



MANITOWOC COUNTY 2011-2012

-Explore and restore our waters of Manitowoc County-

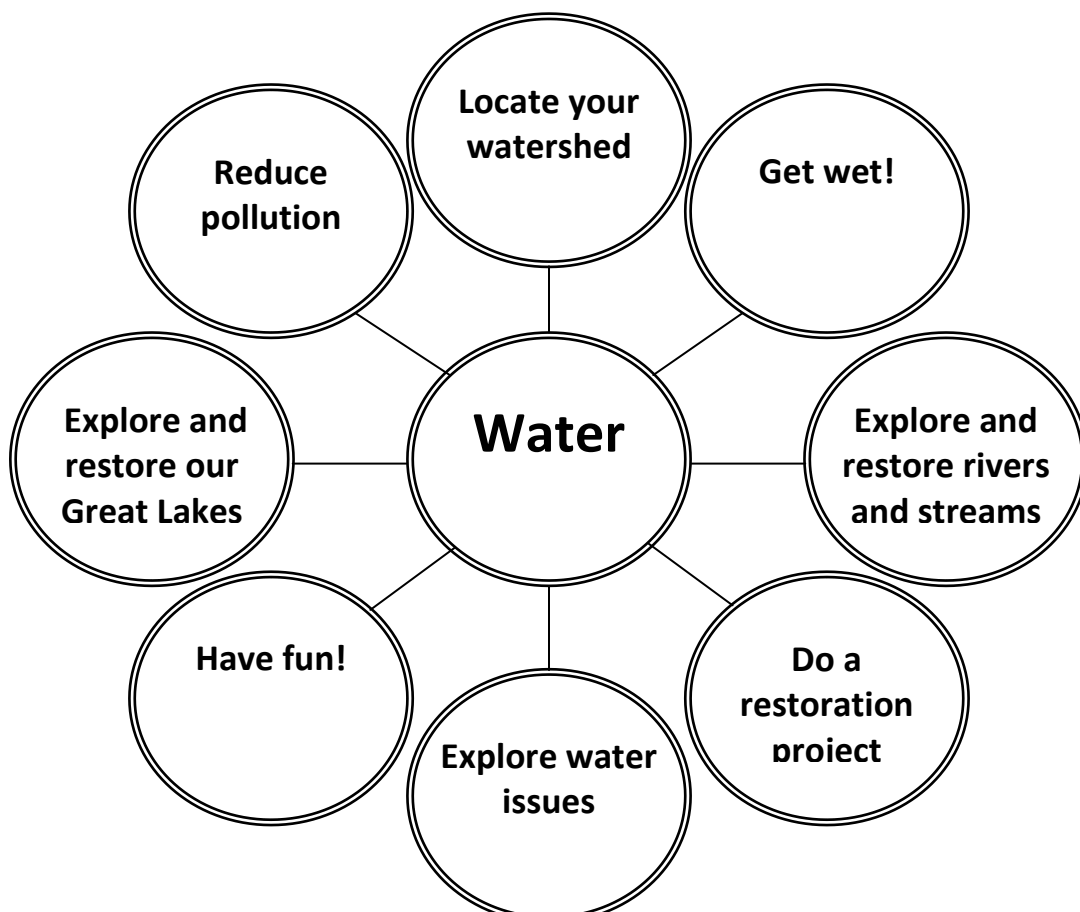
*Part of the largest fresh surface water resource in the world, the
Great Lakes ecosystem*

Table of Contents:

Explore and Restore Goals	2
Why Explore and Restore our Water	3
Scheduled Programs and Events	4-5
Field Trips	5-6
Resources to help develop a project or program	7
Water related meeting starter ideas	7-8
Lesson Plans for club meetings	8-21
Support	22-23
Partners	23

10 "Explore and Restore Our Waters" Goals:

- ✓ Know which watershed you live in.
- ✓ Know that since you live in Manitowoc County you are a part of the Great Lakes ecosystem.
- ✓ Get out to explore and restore a water resource at least once during the year.
- ✓ Identify at least 2 sources of water pollution generated at your club, and home, yard and farm.
- ✓ Adopt at least one water conservation practice in your club, and home, yard or farm.
- ✓ Adopt at least one water pollution reduction practice in your club, and home, yard or farm.
- ✓ List at least one way that the Great Lakes are a valuable resource.
- ✓ List at least 3 species of wildlife that rely on clean water.
- ✓ List at least 3 ways that you depend on clean water daily.
- ✓ Have fun!



Why explore and restore our water?

Thinking about water helps us see how we are connected to our environment, to our neighbors, to the rest of the region and the world. Water is a precious natural resource that we use every day. We depend on it for life and we often take it for granted. All the water that is available is here today; we will not receive more, so we better learn how to protect and use it carefully.

Since Manitowoc County lies along the shore of Lake Michigan, this is a historic and exciting time for exploring and restoring our waters. In 2010, President Obama funded the Great Lakes Restoration Initiative, recognizing the impacts generations of use have had on our Great Lakes and the value in restoring and protecting them as a national and global resource.

You live near a Great Lake, a very special and important resource

Living near one of the Great Lakes is special! The Great Lakes have played a major role in the history of the United States and Canada and they are still immensely important today for food, drinking water, transportation, industry, recreation and energy production.

The Great Lakes make up the largest system of fresh surface water on earth and contain 18% of the total world supply. The Great Lakes basin, the land area that drains in to the Great Lakes, is home to more than 10% of the United States population and 25% of Canada's population. The Great Lakes basin harbors some of the world's greatest industrial capacity and almost 25% of agricultural production in Canada and 7% of agricultural production in the United States.

What we do in Manitowoc County matters!

All of the rivers, creeks and streams in Manitowoc County eventually flow into Lake Michigan. So, what we do in our homes, yards, gardens and businesses, and on our farms, streets, sidewalks, driveways and parking lots matters. All of our activities at these places can impact water quality in our rivers and streams and ultimately Lake Michigan and the other Great Lakes.

