Activity 1: Plant Inventory

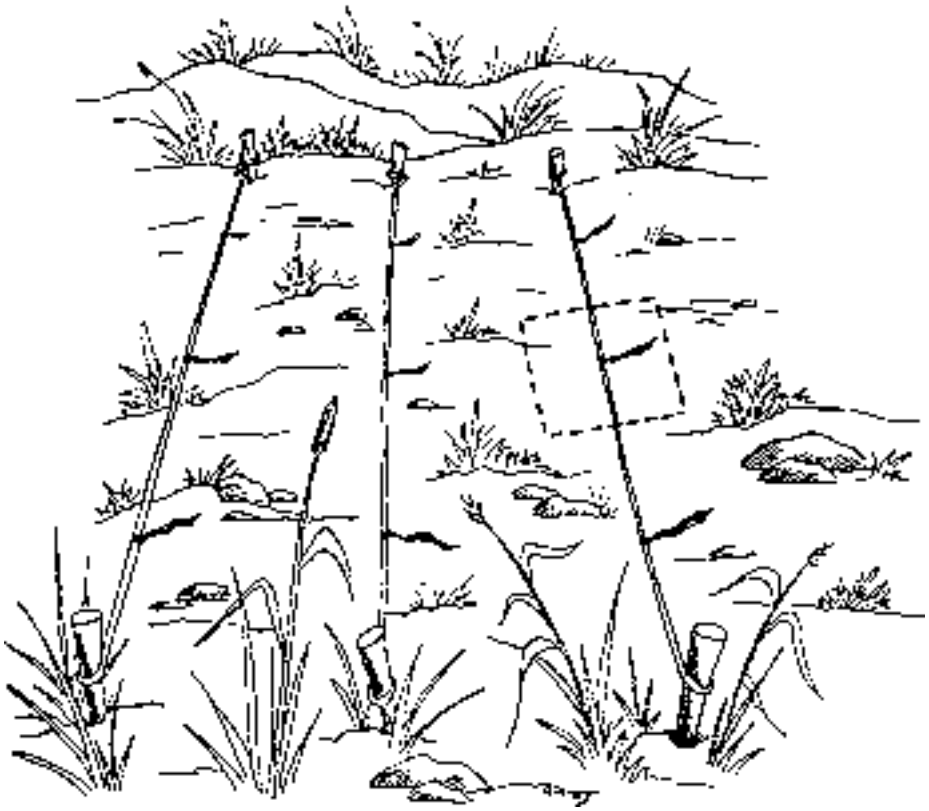
Tasks 1) Set up a plant transect *;

2) Identify as many different types of vegetation as possible in the wetland and

3) Compare upland and wetland species by observing differences in their structure.

* *A transect is a method used to evaluate the landscape of a natural area by recording observations at regular intervals along a straight line and using that information to produce a base map of the site.*

Materials Paper, pencils, clipboards, twine, wooden stakes, flagging tape, measuring tape, plant field guides (see the *Appendix*), measuring tape, copies of plant illustrations from Chapter II.



plant transect

Procedure

1. Begin by setting up a transect. Use the twine and stakes to run a straight line across the wetland. Make sure the line crosses all representative zones of the wetland – from boundaries with upland areas to the edges of standing or running water (avoid running it *through* water). If your wetland is very small (less than half an acre), you can make several transects.
2. Mark off intervals on the twine every 10 to 15 feet with flagging tape. Stick to whatever interval you choose, even if there is a tree at the spot. Give each flagged station a number.

3. At each station, one student in the group should be designated the *measurer*. This person will stand over the flag and stretch his/her arms out wide, both parallel and perpendicular to the line. This distance is the dimension of the study area at each station.
4. Designate someone as a *data keeper* who will record the following information for each station:
   1) kinds of living plants;
   2) approximate plant heights (using measuring tape); and
   3) the number of each plant type.
5. Answer the *Making Observations* questions below for each station, if time allows.
6. Designate a person in your group to sketch a profile of each station.
7. Draw and/or photograph at least two plants per station.

