Stream Ecology

Pre and Post-Trip Packet

A Field Trip for Grades 3 – 7
At The State Botanical Garden of Georgia

This field trip leads students on a true adventure through a watershed, along a river, and into a stream. Students are stream ecologists as they gather data and catch and identify water creatures to monitor stream health. The subjects of erosion, pollution, and conservation and the effects they have on our drinking water supply and the habitats of water animals are also addressed. Students gain a real understanding of what a watershed is and how all members (including humans) of an ecosystem are connected by their common water source.

The activities in this booklet may be used to prepare students for their field trip at the State Botanical Garden and then for review of the concepts learned during the field trip.

Introductory Activities:

- Earth's Water Supply Demonstration
- School Site Water Observation

Review Activities:

- Everybody Downstream
- Make Your Own Water Meter

Earth's Water Supply Demonstration

Essential Questions:
How much of the Earth's water can we use for drinking?
Why should we care about our water source?

Location: School site or home

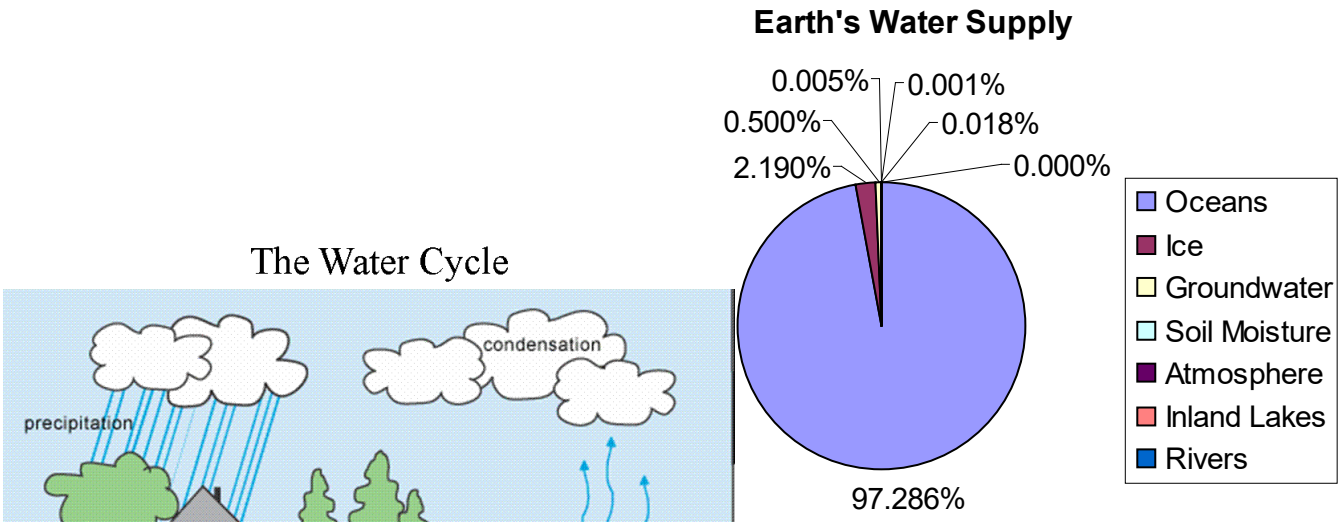
Time: 15 minutes

Objectives: *Learners will:*
- learn the amount of freshwater available to the population on Earth.

Supplies:
- 1 gallon water container
- bowl
- eye dropper
- plate

Background:
Between 2/3-3/4 of the Earth's surface is covered in water. It can be observed in flowing rivers, ponds, lakes, oceans, locked in the Northern and Southern ice caps, and drifting through the air as clouds. Water that has seeped into the Earth's crust (groundwater) is more difficult to see, yet all these forms of water are part of a dynamic interrelated flow that we call the water cycle.

Of the water on Earth, 97.3% is oceans, inland seas, and salt lakes. The rest is fresh water; icecaps/glaciers, groundwater, freshwater lakes, atmosphere, and rivers. People tend to think that the amount of water on the planet is unlimited, yet it actually does not change. The amount of available fresh water to humans and wildlife depends largely on how its quality is maintained. Human beings have a responsibility to conserve water, use it wisely and protect its quality.



