



LAKE SUPERIOR GAME

EVENING ACTIVITY

Wolf Ridge Environmental Learning Center
6282 Cranberry Rd, Finland, MN 55603 • 800-523-2733 (MN, WI) • 218-353-7414



Playing the Lake Superior Game.

LAKE SUPERIOR GAME

WOLF RIDGE CLASSES:

Animals:

Animal Signs
Beavers
Birds
Small Mammals
Snowshoe Hare
White-tailed Deer
Wildlife Management

Plants:

Forest Ecology
Plant Study
Trees and Keys
Wetlands Ecology

Aquatics:

Lake Study
Stream Study
Fisheries Management
Frozen Lake Study

Earth Science:

Acid Rain
Geology
Weather

Human Culture and History:

Living Lightly
Nature's Timing
Ojibwa Heritage
Ojibwa Snowshoe
Seeds of Change
Voyageur Life

Personal Growth:

Adventure Ropes Course
Rock Climbing

Group Building:

Basic Survival
F.I.R.S.T. Games

Outdoor Recreation:

Beginning Orienteering
Competitive Orienteering
Canoeing
Cross Country Skiing
Superior Snowshoe
Superior View Hike

Evening Activities:

Astronomy
Block Printing
Creative Expressions
Creature from Wolf Lake
Dream Catchers
Lake Superior Game
Night Hike
Owl Pellets
Paper Making
Star Lab
Woodland Art
Volleyball

Naturalist Presentations:

Bats
Fur Trade
History of the North Shore
Logging Camp Life
Raptors
Wolves

Description: An Ecology Evening Activity

In this activity students are asked to assume roles of individuals who use Lake Superior and to make action choices appropriate to these roles. As a result of their choices, some will be identified as water abusers. Through this game, students will experience decisions relating to pollution, values, and economics in a dynamic setting. They will also become familiar with water cycles and geography of Lake Superior.

Total Time: 1 1/2 hour

Audience: 6-20 students, 4th grade through adult

Activity Level: Easy

Site: Indoors, Room 7 or 11



About Wolf Ridge

Wolf Ridge is an accredited residential environmental education school for persons of all ages. We offers immersion programs which involve direct observation and participation in outdoor experiences. Wolf Ridge programs focus on environmental sciences, human culture and history, personal growth, team building and outdoor recreation.

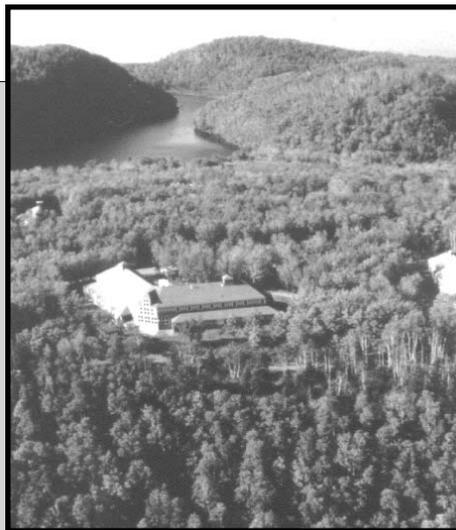
Our Mission

To develop a citizenry that has the knowledge, skills, motivation and commitment to act together for a quality environment.

What We Do

We meet our mission by:

- Fostering awareness, curiosity and sensitivity to the natural world.
- Providing lifelong learning experiences in nature.
- Developing social understanding, respect and cooperation.
- Modeling values, behaviors and technologies, which lead to a sustainable lifestyle.
- Promoting the concepts of conservation and stewardship.



Wolf Ridge Campus

Photo by Jim Brandenburg



Wolf Ridge

Environmental Learning Center

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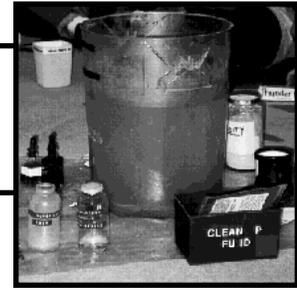
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www.wolf-ridge.org

Wolf Ridge is an equal opportunity educator and employer.

