Get Your Hands and Feet Wet
(Fieldtrip)

Overview
Once students have studied wetlands in the classroom, they are ready to experience a wetland habitat firsthand, exploring its physical components and discovering its many organisms.

Title

Get Your Hands and Feet Wet

Investigative Question

What organisms are present in different parts of a wetland and does temperature or pH differ in these parts?

Overview

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Objective

To sample the organisms in a wetland habitat, to take its physical measurements, and to establish a database on that habitat and its occupants

Materials

Multiple copies of student pages 1-4, field guides for the various organisms likely to be found, white enamel or plastic pans, folding pocket magnifying lenses, forceps (tweezers), large and small eyedroppers (a turkey baster works well for the large eyedropper), plant rake (a small garden rake will do), sorting screens (fine and coarse mesh), aquatic net, collecting jars, simple dredge for bottom sampling, box with a glass bottom, graph paper for mapmaking, and boots (for the students measuring water depths and temperatures) and sampling equipment.

The equipment needed for wetland sampling need not be sophisticated or expensive. Although most of the items described in the procedure are available commercially from biological supply houses, students should be encouraged to construct their own equipment. Suggestions for student-made equipment are given below. In some cases, alternative equipment is suggested that may be available from local merchants.

Time

One field trip to a wetland each season.

Advance Preparation

Find a suitable wetland location for students to sample. If possible, choose a single wetland area near your school and learn everything you can about it. Visit the area over several seasons with different classes, and before long you will have developed a good understanding of the natural history of that particular habitat. Have students record their observations on the chosen site and maintain this information as a permanent "wetland database." Your database can be kept in file folders or computerized. Such a file of information is extremely valuable, particularly because it allows students to compare current data with information from past years.

Include a natural history collection with examples of the different types of organisms students have found. Changes in the physical and biological makeup of the habitat, as well as seasonal changes, can be documented if identical measurements are taken from year to year. Organisms collected in subsequent years can also be compared with the class reference collection to aid in identification and to note differences in the fauna and flora from year to year. Such information, obtained in a uniform way over many years, is called *ecological benchmarking* and is a powerful tool for monitoring habitat change.

Also remember that the area should be disturbed as little as possible by each class so that it will remain as natural as possible. Choosing a site for long-term study by your classes may be the most difficult part of this exercise. The habitat or area to be studied should have the following characteristics:

1. Some standing water for most of the year and water less than 6 feet deep during the wettest part of the year

2. Emergent vegetation along the shoreline (cattails, arrowheads, etc.)

3. Accessibility

4. Permanence (avoid sites likely to be destroyed within a few years)

Ponds can be used for this exercise if they meet the above criteria. The pond must be shallow, however, and have vegetation along its shoreline; otherwise the organisms found may not be representative of a wetland. Other wetlands that may be used include the shallow end of a large lake, preferably where a meandering stream enters it, or a true cattail marsh (although access to the shoreline may prove difficult here). Even a roadside ditch will serve if it has been in existence for several years, holds water for most of the year, and has typical wetland vegetation.

Procedure

1. Students should have completed at least some wetland invertebrate activities before they visit a wetland site. Before leaving the classroom, divide students into working groups of four or five and assign each group one of the data-collecting tasks described below. Assign one student to serve as photographer or assume this role yourself. Distribute copies of the data and identification sheets listed on the previous page.

2. Each group conducts its assigned task at the site and records the data on the appropriate information sheets. Explain that the process of replication is extremely important in any scientific endeavor. The group taking temperature measurements, for example, cannot rely on a single measurement from a given depth but must repeat the process several times to obtain an average reading for that depth. Students sampling the bottom with a dredge must repeat the process several times in the general area, making sure they do not resample an area just sampled and therefore already disturbed.

   A separate data sheet for organisms should be used for each replication. After students return to the classroom, they can combine, summarize, and average data from the various replications. Replication applies to all activities listed below except photography. An alternative approach is to have each group of students complete only one replication of a task and then change activities so that all groups have an opportunity to perform every task.

3. A small garden rake can be used to collect samples of emergent and submerged aquatic vegetation. Samples should be placed in enamel or plastic pans, usually in water, for further examination. Plants for the reference collection should be pressed (in a plant press, if possible); labeled with name, date, location, and collector; and stored as dried specimens.

