Cary Institute of Ecosystem Studies

Water Life

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.
- **S3.1** Organize observations and measurement of objects and events through classification and the preparation of simple charts and tables.

Standard 4- Science:

- Living Environment: **4.1e** Each generation of animals goes through changes in form from young to adult. This completed sequence of changes in form is called a life cycle. Some insects change from egg to larva to pupa to adult. **5.2g** The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight.

Objectives

- Through comparison, students will quantify the similarities and differences of living and nonliving components in two different aquatic systems (a stream and a pond).

Grade Level: 3-12

Duration: 2.5 hours

Background for teachers and older students

Please find the following documents at http://www.ecostudies.org/ed_eco_field_programs.html *Microbes, Macroinvertebrates, Dissolved Oxygen,* and *pH*

Vocabulary

- **WATERSHED –** A piece of land and all the water that falls onto this piece of land drains into the same place.
- **INVERTEBRATE –** an animal lacking a backbone. Examples include insects, spiders, snails and clams.
- **STREAM/CREEK -** a body of water, controlled by a bottom (called the bed) and the edge (called a bank). Streams also have a noticeable current. Creeks are usually just small streams
- **POND –** a small lake, usually shallow enough that plants grow on the entire bottom.
- **MICROBE –** Also called microorganisms, these living organisms, often made up of only one cell, that are too small to see with the naked eye. While these microbes can group together and become visible to the naked eye (think about mold growing on bread!), that colony is made up of individual living organisms. Examples include bacteria, algae, and fungus.
- **DISSOLVED OXYGEN (DO)** – the oxygen gas dissolved in water (not the oxygen in the H_2O water molecule).

- **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.
- **ECOSYSTEM –** A perspective that considers the living (biotic) and nonliving (abiotic) factors, and how they interact, in any place. A log or a city can be viewed as an ecosystem as easily as a forest can be viewed as an ecosystem.

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, water quality and making comparisons.	10 minutes
Relay Game (outdoor). Students learn how water behaves, what lives in the water and that water is everywhere!	10 minutes
Streamside exploration, sensory walk and plant identification (outdoor).	15 minutes
Outdoor Stations – How can we find out if a water body is healthy? Introduce stations and pass out materials. The class will divide in half, complete one station, and then switch stations.	10 minutes (explanation)
DO, temp and pH of a small pond and a stream	25 minutes
Macroinvertebrate collection of the pond and stream	25 minutes
Indoor Stations – In the same groups, students will examine the macroinvertebrates they collected, and microbes in pond and stream water samples.	5 minutes (explanation)
Macroinvertebrate identification using dissecting microscopes.	20 minutes
Microbes in the water. Microbes will be sampled from a hay infusion of stream and pond water, and an algae collection plate. Using a digital microscope, students will record the microbes present in each sample.	20 minutes
Hand out "continuing your study of water life" website link to teachers. Collect program assessment from teachers.	

Post- Program activities (download at http://www.ecostudies.org/ed_eco_field_programs.html)
Analyze the data from the field trip
Build an aquatic ecosystem mural
Diatom art project
Insect life cycle game
Water cycle game
Who dirtied the water?

Middle school/high school

Introduction to Cary Institute, water quality and making comparisons.	10 minutes
Mapping the stream and pond ecosystem, highlighting the inputs, outputs, and processes of this aquatic systems	15 minutes
Outdoor Stations – How can we find out if a water body is healthy? Introduce stations and pass out materials. The class will divide in half, complete one station, and then switch stations.	5 minutes (explanation)
DO, temp, nitrates and pH of a small pond and a stream	25 minutes
Macroinvertebrate collection of a small pond and a stream	25 minutes
Indoor Stations – In the same groups, students will examine the living things in the water.	5 minutes (explanation)
Microbes in the water. Microbes will be sampled from a hay infusion of stream and pond water, and an algae collection plate. Using a digital microscope, students will record the microbes present in each sample.	20 minutes
Macroinvertebrate identification using dissecting microscopes.	20 minutes
Revisit the ecosystem maps and add in any missing pieces.	10 minutes
Graph results to compare the two systems.	20 minutes
Hand out Changing Hudson Project website link to teachers. Collect program assessment from teachers.	

Post-program activities: 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.