LAKE SUPERIOR GAME



OUTLINE:

I. Set-up (15 min.)

II. Introduction (10 min.)

- Greeting/ Grabber
- Learn Names
- Behavior Guidelines
- Class Overview
- Assess Learner Level

III. Background Information

(10 min.)

IV. Playing the Game (1 hr.)

V. Conclusion (10 min.)

- A. Review
- B. Stewardship Actions

VI. Clean-up (10 min.)

VII. Appendices:

- Optional Activities
- Equipment
- References
- Glossary



OUTCOMES:

Upon Completion of the Lake Superior Game Students Will Be Able To:

1. List five sources of pollutants entering Lake Superior.
2. Understand the positions of stake holders using resources in and around L. Superior.
3. Form some of their own values about L. Superior.



CONCEPTS:

- The earth is essentially a closed system.
- Humans and the environment are interrelated.
- Every component of nature forms a cycle and is in constant change.
- Humans have a great ability to alter natural systems, and a responsibility to consider the effects of our actions.



MN GRADUATION STANDARDS:

Wolf Ridge has aligned the Center's entire curriculum to Minnesota Department of Education Academic Standards. The Center maintains a curriculum standards matrix for the following subject areas:

- Science
- History and Social Studies
- Language Arts
- Mathematics
- Arts

The Matrices are organized by grade level and subject area, listing Strand, Sub-Strand, Standards, and Benchmarks. Every class addressing a benchmark is also noted. As the primary student audience at Wolf Ridge is from 4th-12th grade, the matrices address these grade levels. Teachers may request that their students focus upon a specific benchmark while attending Wolf Ridge.

Copies of our matrices are available on the Wolf Ridge web site at www.wolf-ridge.org, found under the "Education" menu. If you cannot access the matrices via the website, request a printed copy by calling 218-353-7414 or e-mailing us at "mail@wolf-ridge.org".

Revised May 2008

INSTRUCTOR NOTE:
Instructor Info: can be read after decisions and consequences are determined for each player.

I. Set-up (15 min.)

All the equipment for the Lake Superior Games is located in cabinets in room #7 or room #11 of the education building. A map of Lake Superior is outlined in the carpet of both rooms.

Fill the LAKE SUPERIOR and INFLOW buckets to their respective fill lines with cold water from the janitor closet sink located opposite the rest rooms. Place the INFLOW bucket near the west end of the lake and the OUTFLOW bucket near the east end. Lay down the plastic carpet protector and place the LAKE SUPERIOR bucket in the middle of the map. Put 3 fish and the shipwreck in the lake. Instructor must keep one un-deformed fish.

Place the pollution dropper bottles (red, green, yellow), the full comparison sample bottle, empty comparison sample bottle, fishing poles, secchi disk, turbidity shaker, and toilet paper near the LAKE SUPERIOR bucket.

Set up the big wall map of Lake Superior and make the role play cards and the wooden block "town markers" available to students as they enter the room.

II. Introduction (10 min.)

Greeting/Grabber

When students enter either room #7 or #11 they will see the room set up as described in the Set-up instructions. They will each take a role play card. Each student must then find their "home" by reading their card, consulting the wall map, picking up a town name block, and placing it and themselves along the shoreline of the Lake Superior carpet map on the floor.

Learn Students' Names

Welcome students to the class. Go around the lake and have each person give their role play name.

Behavior Guidelines

Discuss clearly and specifically which behaviors you expect from your students during the next hour. Explain the need for respect; for you, for each other and for the equipment.

Class Overview

During the game, a bucket of water that represents Lake Superior gradually becomes polluted and depleted. Natural inflow into the lake (streams, precipitation, and runoff) and natural outflow (evaporation and the St. Mary's River) are considered. It takes 191 years for Lake Superior to be flushed entirely. We will span 100 years (a student's life span?) based on the amount of water flowing in and out of the lake during the game. Play your roles with enthusiasm.