Lake Michigan is:

- where 43% of all Great Lakes fishing happens
- where the world's largest collection of freshwater sand dunes and recreational beaches is found

- the source of drinking water for 11 million people, including those in the City of Manitowoc
- the 2nd largest Great Lake by volume
- the 5th largest freshwater lake in the world, by volume
- 307 miles long and 118 miles wide
- an average of 279 feet deep

Lake Michigan and the Great Lakes ecosystem have limits

Although they are large, Lake Michigan and the whole Great Lakes ecosystem are showing serious signs of stress from more than 100 years of intense human activity. Water in Lake Michigan has a retention time of about 100 years. Polluted water entering the lake about 100 years ago is likely to affect it yet today. Water entering Lake Michigan today may be felt by you, your grandchildren and your great-grandchildren. Activities that support healthy water in Manitowoc County support a healthy Lake Michigan and Great Lakes ecosystem.

Scheduled programs and events to help you explore and restore our waters

Woodland Dunes Nature Center and Preserve, the City of Manitowoc, the Manitowoc County University of Wisconsin-Extension and the Wisconsin Maritime Museum are offering a variety of programs and events to help you get out to explore and restore water resources in Manitowoc County.

To reserve a space in a program or event hosted by Woodland Dunes contact:
Kelly Eskew-Vorron, 920-793-4007, or kellye@woodlanddunes.org

To reserve a space in a program or event hosted by the City of Manitowoc contact: Janet
Sosnosky, 920-686-6910, or jsosnosky@manitowoc.org

To reserve a space in a program or event hosted by the Wisconsin Maritime Museum contact:
Wendy Lutzke, 920-684-0218 x 115, or wlutzke@wisconsinmaritime.org

To find out more about Breakfast on the Farm, coordinated by Manitowoc County University of Wisconsin-Extension please visit <http://manitowoc.uwex.edu/agriculture/>

Fall

- Set up a visit to learn about Great Lakes **Aquatic Invasive Species** at the Wisconsin Maritime Museum's Suspect Species Lab
- **Take a hike** along Woodland Dunes Willow Trail, see the largest cottonwood tree in Manitowoc County and end your hike with a picnic lunch on the river.

Winter

- Set up a visit to learn about **Great Lakes Aquatic Invasive Species** at the Wisconsin Maritime Museum's Suspect Species Lab
- Visit Woodland Dunes and enjoy a **snowshoe hike to the West Twin River** and explore what lies beneath the ice, our rivers, lakes and streams are important overwintering sites for many animals. Watch for event January 2012.

Spring

- City of Manitowoc: set up a time to help **stencil anti-pollution messages** near city storm drains.
- Enjoy **paddling canoes and viewing wildlife** on Collins Marsh. Watch for event May or June 2012.
- Create a **rain barrel** and learn about rain gardens. Watch for event spring 2012.
- Learn how to **monitor the health of a stream** near you during a Water Action Volunteer training session, spring 2012.
- Join Woodland Dunes naturalists on a **night hike** to search for the elusive sky dancing Timberdoodle and listen and look for the frogs that live in Manitowoc County. Watch for event April 2012.
- Learn about the importance of Lake Michigan during **bird migration**, see some migrants up close and enjoy a pancake breakfast at Woodland Dunes. Watch for event May 2012.
- Help monitor Woodland Dunes Preserve for **salamanders**, contact the nature center to get involved!
- **Hike** Woodland Dunes Trillium trail to hear and see Wood Frogs in the pond.

Summer

- Take part in **Watershed Heroes Summer Camp** with Wisconsin Maritime Museum and Woodland Dunes. Watch for event June 2012.
- Take part in family activities at **River Rendezvous** along the banks of the Manitowoc River next to the Wisconsin Maritime Museum. Watch for event June 2012.
- City of Manitowoc: set up a time to help **stencil anti-pollution messages** near city storm drains.
- Enjoy **Breakfast on the Farm** in Manitowoc County. Watch for event June 2012.
- Enjoy **paddling canoes or kayaks** down the West Twin River with Woodland Dunes naturalists, watch for event summer 2012.

Watch for more!

Additional activities and opportunities will be advertised in the 4-H monthly newsletter and on the Woodland Dunes (www.woodlanddunes.org) and Wisconsin Maritime Museum (www.wisconsinmaritime.org) websites.

Guided field trips to schedule for your club

Take your club on a guided field trip hosted by Woodland Dunes Nature Center and the Wisconsin Maritime Museum to learn about, experience and enjoy our waters first-hand!

To take your club on a guided field trip hosted by Woodland Dunes contact:

Kelly Eskew-Vorron, 920-793-4007, or kellye@woodlanddunes.org

Cost: Rent-a-naturalist rates of \$25 an hour will apply to any group with 10 or less participants. Groups over 10 will be charged a fee for each individual participant depending on program length and content.

To take your club on a guided field trip hosted by the Wisconsin Maritime Museum contact:

Wendy Lutzke, 920-684-0218 x 115, or wlutzke@wisconsinmaritime.org

Cost: \$5 per child, leader is free, parent chaperone is \$7

Woodland Dunes Nature Center: *Pond Life* (Best for ages 11 and up)

Length: 2 hours, Offered: April, Ponds are full of animal life! We will set live traps and see who is spending spring in the ponds. Students will use dip nets to catch critters, use keys to identify they found, then research and report on their favorite find. Aquatic critters have amazing physical and behavioral adaptations that are fun to see and learn about.

Woodland Dunes Nature Center: *Amphibmeander* (Best for ages 6-10)

Length: 2 hours, Offered: May & June Our location, surrounded by forest and wetland, gives kids the opportunity to immerse themselves in a wetland ecosystem and visit the ponds and pools where many insects, frogs and salamanders begin their lives. Connections to how human activity can change a wetland and the importance of wetlands for people as well as the plants and animals that depend on them is a primary focus. Hiking through the wetland, demonstrations on how pollutants travel and meeting some of the animals that make wetlands home strengthens students understanding and connection to these important habitats.