4. Sorting screens are useful for separating bottom-dwelling animals from mud and debris. Two sizes should be constructed, one from hardware cloth (relatively large holes) for separating larger objects from the sample of bottom debris and one from regular window screen for capturing very small animals. After collecting the bottom sample with a dredge (see item 6 below), a student holds the screen with the larger mesh on top of the other screen, pours the sample onto the larger screen, and rinses the sample with water to wash mud, silt, and smaller particles onto the lower screen.

   The top screen is then examined for organisms, which should be carefully collected. Examine the lower screen to collect smaller organisms. Both screen samples may be washed into enamel pans for further study. Hard bodied insects may be pinned, labeled, and stored as a typical insect collection; soft-bodied animals and submerged plants should be stored in 70% ethyl alcohol. Labels should be written in pencil and dropped in the jar with the specimens.

5. The most useful sampling device is a long-handled dip net. The rim of the net must be sturdy enough to withstand being swept through vegetation tangles and other debris in the water. Nets may be purchased from supply houses or made by purchasing a fishing dip net, removing the rather large mesh bag and replacing it with a hand-sewn bag of sturdy muslin. If the net is to be dragged along the bottom, one side should be flat so that a larger area can be sampled (see below for construction). Samples may be dumped into an enamel pan or washed through the sorting screens before dumping them into the pan.

6. A dredge may be made by bolting a fruit juice can to a broom handle or other long pole. Flatten one side of the can to increase its contact with the pond bottom. Drill several small holes in the bottom of the can so that excess water flows out during sampling. Process the sample as noted above by screening and placing in an enamel pan.

7. A simple device will enable students to see what's happening underwater. Cut a square hole in the bottom of a plastic tub. Use silicone aquarium cement to glue a piece of glass over the hole so that the tub remains watertight. Paint the inside of the box black to reduce glare. When the box is placed just under the surface of the water, surface glare is eliminated and students can observe the activities of organisms underwater. Appoint one student to report observations to another student who serves as note-taker; include these observations with the other data collected during the field trip.

8. Tie a piece of twine to an ordinary thermometer. Use a waterproof marker to indicate one-inch intervals on the string. When the thermometer is lowered into the water, temperatures may be measured at any depth. Remind students to account for the distance between the bulb of the thermometer and the beginning of the string. After the thermometer has been lowered to the desired depth, it should be left there for a few minutes to allow the temperature to register. The thermometer should then be pulled up quickly and the temperature recorded.

9. A simple kit for testing water pH (acidity or alkalinity of the water measured as the concentration of hydrogen ions) may be purchased from a pet store. Changes in the pH of wetlands can have drastic effects on the plants and animals that live there. Sources of hydrogen ions include soil and atmosphere (rain falling through polluted air yields acid rain).
10. Use a camera to record seasonal changes around your chosen site. Place permanent stakes around the margin of the wetland and take pictures, facing in the same direction, each time you visit the area. One or two pictures from each station is sufficient. You will soon have a record of the above-water changes that occur as the seasons change.
11. Students who are sampling the plants and animals in the wetland will be able to identify only a portion of the organisms they collect. Field guides and the plant and animal identification sheets will help with identification. All organisms collected should be identified at the site and returned to the water, with the exception of those that will make up the class reference collection. In some instances, students may wish to keep certain plants or animals alive in a bucket of water to be identified the next day in class. Remember that each specimen that is placed in alcohol should be accompanied by a label written in pencil and listing the collection site, date, time, collector, method of collection, and identity of specimen (if known).
12. A student or group of students may be designated as mapmakers. With graph paper calibrated to X number of feet per unit, students should map the study area as accurately as possible. Later, a larger version may be produced in the classroom, and students can add information to the map from their sampling data. Include information on water depth and pH, distribution of emergent and submerged vegetation, and dredging sites. These maps should be saved from year to year. They will prove to be invaluable in documenting changes in the area over time and will become part of the permanent database for your wetland.
13. The information students have recorded on the data sheets can serve as a permanent database for the site. In addition, you may wish to set up a simple computerized database into which students enter the information collected. The reference collection should become a permanent part of the classroom and can be used by students to identify organisms collected on subsequent trips to the site.

