Exploring Wetland Waters and Soils

Lesson Author: Ashley Schnitker

School or Agency: St. Anne Wetland Education Outreach Project

Grade Level(s): 9-12

Science Topic: Water and Soil Properties

Summary: Students should research amphibian and arthropod life cycles prior to the field trip. They will examine water (if available) and soil from the wetlands in order to understand the unique organisms that rely on these vernal ecosystems. The water cycle should also be discussed to give students an understanding of the water table and soil filtration.

Core Content: Life Science, Earth Science

Objectives: Students will be able to understand the importance of vernal wetlands in the lifecycles of various organisms. Water and soil chemistry of wetlands will also be explored. Students will learn how wetland soils act as a pollutant sponge as a key part of the water cycle. Students will also learn about the importance of groundwater for human consumption.

Materials: Water cycle handout (attached), beakers (5), eye dropper, hand lenses

Procedures: Introduce students to the wetlands by passing around a beaker of water and a beaker of soil from the wetland area. Students should notice dark soil and water, an effect of high quantities of organic matter (leaf litter, mostly). Organic matter tends to break down slowly in this environment due to lack of oxygen. This also produces the smell of methane due to anaerobic microbial activity. Students should use hand lenses to look for insect and amphibian larvae (seasonal variation). Fairy shrimp may also be observed.

Discuss the water cycle and explain the water table to students. Wetlands have a high water table and quickly fill from rains, snowmelt and runoff. The wetland soil acts as a sponge, soaking up pollutants from the water as it moves underground. This is important since humans rely greatly upon groundwater for consumption. The groundwater is also imperative for the

survival of plants (and animals, indirectly), especially during times of drought. The water cycle handout as well as supplemental material will help explain this.

To further demonstrate anthropogenic need for groundwater, fill a 100 mL beaker. This represents the water on earth (over 70% of Earth's surface). Remove 3 mL and place in another beaker; this represents freshwater found on earth. Remove 2 mL from the remaining 3 mL; this represents water stored in the ice caps. The remaining mL is a rough estimate of freshwater that is capable of being utilized by humans for consumption.

Assessment Techniques: (see handout-Assignment)

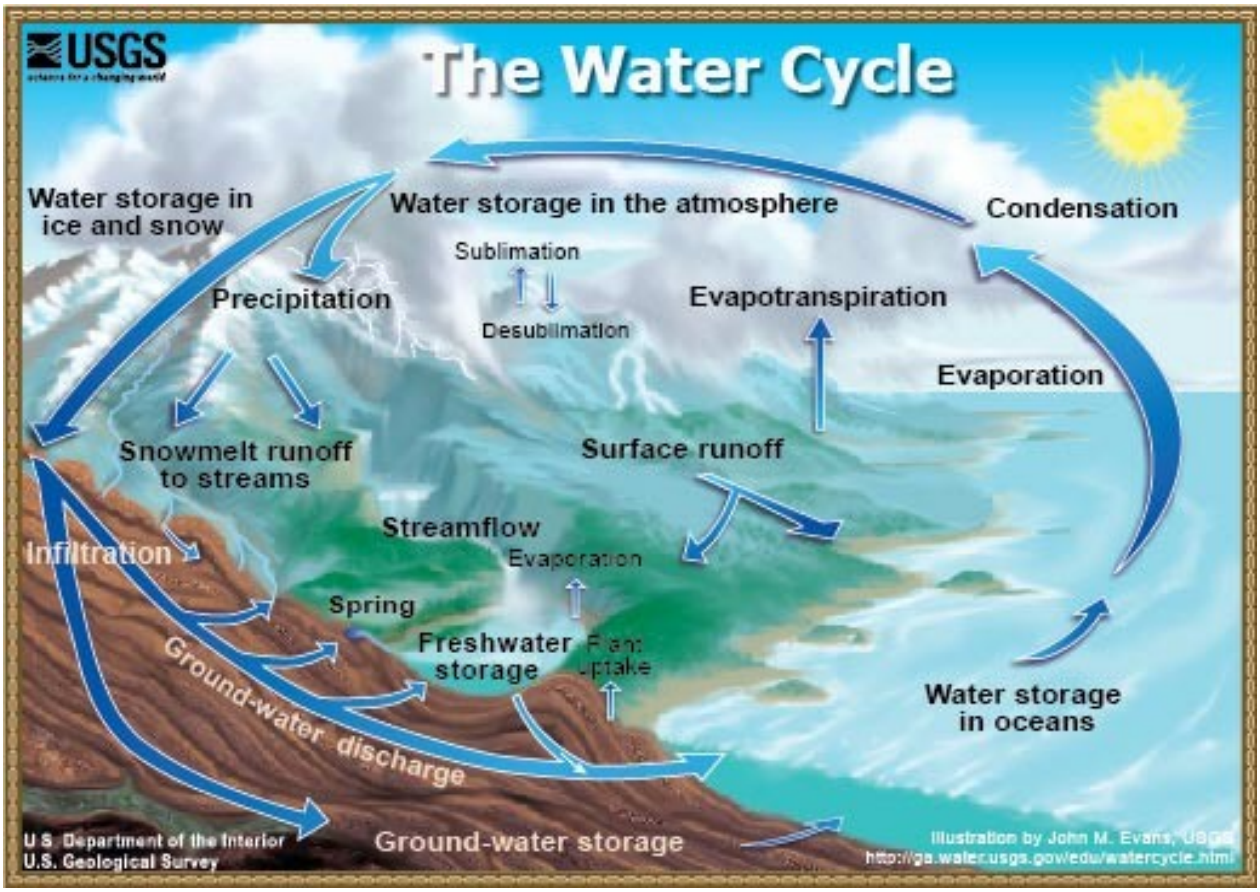
Resources:

http://www.ag.iastate.edu/centers/iawetlands/About.html#Soil

http://ga.water.usgs.gov/edu/watercycle.html

http://www.epa.gov/owow/wetlands/pdf/fun_val.pdf

Handouts: Wetland Assignments, Water Cycle; a Wetland values



Pre-field trip assignment Name:_____

Research the life cycle(s) of various amphibians and arthropods.

Choose from:

Frogs Salamanders Fairy shrimp Dragonfly
Crayfish Mosquitoes Toads

Draw and label the phases of the organism(s) life cycle:

Name:_____

Post field-trip assignment

1) Explain why there is a shortage of drinking water on Earth?

2) How do wetlands create cleaner groundwater?

3) Why are some wetlands seasonal? Where does the water go? Why does the water remain throughout spring?

4) Create a sketch of the water cycle.

WETLANDS-Functions Versus Values:

Wetland functions include water quality improvement, floodwater storage, fish and wildlife habitat, aesthetics, and biological productivity. The value of a wetland is an estimate of the importance or worth of one or more of its functions to society. For example, a value can be determined by the revenue generated from the sale of fish that depend on the wetland, by the tourist dollars associated with the wetland, or by public support for protecting fish and wildlife. Although large-scale benefits of functions can be valued, determining the value of individual wetlands is difficult because they differ widely and do not all perform the same functions or perform functions equally well. Decisionmakers must understand that impacts on wetland functions can eliminate or diminish thevalues of wetlands.

Water storage. Wetlands function like natural tubs or sponges, storing water and slowly releasing it. This process slows the water's momentum and erosive potential, reduces flood heights, and allows for ground water recharge, which contributes to base flow to surface water systems during dry periods. Although a small wetland might not store much water, a network of many small wetlands can store an enormous amount of water. The ability of wetlands to store floodwaters reduces the risk of costly property damage and loss of life—benefits that have economic value to us. For example, the U.S. Army Corps of Engineers

found that protecting wetlands along the Charles River in Boston, Massachusetts, saved $17 million in potential flood damage.

Water filtration. After being slowed by a wetland, water moves around plants, allowing the suspended sediment to drop out and settle to the wetland floor. Nutrients from fertilizer application, manure, leaking septic tanks, and municipal sewage that are dissolved in the water are often absorbed by plant roots and microorganisms in the soil. Other pollutants stick to soil particles. In many cases, this filtration process removes much of the water's nutrient and pollutant load by the time it leaves a wetland. Some types of wetlands are so good at this filtration function that environmental managers construct similar artificial wetlands to treat storm water and wastewater.