Unit III:

Wetland Exploration: A Field Trip

Unit III Wetland Field Trip
Introduction

The wetlands in the any watershed provide a unique opportunity for students to conduct action-oriented exploration in a living outdoor classroom. Getting students out into a wetland gives them a chance to learn how the concepts they have studied in the classroom actually function in the "real world." Field trips allow students to connect these concepts to their own community. In addition, conducting a wetlands investigation is fun, and engages students in their studies. You may choose to take a one-day field trip to explore a wetland, or you may decide to study a particular area in depth. Whatever you decide, taking your students into the field, even for just one class period, is extremely valuable.

When you plan your field trip, it is often useful to have at least two sites to study. This allows for comparisons, which may increase students' questions and ideas about what they are experiencing. For instance, you could study both a freshwater and salt-water site to look at similarities and differences. Are the differences explained by the change in salinity? Or you could explore and compare two salt-water locations in different areas of the Watershed. Are there any differences in the plants and animals you are finding? Why or why not?

The Narrow River Watershed has a variety of diverse and scenic wetlands, including fresh- and salt-water marshes, streams, ponds, and an estuary. Some of these areas lend themselves easily to wetland explorations, while others may be less accessible. Have your students brainstorm about wetland areas that they already know. It may turn out that you have a pond, stream, or marsh within walking distance of your school. Refer to topographic and GIS maps, state and local resource professionals, the Narrow River Preservation Association, or A Guide to Rhode Island's Natural Places for possible locations.

References

Gibbs, E., T. Corey, M. Schwartz, D. Grossman-Garber, C. Jaworski, and M. Bucheit. 1995. *A Guide to Rhode Island's Natural Places*. Rhode Island Sea Grant, Narragansett, RI.

ACTIVITY I: **WETLAND FIELD TRIP**

OBJECTIVE: Students will discover what organisms live in at least two wetland sits. Students will learn about basic ways these organisms are adapted to life in their wetland environment, and learn about the life cycle of these organisms.

METHOD: Students will visit at least two sites. It is most effective to compare two different sites, such as a first or second order stream verses a larger, downstream section of a river; or a stream versus a pond or lake makes a good comparison. Students will use nets to catch aquatic organisms, magnified bug boxes to examine the organisms more closely, and data sheets to write and draw information about their organisms.

MATERIALS: pond or aquarium dip nets, large white trays, ice cube trays, and/or small white plastic containers such as margarine tubs with lids, plastic spoons, bug boxes, magnifying glass, tweezers, eye droppers; several copies of laminated Insect and Crustaceans identification sheets, Pond Life Golden Guides [1] or Wonderful Wacky Water Critters[2], "Water Creature Cards", data sheets, clipboards, and pencils.
Students should wear waterproof shoes or boots.

BACKGROUND INFORMATION:

An excellent source of information: Pond and Brook, A Guide to Nature in Freshwater Environments, by Michael J. Caduto, University Press of New England, Hanover, NH, 1990.

1. **Timing:** The best time for wetland exploration is mid April through mid October. There is a greater diversity of organisms found in warmer weather. Spring is especially interesting because it is the breeding season for amphibians, so newts, salamanders, frogs, and their eggs and larval forms are found in abundance. Insects at this time are emerging from the water as adults and laying eggs, but various larval and adult forms of aquatic insects can be found all year round. If possible, it is ideal to take two trips, one in the fall and another again in the spring, for a valuable comparison.

