

# Water Ecology

## Class Overview

1. Introduction
  - a. The globe toss activity will cover students' names and introductory material for the class.
2. Progression of Activities
  - a. Globe Toss
  - b. Sampling
  - c. Who Dirtied the Water
3. Learning Standards Addressed
  - a. 4.A.2b , 4.A.2c , 4.A.3a , 4.A.3d 4.B.2b
  - b. 6.B.2
  - c. 11.A.2b , 11.A.3c , 11.A.2d
  - d. 12.B.2a , 12.B.2b 12.B.3a , 12.B.3b , 12.E.2a , 12.E.3c
  - e. 13.B.2a , 13.B.2e , 13.B.2f , 13.B.3f
  - f. 17.B.3a , 17.C.2c
4. Vocabulary
  - a. Macro-invertebrate: Aquatic invertebrates including insects (e.g. larval Ephemeroptera and Trichoptera), crustaceans (e.g. amphipods), mollusks (e.g. aquatic snails) and worms (e.g. Platyhelminthes), which inhabit a river channel, pond, lake, wetland or ocean and that are visible to the naked eye (often, greater than 0.5 mm in diameter).
  - b. Delta: Deposit of clay, silt, and sand formed at the mouth of a river where the stream loses velocity and drops part of its sediment load.
  - c. Acid Rain: Precipitation, as rain, snow, or sleet, containing relatively high concentrations of acid-forming chemicals, as the pollutants from coal smoke, chemical manufacturing, and smelting that have been released into the atmosphere and combined with water vapor.
  - d. Pesticide: A chemical prepared to destroy plant, fungal, or animal pests.
  - e. Angler: A person who fishes with a hook and line.
5. Wrap Up
  - a. What are some ways we can protect our waters?

# Globe Toss

**Objective:** Students will get to know each other's names and get an introduction to how much land/water we have on earth, and where that water can be found.

**Method:** Tossing a globe ball around a circle

**Location:** Anywhere

**Time:** 5-10 minutes

**Materials:** Globe Ball

**Background Info:** About 70-75 percent of the Earth is covered in water. Most of this water is salt water, but about 3 percent is fresh water. Two percent of our fresh water is frozen in glaciers and is not available for everyday use, leaving us only 1 percent of usable water. In this activity, have the students talk about where they can find water (fresh or salt) and what water we are able to use on a daily basis.

**Procedure:**

1. Have the students stand in a circle.
2. Each student should have one finger pointed outward.
3. Students will start passing the ball to each other. When the students catch the ball, they should tell the group their name and if their finger landed on water or land.
4. Keep passing the ball around until everyone has received the ball once.

**Wrap Up:**

1. How many students landed on water? On land?
2. How do they think the ratio they have compares to the ratio on the planet?
3. Have the students come up with a list of places where water can be found.

# Sampling

**Objective:** Students will assess the quality of the Rock River by looking for different macro-invertebrates.

**Location:** Delta, spring, or anywhere there is access to the river

**Time:** 30-45minutes

**Materials:** Nets, buckets, magnified glasses or bug boxes, id sheets, water assessment sheets, boots, and PFD's (lifejackets).

**Background Info:** The quality of a body of water can often be determined by the types of invertebrates found within it. Some invertebrates are much more tolerant of pollution than others. A stream or pond with only highly tolerant species is probably more polluted than one containing both tolerant and intolerant species. Therefore, the presence of tolerant species does not necessarily mean the water is highly polluted, the presence of less tolerant species (often in addition to the more tolerant), usually means a healthier body of water.

**Vocabulary:** Macro-invertebrate, delta

## Procedure:

1. Stop at Lower Taft to pick up all necessary supplies.
2. If the students are going to wear boots, they also need to have a PFD.
3. Carry all items down to the delta fire circle. Students should not wear the boots while walking down the stairs.
4. Once the students are ready to collect, go over safety procedures.
  - a. No running or pushing around the river.
  - b. No climbing on fallen logs or branches.
  - c. Only 5 students can be in the river at a time. The rest of the students need to be on the delta (if it's not underwater) or on the shore line. Students in the river should not be in water above the half way point on their boots.
  - d. When picking up an insect or animal from your net, be very careful and return it to the water as soon as possible.
5. Have the students try to identify each species as they find it using the id guides. If possible, try to keep an example of each in a sample container for the students to observe.
6. The students should also make a tally in the correct column in the water assessment chart.
7. At the end of the activity, have the students gather around to talk about their findings and talk about the quality of the Rock River based on the assessment chart.
8. Very carefully put all insects back into the river. Dump all the containers from a low spot close to the water. No one should be standing while putting the macro-invertebrates back in the water.

## Wrap Up:

1. What is the state of the Rock River?
2. If the group did not find many species, why?
3. How could the group help improve the quality of the Rock River?

