

Water on the Move

The hydrology of our forest



Contact:

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NY State Standards addressed

Elementary standards for math, science and technology:

Standard 1 (Analysis, inquiry and design):

- **M1.1c** Apply mathematical skills to describe the natural world
- **S1.3** Develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed.

Standard 4 (Science):

- Physical Setting: **2.1c** Water is recycled by natural processes on Earth. **5.1c** The force of gravity pulls objects toward the center of Earth.
- Living Environment: **7.1a** Humans depend on their natural and constructed environments. **7.1c** Humans, as individuals or communities, change environments in ways that can be wither helpful or harmful for themselves and other organisms.

Objectives

- Students draw the local water cycle, understanding that the water cycle is not just a circle, but a web.
- Students can describe local ways in which humans use, move, store and pollute water.

Grade Level: 3-12

Duration: 2 hours

Background for teachers

Please find *The Water Cycle in New York* and *Groundwater* at http://www.ecostudies.org/ed_eco_field_programs.html

Vocabulary

- **WATERSHED-** A piece of land and all the water that falls onto this piece of land drains into the same place.
- **EVAPORATION-** The change of a liquid into a gas
- **WATER CYCLE-** Also called the Hydrologic Cycle, it is the movement and recycling of water in gas, liquid and solid forms throughout the Earth's systems.
- **GROUNDWATER-** Water that is stored underground in slowly flowing and renewed reservoirs.
- **HUMIDITY-** The amount of water vapor in the air.
- **CHLORIDE-** Chlorine is used in various forms as a disinfectant, in bleach, and to purify water. The chloride ion is the most common form of chlorine, and is one of the two elements that make up salt, or sodium chloride.
- **TRANSPIRATION-** The process where the water that is collected by plant roots is evaporated, at the leaves, into the atmosphere.
- **PRECIPITATION-** Water that falls from the atmosphere, including rain, snow, sleet, fog, hail.

- **ACID RAIN-** Also called acid deposition, it forms when water vapor combines with sulfur dioxide and nitrogen dioxide (air pollutants) and then falls as polluted (or acidic) precipitation or as dry particles.
- **RUNOFF-** Precipitation that travels over land into water bodies.
- **POINT POLLUTION-** Pollution that was created, and can be traced to, a specific place. Examples include pollution from a wastewater treatment plant or factory.
- **NONPOINT POLLUTION -** Pollution that is spread over large areas and therefore can't be traced to a specific place. Examples include agricultural chemicals and acid rain.
- **pH-** An indicator of the acidity or alkalinity of a substance. A pH of 14 through 8 indicates decreasing alkalinity, a pH of 7 is neutral, and a pH of 6 through 1 indicates increasing acidity. In other words, 14 and 1 are the two extremes on the pH scale.

Pre- Program

Please download presentation slides (to print on transparencies or project) at http://www.ecostudies.org/ed_eco_field_programs.html

Program Synopsis

Elementary

Introduction to Cary Institute and the water cycle	10 minutes
Stations (indoor)- Using models to understand water movement	
Groundwater Model (half the class). Time how long it takes for water to infiltrate through different substances.	10 minutes
Stream Model (other half of class). Drop water in one place and see where it ends up. Do this 3 times in 3 places on the model.	10 minutes
Making stops along the water cycle as we walk on the trail. Students complete a worksheet to describe each "stop" and ponder where the water could go from each stop.	5 minute instructions
Stop 1: Measure daily humidity and count the number of clouds. Add today's data to the growing table of data.	5 minutes
Stop 3: Groundwater wells: test for nitrates, measure water level and temperature, walk to stream to search for surface discharge.	15 minutes
Stop 5: Runoff experiment on different slopes	10 minutes
Stop 6: Walk along Wappinger Creek, measure stream level and conduct the flow rate experiment at 3 spots in the Creek.	15 minutes
Stop 6: Water budget of a leaf: examine leaf transpiration.	10 minutes
Stop 7: Evaporation experiments	10 minutes
Tour the IES Environmental Monitoring Station and do an acid rain demonstration using maps and graphs	10 minutes
Water use and water cycle- if there is the same exact amount of water on earth as there was one million years ago, what happens as human population grows?	10 minutes

Discuss water conservation, show population growth and water usage around the world.	
Collect program assessment and hand out post-activities.	
Bus picks up students at the <u>environmental monitoring station</u> .	

Middle and Highschool

Introduction to the Cary Institute and discussion of the importance of the water cycle in an ecosystem	10 minutes
Stations (indoor)- Using models to understand water movement	
Groundwater Model. Discuss how groundwater becomes polluted and how groundwater moves.	15 minutes
Stream Model. Discuss runoff and watersheds.	15 minutes
Making stops along the water cycle as we walk on the trail. Students complete collect data about each “stop” and diagram a water cycle “web”.	5 minute instructions
Stop 1: Measure daily humidity and discuss precipitation in New York	5 minutes
Stop 2: Groundwater wells: test for chloride, measure water level and temperature. Explore Gifford Stream watershed, from its headwater wetland to its confluence with Wappinger Creek, looking for areas where groundwater seeps to the surface along the way.	20 minutes
Stop 3: Walk along Wappinger Creek, measure stream level and conduct the flow rate experiment.	10 minutes
Stop 4: Examine water uptake by a tree using a band dendrometer and do an experiment on leaf transpiration.	10 minutes
Stop 5: Evaporation experiments using a piche evaporation meter or evaporation trays.	15 minutes
Tour the IES Environmental Monitoring Station	15 minutes
Humans in the water cycle	15 minutes
Collect program assessment and hand out post-activities.	
Bus picks up students at the <u>environmental monitoring station</u> .	

Post Program Activities (can be found at http://www.ecostudies.org/ed_eco_field_programs.html)

Water Diary

Students use our activity sheet to find out where the water in your school or home comes from and how much you use in a day.

My water budget

Students see their bodies as ecosystems, and calculate the water inputs and outputs!

School water budget

Using what they learned in the My Water Budget activity, students calculate the water inputs and outputs of the school ecosystem.

How much water does it take to make a hamburger?

Students draw diagrams or concept maps to think about the water, and other resources, needed to grow the main ingredients for one hamburger.

Changing Hudson Project

Download numerous activities from our Changing Hudson Project website at <http://www.ecostudies.org/chp.html> These standards-based lessons engage students in innovative science that connects them with current research about the Hudson River.