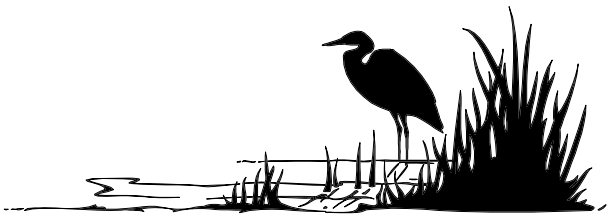
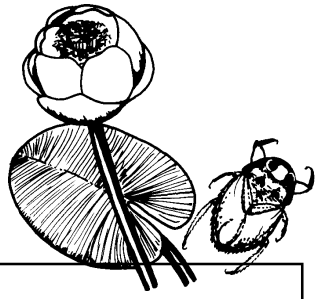
Lesson Plan 1:



Freshwater Marsh Investigations

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example, "In this investigation, we will develop some skills in collecting and interpreting data about the freshwater environment. We will then apply these data in discussing the role of water in the environment and our society."



Activity 1: Observing the Wetland Environment

As you approach the water, observe and record your observations.

Plants

Animals

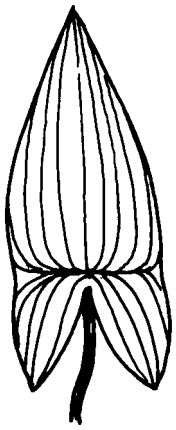
Evidence of Animals

Air

Water

Other

Activity 2: Collecting and Observing Aquatic Life



Discussion:

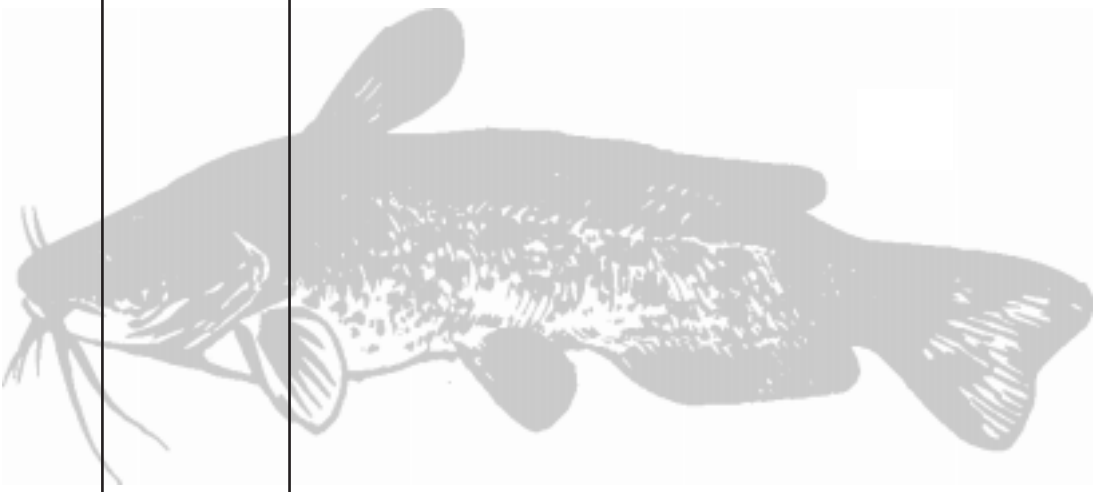
"What are some factors that affect the lives of animals in water?" What animals would you find in the freshwater but not in the saltwater (e.g. beaver, frogs, painted turtles) because they can not tolerate salt."

What are some guidelines that we need to consider in collecting aquatic life so our investigation will cause the least impact on the environment?"

There are 10 nets and jars and a white bottomed pan. Depending on the size of your group, divide into teams of 2-5 students. Each team will share one aquatic net and jar. Keep the skirt on the outside of the white nets to protect netting. Fill the jar halfway with water. From the bank, dip for animals. Run your hand through the marsh mud and plants to find any small organisms. Collect as many types of aquatic animals as possible, and place them in the jar. Place plants and mud back into water; do not leave them in piles on the bank. Try to identify the organisms using keys and guides provided, and list your plants and animals on the chart below. If time allows, students may wish to sketch their animals. When finished, have teams place animals in white bottomed pans for observation by the group. Return all specimens to the water when through.