## Water Quality Assessment

The quality of a body of water can often be determined by the types of invertebrates found within it. Some invertebrates are much more tolerant of pollution than others. A stream or pond with only highly tolerant species is probably more polluted than a stream or pond containing both tolerant and intolerant species. Therefore, the presence of tolerant species does not necessarily mean the water is highly polluted, the presence of less tolerant species (often in addition to the more tolerant), usually means a healthier water body.

Group 1	Group 2	Group 3	Group 4
___ stonefly	___ caddisfly	___ black fly	___ worms
___ alderfly	___ mayfly	___ midge	___ leech
___ dobsonfly	___ riffle beetles	___ sowbug	___ left-handed
___ snipefly	___ water penny	___ scud	___ snails
	___ damselfly	___ right-handed	___ blood worm
	___ dragonfly	___ snails	
	___ crayfish		
	___ cranefly		
	___ clam/mussel		

___ # of taxa			
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X 1 = ___	X 2 = ___	X 3 = ___	X 4 = ___
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TOTAL OF ALL GROUP SCORES ___	TOTAL CUMULATIVE SCORE
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Divided by TOTAL # OF DIFFERENT TAXA ___	_____
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1.0 -2.0 excellent water quality  
 2.1-2.5 good water quality  
 2.6-3.5 fair water quality  
 over 3.5 poor water quality

WATER QUALITY RATING:  
 \_\_\_\_\_

## Who Dirtied the Water?

**Objective:** Students will visually see the effects of pollutants, soil runoff, and acid rain entering our water supply.

**Vocabulary:** Acid rain, pesticide, angler

**Materials:** Plastic container, 11 film canisters, script

**Background:** Substances go into our water supply in many different ways. Litter and garbage are directly dumped into waterways; chemicals are leached through the soil; oil from spills and motorboats enter the water; fertilizers and pesticides applied to crops get washed into waterways by rain; emissions from factories and cars precipitate and return as acid rain; sewage and drainage systems leak or are pumped into our water; and leaves and soil are continually entering our water systems.

### Procedure:

1. Fill the plastic container with water and put it in view of all the students. This represents the lake.
2. Pass out a film canister to each student. If there are more than 11 students, some may have to share a canister. If there are fewer than 11 students, some may have 2 canisters.
3. Explain that each student represents a character in the story. When their character is named during the story, they need to dump the contents of their container into the "lake."
4. Read the story, pausing to allow the students to dump their containers at the appropriate times.

### Character List

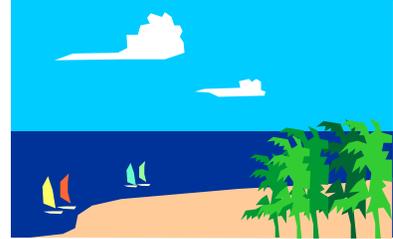
Character	Contribution	Contents of Canister
Homeowners	Sewage	Soil and vegetable oil
Children	Soap	Dish soap
Trees	Leaves	Leaves
Soil	Soil	Soil
Beach Visitors	Trash	Paper
Boaters	Motor oil	Vegetable oil
Anglers	Bait containers	Paper
Farmers	Pesticides	Baking soda
Electrical Plant	Emissions > acid rain	Vinegar
Chemical Plant	Illegal dumping	Baking soda
Commuter	Exhaust > acid rain	Vinegar

### Wrap Up:

1. Who was responsible for dirtying the water?
2. Is this activity like real life? In what way? How can this problem be prevented? What can we do?

## Who Dirtied the Water?

As you can see, this lake is clean and beautiful. Recently, more property became available, and people started to move in. The homeowners, Mr. and Mrs. Human, are very excited about their new house. They're so busy that they forgot to hook up their sewage system. All of the sewage went right into the ground and lake.



The homeowner's children have been helping a lot around the house. They are working hard doing dishes and washing the car. All of their soap went into the storm sewer that empties right into the lake.

The night before there was a thunderstorm. The high winds blew many leaves off the trees. With all the construction around the lake, there is a lot of exposed land. The people moving in still haven't planted grass, which holds the soil in place. So much of it has washed into the lake.



The lake is also a popular place for people to come and have fun on sunny days. Beach visitors like to swim and have picnics. But many of them leave behind trash that gets blown into the lake. Boaters speed around the lake and like to go water skiing. Some have leaky motors. There are also a lot of different fish that live here. Some anglers leave behind bait containers, old fishing line and hooks.

Nearby the lake, farmers are spraying their crops with pesticides. Eventually, these chemicals get washed into the lake with rain. On the other side of the lake, an electrical plant is releasing toxins into the air. In the end, these come down in the form of acid rain. Meanwhile, the chemical plant can't afford to pay to get rid of their waste. They have been dumping it illegally.



As all of this is going on, the commuters are driving home from work. While reflecting on how much they enjoy the lake, the exhaust from their cars adds to the effect of acid rain. Our lake has taken on quite a different look.