Making Observations

- Are wetland plant roots visible?
- Are plants alive or dead?
- Is there anything unusual at the station that might influence the kinds of plants growing there – a wind-thrown tree, a large boulder, hummocky ground surface, etc.?
- Are there any unusual smells?
- Can you observe any differences between the wetland plants and upland species? Can you identify any upland plants or trees?
- Which species are able to live in both upland and wetland habitats?
- Is there any difference in the diversity of plants in the upland habitat compared to the wetland habitat?

Vegetation Data Sheet

Station #	Plant Types	Average Height (ft)	# Plants	$\frac{\text{\# plant types}}{\text{total \# plants}} = \%\text{total}$
Example: 1	*willow, tree*	*12 ft*	*2*	

✎ On a separate sheet of paper sketch a profile of at least three of your stations.

Activity 2: Soil Survey

Tasks To observe soil profiles and record wetland soil characteristics.

Materials Shovels, baking pan, soil survey data sheet

Procedure

1. Choose three sites along the transect line to dig soil pits or cores. One sample should be closest to the upland boundary of the site, one midway through the wetland, and one close to standing or running water (if present).
2. Dig a pit at each site, about 1 to 2 feet square and at least 18 inches deep – or until you reach the water table.
3. Use all your senses (*except taste*) to make observations of the soils and record these on the data sheets.
4. Reconstruct a profile of each soil station on the baking pan to take back to the classroom.
5. Fill in the pits before leaving the site to prevent wildlife from falling and becoming trapped in them.

wetland soil profile

Making Observations

- Is the soil the same from top to bottom in the pit, or are there distinct layers, like a cake?
- What colors do you notice?
- How does the soil smell?
- Pinch the soil from different layers between your fingers and feel the texture – is it rough or smooth?
- Does the soil leave stains on your fingers?
- Is it wet, damp, or dry?
- Is there any identifiable plant material (leaves, stems, roots) in the upper soil layer?
- How deep do plant roots penetrate the soil?
- What organisms (insects, earth worms) are living in the soil?
- What are the differences between the three pits?

Soil Survey Data Sheet

	Soil Characteristics		
	Station 1	Station 2	Station 3
Number of soil layers			
Color			
Smell			
Texture (fine, gritty)			
Does it stain your fingers?			
Degree of wetness (wet, damp, dry)			
Presence of organics (leaves, roots)			
Presence of living organisms (insects, earth worms)			
Depth of plant roots			

Activity 3: Wildlife Inventory

Tasks Record direct and indirect observations of wetland wildlife.

Materials Field guides *, collection containers, wildlife data sheet, base map

* Refer also to Chapter II for a reference list of the wetland wildlife you might expect to find in your wetland.

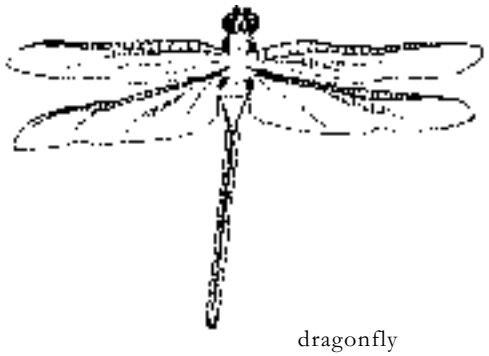
Procedure

1. Equip as many people in your group as possible with field guides to help you identify birds, mammals, amphibians, reptiles, fish, and insects.
2. Begin your approach to the wetland area quietly to avoid scaring away wildlife.
3. Walk through the wetland and along its borders and look for signs of animal life. You will probably find less *direct* evidence of wildlife (*seeing* the beaver, woodpecker or vole) than *indirect* evidence (burrows in the ground, the tap-tap-tap sound on a tree, animal excrement called *scat*, remnants of a beaver dam, animal tracks, etc.).
4. If there is standing water on your site, look for insects, fish, and other aquatic organisms.
5. On the worksheet, list every organism or indirect evidence you observe and mark its location on the base map.
6. If you collect any specimens for study, be sure to pick them up with *wet* hands and include a piece of their habitat (e.g., bark, floating plants) with them in your collection container until you are ready to return them.