2. **Metamorphosis:** Many aquatic insects live their adult life on land, but lay their eggs in the water, so the larval forms are aquatic. Insects go through two types of metamorphosis, or change: complete and incomplete. Complete metamorphosis means that the egg hatches into a larva, the larva changes into a completely different form, the pupa, which later hatches into yet another completely different form, the adult. Incomplete metamorphosis means that the egg hatches into a nymph, which is similar in structure to an adult, except it does not have wings, and it has adaptations for survival beneath the surface of the water that the land dwelling or airborne adult lacks. The nymph grows wings and goes through other changes, then emerges from the water as an adult. Sometimes a nymph is called a naiad. Examples of complete metamorphosis: aquatic beetles, mosquitoes, black flies. Examples of incomplete

metamorphosis: dragonflies, mayflies, damselflies. Examples of adult insects in the water: aquatic beetles, aquatic "true bugs" such as the water boatman, backswimmer, giant water bug, and water scorpion.

3. **Adaptations:** There are certain benefits and drawbacks to living under the surface of the water. On the positive side, food is readily available, water is readily available, and water temperatures do not vary as quickly or as widely as air temperatures. However, in water, aquatic animals need special adaptations for gas exchange, locomotion, or staying put in moving water. The following are some of these adaptations (from Michael Caduto, Pond and Brook, 1990):

Gas exchange:

Physical gills consist of a bubble that is carried on the body, usually under the wings or on the abdomen, which supplies oxygen to the submerged insect. Oxygen diffuses into the bubble as it is used up. Many beetles and "true bugs" use physical gills.

Blood gills are an extension of the skin through which gases diffuse. Mayflies often have elaborate, feathery blood gills on their abdomen.

Spiracular gills are canals found under a layer of skin into which oxygen diffuses. Black fly and crane fly larvae use this method.

Fish gills involve the flow of blood beneath a layer of skin only a few cells thick, into which air moves. Using a counter current multiplier, the blood flows toward the fresh water so it always contacts water containing higher levels of oxygen.

Habitat preferences: many species of stoneflies, caddisflies, and mayflies only live in fast running, well aerated water (streams).

Staying put in moving water:

Flattening to stay out of the current (mayflies and stoneflies).

Streamlining to decrease resistance to the current (fish).

Small size.

Ballast is used by those caddisflies that build their homes of heavy sand grains.

Grasping devices include suckers (leeches, snails), silk threads (black fly larvae), hooks, and jelly (snail egg masses).

Current avoidance, such as hiding under rocks, moving into slower current, and burrowing into sediments.

Locomotion:

Swimming: fish swim with side to side motion, leeches undulate up and down as well.

Oar-like legs: found on many insects such as water boatmen and diving beetles. These "oars" are often formed by a broad surface area composed of stiff hairs.
Jet propulsion is used by dragonfly nymphs as they shoot water from their anal pores.

Wriggling: mosquito and midge larvae.

Webbed feet: beaver, otter, muskrats, ducks.

Feeding:

Many of the same feeding mechanisms are used by aquatic life as are used on land. One additional method is filter feeding, by which water is sieved for fine food particles. Freshwater mussels use this method in still waters, as do black fly larvae in streams.

1. **The effect of water quality:** Aquatic insects can offer us a crude rating of water quality because species differ in their tolerance of pollution. High quality sites have high levels of dissolved oxygen in the water and tend to contain a higher diversity of species. Low quality sites have low levels of dissolved oxygen and tend to contain an abundance of only a small number of species. See the "Biotic Index" below.

2. **Conservation:** In bringing students out to natural habitats with nets, it is important to emphasize the need for respect. We are invading the lives of these organisms; they are fragile and are easily injured if handled roughly or exposed to the air for too long. Encourage students to place creatures from nets carefully into trays of water, and to minimize contact with their hands (the oils on our skin can be harmful). Plastic spoons work well. All creatures should be returned to the place where they were found, and students should walk carefully on the water's edge to minimize habitat damage.

3. **Supervision:** it is best for students to work in small groups of 6 to 10 per area. It will help if you can recruit willing parents to supervise groups. It is even better if you have a chance to train these parents in creature collection, handling, and identification before the field trip.

PROCEDURE:

1. Introduce the exploration procedure, emphasizing safety and respect for all living things. Before collecting, all trays should be full of water so creatures can be transferred swiftly into water from the nets. Remind students to walk carefully in the delicate wetland habitats.