Woodland Dunes Nature Center: *Water Wonders* (Best for ages 11 and up)

Length: 2.5 hours , Offered: May & June During this program participants learn about the importance of water and how they can help keep waterways healthy. Testing the water quality of two ponds, one that receives non-point source pollution from an adjacent highway and one that is surrounded by wetland gives students a first hand look at the impact of pollution on water quality and animal life. Exploration of a wetland highlights the role these natural systems play in storing and cleaning water before its journey into the nearby West Twin River and Lake Michigan.

Woodland Dunes Nature Center: *Pontoon Tours* (Best for ages 6 and up)

Length: 2 hours, Offered June - August (Maximum: 9 people) Price: \$10 per person.

See the West Twin River from a new point of view on guided pontoon tours. Sit back and relax as you learn about the animals and plants that make the West Twin River and the marsh their home.

Woodland Dunes Nature Center: *Any time of year*

If you don't see what you want in the field trips listed here, our staff will work with you to create a unique learning experience for your group. Groups are always welcome to join us for a guided visit or to explore on their own. Contact us to arrange a specialized program or for

suggestions on where to explore.

Wisconsin Maritime Museum: *Aquatic Invaders* (Best for ages 11 and up)

Have you ever wondered how many different species call Lake Michigan home? Lake Michigan is being threatened by some invasive species and its fish population is continually being influenced by other factors. Using a time line and a role playing activity, you will find out how aquatic invasive species are arriving in the Great Lakes, the effects they are having, and how everyone can help slow down the spread of these invaders.

Wisconsin Maritime Museum: *Groundwater: It's In Your Hands* (Best for ages 10 and up)

The first step in taking care of our environment is to understand it. With the help of a groundwater model and other hands-on activities, students will learn about the porosity and permeability of soil, how contaminants move in groundwater, and how humans' everyday actions affect the groundwater beneath them.

After the Rain: *Pollution Solutions* (Best for ages 10-14)

Students will interact with an Enviroscape model and each other to learn how the choices humans make in yards, rural fields, and urban developments have a direct impact on rivers and lakes after a rainstorm. Students will gather ideas they can help implement to take care of the planet's precious water resources.

Wisconsin Maritime Museum: *Water Wonders* (Best for ages 10-12)

Through a combination of hands-on experiments and demonstrations gain a clearer understanding of the scientific principles of buoyancy, water pressure, and weight distribution. We'll also venture into the Children's Waterways Room for some applied learning and fun!

Resources to help you develop a project or program

4-H adults and youth can all lead water activities and programs. Here are some resources to give you the guidance, information and gadgets to develop some fun activities.

Great Lakes Park Packs

To check out a Great Lakes ParkPack, contact Point Beach State Forest at 920-794-7480. Point Beach offers 6 different thematic packs: Glacial Gifts, Mysteries, Survival, Challenges, Forest and Smokey Bear. Pick just one, or return for more time on the beach and more fun! You can also contact Tim Campbell, UW-Sea Grant Invasive Species Outreach Specialist at timothy.campbell@uwc.edu or call 683-4697. His office is on the campus of UW-Manitowoc.

Wisconsin Wild Cards

Wisconsin Wild Cards are pocket-sized informational cards available at state parks, through the Wisconsin DNR and UW-Sea Grant . Themes include invasive species, native trees and bugs, furbearers, and special places such as state parks.

Contact Point Beach State Forest (or any state park) or Sea Grant Specialist Tim Campbell to get a set of wildcards for your club or family. For ideas on how to use Wildcards, check out this website! <http://www.dnr.wi.gov/eeek/teacher/wildcardguide.htm>

Invasive Species

For activity ideas involving aquatic invasive species, visit Michigan Sea Grant at <http://www.miseagrant.umich.edu/flow/>

Local Watershed Information: *Explore and Restore Pamphlets*

To learn more about the watershed nearest you, you can obtain brochures and posters that highlight the Manitowoc River, Silver Creek, West Twin River, and East Twin River. Brochures and posters can be found at the following locations:

Woodland Dunes Nature Center and Preserve, 3000 Hawthorne Ave. (Hwy 310), Two Rivers
Wisconsin Maritime Museum, 75 Maritime Drive, Manitowoc

Water Related Meeting Starters

Roll Call:

Club roll call is a great way to give everyone a chance to speak in front of your club and participate in the special emphasis programming. Why not try to incorporate the following ideas into your club roll call:

1. **Name a body of water in Sheboygan County**
2. **Name the watershed in which you live**
3. **Name a food grown in water**
4. **Name one way to conserve water**
5. **Name something that can pollute our water**
6. **Name one way to reduce water pollution**
7. **Name your favorite water sport**
8. **Name an animal that lives in water**

Use your Manitowoc County Watersheds poster:

Have 4-Hers mark where they live on the map and discuss whether or not they realized that rainfall and snowmelt from their yard/property flows into that particular river, stream, or lake. Ask what the rainfall and snowmelt might carry into the rivers and streams besides just water? Ask what they could do to help reduce the amount of pollutants that are carried into rivers, streams and lakes.

Use Wisconsin Wildcards to explore “wild” connections to water:

Hand out a variety of Wisconsin Wildcards and ask 4-Hers to share with the rest of the club how the plant or animal on their card is connected to water. Feature a few different cards at each meeting throughout the year.

“Explore and Restore our Waters” Lesson Plans

Five simple lesson plans are provided on the following pages to help you develop an activity or program to include in a club meeting. The titles are:

- **Watch what you do to your storm drain**
- **How well do you know the Great Lakes?**
- **How wet is our planet?**
- **Incredible journey: A day in the life of a water molecule**
- **Water Conservation Challenge**

Lesson Plan: Watch What You Do to Your Storm Drain

Overview: This program introduces the purpose of storm drains and demonstrates the potential contamination that can occur when storm drains are used improperly.

Ages: 4 and up

Objectives: Upon completion of this activity participants will be able to:

Describe the purpose of a storm drain.

Describe what storm water is.