Assess Learner Level

Ask the students about their experiences with Lake Superior. Read the following background information about Lake Superior.

III. Background Information (10 min.)

North America is generally recognized as having the Atlantic coast, Gulf coast, Pacific coast, and the Arctic coast. But when you think about it, Lake Superior and the other four Great Lakes represent a fifth coast. The Great Lakes ecosystem is vital to the economy and quality of life in the United States and Canada. Among the Great Lakes, Lake Superior stands out as “superior.”

Lake Superior is about 350 miles long and 160 miles wide. To drive its coastline would be equal to driving from Duluth to Miami, Florida. It is bordered by the states of Minnesota, Michigan and Wisconsin, and the Canadian province of Ontario.

The Great Lakes are huge. Together they represent about 20% of the earth's available surface fresh water. Lake Superior is the largest of the lakes, containing about half of their total volume. In surface area, Lake Superior is the largest freshwater lake in the world. Lake Baikal in Siberia and Lake Tanganyika in central Africa each have less surface area but hold more water because of their depth (Lake Baikal is over a mile deep). Lake Superior covers 31,280 square miles, roughly the area of Massachusetts, Connecticut, Rhode Island, Vermont and New Hampshire combined.

In addition to being the largest of the Great Lakes in surface area, Lake Superior, with a maximum depth of 1,333 feet, is also the deepest. It has an average depth of 489 feet and contains nearly three quadrillion (3,000 billion) gallons of water.

Lake Superior is linked to the Atlantic Ocean via the St. Lawrence River. Shipping is important. Grain and other agricultural products, western coal, iron ore, steel, limestone and cement are some of the major cargoes.

The shores of Lake Superior are sparsely populated. The coastal area has about 14 people per square mile, far below Lake Erie's ratio of 567 people per square mile. Lake Superior's sparse population has helped it to remain the cleanest of the Great Lakes. Municipal and domestic use of Lake Superior's water is minor compared to the other Great Lakes.

Lake Superior's water quality is vital for recreation and is therefore important to our economy. If the concentration of PCB's (polychlorinated bi-phenols) in the lake increased, fishing would be reduced because the fish would be considered less desirable (more poisonous). Polluted water would also attract fewer visitors, whose spending makes a major contribution to the region's economy.

Residents and visitors are concerned about Lake Superior's water quality for many reasons. In addition to the many people who recreate along the Great Lakes coasts every year **an estimated 23 million people get their drinking water from the five Great Lakes.**

Lake Superior's water quality needs to be preserved because once such a large lake becomes contaminated, it is difficult to clean up: it takes about 191 years for water in Lake Superior to be flushed out and renewed. Pollutants come from five major sources:

1. The atmosphere
2. Municipal and industrial discharges
3. Farmland and municipal runoff
4. Contaminated ground water
5. Contaminated sediments

*INSTRUCTOR NOTE:
Illustrate Lake Superior's
geography by referring to
the wall map.*

More than half of the toxic chemicals entering Lake Superior are believed to come from the atmosphere. The concern for Lake Superior's water quality extends far beyond its shores. The care for Lake Superior also needs to extend beyond its shores. **As a society we need to use Lake Superior without abusing it.**

IV. Playing the Game (1 hour)

INSTRUCTOR NOTE:
Keep the pace lively and the action going. Don't let the students dwell on an issue for too long.