2. Show students how to use nets. Where is the best place to look for creatures? Some crawl on and burrow in the bottom sediment. Some hide in slower moving pockets of water. Some attach to rocks or other substrates. Some skim on the surface of the water. If students scoop up a lot of muck, show them how to wash it off by gently swishing the net in the water, open side up above the surface.

3. Show students how to transfer creatures to trays carefully, by turning the net upside down and inside out into the tray. Show students how to put creatures into smaller trays or bug boxes, using a plastic spoon. Remember that bug boxes must also have water in them.

4. Split students into groups, pass out materials, and assign each group to an area. Give them ample time to explore.

5. Each student should put one creature in a small tray or bug box, and fill out a "Water Creature Card", drawing and answering questions about the creature, both from direct observations and from research, using the pond guides.

6. Each student then shares their creature and information with the rest of their group (or gather back together in a large group for this part, but after completing #7).

7. Each group fills out a "Field Group Data Sheet", recording physical characteristics of the wetland, plant life, and signs of vertebrates and human impact.

8. Have each group share with the rest of the class the information on the "Field Group Data Sheet".

9. Repeat for the second sites, and compare: What creatures were found at both sites? What creatures were unique to each site? What does this tell you about habitat preferences? About human impact? Was one site more pristine or less polluted than the other site?

10. Back in the classroom, have students look on the GIS maps to see where they went on the field trip. Where in the watershed are the sites? Is one site upstream from another? By looking at the map, can you see any potential sources of pollution that may exist at each site or between sits?

[1] Pond Life Golden Guides are available from any bookstore.
[2]Wonderful Wacky Water Critters is available from the University of Wisconsin Extension.

WATER CREATURE CARD

draw your creature here

1. How big is it? _____
2. What color is it? _____
3. What does it eat? _____
4. How does it eat? _____
5. Who might eat it? _____
6. How does it move around? _____
7. How does it breathe under water? _____
8. Describe its habitat (where did you find it?) _____

   _____
9. Is it a young stage of an animal or an adult? _____
10. What is it? _____

GROUP
FIELD DATA SHEET

DATE: _____ GROUP NAME: _____

LOCATION: _____

ORGANISMS FOUND:

PLANTS: _____

CRUSTACEANS: _____

MOLLUSKS and WORMS: _____

INSECTS: _____

_____

VERTEBRATES: (fish, reptiles, amphibians, birds, mammals) _____

_____

SIGNS OF HUMAN IMPACT: _____

_____

PHYSICAL CHARACTERISTICS:
How much of the area is relatively still (pool)? _____
How much of the area is swiftly flowing (riffle)? _____

Describe habitats available (fallen logs, aquatic plants, rocks, banks, etc.)

_____

Give your best estimate of width _____ and depth _____

Is the bottom _____mucky
_____sandy
_____rocky
_____weedy
_____ _____other
(describe)

The water appears _____clear
_____brownish
_____green from algae
_____muddy
_____ _____odor
(describe)

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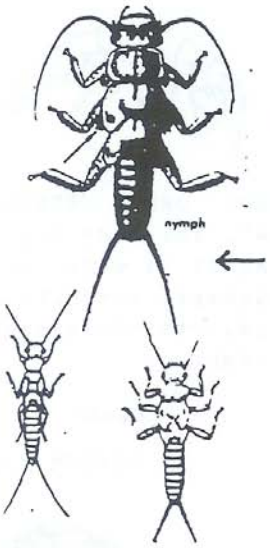
BIOTIC INDEX

Stream Insects & Crustaceans

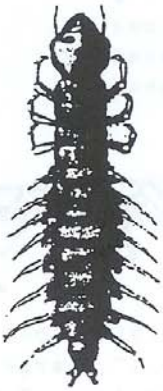
SAVE OUR STREAM

GROUP 1 TAXA — GOOD WATER QUALITY



STONEFLY:
ORDER PLECOPTERA

1/2 - 1 1/2", 6 legs with hooked tips, long antennae, 2 hair-like tails.