Describe the impact of pollution on our water supply.

Materials:

Large, clear jar

Food coloring (brown and green)

2 small bottles or baby food jars

Large stir stick

Photos of storm drains

A small piece of paper that says “river” on it

A small piece of paper that says “storm drain opening” on it

Tape

A mix of soil, sand, leaves and pebbles -1 cup

Vegetable oil- ¼ cup

Food scraps and food wrappers- 1 cup

Yard waste- grass clippings, leaves, nuts, and small sticks – 1 cup

Paper waste- shredded newspaper, cardboard, tissues – 1 cup

Bite-size Tootsie Rolls (four or five)

Procedure:

Introduction- Storm Drains

Show the students a picture of a storm drain. Ask them if they can tell you what it is (storm drain)? Ask the students where are storm drains typically found (alongside curbs or embedded in pavement, parking lots, bridges, etc)? What is the purpose of a storm drain and how does it relate to a storm (Flood control)? Where does water from snow or rain go after it enters a storm drain (In most cases water is carried by a pipe into a nearby waterway)? What besides water might enter storm drains with storm water (litter, fertilizer, road salt, oil, sand, soil, leaves, twigs, animal waste, and other pollutants)?

Making a Storm Drain

Explain that today the students will be making a storm drain in order to learn more about its purpose and the types of materials that can fall into it.

1. Fill the jar halfway full with water. Label the water in the jar with the small piece of paper that says “river”. This water represents the river that the storm water drains into after it has rained and the storm water has traveled from a street through a storm drain and into the river.
2. Label the top of the jar opening with the small piece of paper that says “storm drain opening”. This represents the storm drain opening.
3. Hand out some of the scenario sheets to the students. One student can read it to the class and the other student should find the corresponding material on the table and drop the “simulated pollution” into the storm drain (jar opening) when the reader is finished. After each scenario stir the contents of the jar to see the effect of each scenario.
4. Ask the students to examine the contents of the jar and describe how the quality of the water it contained changed during the activity. In a real-world setting, what do they think happens to these forms of water pollution?
5. Discuss the definition of “nonpoint source pollution” and explain that the forms of pollution mentioned in the scenarios are all forms of nonpoint source pollution. Explain that nonpoint source pollution originates from the individual actions of residents and can occur anywhere (we cannot point to the offender) in small communities and neighborhoods as well as cities and suburbs.

Wrap-up

1. Does this type of pollution harm the environment?
2. Do you think people in the scenarios wanted to harm the environment?
3. What can you do to help (storm drain stenciling)?

Scenario Cards to use with activity:

Scenario #1: Mrs. Howard has two small trees next to the house porch. The trees attract wasps, mosquitoes and caterpillars. She sprayed the trees with a chemical to kill or drive away the insects. A storm occurs soon after she sprayed and most of the chemical is washed off the leaves and onto the sidewalk and driveway. From there it is washed with rainwater into the storm drain along the curb.

Simulated Pollution: Mix 2-3 drops of green food coloring with the water in one of the bottles.

Empty this green water into the opening at the top of the jar.

Scenario #2: A small stream winds through a popular golf course. During a heavy rain the stream is filled with fast flowing water. In certain places the sides of the stream are wearing away and tree roots are showing. During and after each rain soil, sand, leaves, pebbles and other natural debris are swept away with the heavy flow of water as the shores of the stream slowly collapse. This material is eventually carried by the stream into the river that it empties into.

Simulated Pollution: Add the mix of soil, sand, leaves and pebbles into the opening at the top of the jar.

Scenario #3: Susan enjoys helping her father change the motor oil in the family automobile. She clumsily carries the huge pan of black, thick used motor oil to the storm drain in front of their apartment building, where she dumps it. It's gone! Eventually the oil will mix with the water of a nearby stream or river; and any motor oil that she spilled onto the ground will go into the soil and mix with water that is underground.

Simulated Pollution: Empty the vegetable oil into the opening at the top of the jar.

Scenario #4: One snowy winter evening the Palmer family heard raccoons outside opening and turning over their garbage cans left out by the curb, but it was too dark and cold to go outside and chase them away. The next morning no one in the family had time to clean up the litter that was strewn all over the street. When the snow melted most of the trash floated with the water into the storm drain.

Simulated Pollution: Add the paper waste through the opening at the top of the jar.

Scenario #5: One of Matthew's jobs at home is to cut the lawn each week after school. When the grass catcher is full he dumps the grass clippings into the nearby ditch or sewer, whichever one happens to be closer to the lawnmower at the time. While in the ditch or drain the clippings turn yellow and begin to rot and smell until water from the next rainstorm carries the clippings away.

Simulated Pollution: Add grass clippings through the opening at the top of the jar.

Scenario #6: Theresa enjoys walking the family dog, Patches. When Patches needs to go to the bathroom she is careful to make Patches go on the paved road along the curb so that Patches doesn't create a mess on the neighbors' lawn. She doesn't worry about picking up the mess because she knows that eventually the dog's waste will be washed with the rain into the nearby storm drain.

Simulated Pollution: Put the Tootsie Rolls through the opening at the top of the jar.

Scenario #7: The Smith family enjoys stopping at a fast-food restaurant for dinner while on their way to the beach for the weekend. To save time, the family eats inside their mini-van that is

parked in the restaurant parking lot. In order to keep the car clean, they leave their bags of food trash on the pavement in the parking lot for the workers to pick up, since there are no trashcans in the parking lot. This family may not realize that animals and wind will eventually open up the bags and spread this trash around. If it isn't picked up it can be carried by rainwater during the next storm into a nearby storm drain.

Simulated Pollution: Add food scraps and food wrappers through the opening at the top of the aquarium.

Scenario #8: A maintenance worker employed by a resident's association for some townhouses must take on new summer duties for the landscaper while he is out sick. These duties include lawn care for each of the residences. The procedure of spreading weed killer takes about three days to complete and two days after he began an all-day rainstorm kept him indoors. The maintenance worker failed to realize that the downpour would wash away most of the weed killer that was already applied on the lawns. In fact, the chemicals would most likely be washed from plants and pavement into the nearby storm drains.

