What is a wetland?

Grade Level:
6-8

Subject Areas:
Science
- Ecosystems
- Wetlands
- Ecosystem function

Geography
Wetland locations

Duration:
Depends on depth of activities

Setting:
Classroom or field

Link to Washoe County School District Standards:
Science
- 9.8.2
- 9.8.3
- 9.8.4
- 16.8.1
- 16.8.2
- 16.8.3
- 16.8.4
- 16.8.5

Geography
- 5.7.1
- 5.7.2
- 5.7.3
- 5.7.4
- 5.7.7

PURPOSE: This activity focuses on defining what a wetland is and what they are useful for. There are several in class paper activities, a field activity and a separate activity #4 that focuses on wetlands as pollutant filters. These will introduce students to the significance of some water quality measurement and how to go about collecting a few water quality parameters

SUMMARY: The students will be provided with the definition of wetlands and certain types, and the importance of wetlands as ecosystems.

BACKGROUND:

A wetland is defined based on soil, plant and water characteristics. Delineation of a wetland area and the actual definition of a wetland depend on which federal or state agency you are dealing with. The major characteristics that distinguish a wetland are:
1) hydric soils (soils that form under conditions of saturation, ponding, flooding long enough to develop anaerobic conditions in the upper part);
2) hydrophytic (water tolerant) plants; and
3) standing water covering the soil for a certain period of time.

Hydric soils are saturated with water for a long enough period of time for anaerobic or low oxygen concentrations to be present in the soils. This gives the soils distinguishing colors called gleying (black, dark grey, blue-grey and green-grey), and often mottles (patches) of black and red coloring. Sometimes the soils have a rotten egg smell. Gleying is due to iron being converted from an oxidized to the reduced state when soils are saturation with water and oxygen is depleted in the soils. This gives the soil a bluish grey color (iron is red or orange or yellow when oxidized). Mottles or patches of orange, red and yellow occur when the soils are alternately wet and dry. The rotten egg smell is caused by bacteria in the soil converting sulfur in the soil that is as sulfate (SO_4^{2-}) to hydrogen sulfide H_2S.

Hydrophytic plants are those that can survive in water. Some wetland plants like cattails actually take oxygen from the air and move it to their roots creating an oxygenated environment around their roots. Reeds have long oxygen transporting tubes. Some adaptations of wetland plants include: “knees” or bulges in the trees root system that extend above the high water mark where they take in oxygen. An example would be cypress tree roots. Some have shallow or exposed roots so the roots can get to oxygen. Plants with hollow tubes that allow them to transport oxygen to their roots, and Floating plants with roots that dangle in the water, like water lilies, are other adaptations.

In a wetland substrate is saturated by or covered with water at some time during the growing season of each year; or is inundated and saturated at a frequency and duration sufficient to support a prevalence of

hydrophytic vegetation typically adapted for like in saturated soil conditions. This results in spongy or mushy ground, water-staining vegetation in the area, high water marks and other evidence of water covering the area.

WHAT ARE SOME EXAMPLES?

Bogs-peat accumulating wetland with no significant inflows our outflows
Bottomlands or Forested bottomlands-lowlands along streams and rivers, usually on alluvial floodplains, that is periodically flooded
Marsh- a frequently or continually inundated wetland characterized by emergent herbaceous vegetation adapted to saturated soil conditions.
Swamp-wetland dominated by tress or shrubs
Playa- an arid- to semi-arid region wetland that has distinct wet and dry seasons.
Pocosins- peat accumulating, nonriparian freshwater wetland, generally dominated by evergreen shrubs and trees. These are found in the southeastern United States on the coast plain. The word means “swamp on a hill.”
Prairie Potholes- potholes are shallow marsh like ponds and found primarily in the Dakotas and Central Canada.
Mangroves- subtropical and tropical coastal ecosystem dominated by halophytic trees, shrubs and other plants growing in brackish to saline tidal waters.
Salt marsh- a halophytic grassland on alluvial sediments bordering saline water bodies where the water level fluctuates due to tide or nontidally.
Some famous wetlands are the Dismal Swamp in Virginia and North Carolina, the Great Kankakee Swamp in Indiana and Illinois, and the Mississippi River Delta in Louisiana.

