Beneficial Functions of the Wetlands

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The Fragile Fringe – A guide for teaching about Coastal Wetlands

Objectives:

1. **To illustrate the value of the wetlands as a nursery for young organisms**
2. **To show the value of the wetlands in controlling erosion and retaining water**
3. **To demonstrate the role of the wetlands in absorbing/filtering pollutants and excess nutrients that would ultimately affect the Gulf of Mexico**

The human view of the wetlands is, on occasion, focused too narrowly on the economic value of the area. There is no doubt about the economic value from commercial and recreational fishing, trapping for hides and furs, and tourism. Wetlands, however, have functions that are overlooked as a vital part of the ecosystem. Wetlands provide homes for juvenile organisms that need the protection of the grasses, more shallow water, and a sufficient food supply to grow into adults. They also provide temporary refuge for an extraordinary number of migrating birds. The structure of wetlands allows them to protect, in effect, the Gulf of Mexico as they absorb some of the pollutants and excess nutrient compounds that would otherwise drain off into the gulf and upset the chemical balance there. Because of wetland plants like *Spartina* (wiregrass and oystergrass) and their root systems, the flow of water across the area is slowed, which reduces erosion and enables the water to soak in and, under the appropriate conditions, supply surrounding aquifers with water. These fragile areas must be protected so they, in return, will continue to function as protectors of the coastal areas and wildlife.

Activities: (for elementary students)

1. On a tile or wooden floor (the size of the floor area will be determined by the number of groups and the number of students in each group), drop 100 squares of paper, 1cm X 1cm, of several different colors. The different colors represent the various juvenile species (shrimp, red drum) that use the wetlands/estuaries for protection and feeding grounds until they are old enough to move into their adult habitat. The students are the predators of these juvenile organisms. The students can use their fingers (very young students) or forceps (older students) to remove the "organisms" from the wetland. Allow the students to pick up "organisms" ONE AT A TIME for 30 seconds. Count the number of organisms remaining in the wetland.

Cover the same area of the floor used above with a piece of deep-pile or shag carpet that has at least one of the colors of the paper used. This will represent the real wetlands with the plants that provide shelter and camouflage for the juvenile organisms. Repeat the same procedure with the squares and predator activity. The number of "organisms" surviving this time should increase since the "plants" provide protection from the predators and they are not as easily spotted.

Extensions: (upper elementary and middle school):

a. Continue the activity for several growing seasons and graph the numbers of organisms that survive.
b. Calculate the percent survival for each season and for the overall activity.
c. Make the activity more realistic by reducing the number of organisms each consecutive season by the percent of organisms that are eliminated by predators. This should show a drastic change in the scenario without protection for the juveniles.
d. Have the students do research on shrimp and red drum and produce food webs for the juveniles in the estuaries and the adults in the Gulf.

(for elementary - middle school students)

2. Demonstrate the change in the rate of flow of water and the amount of sediment carried when plants are introduced in a drainage pattern. Cover the bottom of a large baking pan (deep enough to contain enough soil to "plant" vegetation) with a two inches of soil. Tilt the pan and pour a given quantity of water (a quart to a gallon depending on the size of the pan) onto the soil (a watering can will simulate rainfall; pouring water directly from a bottle will simulate stream flow and will increase sediment transport). Try to empty the container of water in the same amount of time for each trial.

Measure the amount of time with a stopwatch (or second hand of a clock) it takes the water to get from the top of the pan to the bottom. Catch overflow in a dishpan. Using a relatively small diameter container, collect the overflow and water that reached the bottom of the pan and let it settle. Record the amount of water that reached the bottom (a mark on the container will be sufficient if you do not have a beaker) and the amount of sediment that settles out of the water.

You can measure the depth of the sediment if you use the same container to catch the water on the next trial since the diameter of the container will be the same. (If you have access to an Imhoff Settling Cone, you can read the amount of sediment directly but this is not necessary) Repeat the same process but "plant" some vegetation in the soil (you can use weeds that you pull up out of the school grounds - include the roots for a more realistic situation). Put as many plants in the soil as you can since an effective wetland would contain a high concentration of plant life. For this trial, the water should take longer to get to the bottom of the pan, less water should make it to the bottom, and there should be less sediment than with the first trial. (NOTE: this is a simple exercise for introducing the concepts of controls and experimental groups in scientific investigations.)