Making Observations

- What color is the specimen? What is its shape and size? Where specifically did you find it (in the water, under a rock or log)? How does it move? How does it breathe?
- Think about the role, or niche, of each organism in the wetland – is it a predator, is it prey, or is it both?
- Why is the animal found here? Is there any particular reason why it depends on a wetland for habitat?
- Why are food chains important?
- List at least three characteristics of a wetland habitat.

greenhead fly



dragonfly

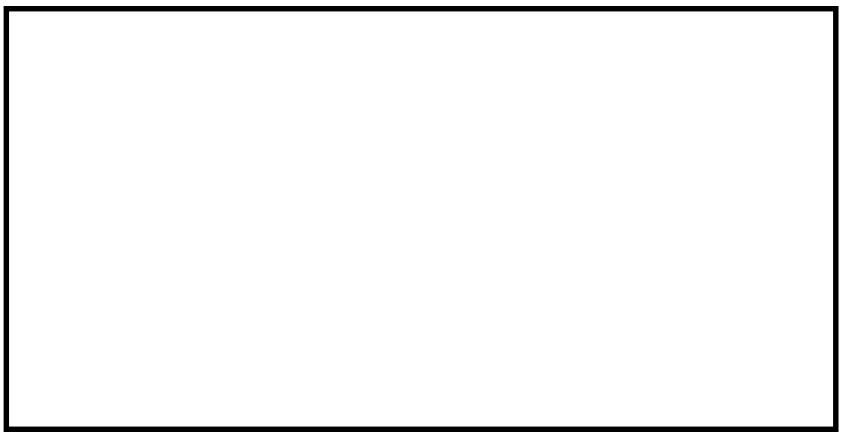
Wildlife Data Sheet

Name _____

Phyical characteristics _____

Where found _____

Drawing:



What it might eat (prey) _____

What might eat it (predator) _____

Other observations _____

_____

Back in class, use a field guide and try to identify one organism in each feeding level that you'd find in a wetland:

producer _____

herbivore _____

carnivore _____

omnivore _____

scavenger _____

parasite _____

Using any of the organisms above, construct a wetlands food web:

Sun ⇨ ⇨ ⇨ ⇨

Activity 4: Water Watchers

Tasks If there is a body of surface water at your site, your group will investigate characteristics of water – water velocity (for running water), temperature, dissolved oxygen, and pH. If your site has no visible standing water, skip to step 6.

Materials Thermometer, litmus paper, measuring tape, stopwatch, wiffle ball (or other buoyant object), sampling bottles, water watchers worksheet, water quality monitoring kit (optional).

Procedure

1. Choose three sites in the wetland area for sampling and mark their location on the base map.
2. Use the worksheets to record temperature of air and water, pH, and visibility. If your class has access to water quality monitoring kits, perform these activities now.
3. To record the velocity of running water, place a wiffle ball or other small, buoyant marker in the water. Designate someone as the timekeeper, and release the marker while starting the stopwatch. When the object has traveled a known distance (10 feet, for example) stop the stopwatch and record the time and distance traveled.
4. Calculate the water velocity by dividing the distance traveled by the time (Distance/Time = Velocity). Record your results. Make sure to include appropriate units for your calculated velocity.
5. Next, use the *Evidence of Point & Nonpoint Source Pollution* handout to identify any strange or unusual materials in the water. Share this information with the group looking for activities impacting the wetland.
6. If there is no standing surface water on your site, you will have to do more observing and less testing. Try to figure out how water is getting to the wetland site and determine the following:

- Where do you think the water on this site is coming from? In which direction does it seem to be traveling? Where does it go?
- Are there any rivers or ponds nearby?
- Are there high points of land nearby?
- Are there any road drainages leading to the site?
- Try to remember the weather lately – has it rained recently? If so, is there any evidence that water has been retained on your site?
- What is the quality of the water coming onto the site?
- Does the quality of the water seem to change as it enters the wetland?
- How is nearby land being used?