WHY ARE WETLANDS IMPORTANT?
Flood control. Wetlands are often areas that are inundated during wet times of the year. Water is captured, stored, and slowly released to ground water and back to surface water. This reduces the amount of water in a river or creek and therefore the potential for flooding.
Coastal protection. In areas of the coast, salt marshes, mangroves and estuarine wetlands act as storm buffers absorbing energy and reducing impacts and erosion.
Ground water recharge. Wetlands can be areas where rainfall or flood waters gently percolates down through the ground to the ground water table. This process purifies the water.
Sediment and pollution traps. When water enters a wetland the velocity slows down. This allows sediments to settle out, plants to assimilate nutrients, and pollutants to be deposited. Nitrogen and phosphorus (nutrients) are derived from agriculture wastes, fertilizers and detergents. These are nonpoint source pollutants in freshwaters. Wetlands function to remove these pollutants from water. Many times pollutants are bound to sediments so they may be deposited and buried in wetlands. However, some pollutants like mercury can be converted to more toxic forms in a wetland environment.
High rates of biological productivity and important habitat for many organisms. Wetland ecosystems are know to have high rates of primary productivity (plant growth) and high species diversity and are important breeding grounds for many species.
Food resource. Some products of wetlands include wild rice, cranberries, and many major commercial fish and shellfish.

WHY ARE WETLANDS GOOD FOR WASTE TREATMENT?
In wetlands there are high rates of biological productivity that leads to high consumption of nitrogen and phosphorus.
High rates of sediment deposition occurs as the water slows down and is stagnant over an area, so storage and burial of wastes and pollutants occurs

Wetlands have high rates of microbial activity that consumes nutrients and pollutants and changes them to less harmful forms.
High rates of biological productivity and important habitat for many organisms.

Materials

1. Video “Fabulous Wetlands” by Bill Nye.
2. Handouts for “Wetland Habitat Identification” and “Put It on the Map.”
3. Handout for “Wetland Identification”.

Procedure

VIDEO

Show Billy Nye video on Wetlands available through A World in Our Backyard. Use this as a lead into discussion of the definition of a wetland and the role of wetlands as an ecosystem in the environment.

PAPER ACTIVITIES

Wetland Habitats Identification (from pg 89 in Wow the Wonder of Wetlands).
This activity consists of 10 habitat cards that the students read and then use a flow diagram to determine what type of wetland is described on the habitat card.

Put it on the Map (from pg 43 in A World in Our Backyard)
Students using a map of the United States will label where some of the better-known wetland types are located in the United States. Use of an atlas with maps of the United States vegetation types, land types etc can turn this into an interesting geography exercise.

FIND A WETLAND TO STUDY AND ADOPT OR DECIDE IF AN AREA IS A WETLAND

What better way to learn about a wetland than to go and study one!
First have the students brainstorm wetland areas they know around the school. See if you can identify one close to the school that the students could walk to. Go out and decide if the area is a wetland or not. If there is no wetland close to school an alternative is to have one or several of the students visit a wetland on their own and bring their observations back to the class. They present their data and the class then discusses whether the area is a wetland or not.

Some important indicators to look for:
Seasonal saturation. If there is no standing water to see whether the soils are saturated dig a hole to see if the soil is damp or wet. Are there depressions or low spots with dark water stained leaves? Are there water lines or stains on tree trunks or objects in the area? Are there thin layers of sediment that were deposited when water was standing in the area? Is there water-transported debris in the area? Does the area have organic soils? Is it black and mucky? Does it leave a dark stain when you rub it between your fingers, which would indicate that it was high in organic matter?
If the soils are more like sand and clay what color are they? Are they bluish grey? Are they mottled red brown or yellow near the surface? Does it smell like rotten eggs?
Are the plant hydrophobic species like rush or cattails?

Materials

For Plant Inventory:
Paper
Pencils

Clipboard
Twine
Wooden stakes
Measuring tape
Plant field guides
Plant data sheet

For soil survey:
Shovels
Baking pan
Soil survey data sheet
Paper
Pencil
Clipboard

Procedure
For plant inventory

1. Set up transects across the wetland area. Use twine and stakes to set up a straight line across the area. Make sure the line crosses all representative zones of the wetland.
2. Mark off equidistant intervals and flag each spot.
3. At each station record on the vegetation data sheet
    a. The kinds of plants
    b. Approximate height
    c. Number of each plant type within a certain area at the flagged point.
    d. Sketch the plant
4. Make observations. Are there wetland plant roots visible? Are the plants dead or alive? Are there any unusual smells?

For the soil survey

1. Choose three sites along the transect to dig soil pits or cores. Try to make them representative of the different terrain in the wetland.
2. Dig a pit at each site, about 1 to 2 feet deep and 18 inches deep or to the water table.
3. Make observations and record on data sheet.
4. Fill the pits before you leave.

Resources

A world in our backyard: A wetlands educational and stewardship program. Video by Bill Nye www.envmedia.com/catalog/products/a_world_backyard.html. Printed material 144 pages with information and activities

Wow! The Wonders of Wetlands. Book with activities and handouts from Environmental Concern Inc.
201 Boundary Lane, P. O. Box P, St. Michaels, MD 21663
410-745-9620

Wetlands, 3rd edition, 2000, by W.J.Mitsch and J. G. Gosselink. New York: John Wiley and Sons, 919 p.

Vocabulary Words

wetland
hydric soil
hydrophytic plants
halophytic plants
nitrogen
phosphorus
pH