

**Grade Levels:** 2<sup>nd</sup> – 4<sup>th</sup>

**Description:**

Students will experience the process of decomposition, from understanding that only organic objects decompose to collecting organisms that live in the compost bins at GBBG. The soil components silt, sand, and clay will also be discussed and viewed.

**Objectives:**

Upon completion of this lesson, students will be able to

- List several reasons why water is important, including
  - its importance as a habitat
  - to help plants grow
  - for animals to drink
  - to create our weather
- Explain the phases of the water cycle
- Identify several organisms that use water as a habitat
- Explain how water moves through trees and other plants
- Describe the characteristics of different types of weather

# Wisconsin Weather and Water

## Pre-Visit Activities

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*Please use the following materials as an aid to help prepare your students for their visit to Green Bay Botanical Garden. The vocabulary list consists of terms that may be used during your visit and the activities listed below are designed to familiarize your students with the topics that will be covered during their visit. They are listed as options – it is not necessary to complete them all or do them in any particular order. Please feel free to modify the vocabulary definition or activities in any way to better suit your students. Keep in mind, their experience will be enhanced if they are familiar with the concepts before their visit, or if the learning that took place in the Garden is reviewed and reinforced back in the classroom.*

### **Vocabulary**

**Condensation:** when water vapor in the air gets cold and changes back into liquid water forming clouds

**Evaporation:** when liquid water changes into water vapor, or the gaseous form of water

**Exoskeleton:** the hard, protective, outer shell of many invertebrates

**Habitat:** the natural surroundings of a plant or animal, where an organism finds the food, water, shelter, and space it needs to survive

**Invertebrate:** animals without a backbone

**Precipitation:** when water falls from clouds to the earth in one of many forms, including rain, snow, sleet, hail, etc.

**Predator:** an animal that hunts down and eats other animals as food

**Prey:** the animal that is hunted down and eaten by a predator

**Transpiration:** when water is released through the leaves of trees and other plants, usually as water vapor

**Vertebrate:** animals with a backbone

**Water Cycle:** the path that water takes in nature – falling as precipitation, evaporating into vapor, condensing into clouds, and on and on and on

### Activity 1:

Discuss with students the importance of water. Ask them to raise their hand if they use water every day. Create a list of all the different ways the students use water in their daily lives. Try to come up with a list of other living things that use water and how they use the water. Once you have named as many uses of water as possible, ask students to try some creative science writing: brainstorm and write a paragraph in response to one of these statements:

- Imagine if you could no longer get water out of any of your water faucets. How would your life change and where would you get your water?
- What if a pond (use a specific body of water if there is one near your school) dried up. How would the plants and animals living in and near the pond be affected?
- Imagine you live in the desert. How could you adapt to survive in such a dry environment?
- Imagine what would happen if a dam was built on a stream that runs through a woods. Once the dam is in place, a large lake forms above it. What would happen to the plants and animals that lived in the forest where the lake now is? How would the woods change because of this newly formed lake?
- What if it rained every day for 2 weeks. How would the plants in your yard and garden be affected?

### Activity 2:

Using small plants, or plants you have sprouted in the classroom, try some simple experiments. Ask students what the plants will need to grow? (water, sunlight, soil, air).

Need for Water Experiment – Use plastic wrap to cover the soil of several of the plants. Make sure that the plastic wrap is fitted tightly around the stem of the plant and around the rim of the container it's growing in (so it does not allow any water to get onto the soil). Leave several plants uncovered to act as the control. With a spray bottle, spray each group of plants with the same amount of water. Spray the water for the control group right onto the soil and spray water for the experimental plant onto the leaves. Make sure that the plants remain in the same area with natural light and are only watered as described above. Maintain the experiment for five days. In about 3 to 5 days, the plants that have their soil covered with plastic wrap should begin to wilt. The other plant should continue to grow. Students should conclude that plants need water to live. They should also conclude that the roots are the part of the plant that takes in water and not the leaves.

Try other simple experiments to see what the plants need. What happens if a plant cannot get any air? What happens if just one leaf is covered and can't get sunlight? How do the same plants compare when one is grown in the shade and one in the sun? Have students design an experiment, make a guess as to what will happen, and test their hypothesis.

### Activity 3:

Try an experiment to discover how a tree can overcome gravity to bring water from its roots to its leaves which can be hundreds of feet in the air.

Materials needed per group: Paper towel, 5 oz cup, water, 25 pennies

Directions: Have students fill their cups with water as close to the top as they can. Have the students estimate how many pennies can be added to the cup before the water spills over the top edge. Once they have written down their guess, have them add one penny to the cup at a time and observe what happens. (The water will bulge over the rim of the cup. This is due to cohesion, or the ability of water molecules to stick together.) The cohesiveness of water molecules is an important factor in transpiration, or the water movement through a plant. Scientists believe that as plants evaporate extra water through their stomata (the tiny holes in leaves), the column of water in the trunk is pulled upward through its xylem tubes. Imagine a 300 foot tall Redwood tree being strong enough to pull water up all that way.

### **Activity 4:**

Create the water cycle in your classroom to show students the different phases of the water cycle. This can be done as a classroom demonstration or in small groups.