7. If possible, dig a few pits in the ground and see if you can hit the water table. Record the depth to groundwater in three different locations.

Evidence of Point & Nonpoint Source Pollution in Waters

Condition	Possible Cause
Muddy water	Erosion of soil in upstream area; in tidal waters the cause could also be high winds.
Greenish color	Microscopic plant cells called algae. Algae growth may exceed normal limits due to excessive nutrients in the water. Nutrient sources include: fertilizers, pet waste, grass clippings, and leaves.
Yellow-brown to brown water	Acids released from decaying plants. Naturally occurs each fall when dead leaves collect in the stream. Common in streams, draining marsh or swamps.
Orange to red on stream bed	Results from bacterial action upon iron. May indicate a high erosion rate or industrial pollution.
Colored sheen on water surface	May indicate oil has entered the stream, particularly if the water surface also has an oily odor.
Foam	When foaming occurs in only a few scattered patches and is less than three inches high and is cream-colored, it is probably natural. If the foaming is extensive, white in color or greater than three inches, it may be due to detergents entering the stream.
Rotten egg odor	Could indicate sewage pollution, but in a wetland it is often the result of sulfides released from the soil.
Yellow coating on stream bed	May indicate polluted water draining from a coal mine.
Musky odor	May indicate presence of untreated sewage, livestock waste, or algae.
White cottony masses on stream bed	Could be *sewage fungus*. The presence of this growth indicates sewage or other organic pollution.
Blue-green algae	Could indicate sewage or other pollution if growth is excessive.

Adapted with permission from the Riverways *Adopt-A Stream* program materials, Mass. Dept. of Fisheries, Wildlife & Environmental Law Enforcement.

Water Watchers Worksheet

I : Rate of water flow (velocity)

Station #	Distance (ft)	Time (sec)	Velocity (ft/sec)

II : Temperature, dissolved oxygen & pH of water *

Station #	Temperature	Dissolved Oxygen	pH

air temperature _____

*date of recording*_____

* This data table map may be replaced by those included in water quality monitoring kits (e.g., Lemott or Hach).

Activity 5: Sounds, Shapes, Colors, and Prose

Tasks Make an artist's inventory of the wetland by describing, illustrating, and photographing its shapes, colors, and sounds.

Materials Sketch pads, writing paper, pens, colored pencils, tape deck, still or video camera.

Procedure If appropriate, divide your group into subgroups and perform the following:

Shapes/colors

- Describe the shape and color of the objects on top of the land.
- Describe and draw the biotic (living) component and the abiotic (non-living) component.
- How will the shapes and colors of the area change with the seasons?
- Pick one small feature (a plant, insect, fallen log) of the wetland that appeals to you and draw a picture of it.

Sounds

- What are the loudest sounds? The quietest sounds?
- What are the most distant sounds? The closest sounds?
- What are the most pleasant sounds? The most unpleasant ones?
- Can you differentiate between natural and "human generated" sounds?
- If you didn't know where you were, would your sense of hearing help you determine your location?

Writing

- Describe the different parts of the wetland; e.g., where it is wet, muddy, paved, overgrown, scary, pretty.
- Think about the *Wetland Metaphor* activity; do any of the metaphors apply out here?
- Describe the sensations of being outside.

Activity 6: Changes to the Wetland

Tasks Observe and document any impacts that people have made to the wetland interior and boundaries.

Materials *Changes to the Wetland* data sheet, pens or pencils, base map, camera (optional).

Procedure

1. Depending on the size of the wetland, you may want to split up into groups to investigate different areas. Use your *Changes to the Wetland* data sheet to look for and record specific land uses and any man-made structures located in or near the wetland. Make note of any impacts to the wetland that could have been caused by these activities, such as filling, dredging, erosion, pollution, etc. Be sure to record these activities on the base map.

