Wetland Wonders Teacher Background

Activity 6, Wetland Wonders, contains six experiments:

Experiments 1 through 3 (**pages 12-15**) in the teacher's guide can be used to increase student's awareness about the characteristics of wetlands. Set up stations where students can try the experiments in small groups.

Experiments 4 and 5 (**pages 16-18**) in the teacher's guide illustrate the effects of pollution on life, how wetlands can filter water and how plants can prevent erosion and neutralize pollutants.

Water Quality and Quantity

Wetlands sustain more life than almost any other ecosystem. Although wetlands comprise no more than six percent of the earth's surface, they are vital to the stability of the global environment. Wetlands regulate large quantities of water that would otherwise flood land. In times of heavy rain, wetlands can store extra water and prevent flooding. During periods of drought, wetlands become a source of water. Sometimes they recharge or replenish aquifers, an underground source of water.

Wetlands also trap and filter sediment (small particles of dirt) and pollutants that are washed off the land. Once runoff reaches a wetland, aquatic plants slow the water down and allow the sediment to settle out. Now the cleaning process has begun! Tiny microorganisms help to break down harmful chemicals and turn them into less harmful forms. They also release smelly by-products such as ammonia, methane and hydrogen sulphide back into the atmosphere. Now you know why a wetland can smell so bad!

Aquatic plants also work to "suck up" excess nutrients such as nitrogen and phosphorus. These elements are essential for plant growth, but can be harmful in large quantities. For example, excess nitrogen and phosphorus can promote excessive algae growth, resulting in algal blooms. As blooms die, they decompose and reduce dissolved oxygen levels in the water. Adequate levels of dissolved oxygen are needed to support fish, insects and other aquatic organisms. Low oxygen concentrations can threaten a variety of critical life stages of aquatic animals including larval invertebrates, fish eggs and fry.

Excess ammonia and nitrates can also promote algae growth. Wetlands help to prevent this from happening by creating balanced environments, complete with plants that help remove impurities and toxins before pollutants become unmanageable.

Some communities in Alberta have created wetlands to treat wastewater. Examples include:

- Kennedale Constructed Wetland (City of Edmonton)
- Coventry Hills Wetland (City of Calgary)
- SunRidge Constructed Wetland (Lethbridge)

What influences water quality?

Water quality can be affected by many factors including climate, landscape and human activities. The following are three major factors that affect water quality, all of which are subject to human influence:

1. **Water quantity.** The amount of water available affects its quality. The less water there is, the lower the capacity to dilute wastes. Climate change and increased consumptive demand are two issues that affect water quantity.
2. **Point sources.** These are "end-of-pipe" sources of contaminants (e.g., return flow from industries and municipalities) known as effluents. Because these sources are easily identified, they are also fairly simple to monitor and regulate.
3. **Non-point sources.** These are sources of contaminants that cannot be easily traced (e.g., runoff from land draining to a stream, contaminants that fall with rain, snow and dust). Non-point sources are of significant concern because they are difficult to monitor and regulate.

The following features on our landscape can affect water quality:

Construction Sites
- soil erosion
- impeding water flow
- habitat destruction

Factories
- effluent (discharge)
- air pollution

Parking lots, streets and driveways
- paved surfaces (impermeable surfaces, speeds up water flow, doesn't allow the water to penetrate into the soil)
- runoff of sediment-laden rainwater and pollutants

Storm Drains
- pollutants disposed of in drains. Rainwater flows into grated drains in streets so the streets don't flood. Storm drains typically bypass waste water treatment plants and flow directly to the nearest body of water, usually through underground pipes and culverts installed by the municipality.

Lawns and Farms
- runoff of pet and livestock wastes
- livestock standing in streams (adds waste directly; trampling increases streambank erosion)
- soil erosion from bare spots or tilled fields
- improper application of fertilizers, pesticides, and other lawn and crop care products (leads to contaminated runoff)

Wetlands aid in absorbing and filtering out pollutants as the water travels across the landscape. The quality of water in a wetland can indicate the "environmental health" of the surrounding landscape.

Wetland Functions

Wetland functions may be grouped into five major areas with numerous wetland values associated with each function.

1. **Life Support:** Habitat for waterfowl, wildlife, including invertebrate and vertebrate animals, microscopic and macroscopic plants, and endangered species (plants and animals).
2. **Hydrology Functions:** Groundwater recharge and discharge, flood control, flow stabilization, erosion control, water storage and release, and climate modification (e.g. precipitation, greenhouse gases).
3. **Water Quality Functions:** Pollution treatment and flow stabilization.
4. **Economic Functions:** Waterfowl and wildlife production, agricultural enterprises, carbon sequestration, peat extraction, wild rice, wildlife viewing, trapping, and some recreational activities.
5. **Heritage Functions:** Education and research, recreation, existence and bequest value.

Understanding Wetland Soils

Wetlands are characterized by *hydric soils*. These soils are saturated with water long enough to create anaerobic conditions (low oxygen). This lack of available oxygen creates some distinct soil characteristics and limits the types of plant species that can survive there. Hydric soils are often mottled or grey in color.

In a bog or fen, where Sphagnum moss is the dominant plant species and acidic conditions exist, plant matter accumulates much more quickly than it can decompose. The result is a build up of peat, the first stage in the development of coal. This type of organic soil is different from the soil you would find on drier ground. Peat develops in bogs and fens (collectively called peatlands) which are saturated for most of the growing season. Microorganisms are fewer, and there is low to no oxygen present in a bog.

Wetlands with mineral soils (clay, sand, silt) exist where soil is only saturated for a portion of the growing season. In these wetlands (marshes, swamps, shallow water ponds) decomposition keeps pace with accumulation due to the presence of microorganisms. These microorganisms continually decompose matter.

The soil, aquatic organisms and plants all work together to filter water and remove impurities.

To learn more visit www.anr.state.vt.us/dec/waterq/wetlands/htm/wl_id-hydricsoil.htm

Check out these websites
www.waterquest.ca
www.yellowfishroad.org

Name: _____

Observation Worksheet: Experiment #____

Time	Date	Observations

Name: _____

Activity 6: Lab Report, Experiment # ___

Title: Provide a short title of the experiment.

_____

_____

Purpose: What are you trying to find out? What do you want to learn?

_____

_____

_____

_____

Hypothesis: What do you think will happen and why?
If _?__ happens, then _?__.

_____

_____

Materials: List all of the materials used in the experiment.

-_____ -_____

-_____ -_____

-_____ -_____

-_____ -_____

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Procedure: List the steps you followed to construct and then conduct your experiment.

1._____

2._____

3._____

4. _____

5._____

6._____

7._____

8._____

9._____

10._____

Observations and Results: Describe your observations / results in a few sentences. Use your observation chart to explain what happened.

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_____

Conclusions: What did you learn from the experiment Did you prove you hypothesis or not? What would you try next tie, if you were to do this experiment again?

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