Materials: Hot water source (tea kettle would be great), 2 beakers or plastic cups, ice

Directions: Heat up water in a tea kettle or use hot tap water. Pour a couple of inches of hot water into one of the beakers or cups. (Students should be very careful when working with hot water.) If the water is a good temperature, you should be able to see steam rising from the cup. The steam is actually water that has evaporated. (In the water cycle, water evaporates from the surface of lakes and other surfaces after being warmed by the sun.) Fill the second cup with ice and hold above the steam. After a few minutes, the steam will begin to condense on the sides of the ice-filled cup. (In the water cycle, the water vapor that has evaporated off the earth's surface rises into the atmosphere. When it reaches an area of colder temperatures, the vapor condenses into clouds.) If enough water condenses onto the cup, water droplets will begin to form and some may even drip off or slide down the side of the cup. (In the water cycle, when the clouds in the atmosphere gather enough condensed water, the water falls as precipitation.) The water cycle would be complete if the water that falls off the cold cup lands back in the hot cup and evaporated again.

### **Activity 1:**

Learn more about the organisms the students found in the pond during the field trip and more about other pond inhabitants. Begin by having students name all the animals they discovered living in the pond during the pond search. Some common creatures found are backswimmers, water boatmen, tadpoles, dragonfly larvae, bloodworms, snails, water beetles, water striders, aquatic isopods, and water spiders. Once students have named all the animals they found during the field trip, add to the list by having students name other animals that they know live in ponds (fish, turtles, frogs, ducks, geese, beavers, muskrats, etc.).

Have each student pick an animal that lives in the pond (preferably, each student should pick a different animal) and have them research the animal to discover more about them. Students should then create posters to share the facts they have learned about their animal. Some facts to discover about their animal could include: name and picture of the animal, whether it is a vertebrate or invertebrate, where in the pond it lives, what it uses for a shelter, what it eats, what eats it, how it breathes, and other interesting facts about the animal.

### **Activity 2:**

Build a terrarium, or bottle garden. Terrariums recycle water in the same way the environment does, just on a smaller scale, and is a good way to show the water cycle in action.

Materials needed per group: Large plastic wide-mouthed jar with lid, gravel, potting soil, small plants

\*\*\* (If you don't have wide mouthed jars, you can use 2-liter soda bottles with their caps. Simply cut the tops off the bottles at the point where the sides start to become straight, add the soil and plants, then set the top back onto the bottle upside-down, so the cap sticks down into the bottle.)\*\*\*

Directions: Put some gravel or small stones in the jar and lay it on its side. Add a layer of damp potting soil. Choose some small plants, and press the plants firmly into the soil. Put the lid on tightly. Place the jars in a light place but not in direct sunlight. During the day, the plants will take in the water from the soil and carbon dioxide from the air to make sugar (photosynthesis). As the plants transpire, students will notice water condensing on the top and sides of the jar. This water will fall back to the soil as rain, which the plants will use again. Do not worry about giving the plants more air by opening the jar. At night when there is no light to help photosynthesis, the plants will use the energy in their food stores, a process that releases carbon dioxide back into the jar.

### **Activity 3:**

The total amount of water on earth is nearly constant. No water arrives or leaves, it is constantly cycling through the water cycle. Since water is in all stages of the water cycle at once, only a small portion of the water on earth is available to us as freshwater. Use this demonstration to show students how much fresh water is available to us.

# Wisconsin Weather and Water

## Post-Visit Activities

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Materials: container that holds 5 gallons, measuring cups, various smaller containers

Fill an aquarium with 5 gallons of water, or bring in five gallon sized jugs of water. This represents the total amount of water in our ecosystem, the Earth. Remove 2.25 cups of water. This is the total supply of freshwater on Earth. Pour into container #1. Ask group what kind of water is left in the aquarium. (salt water) Take 1.75 cups of water from container #1 and set it aside. This represents the water locked up in polar ice caps, glaciers, topsoil, and suspended in the atmosphere (located in other phases of the water cycle). There is 0.5 cup of water left in container #1. Remove half (.25 cup). This water represents the water that is either inaccessible or polluted. The remaining .25 cup represents the fresh water supply that is available and useable to people.

Since we can never add new water to the water cycle, it is important to keep our supply of water clean. Discuss with students some of the things that people and communities do that can pollute the water. What does this tell you about how we should use our water resources? Ask students how they can use water more wisely. How can we conserve water?

### **Activity 4:**

Create a weather observation station in your classroom. For each day record whether it is sunny or cloudy, the types of clouds present, if any precipitation is occurring and what kind, and the temperature each day. Use the daily temperatures to create a bar graph, with the date on the horizontal axis and temperature on the vertical axis. Discuss how the graph of temperatures for other months would compare to your graph.

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## **Teacher Resources:**

de Paola, Tomie. 1975. *The Cloud Book*. New York: The Holiday House.\*

Morgan, Sally. 1996. *Weather*. Time Life Books.\*

Wyatt, Valerie. 1990. *Weatherwatch*. Reading, MA: Addison-Wesley.

## **Student Books:**

Cherry, Lynne. 1992. *A River Ran Wild*. San Diego, CA: Harcourt Brace & Company.\*

Cristini, Ermanno. 1984. *In the Pond*. Picture Book Studio USA.\*

DeWitt, Lynda. 1993. *What Will the Weather Be?* New York: Harper Trophy.

Hunter, Anne. 1999. *What's in the Pond?* New York: Houghton Mifflin Company.\*

McKinney, Barbara Shaw. 1998. *A Drop Around the World*. Nevada City, CA: Dawn Publications.\*

Muller, Gerda. 1995. *Circle of Seasons*. New York: Dutton Children's Books.\*

Santore, Charles. 1997. *William the Curious: Knight of the Water Lilies*. New York: Random House.\*

*\* Books available for checkout in Green Bay Botanical Garden's Children's Library*