Source: www.groundwater.org/kc/watercyclefillin.html

Procedure:
This activity can be done as a demonstration to introduce students to the fact that the amount of fresh water available for humans to use is less than one percent of the total of Earth's water. It can also be done with an apple; the apple represents the Earth, and you cut the fractions from the apple stating why we cannot use them.

1. Fill a one-gallon container (such as an ice cream bucket) with water.

2. Pour a half-cup of water out of the one-gallon container and into a clear bowl. The water in the bowl represents all of the fresh water on earth, which is less than three percent of the total water on earth. The 15 ½ cups that are still in the one-gallon container represent salt water.

3. With an eyedropper, drop one drop of water from the half-cup onto a small plate. This one drop represents the freshwater that is available for our use. This water is found in rivers and lakes. The rest of the water in the half-cup is deep groundwater, bound up as soil moisture, biomass water, or water in the atmosphere.

Discussion/Assessment:
Where does water come from?
Will we ever run out of water?
What threats does the water cycle face?
Will freshwater quality always be the same?
Why should we care about water quality?
What can we do to improve the quality of our drinking water?

School Site Water Observation

Essential Question:
What part does this body of water play in our school site ecosystem?

Location: Near a body of water on your school site

Time: 45 minutes

Objectives: *Learners will:*
- investigate life support functions of the school site in water from either a puddle, a downspout, a pond or an aquarium.

Supplies:
- rulers, tape measures or meter sticks
- pens/pencils
- clipboards
- thermometer
- eye dropper
- hand lens
- flour
- microscope
- aquarium (optional)

Background Information:
Even if there is not a stream running through your school's campus, there is sure to be water. Even if it is only immediately following a rain event, that water is providing a service to the school site ecosystem. It waters the plants, provides drinking water for wildlife, and provides habitat for aquatic plants and animals. Students can learn about these ecosystem services by observing the water on their school site no matter how much of it there is.

Procedure:
This activity contains three options for observation depending on the facilities on or near your school site. Choose the one that works best for you or adapt it to suit your class.

<u>Option 1: Puddle Observation</u>

1. Assemble students near a puddle in your parking lot or schoolyard and ask the following questions.
   - Where did the water come from?
   - Did it flow anywhere to get here?
   - Why did it collect here?

2. Assign groups of students to determine answers to the following questions and record the data on a piece of paper.
   - How deep is the puddle?
   - Is it the same depth all over? Why or why not?
   - How long is it?
   - How wide is it?
   - Is this water clean? Give reasons for your answer.
   - Do any creatures live in this water? Why or why not?
   - If this puddle stayed here for a long time who would be the first to move in?
   - What happens to the water in this puddle? Relate this to the water cycle.

3. Take a sample of the water with an eye dropper and investigate it under the microscope. If there are several puddles compare and contrast them.

4. If your puddle is on blacktop, sprinkle flour around the edge. Go back later and check to see if there have been visitors to the puddle. Students should record the tracks that they see.

5. Keep a day to day record to determine how long the puddle remains on the school site and the size of the puddle each day.

Option 2: Downspout Observation

1. Place a container under a downspout to catch runoff from a building. Measure the amount of water you collected by depth, volume, or weight.

2. Assign groups of students to determine answers to the following questions and record the data on a piece of paper.
   - Why do buildings have gutters and downspouts?
   - Why do you get more water in the container under a downspout than you would get in a puddle?
   - Does this water have any connection with the water cycle? Explain.
   - Is this water clean? Give reasons for your answer.
   - Do any creatures live in this water?

3. Take a sample of the water with an eye dropper and investigate it under the microscope.

4. Pour the water into different types of containers. Compare and contrast the temperature and the rate of evaporation in the different containers.

5. Pour the water into three similar containers and cover one with a piece of screen wire, another with a tight lid, and leave one open. Check the containers daily. What changes occur?

Option 3: Aquarium Observation

1. Assemble students around an aquarium.

2. Assign groups of students to determine answers to the following questions and record the data on a piece of paper.
   - Who lives in this aquarium?
   - How did these life forms get there?
   - Why do you need different kinds of life in an aquarium?
   - How is the water kept clean?
   - Why is temperature important in an aquarium?
   - What would be the effect of putting too much of any one thing or too many of any one creature in an aquarium?