1. Encourage students to role play. Ask them to step into the shoes of the person they are representing and to act as that person would.
2. Give students time (about 3-5 min.) to read cards and decide on a course of action. They may consult their neighbors or others around the lake at this time, but **remind them not to reveal their secret mission.**
3. Begin play with the student at or closest to Duluth and continue clockwise around the Lake until everyone has played. Hand out the 200 ml "flow cup" to the first student.
4. Each student will begin the game with the allotted points on the point sheet for health, wealth, and prosperity. They lose or gain points depending on their decisions, and decisions of others around the lake.
5. Have each student, in playing order, read his or her card out loud. The decision to be made may be influenced by others around the lake. Run this decision making process like a town meeting they must raise their hand and be recognized by you to be able to speak (otherwise chaos may commence). Only one person may speak at a time and positions must be kept short (give

Assessment: Discuss the students' decisions as they play. Balance economic considerations against idealism. If no students opt to pollute, ask if that is realistic. Conversely, would they pollute as much if this were not a game.

each student 15 to 30 seconds to state their position). Once the debating is over (allow no more than 2-3 minutes total debate) then the player must make their decision or initiate the vote by the state/province and announce this decision to the group.

6. Once the decision is made read out loud the consequences of their decision

Assessment: Lake Superior is sensitive to pollution. From playing this game, name five ways pollution can enter Lake Superior. (Air, city and industrial sewers, runoff, polluted ground water, polluted soil and sediments.)

and allow them to act as indicated. The green die represents the regional effects of their decision, the red die represents the magnitude of the decision, and the blue die represents local effects. Depending on the roll of the dice the students will gain or lose health, wealth, and prosperity points.

7. Students may also gain points depending on their secret mission on the bottom of their card. They may work on their mission at the beginning of class and during the turns of the parties effected by their mission (in other words anyone may debate an issue but only one issue may be debated at a time). If they are successful in their mission they may gain extra points according to their card. They may not lose points from their secret mission unless they are effected by the role of the dice.

8. Each playing student must perform the following actions:
 - Take a cup of water from INFLOW and add to LAKE SUPERIOR before they read their card.
 - Read the dilemma they face and open the floor for debate so a decision can be made.
 - Make a decision on which way they will react to their dilemma.
 - Give their card to the teacher and perform the appropriate actions read by their teacher for the decision they made.
 - All effected students exchange the appropriate number of chips for health, wealth, and prosperity points gained or lost.
 - Take a cup of water from LAKE SUPERIOR and add to OUTFLOW.
 - Pass the “flow cup” to the next student.
9. After all players have gone through their cards you may choose to read through remaining cards and make decisions as a group.

V. Conclusion (10 min.)

Assessment: Ask students what they as individuals can do to prevent/reduce pollution. (They can choose to recycle, avoid littering, and support family actions that reduce pollution.)

A. Review

1. What happens to water leaving Lake Superior? (Flows to the other Great Lakes and eventually to the oceans)
2. How do you think the people living downstream of Lake Superior feel about our polluted water?
3. Where do we get the precipitation to feed water to Lake Superior and its incoming streams? (Evaporation...mostly from the oceans)
4. Demonstrate a simple water cycle by pouring the OUTFLOW bucket into the INFLOW bucket into the LAKE SUPERIOR bucket several times.
5. In the real world, evaporation would “clean up” most of the polluted water so it would fall relatively clean back into Lake Superior. Where does the pollution go? (It remains in the ocean water and sediments of lakes, rivers, and the oceans. Some crud is broken down by bacteria or sunlight. Some such as PCB’s and dioxin remain as pollution for a long, long time.)
6. We say that the flush time of Lake Superior is 191 years. Will the lake be totally clean if we stopped pollution right now and waited 191 years? (No. Lingering pollution in the atmosphere and bottom sediment will contaminate the lake for hundreds of years.)
7. Look at the economics of keeping Lake Superior clean. By checking the Clean-Up Fund box, determine the amount of money the group chose to spend. Where did the money go?

B. Stewardship Action

Challenge each student to pick one of their answers and do it.

VI. Clean-up (15 min.)

Collect cards and town markers. Empty water buckets into the janitor’s closet floor sink. Both rooms (#7 and #11) have cupboard storage for all of the Lake Superior Game equipment.

