTHER RESOURCES:

Listing of lake names and sizes by county: DNR Waters Section. 1968. An Inventory of Minnesota Lakes, Bulletin No. 25, St. Paul, MN.

Burnson, Bill. 1981. Yes, Folks, There Really is a Lake Lake! *Volunteer* 44 (256):1-20. Minnesota Department of Natural Resources.

Minnesota Pollution Control Agency annual summary of lake water quality.



Minnesota Sea Grant is a statewide program that funds research, extension, and education projects related to Lake Superior and Minnesota's water resources. It is funded by NOAA, the University of Minnesota, the Minnesota Extension Service, and the state legislature. Sea Grant offices are located on the Duluth and Saint Paul campuses of the University of Minnesota.

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