3. Create a chart on the board and compare and contrast the following between a pond and an aquarium:
    - What kinds of things do you have to put into an aquarium to keep it healthy? Are those things present in a pond?
    - How do the creatures in the aquarium get food? How does this food differ from food creatures would get in a pond?
    - If you took the creatures that live in an aquarium and put them in a pond, what do you think would happen to them? What about the reverse?
    - How do you keep an aquarium clean? How do organisms keep a pond clean?
    - Why is it important to circulate the water in an aquarium? How is water circulated outside?

4. Keep daily records of your care of the aquarium and your observations of life in the aquarium. Explain the causes and effects (inputs and outputs) of the changes.

Discussion/Assessment:
What factors affect the body of water (ecosystem)?
What did you find out about this system?
What other bodies of water are there?
What life do they support?
What role do they have in the water cycle?

Everybody Downstream

Essential Question:
What is non-point and point source water pollution?

Location: School site

Time: 45 minutes

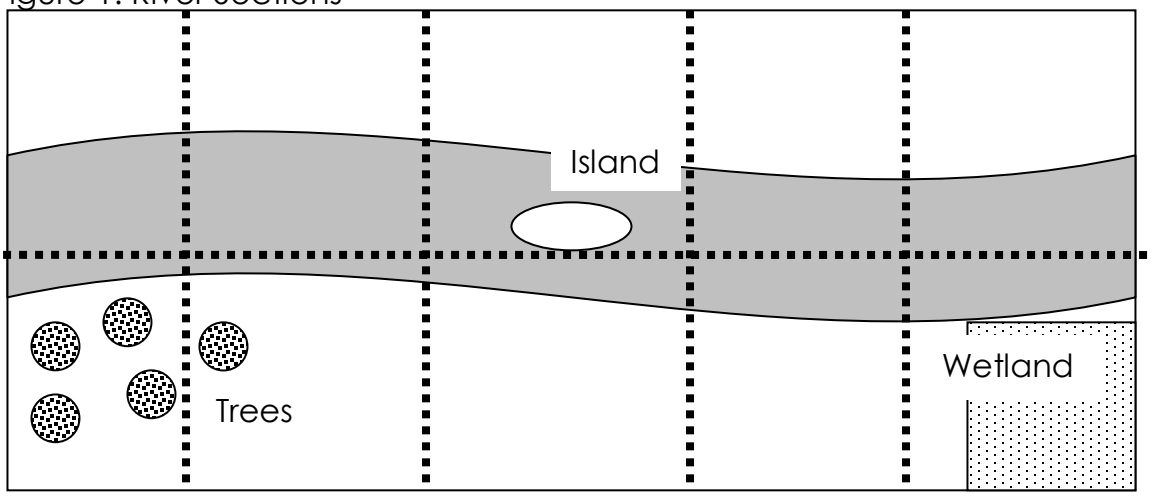
Objectives: *Learners will:*
- understand how humans and land use affect water quality

Supplies:
- paper
- markers, colored pencils, crayons
- tape

Background Information:
Water pollution occurs when a body of water is adversely affected due to the addition of large amounts of materials to the water. When it is unfit for its intended use, water is considered polluted. Two types of water pollutants exist; point source and non-point source. Point sources of pollution occur when harmful substances are emitted directly into a body of water. The Exxon Valdez oil spill best illustrates point source water pollution. A non-point source delivers pollutants indirectly through environmental changes. An example of this type of water pollution is when fertilizer from a field is carried into a stream by rain in the form of run-off, which in turn affects aquatic life. The technology exists for point sources of pollution to be monitored and regulated, although political factors may complicate matters. Non-point sources are much more difficult to control. Pollution arising from non-point sources accounts for a majority of the contaminants in streams and lakes.

Procedure:
1. Prepare 10 sections of a river on paper or cardstock. Include straight sections, curvy sections, some wide sections, some narrow, some with islands in the middle, etc. Some can have trees already shown, some not. See below Figure 1: River Sections for example.

Figure 1: River Sections



2. Break class into 10 groups and assign one section of the river per student group.

3. Instruct the groups to design their section of the river as if they were given 1 million dollars to do whatever they want. They can also write a description of the property, the land use, and an explanation of why they designed it the way they did.