Simulated Pollution: Mix 2-3 drops of brown food coloring with the water in one of the small bottles.. Empty this brown water into the opening at the top of the jar.

References

- Environmental Protection Agency,
- <http://www.epa.gov/nps/http://www.haddonfieldnj.org/pdf/Non-Point-Source-Pollution.pdf>
- Beneath the Shell...A Teacher's Guide to Nonpoint Source Pollution and Its Potential Impact on New Jersey Shellfish. New Jersey Department of Environmental Protection. First Printing 1991; Revised 1993; Reprinted annually from 1997 - 2002 and 2004; adapted from "Storm Drain Watch" (pgs. 46 - 48).
- Storm Drain Watch Worksheet: Eight Scenarios (below)

Susan Howard, Avon Grove Charter School, West Grove, PA

Revised by:

Sarah Dezwarte- Director of Education, Camp Y-Koda Outdoor Skills & Education
Kelly Eskew-Vorron and Wendy Lutzke, Educators at Woodland Dunes Nature Center and Wisconsin Maritime Museum



How Well Do You Know the Great Lakes?

Many people, including a large proportion of those who live close to the Great Lakes, do not have a basic understanding of the individual characteristics of and the differences between the lakes. Since it is difficult to understand many of the Great Lakes issues, such as global warming, pollution, and water use without a basic understanding of the lakes, this activity is designed to help visualize the differences in the volume, length of shoreline, human population distribution, and fish populations of the Great Lakes.

OBJECTIVES

In this activity, you will develop a perception of the differences between the Great Lakes in water volumes, length of shoreline, human population distribution, and the amount of fish harvested from each lake.

PROCEDURE

1. In this activity you will work in groups. You will be assigned to an expert group and a base group.

Expert Groups

There should be a total of five expert groups, one assigned to each lake. Each expert group studies one lake to become "experts" on that lake.

Base Groups

The base groups should have five (or more) people in them; in this group students from the different expert groups come together to share their knowledge. There must be at least one member from each expert group (in other words, a representative from each lake) in each base group so that every lake has a spokesperson.



Source

"How well do you know the Great Lakes?" by Heidi Miller, in GLIMCES, *Great Lakes Instructional Materials for the Changing Earth System*, Ohio Sea Grant Education Program, 1995.

Earth Systems Understandings

This activity relates to ESU 3 (science methods and technology) and ESU 4 (interactions).

Materials

Each base group (of five students) will need:

- A set of five labeled strings as described in step 1 of *Using the Data*.
- 100 squares of blue paper.
- Five strips of paper that will be placed next to the coastline of each lake (one strip for each lake).
- Twenty "fish" (they could be washers, corn kernels, or peanuts...).
- A pen or pencil.

Each of the five expert groups will need:

- Access to a map of the Great Lakes.
- A copy of the *Great Lakes data* (other resource books are optional).

Teacher's Note

Groups should each have a large working surface that all can gather around.

2. Gather in base groups. Discuss the following and make your group's best guess about the characteristics of the Great Lakes.

3. *Shoreline*: Arrange your labeled set of five strings to form a model of the outline of the Great Lakes.

4. *Volume*: Distribute 100 squares of blue paper among the lakes to represent all of the water contained in the lakes. For example, if your group thinks that the water is divided equally among the lakes, then put 20 blue squares into each lake.

Teacher's Notes

5. Instead of writing actual numbers on the strips of paper, the lakes could be ranked from 1-5 for most population to least population.

5. *Human populations*: Cut five strips of paper, which will be placed along the shoreline of the lakes (one for each lake). The total population of people living in the Great Lakes watershed is 33.2 million. Divide that number among the Great Lakes. For instance, if your group thinks that about half of the people in the Great Lakes watershed live on Lake Superior, then they would write 16 million on a strip of paper and place it next to the Lake Superior coastline. The goal is not to get the number correct but to start thinking about where people are located around the lakes.

6. *Fish*: Try to predict the amount of fish taken from each lake for human food. Collect 20 "fish" from your teacher. These 20 fish represent all of the fish taken out of the Great Lakes. If your group thinks, for instance, that almost all of the total fish come from Lake Superior, then they should put 18 or 19 fish in that lake.

7. You may either give them the correct percentages or have the students figure them out.

7. After the base groups have made their guesses, leave the lake models in place and move into expert groups. Your group is assigned to one of the lakes. Look at the actual data available on your lake so that when you move back to base groups you will be able to correct the guesses originally made.

8. Return to base groups to correct the models and discuss the review questions.

Answers

1. Students may find the amount of fish taken and the amount of people living on Lake Erie surprising because of the lake's relatively small size.

2. Answers will vary.

3. There are several reasons, one is that Lake Erie has a somewhat milder climate, early trade routes were along its shores, and large population centers developed early.

REVIEW QUESTIONS

1. What was the most surprising thing about this activity? Discuss why.

2. Which guesses were not close to the correct answers? What reasoning led the group to its wrong decisions?

3. Why do the majority of the people live around Lake Erie?

4. Why don't the length of coastline and the amount of water correspond?
5. How did the groups work out differences in opinion in order to come to common agreement?

Answers

4. The depths of the lakes are very different.
5. Answers will vary.

EXTENSIONS

1. As a class or individually, make up a question pertaining to the Great Lakes (for instance: "Which lake (on a map of the Great Lakes) is Lake Huron?" or "Which of the Great Lakes has the largest human population living in its watershed?") and ask the question to a variety of people either around the school or in the community. This may lead to interesting discussions concerning the possibility that the voting public may make uninformed decisions.
2. Try to find an additional set of data about the Great Lakes such as average depth, fish populations, average water retention time, level of pollution, etc. to present to the class or to lead the class through, as with the other data sets.

USING THE DATA

These notes should help with interpreting the *Great Lakes Data* chart and with setting up the experiment.