VII. Appendices

A. Optional Activity

Watch the video “Rise and Fall of the Great Lakes.” This 20 minute program is humorous and informative.

B. Equipment

- 2 colored 5 gallon buckets
- 1 clear 5 gallon bucket
- 20 role play cards
- 3 dropper bottles (red, yellow, green)
- 20 town markers
- Big Lake Superior Wall Map
- 6 "fish"
- 1 "shipwreck"
- 1 mini-secchi disk
- 1 mini-fishing pole
- turbidity shaker container (mixture of ashes, hot chocolate powder)
- toilet paper
- 1 full, 1 empty comparison sample jar
- 1 "flow" cup
- 100 blue poker chips
- 100 red poker chips
- 100 white poker chips
- 3 dice (1 green, 1 red, 1 blue)

C. References: In addition to the many people recreate along the Great Lakes coasts every year

- Ashworth, William, The Late, Great Lakes.
- Luikkonen, Barb, and Bruce Munson, Lake Superior Game.
- Waters, Thomas, Superior's North Shore.
- National Wildlife Magazine, Feb-March, 1990.

D. Glossary

- Lake Baikal** – The oldest, deepest, largest (by volume) freshwater lake in the world. Located in Siberia (Eastern Russia).
- Lake Tanganyika** – The second largest (by volume) freshwater lake in the world. Located in Africa (bordered by Tanzania, Zambia, Burundi, and Dem. Rep. of Congo)
- CFC's** - Chlorofluoro Carbon. Used as refrigerants, cleaning solvents and aerosol propellants and in the manufacture of plastic foams.
- DDT** - Dichloro-diphenyl-trichloroethane. Insecticide used in the US until 1972. Found to progress through the food chain and cause the thinning of egg shells of birds of prey. DDT is still in use in other countries.

Mercury - A metal used in thermometers, batteries, latex paints, and found in coal. Three quarters of the 930 tons of mercury drifting around in our atmosphere at any given moment is human caused. Most comes from the burning of coal and trash. (Acid rain contributes to the release of natural mercury found in rocks by lowering the pH of lake water.) When mercury washes out of the air (19 ppb in northern Minnesota precipitation average) and into lakes and wetlands, bacteria convert it to methyl mercury, a fat-soluble poison that lodges in the bodies of animals. While fish appear relatively immune, mercury is a powerful nerve poison in mammals - especially primates. Even quantities as low as 1 part-per-million (ppm) can have disastrous effects of developing fetuses. Mercury levels in northeastern Minnesota lakes have been increasing at a rate of 2 - 5 % a year.

PCB - Poly chlorinated biphenyl. Before being banned in 1976, PCB's found use in many industrial products, such as in coolant for electrical transformers, dyes, and printing inks. PCB's cause cancer in laboratory animals, linked to behavioral and reproductive problems in humans. Earlier Sea Grant studies showed that 90% of the PCB's enter Lake Superior from the atmosphere. The lake contains and estimated 15 - 22 tons of PCB's. PCB's are hydrophobic (water hating). They attach to small, suspended particles in the lake, such as dead and living algae, instead of dissolving in the water or settling the bottom of the lake. As particles move from the surface to the bottom and back up again, contaminants circulate throughout the ecosystem. This movement makes contaminants available for the uptake by algae, zooplankton, fish, and eventually us. Fish in Lake Superior have PCB levels 50 times higher than fish in nearby lakes. Lake Superior lake trout tested 4 ppm. Maximum safe consumption level is 2 ppm. PCB contamination in the atmosphere is decreasing due to the 1976 ban. Lake Superior may actually be an emitter of PCB's that have been in the lake and are now evaporating into the air. There is progress toward the use of an enzyme of a common bacteria to degrade PCB's by removing the chlorine.

Retention time - The time an average drop of water remains in a body of water. The retention time of Lake Superior is 191 years.

Watershed - The region draining into a body of water.