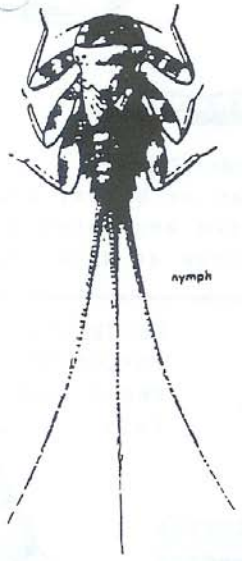


DOBSONFLY (HELLGRAMMITE):
SUBORDER MEGALOPTERA

3/4 - 4", dark-colored, 6 legs, many long feelers on lower half of body, short antennae, 4 hooks at back end.

CADDISFLY:
ORDER TRICHOPTERA

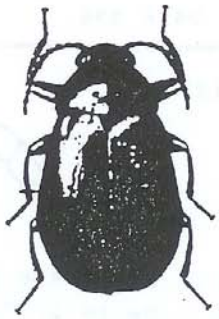
Up to 1/2", 6 hooked legs on upper third o body, 2 hooks at back end. May be in a cas with its head stickin out.



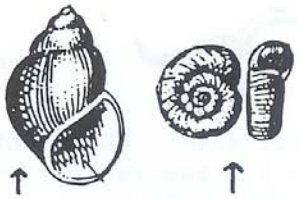
MAYFLY: ORDER EPHEMEROPTERA

1/4 - 1", brown, plate-like gills on sides of body, 6 large hooked legs, many long feelers on lower half of body, antennae, 2 or 3 long hair-like tails.

WATER PENNY: ORDER COLEOPTERA
1/4", saucer-shaped body with a raised bump on one side and 6 tiny legs on the other side.
Immature riffle beetle.

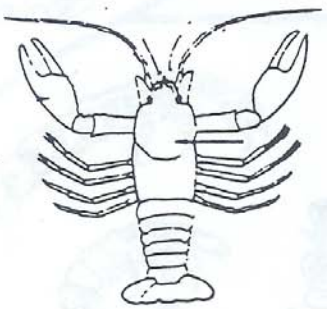


RIFFLE BEETLE: ORDER COLEOPTER.
1/4", oval body covered with tiny hairs, 6 legs, antennae.



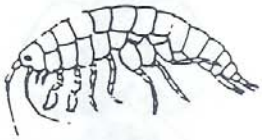
OTHER SNAILS:
PHYLUM MOLLUSCA
Shell opens on right or in center.

GROUP 2 TAXA — FAIR WATER QUALITY

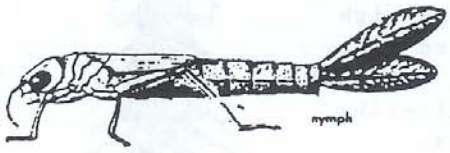


CRAYFISH:
ORDER CRUSTACEA
1/2 - 6", 2 large claws, 8 legs, resembles small lobster.

SOWBUG: ORDER CRUSTACEA
1/4 - 3/4", gray oblong body wider than it is high, more than 6 legs, antennae.



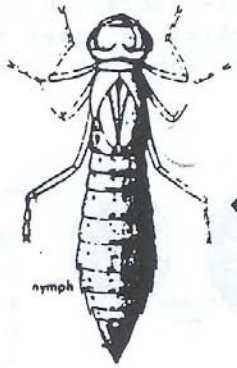
SCUD: ORDER CRUSTACE
1/4", fat body higher than it is wide, swim sideways, more than 6 legs, resembles small shrimp.



DAMSELFLY: ORDER ODONATA
1/2 - 1", large eyes, 6 hooked legs, 3 broad oar-like tails.