1. *Shoreline*: In order to make strings that depict the relative lengths of shoreline of the Great Lakes, use the relative length data in the shoreline section. Any unit of measurement may be used as long as it is used consistently. The measurement units will depend on the amount of space available for the lesson. For instance, if the lesson will be taught outdoors, a large unit of measurement may be used, such as meters. In this case, the Lake Superior string would be 3.0 meters long. Make sure each string is labeled with a piece of tape.
2. *Water Volume*: The student groups each have 100 blue squares, which represent all of the water in the Great Lakes combined. To find how 100 squares should be distributed, look at the relative volume section in the volume category. It lists 54 for lake Superior. This means that 54 of the squares should be in the Lake Superior string model (over half of the water is in Lake Superior).
3. *Human population*: The total population data figures are rounded off in the section *Population* to the nearest million. The students attempt to guess the numbers in this category. It is interesting to realize that Lake Superior has only .6 million people living near it. This is less than 2 percent of the total population of the Great Lakes watershed.
4. *Fish*: The row labeled *percentage* in the fish section of the chart indicates the number of pounds of fish that would come from each lake if the total number of pounds from all the lakes was 20. Each base group of students should be given (or make) 20 "fish" so that they can make their best guess as to how the fish should be distributed in their string bordered "lakes."

		Great Lakes Data					
		Superior	Michigan	Huron	Erie	Ontario	Total
Shoreline (with Islands)	(miles)	2,726	1,638	3,827	871	712	10,210
	relative length	3.0	1.6	3.8	0.9	0.7	10.0
Volume ^a	(cu. miles)	2,900	1,180	850	116	393	5,439
	(km ³)	12,100	4,920	3,540	484	1,640	22,684
	relative volume	54	22	15	2	7	100
Human Population in Watershed	U.S. & Canada (2000)	673,000	12,052,743	3,000,000	11,400,000	5,600,000	32,725,743
	population to nearest million (approx.)	0.7	12.1	3.0	11.4	5.6	32.8
Annual Commercial Fishing Harvest	U.S. (lbs)	2,459,256	7,541,800	4,819,119	3,929,459	70,260	18,819,894
	Canada (lbs)	1,489,000	0	10,472,000	23,089,000	914,000	35,964,000
	Total	3,948,256	7,541,800	15,291,119	27,018,459	984,260	54,783,894
	Relative percentage of fish harvested	7	14	28	49	2	100
	Number of fish species	45	78	87	100	90	

^a Measured at Low Water Datum.

Note: The total shoreline is greater than the sum of the lakes because connecting channels are included.

REFERENCES

Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data. Coordinated Great Lakes Physical Data. May 1992. Agencies represented include: U.S. Department of the Army, Department of Commerce, and Department of the Interior; Environment Canada, Department of Fisheries and Oceans, and Natural Resources Canada.

Great Lakes Facts Maps, Michigan Sea Grant College Program. 2000. Cooperative Extension Service, Michigan State Univ., E. Lansing, MI.

The Life of the Lakes, Michigan Sea Grant and Michigan State University (Revised, 2003).

Lesson Plan: *How Wet is Our Planet?*

In this demonstration one jar of water represents all of the water on earth. As students are asked to pour out the percentage of water they think is held in oceans and then in icecaps/glaciers, they get a powerful image of how precious and fragile our supply of freshwater is. This is a great introductory activity to the water conservation challenge.

Learner Outcomes:

Students will see the importance of water conservation and protection and be able to identify steps they can take to do both.

Students will gain a basic understanding of the water cycle.

Materials:

1 large dry earse board or piece of paper and markers

1 large clear jar able to hold liquid

1 equivalent sized container able to hold liquid or multiple clear jars able to hold liquid

Optional: blue food coloring to make the water easier to see

Optional: World Map

Procedure:

Engage: Ask the kids if they feel lucky that they live in Wisconsin? Why or why not? Explain that one of the reasons you feel lucky to live in Wisconsin is because we are surrounded by water here, our state's name comes from the Chippewa word "Wees-kan-san" which means "gathering of waters". Not only do we have many lakes, rivers and wetlands, there is enough groundwater - under our feet - to cover the entire state (above ground) with 30 feet of water. *Ask the kids if they know approximately how much of the earth is made of water?* About 75%. Bring your full jar of water to the table and tell the kids this represents all of the water on the planet (100%)

Explore: Ask students: *Who thinks they can guess what percentage of the water on this planet is in the oceans?* Once someone has guessed correctly or guesses close (about 97%) have one kid pour 97% of the water into a second container, label this water ocean water explaining this water has something in it that makes it undrinkable and unusable for humans. Salt! There are ways to get salt out of the water but it is very expensive and energy intensive to do. Next ask: *Where is the rest of the water?* Generate a list on the white board/paper (lakes, streams, groundwater, rivers, atmosphere, icecaps/glaciers, in us. Ask: *Where do you think the majority of the remaining fresh water is held?* Once someone has guessed glaciers, have another kid pour about 2% (2/3) of the remaining water into another container, label the container glaciers explaining this fresh water is unusable because it is in the form of ice. We have another problem with the remaining fresh water - only half of the water is potable! (water pure enough to be consumed or used with low risk of immediate or long term harm), have a kid dump half of the water out of the container. The other half is either polluted or trapped in the soil too far below the ground for us to use. Of all the water on earth less than 1% can be used for human needs!

Explain: Have the students guess how many gallons of water the average person uses per day. The average person uses 63 gallons per day (show them a gallon milk jug). How many gallons does your club use in 1 day (multiply 63 x the number of club members)? Have them brainstorm ways we use water: drinking, showering, washing dishes, flushing the toilet, filling swimming pools, doing laundry, using sprinklers ect. Even though when you look at the planet it looks

like we have all the water we will ever need in reality much of it is unusable to us as humans which is why it is important that we conserve water. What does it mean to conserve? Protect (something, esp. an environmentally or culturally important place or thing) from harm or destruction, make sure we are not wasting or polluting water! Suggest there are a lot of ways we can conserve water at home and school. Generate a list of action steps.