Have students discuss reasons for the following:

1. Why was there less runoff when the plants were in the "wetland"? Discuss the "sponge" capabilities of the coastal marshes.
2. Why was the time different for the second trial?
3. Why was there a difference in the amount of sediment deposited in the two trials? How is this important to the wetlands?

Extensions: (middle - high school students)

a. Investigate and set up an experiment to demonstrate a wetland's capabilities of reducing the amount of pollution entering the Gulf of Mexico. Suggestion: Use a plastic flower plot with drain holes in the bottom to allow you to catch the water draining through. Fill the pot with soil. Mix water (about a quart) and diatomaceous earth (this will become suspended but not dissolve) and pour this over the soil. Collect the water that drains through and compare it to what you poured in. This will show the reduction of materials draining out of the wetland into the nearest body of water.

b. Runoff from farming communities poses a problem to streams, rivers, bayous, and even the Gulf of Mexico because it contains excess nitrogen and phosphorous compounds that change the amounts of aquatic vegetation. Research the effects of these compounds (primarily from fertilizers) on the plant and animal life in water bodies. Find recent examples of these occurrences in wetland areas.
c. Use the information in #2 to describe the effects of contaminants on a food web in a stream or bayou. What influence could this have on the juvenile organisms living in the estuaries? Discuss any effects on the fishing and/or shrimping industries.
d. (for physical science and physics students) Discuss the carrying capacity of water as related to velocity. Find historical examples of destruction by fast-moving flood waters.

(for elementary students)

3. Demonstrate the concept of how a water table works and a wetland's ability to replenish aquifers. Older students can work in small groups and perform the activity on their own.

Use a large baking dish or dishpan (at least 10" X 13") for this activity (Fig. 1). Place a large sponge in one end of the pan to represent a wetland. Add enough sand to the rest of the pan to make a level landscape. Add water to the pan so that the sponge is completely saturated and the sand is saturated but not covered with water.

First, scoop out a spoonful of sand (to a depth below the water table) and let the students observe the filling in of the hole. Discuss the water table. Make a stream several inches away from the wetland by making an indention into the sand from one side of the pan to the other. To demonstrate the wetland's ability to replenish lost water, use a dry sponge and soak up the water IN the stream. Have the students observe the resulting water movement. The sponge or wetland is going to give up its water as the water in the sand moves into the "dried up" stream.

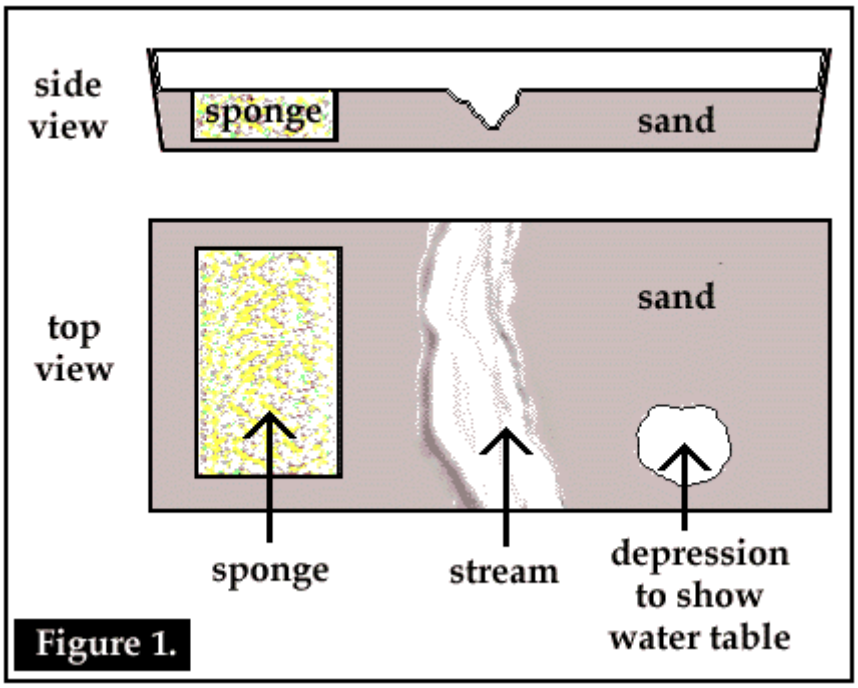

Figure 1.

Extensions: (for middle-high school)

a. Have students relate the movement of water to changes in concentration and flow between areas of high and low concentrations and identify the laws that govern these physical principles.
b. Have students research pollution and water tables. Identify historical examples of delayed problems with water sources related to pollution.