4. Have groups present their section and explain their design, and then tape each section together. As you move from section to section, have students discuss how each development may affect the land and water downstream from them.

5. For any extra wrap up activity you can have the students stand in a line representing their parts of the watershed. Each group should bring with them one item per pollution they contributed to the river. The items can be pens, pencils, rulers, pencil cases, etc. The pollutants are passed down the river until the pollution is collected at the other end. When you look at the pollution that has collected downstream you can separate it. Some items will have obvious owners and can be traced back – this can be related to point source pollution. The other pens and pencils which look very much alike cannot be traced back and these represent the non-point source pollution.

Discussion/Assessment:
What is point and non-point source water pollution?
What were some of the effects of each type of land use?
What are some things that could have been done differently to better protect the health of the river?

Make Your Own Water Meter!

Essential Question:
How much water do you use in a day?

Background Information:
See background information from Earth's Water Supply Pre-Trip Activity.

Procedure:
1. Copy the water meter template onto white cardstock. There are two water meters per page.

2. Explain to the students that the Earth has very little fresh water and it is important to conserve water and use it wisely. They are going to make their own water meter to see how much water they use during a day. Hand out one water meter, a piece of ribbon, and a bead to each student.

3. Instruct students to cut out the water meter and score a line along the two ends of the internal small rectangle (Figure 1). This will allow the ribbon to pass through.

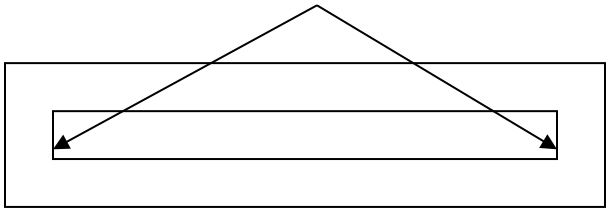


Figure 1: Where to score the water meter.

4. Fold the template in half along the black line, so that the two blank sides touch.

5. Unfold the water meter and thread the ribbon through one side and attach it at the back with tape. Put the bead on the ribbon so it will act as a marker on your scale. Thread the other end of the ribbon though the other slit, pull tight and attach with tape.

6. Glue both blank sides of the water meter together. The water meter is now complete and the bead should move up and down the ribbon when pulled.

Location: School site or home

Time: 1 day - 1 week

Objectives: *Learners will:*
- investigate how much water they use in a day

Supplies:
- Class Water Use Worksheet
- water meter template on cardstock
- one bead for each student
- one piece of ribbon for each student
- scissors
- pens/pencils
- tape
- glue

7. Go over how to use the water meter with the students. On the back is a small table which will help them work out how much water they use. They will then move the bead to the appropriate amount.

8. After a day or one week, compile the students' data and discuss the results.

Discussion/Assessment:
Where does water come from?
What threats does the water cycle face?
Why should we be concerned about water use?
How can we make simple changes to save water?
Why should we care about water quality?

Activity	Amount of Water in Gallons	Amount of Water in Liters
1 cup of drinking water	1/8 gallon	1/4 liter
Flushing toilet	5 gallons	19 liters
Brushing teeth (water running)	2 gallons	7 liters
Dishwasher	20 gallons / number of people in household	75 liters / number of people in household
Dish washing by hand (water running)	30 gallons / number of people in household	113 liters / number of people in household
Dish washing by hand (with stopper)	10 gallons / number of people in household	87 liters/ number of people in household
Load of laundry	40 gallons / number of people in household	152 liters / number of people in household
Shower/bath/hose	5 gallons per minute water is running	19 liters per minute water is running

PERSONAL WATER METER

Liters

0 10 20 30 40 50 60 70 80 90 100 10 20 30 40 50 60 70 80 90 200 10 20 30 40 50 60 70 80 90 300 10 20 30 40 50 60 70 80 90 400 10 20 30 40 50 60 70 80 90 500

0 10 20 30 40 **50** 60 70 80 90 **100** 110 120

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Gallons

Class Water Usage

Date: _____
Total number of students participating in the survey: _____
Total water use: _____
Average water use per student: _____

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Total water use: _____
Average water use per student: _____

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Total water use: _____
Average water use per student: _____

Class suggestions for conserving water on a personal level:

_____
_____
_____
_____
_____
_____
_____