Conclusion:

Conclude by having the kids help you create a diagram of the water cycle on the board. When it is completed, you will want them to connect this diagram to the jar demonstration by asking them *So is it only the 1% of freshwater that we use that needs to be taken care of?* Students will see that our water supply is all the more fragile for its connection to the ground, water in the ocean and the atmosphere. We need to take care of the entire planet to keep water clean. What happens on land and in the air can get into the water!

Extension: While brainstorming ways that humans use water, have the students add those "ingredients" to a pitcher of water and stir the water with a long spoon. Continue adding all the ingredients, even brushing your teeth and spitting into the pitcher. They will see how gross the water gets as you stir it. When all the ingredients have been added, ask them where the water goes (water treatment, septic system). Ask the kids if they live in the country and your septic system is broken where do these things go? It might go into the groundwater, lakes or streams. Ask what might happen if you live in the city and something happens to the wastewater treatment plant? These things could get backed up or released into lakes or rivers! We also need to be careful, just because the wastewater treatment plant is cleaning the water doesn't mean they can get everything out - you should never put things down the drain that might harm the environment. (Possible materials to add: toothpaste, shampoo, conditioner, body wash, shaving cream, toilet paper, dish soap, laundry detergent, cleaning product, oatmeal from washing dishes.)

Revised by:

Kelly Eskew-Vorron - Education Coordinator, Woodland Dunes Nature Center and Preserve
Sarah Dezwarte- Director of Education, Camp Y-Koda Outdoor Skills & Education

Lesson Plan: *The Incredible Journey, a day as a molecule*

Overview: Role playing a water molecule will help students understand the journey water takes on our planet.

Objectives: Upon completion of this activity participants will be able to: Describe the movement of water within the water cycle and understand how pollution can travel.

Materials:

*9 large pieces of paper, write/draw clouds on one piece of paper, plants on another, animals on another ect., rivers, oceans, lakes, ground water, soil and glaciers.

*9 boxes to make dice for the game. Gift boxes used for coffee mugs are a good size. There will be one die per station of the water cycle. Label the sides of the dice for each station according to the dice chart.

* String for a necklace or bracelet

*9 different colored beads, many beads of each color

Introduction: Ask the kids, *Where will the water you drink today be tomorrow?* (Down the toilet, wastewater treatment plant, lake Michigan it might even get into the Atlantic Ocean OR sweat from our bodies evaporates into the atmosphere might get blown all the way to Canada!) *Brainstorm the different places water can go as it moves through and around the Earth.* (Atmosphere, plants, animals, rivers, oceans, underground etc.) Write down responses on a piece of paper or white board.

Explain that the water we have on the planet today is the same water that has always been here, the water we drink might have at one point been in a glacier, in the ocean, under the ground, or even in the body of Abraham Lincoln or your favorite musician! Water continuously cycles through different places and stages. *What are the three different forms we find water in?* A solid, liquid or a gas. When water changes its form there is often movement from one place to another. Glaciers melt to form pools which overflow to streams, where water may evaporate into the atmosphere. Gravity influences the ability of water to travel over, under and above the Earth's surface. Snow on mountaintops melts and moves through watersheds to the oceans of the world. Water is seen flowing in streams and rivers or resting in ponds. Water even travels slowly underground, seeping and filtering through particles of soil and pores within rocks. When water evaporates from a liquid to a gas, it can travel through the atmosphere over Earth's surface, falling back to the Earth close to where it came from or traveling far and wide.

Explain: Today you will get to be a drop of water moving through this amazing water cycle. Scatter the 9 pieces of paper around the yard or room. Assign a group of kids to each station. Have the kids brainstorm the different places water can go from their station in the water cycle. After the kids brainstormed where the water from their station could move have them share with the large group and give them the die for their station.

Procedure: Students at each station form a line behind the die, roll the die and move to the station indicated, when they get to the new station they should add a bead to their string, if they rolled "stay" they should add a bead from the station they are at and go to the end of the line to roll again. Play the game for at least 15 minutes or longer depending on the kids interest level.

Wrap-up: Where did you spend the most time as a water molecule? The least? Have students write creative stories about what it was like to be a water molecule to share at the next meeting. What would happen to the water in the cycle, if the lake became polluted (the pollution would travel with the water molecule, and slowly pollute the other areas too)? If water is polluted near you, can it affect those that live near and far? Tell the students they did a great job, and help them to put their necklaces/bracelets on to take home to remember their journey.

Dice Chart:

Soil: one side *plant* Water is absorbed by plant roots.

one side *river* The soil is saturated, so water runs off into a river.

one side *ground water* Water is pulled by gravity; it filters into the soil.

two sides *clouds* Heat energy is added to the water, so the water evaporates and goes to the clouds.

one side *stay* Water remains on the surface (perhaps in a puddle, or adhering to a soil particle).

Plant: four sides *clouds* Water leaves the plant through the process of transpiration.

two sides *stay* Water is used by the plant and stays in the cells.

River: one side *lake* Water flows into a lake.

one side *ground water* Water is pulled by gravity; it filters into the soil.

one side *ocean* Water flows into the ocean.

one side *animal* An animal drinks water.

one side *clouds* Heat energy is added to the water, so the water evaporates and goes to the clouds.

one side *stay* Water remains in the current of the river.

Clouds: one side *soil* Water condenses and falls on soil.

one side *glacier* Water condenses and falls as snow onto a glacier.

one side *lake* Water condenses and falls into a lake.

two sides *ocean* Water condenses and falls into the ocean.

one side *stay* Water remains as a water droplet clinging to a dust particle

Ocean :two sides *clouds* Heat energy is added to the water, so the water evaporates and goes to the clouds.

four sides *stay* Water remains in the ocean.

Lake: one side *ground water* Water is pulled by gravity; it filters into the soil.

one side *animal* An animal drinks water.

one side *river* Water flows into a river.

one side *clouds* Heat energy is added to the water, so the water evaporates and goes to the clouds.

two sides *stay* Water remains within the lake or estuary.