BEETLE LARVA:
ORDER COLEOPTERA
1/4 - 1", light-colored, 6 legs on upper half of body, feelers, antennae.

CLAM:
PHYLUM MOLL



DRAGONFLY:
ORDER ODONATA
1/2 - 2", large eyes, 6 hooked legs.

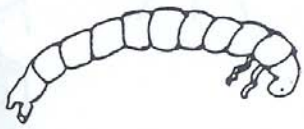
WATERSNIPE FLY LARVA:
ORDER DIPTERA (ATHERIX)
1/4 - 3/4", green, many caterpillar-like legs, conical head, feathery "horn" at back end.

CRANE FLY: Order Diptera
1/3 - 2", green or brown, plum caterpillar-like segmented bod finger-like lobes at back end.

GROUP 3 TAXA — POOR WATER QUALITY

POUCH SNAIL:
PHYLUM MOLLU
Shell opens left.

AQUATIC WORM: ORDER OLIGOCHAETA
1/4 - 1", can be very tiny, thin worm-like body.

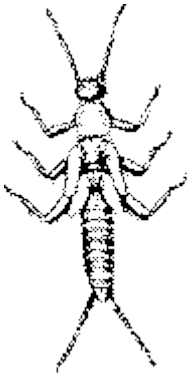


MIDGE FLY LARVA: ORDER DIPTERA
Up to 1/4", worm-like segmented body, 2 legs on each side.

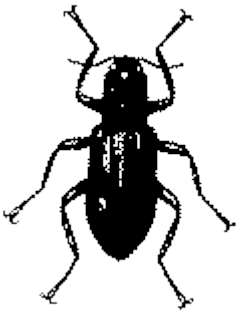
LEECH:
ORDER HIRUDINEA
1/4 - 2", brown, slimy body, ends with suction pads.

BLACKFLY LARVA:
ORDER DIPTERA
Up to 1/4", one end of body wider, suction pad

Macroinvertebrates That Are Sensitive to Pollution
Found in Good Quality Water

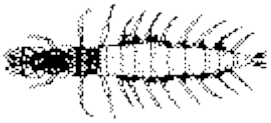


Stonefly



Riffle Beetle Adult

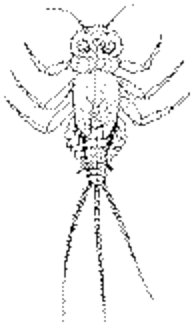
Caddisfly



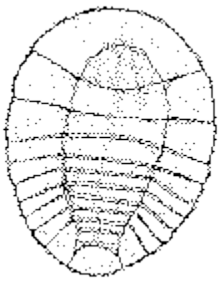
Hellgramite

Gilled Snail

Planarian



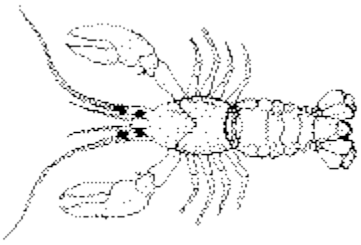
Mayfly



Water Penny

Macroinvertebrates That Are Somewhat Sensitive to Pollution

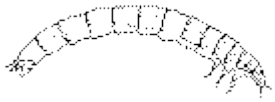
Found in Good or Fair Quality Water



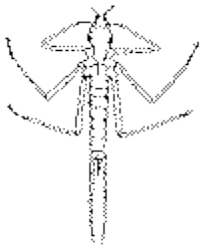
[Crayfish]

[Alderfly]

[Crane Fly]



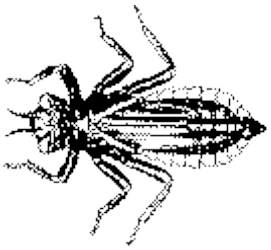
[Riffle Beetle Larva]



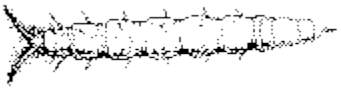
[Damselfly]