   Look for Signs of Encroachment:

   - Are there areas that have been dug out (dredged) or filled in?
   - Has water been drained off the site?
   - Is water coming on to the site through culverts or drainage ditches?
   - How is the land used near the wetland? How might this affect the wetland?
   - Are there old stone walls or other historical remnants?
   - Have trees been removed?

2. Mark any of these findings on the base map.
3. If possible, document any evidence of harmful activity by photographing the portions of the wetland that show signs of filling, erosion, pollution, or improper development. These photos will be helpful as documentation to municipal officials, such as conservation commissions, who are interested in protecting community wetlands. Even if the alterations are not recent, this information represents a snapshot in time that is useful for later reference.

Changes to the Wetland

Types of Development Located Along the Wetland Boundaries:

Urban: _____

_____

Suburban: _____

_____

Rural: _____

_____

Agricultural: _____

_____

Industrial: _____

_____

Commercial: _____

_____

Residential: _____

_____

Be on the lookout for the following human activities and building structures – draw them on the base map of your wetland:

* Discharge pipes
* Construction work
* Parking lots
* Roadways / driveways
* Buildings
* Woods / open space
* Landfills
* Steep slopes
* Lawns
* Farming / pasture
* Logging
* Highways
* Stored equipment spilling over into the wetland from nearby property
* Dumping
* Unpermitted vehicle access
* Alteration to fencing

Activity 7: Mapmakers

Tasks Refine the measurements of the wetland base map.

Materials Compass, protractor, tape measure, graph paper, stakes, compass reference text,* paper, pens.

Procedure

1. You will first need to determine the average walking pace of one person in your group. The walking pace will be used to measure the area of your wetland. With a tape measure extended, have one person walk naturally while another student measures the distance of each pace (a typical adult pace is about 3 feet). You will use the following equation to determine the distance between each staked area in the wetland:

   (measured pace) x (number of steps taken between each stake) =
   the distance between stakes

2. Place stakes around the wetland boundary so that a student can walk a straight line between stakes. Number each stake, and pace off the distance between stakes.
3. Designate at least two students as *pacers* for each measurement; combine the total and divide by two to get an average. Record the distances. Repeat these measurements around the wetland.
4. Once you have measured the distances between each stake, determine a scale for your base map (the graph paper), such as 1 inch = 10 feet or 1 inch = 100 feet.
   Plot your measurements on the graph paper, using a protractor to transfer the compass bearings. Make sure the map includes a compass rose or a north arrow.
5. Once the wetland boundaries and map scale are established, mark the major landscape features on the map, such as nearby roads, buildings, streams, etc. Work with the other groups to incorporate their data on the map as well.

* Refer to the following publication for assistance in map and compass reading:
The Basic Essentials of Map & Compass by Cliff Jacobson. ICS Books, Inc., Merriville, IN. 1988.

Activity 8: Bringing It All Together – Making a Field Guide

Students will have gathered quite a bit of information about their wetland and can put this information to good use in the wetland protection activities that follow in Chapter VII.

Objective Students will work together to assimilate the qualitative and quantitative information they have gathered in the field so it can be shared with others. (Bear in mind that the there is another important layer of information to follow concerning the history of land use and the ways to protect wetlands; however, the class should first consolidate the results of their field work.)

Procedure Look at a few field guides * (birds, insects, amphibians, etc.). Discuss the purpose of field guides — they organize information so that it is useful to other people. How can the class organize all its field information so that someone could learn about its wetland by reading the class's field guide? A table of contents might include:

a. directions to the wetland
b. what region of the country your wetland is found in; what type of wetland it is
c. map of the wetland
d. water: where does it come from and where does it go?
e. soil characteristics
f. plant species and communities
g. animal species, niches, and habitat
h. changes to the wetland
i. sounds, colors, and prose

The class can be divided into groups to assemble each chapter. The groups might be the same as the field groups with a few students pulled out for introductory sections. Have students share their information with the mapmakers. The class might choose to put all data on one map or to use mylar to create a series of overlay maps.

* See the *Appendix* for a list of suggested field guides.