Animal: two sides *soil* Water is excreted through feces and urine.

three sides *clouds* Water is respired or evaporated from the body.

one side *stay* Water is incorporated into the body.

Ground Water: one side *river* Water filters into a river.

two sides *lake* Water filters into a lake.

three sides *stay* Water stays underground.

Glacier: one side *ground water* Ice melts and water filters into the ground.

one side *clouds* Ice evaporates and water goes to the clouds (sublimation).

one side *river* Ice melts and water flows into a river.

3 sides *stay* Ice stays frozen in the glacier

Adapted from:

Project WET Curriculum and Activity Guide

© 1995, Project WET International Foundation and CEE

Revised by:

Kelly Eskew-Vorron - Education Coordinator, Woodland Dunes Nature Center and Preserve
Sarah Dezwarte- Director of Education, Camp Y-Koda Outdoor Skills & Education

Lesson Plan: *Water conservation challenge*

Print off the following two pages back to back, fold the pages to make water conservation booklets for each member of your group. Make it into a club competition between your club and another or an individual challenge between members in your own club.

Created by:

Kelly Eskew-Vorron - Education Coordinator, Woodland Dunes Nature Center and Preserve

Water Wonders Showdown  Hey kids! You've learned how important our water supply is, and how it is threatened. Now we're challenging you to use less water, and to help keep our water supply clean and safe—and to encourage your family and friends to do the same.	Name _____ Phone number _____ 4-h Club _____ As the parent of _____ I confirm that I have participated in the showdown with my child and that the total points reported are accurate. I have initialed each item to verify that it was completed. Parent's signature _____ Date _____
---	---

Here's how the Water Wonders Showdown works:

Did you do this action? It's worth 20 points a day!

Brushing your teeth!

Turn off the water while brushing your teeth.

Fact: Every minute you have the faucet fully open 3 to 4 gallons of water pour out. Think of the gallons you will save by keeping the faucet off while brushing your teeth!

How many minutes did you run the water before?

How many minutes do you run the water now?

daily points	

total points

Parents initials

Did you do this action? It's worth 150 points!

Lightbulbs: A Bright Idea!

Replace the light bulbs in your house with energy-efficient ones. Open curtains to let in natural light and leave lights off when you can. Turn lights off when you leave a room. It takes 16 gallons of water to make the energy to light a 60 watt bulb for 12 hours. **Fact:** Turning lights on and off does NOT take more energy than leaving them on, even for a few minutes.

How many lightbulbs did you replace? _____

total points

Parents initials

Did you do this action? It's worth 200 points!

Install a Low Flow showerhead!

Ask your parents to install a low flow showerhead. **Fact:** You can find low flow showerheads or a water saver kit at most hardware stores.

Where did you

When did you

total points

Did you do this action? It's worth 300 points!

Get out there!

Take a walk along a river, canoe or kayak on a lake, go fishing! Enjoy the water resources we are so fortunate to have.

Fact: You can contact local nature centers to get ideas on where you can have your water adventure!

Where did you go on your adventure?

What did you see?

total points

Parents initials

Did you do this action? It's worth 250 points!

Garbage Pick up!

A lot of the garbage that ends up on land gets washed into rivers lakes and streams. Go on a garbage hunt and pick up as much garbage as you can. Add 50 extra points if you go to a park or somewhere near water.

Fact: Fish and other aquatic animals can become injured or die from garbage that enters their watery home.

Where did you pick up garbage?

What is the weirdest piece of garbage you found?

total points

Parents initials

Did you do this action? It's worth 100 points!

Washing the car!

total points

Support

If you are excited about what is offered in this booklet, consider becoming a member of one of the partnering organizations. Support from families and clubs like yours help to keep our organizations and programs running.

Woodland Dunes Nature Center and Preserve



When you become a member you support an organization that provides environmental education to thousands of children and adults each year and preserves 1200 acres of forest, prairie and wetland.

My Membership	Membership Perks
Name _____	* Quarterly newsletter, the Dunesletter, emailed or mailed to your home.
Address _____	* Discounts on admission to most Woodland Dunes events and festivals.
City _____	* 10% discount in our Nature shop
State _____ Zip _____	* An invitation to the annual members meeting.
Phone _____	*The satisfaction of supporting a non-profit organization working hard to educate the community and preserve the natural world.
Email _____	
Regular Membership	
c \$25 Individual	
c \$35 Family	
c \$50 Patron	
c \$100 Contributor	
Guarantor Membership	
c \$250 Conservator	
c \$500 Benefactor	
c \$1,000 Steward	
c \$5,000 Guardian	

For more information about becoming a member contact Woodland Dunes at 920-793-4007.

Wisconsin Maritime Museum



Membership Levels

Benefactor* (Smithsonian benefits included)
Sponsor* (Smithsonian benefits included)

Price

\$500-\$999
\$250-\$499

Sustaining* (Smithsonian benefits included)	\$100-\$249
Family (two adults with children 18 & under)	\$60
Individual	\$40
Senior Couple (with grandchildren 18 & under)	\$35
Senior Individual (with grandchildren 18 & other)	\$25
Young Adult/Student (18-25 years)	\$20

All Museum Members will receive:

Free Admission to all Museum galleries and USS COBIA

Personalized Membership Cards

Subscription to the quarterly newsletter *Anchor News*

Annual wall calendar

10% discount on purchases at *Pier 75*, the Museum Store

20% discount on facility rentals

There is also an option to receive Smithsonian benefits for an additional \$20.

Download our membership brochure at www.wisconsinmaritime.org or call 684-0218 for details.



This 4-H special emphasis education program is made possible through support from the Wisconsin DNR River Planning and Protection Grant Program and brought to you through collaboration with Woodland Dunes Nature Center and Preserve, Wisconsin Maritime Museum, City of Manitowoc, Manitowoc County Soil & Water Department and UW-Extension. This material is paid for by the UW-Extension Manitowoc County 4-H.