[Sowbug]

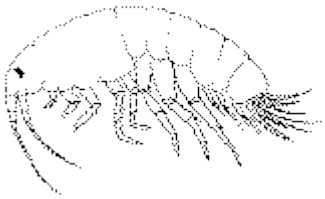
Somewhat Sensitive to Pollution



Dragonfly

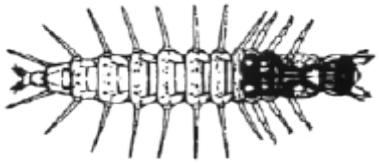


Watersnipe Fly



Scud

Whirligig Beetle Larva



Fishfly

Clam or Mussel

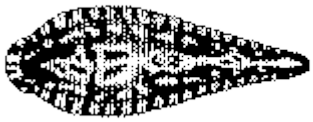
Macroinvertebrates That Are Tolerant of Pollution

Found in Any Quality Water

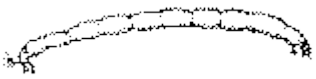
Aquatic Worm

Lunged Snail

Black Fly



Leech



Midge Fly

ACTIVITY II : SCIENCE LABORATORY ACTIVITIES FOR WETLAND FIELD TRIP

(by Walter A. Cole)

See beginning of Unit III for the information necessary to instruct the students on background information.

These sessions can be used as supplemental activities if the classroom is set up for science experiments.

OBJECTIVES:

1. Students will discover what organisms live in at least two wetland sites. Students will learn about basic ways these organisms are adapted to life in their wetland environment and learn about the life cycles of these organisms.

2. Students will discover the causes and effects of acid rain and thermal pollution upon the wetland microscopic organisms.

METHODS:

1. Under parent/guardian supervision, students will gather various water samples from nearby puddles, ponds, streams, and/or rivers.

2. Place water samples in jars and label with location. Try to make sure samples have sediment with organisms.

SUPPLIES NEEDED:

-pH paper
-Microscopes and/or magnifying lenses
-Pipettes
-Microscope covers & slides
-Hot plate & stirrer
-Thermometers
-Beakers, flasks, test tubes
-Stand & clamps
-Latex gloves, safety goggles, laboratory jackets

PROCEDURES: (sessions may last one or more class sessions)

STUDENTS MUST WEAR SAFETY GEAR!

First session

1. Students bring in the water samples from watershed around home.

2. Check the pH and the temperature of the water samples.

3. Make microscope slides.
    a. Place one drop of pond/river water onto slide and cover. (20 microliters may also be used wherever one drop is indicated)
    b. Examine under the microscope.
    c. Record observations.
    d. Identify organisms by using Pond Life.

Second session

1. Place 10mL pond/river water into a 250mL flask.

2. Increase pH to at least 9 by adding one drop at a time of ammonia (NH3) to the 10mL pond/river water.

3. Stir and/or shake the flask.

4. Make microscope slide(s) as directed in the first session and proceed as directed with observations.

5. Discuss findings.

Third session

1. Place 10mL pond/river water into a 250mL flask.

2. Decrease pH by adding one drop of vinegar at a time until the pH of about 4 is reached. Stir and/or shake flask.

3. Make microscope slide(s) as described in the first session and proceed as directed with observations. Discuss findings.

Fourth session

1. Place 200mL of pond/river water into a 250 mL flask.

2. Use hot plate and thermometer and increase the temperature to at least 55 degrees Celsius but no more than 80 degrees Celsius. The teacher will do this activity for safety purposes. Use stand and clamps carefully. Wear all safety equipment.

3. Make microscope slides and proceed as directed in earlier sessions. Discuss findings.

Fifth session

1. Place 200mL pond/river water into a 250 mL flask.

2. Decrease temperature of water to about 5 degrees Celsius by adding ice chips.

3. Make microscope slides and proceed as directed in earlier sessions. Discuss findings.