Assessing the Activity

The information collected at the site and its incorporation into the ongoing database serves to evaluate the success of this activity. Students should compare their results with previously collected results and attempt to explain any possible changes.

State Goals

11, 12

Concept

Different factors can affect what types of organisms are found where and these things can change over time. Long term studies are important in ecological research.

Safety and Waste Disposal

Obtain permission before entering private land. Watch for poison ivy.

Student Page 1 – Data Sheet: Wetland Organisms

Sample number or replication _____________

Sampling method (circle one): plant rake dredge aquatic net

Location of sample (circle one): shoreline bottom surface of water

Record on the lines below each kind of organism found and the number of individuals found. Identify organisms to the lowest level possible. Be as specific as you can. For some—worm, mussel, or insect, for example—you may be able to supply only general terms; for others, you may be able to identify the species (for instance, cattail, arrowhead, whirligig beetle).

Kind of Organism	**Number of Individuals in Sample**

Student Page 2 – Data Sheet: Temperature and pH

Temperature. Choose three water depths and complete three replications at each depth.

Sample	Replication	Depth	Temperature	Average temperature
A	1			
	2			
	3			Sample A __________
B	1			
	2			
	3			Sample B __________
C	1			
	2			
	3			Sample C __________

pH (acidity or alkalinity). Choose three sites (shoreline, shallow water, deepest water) and complete three replications at each site.

Sample	Replication	pH	Average pH
Shoreline	1		
	2		
	3		Shoreline ___________
Shallow	1		
water	2		
	3		Shallow water ___________
Deepest	1		
water	2		
	3		Deepest water ___________

What is the average temperature of the entire wetland?____________

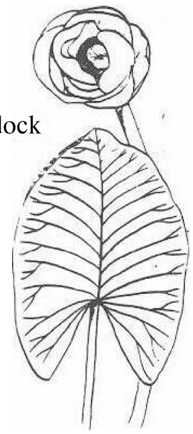
What is the average pH of the entire wetland?_____________

Which data are most meaningful—averages by depth and location or averages for the entire wetland?

Why?

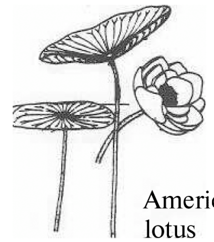
Wetland Plant Identification

Water U
horsetail



Spatterdock

White water
lily

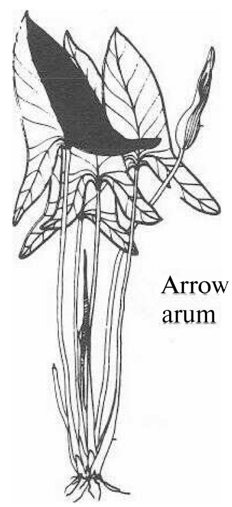


American
lotus

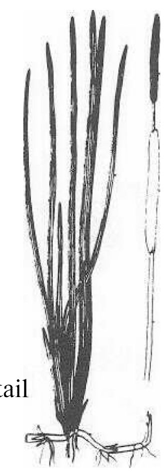
American
elodea

Water
smartweed

Common
arrowhead

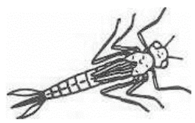


Arrow
arum



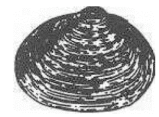
Cattail

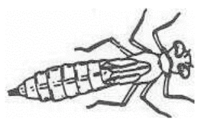
Wetland Animal Identification

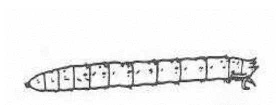

Damselfly nymph

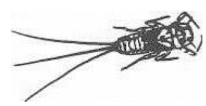

Caddisfly larva

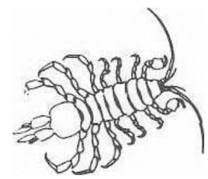

Crayfish

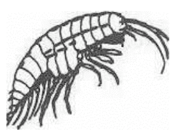

Clam/mussel

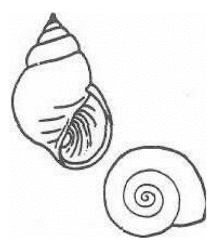

Dragonfly nymph

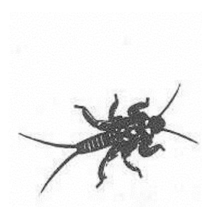

Crane fly larva

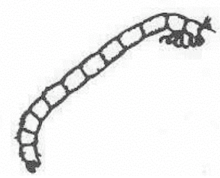

Mayfly nymph

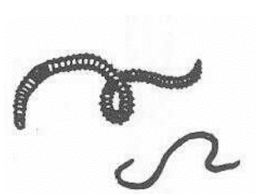

Sowbug

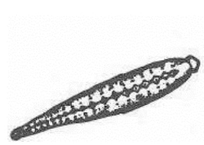

Scud

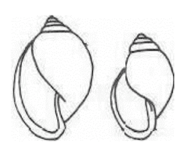

Right-handed/other snails

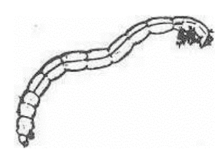

Stonefly nymph


Midge larva


Aquatic worms


Leech


Pouch/left-handed snails


Blood worm
midge larva

Building an Aquatic Net

Aquatic nets can be purchased from biological supply houses, but they also can be made at home or in the classroom.

Materials

- large wooden dowel or discarded broom handle 4–6 feet long
- sturdy wire (no. 4 or 6) approximately 50" long, to be bent as shown in Figure 1.
- white muslin cloth for bag (Figure 2) and canvas cloth (or other sturdy cloth) for rim band (Figure 3)
- hose clamps to secure frame to handle
- needle, thread, straight pins (sewing machine is preferable)

Construction

Net bag. Cut two muslin triangles with the dimensions shown in Figure 2. Sew the triangles together along the seamlines, allowing 1/2 inch for the seams. Turn the bag inside out so the seam edges are on the inside. Fold a band from the canvas cloth as shown in Figure 3 and pin it around the top of the net bag (Figure 4). Leave approximately 4 inches of the bag unbanded to allow room to insert the wire frame (Figure 5). The final product is a two-sided bag that slides onto a three-sided wire frame. Because the top of the net will receive most of the stress during sampling, double stitch where the canvas and muslin cloth are joined.

Frame. Shape the triangular frame as shown in Figure 1; make one stem 1/2 inch shorter than the other.

Handle. On opposite sides of the handle, score grooves for the two wire stems. Use a small wood gouge or a sharp knife. Drill two holes that match the diameter of the wire at the end of each groove to accommodate the end of the wire (Figure 5).

Assembly

Thread the wire triangle through the band at the top of the bag. Position the wire frame into the handle using the grooves and holes and fasten securely with one or two hose clamps (Figure 5).

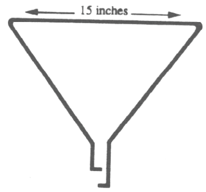


Figure 1

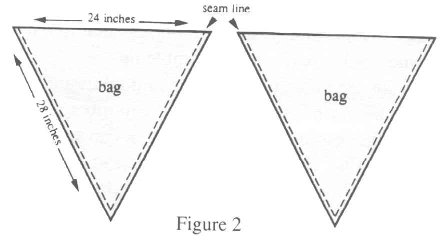


Figure 2

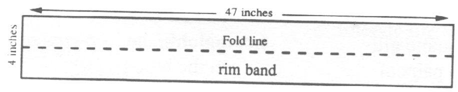


Figure 3

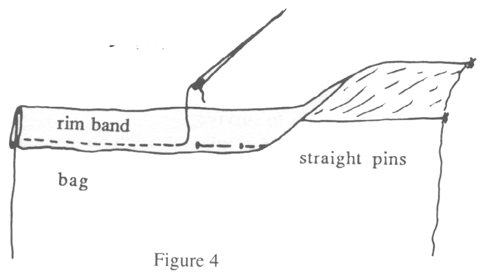


Figure 4

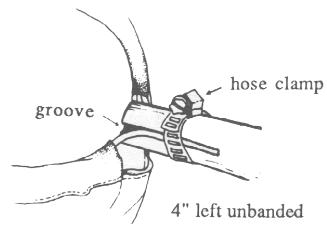


Figure 5