CHART

Common Name	How Many?	Describe where you found it



Activity 3:

Predicting Water Characteristics from Aquatic Animals Found

Background Information:

pH - The percentage of hydrogen ions (H+) in a solutioin is called the pH. A solution is more acidic when it contains more hydrogen ions. The level of acidity of the water in wetlands is important to the plant and animal life there. Most animals are adapted to living in *neutral* (neither acidic nor basic) conditions. Changes in pH endanger the lives of young animals in particular.

Dissolved Oxygen (DO) - DO is vital to the health of aquatic habitats, since plants and animals need oxygen to survive and for metabolism.. A low amount of oxygen in the water is a sign that the habitat is stressed. Oxygen is mixed in the water from the air above, with the help of rain, wind, waves, and currents. Faster moving water contains more DO because it has more contact with the air than still water. Underwater plants and algae also contribute oxygen that is given off during the process of photosynthesis. DO is affected by the weather, temperature and salinity. Cold, fresh water holds more oxygen than warm or salty water.

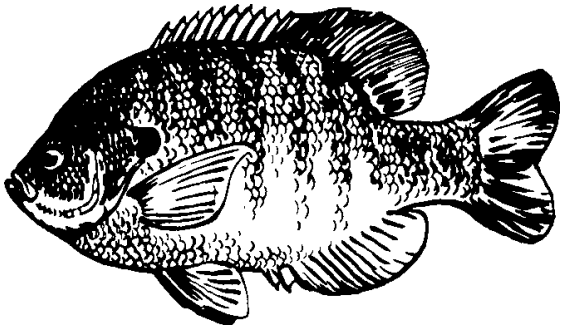
Temperature - Most creatures living in water are cold-blooded, so their body temperatures and metabolism and growth rates are determined (and limited) by surrounding water temperature. Dissolved Oxygen (DO), necessary for the survival of aquatic life, is also dependent upon temperature. Cold water can hold more DO than warm water.

Distribute Activity Sheet. On the basis of the aquatic animals you found, and the *Table 1*, *predict* the pH, temperature, and dissolved oxygen (DO) count.

Activity Chart: Our group predicts:

On the basis of the aquatic animals you found, the information in the Aquatic Data section below, and your observations, predict the following characteristics of the pond.

We predict that based on _____
pH will be _____
Dissolved Oxygen count will be _____
Water temperature will be _____
The color of the water is _____
Keep these predicitions for future use.



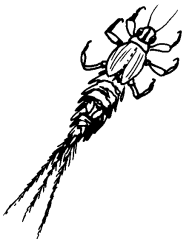
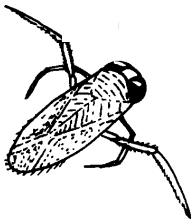


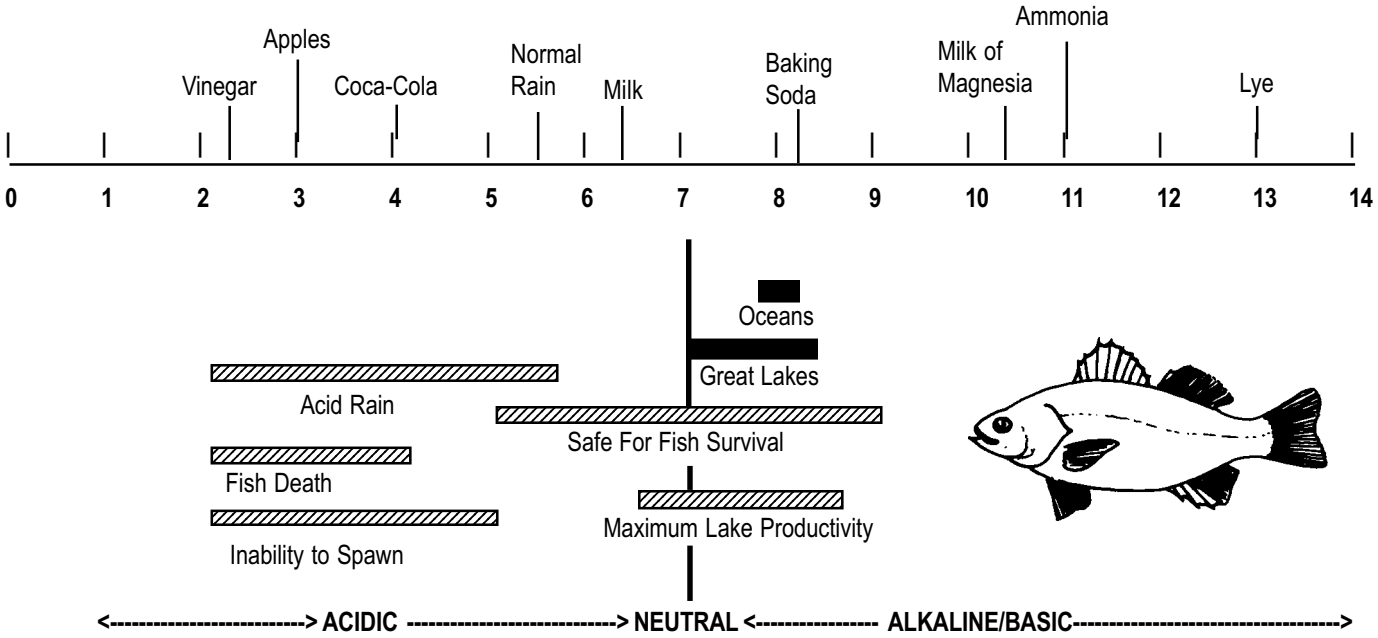
Table 1:

pH Ranges that Support Aquatic Life

	Most Acid					Neutral					Most Alkaline			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bacteria	1.0													13
Plants (algae, rooted, etc.)						6.5						12		
Carp, catfish, some insects						6			9					
Sunfish						6.5		8.5						
Snails, Clams							7			9				
Largest variety of animals mayfly, dragonfly nymph							6.5	7.5						



The pH Scale


Vinegar
Apples
Coca-Cola
Normal Rain
Milk
Baking Soda
Milk of Magnesia
Ammonia
Lye
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Oceans
Great Lakes
Acid Rain
Safe For Fish Survival
Fish Death
Maximum Lake Productivity
Inability to Spawn
<----------> ACIDIC ----------> NEUTRAL <---------- ALKALINE/BASIC---------->

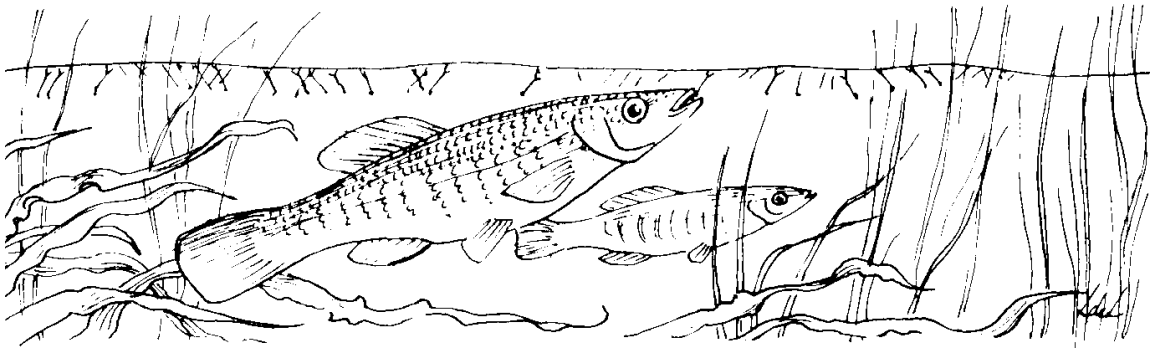


Table 2:

Dissolved Oxygen Requirements for Native Fish and other Aquatic Life

Examples of Life	*Dissolved Oxygen (DO) in parts per million (ppm)*
Cold-water organisms, including salmon and trout (below 68 degrees F.) Spawning, growth, and well-being. Caddisfly, mayfly, stonefly.	6 ppm and above
Warm-water organisms (including fish such as catfish, carp, some mayfly and dragonfly larvae above 68 degrees F.)	5 ppm and above
Some estuarine fish populations (such as weakfish) require minimum DO levels for larvae to hatch and survive. Growth and well-being.	4 ppm *minimum*
Lethal level of DO for most fish.	2 ppm and below

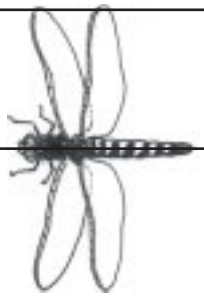


Table 3:

Approximate Temperature Ranges Required for Certain Organisms

Examples of Life	*Temperature (Fahrenheit)*
Much plant life, sunfish, bluegills, carp, catfish, dragonflies, frogs.	Warm water (greater than 68 degrees F)
Some plant life, sunfish, beetles, tadpoles, frogs.	Middle range (55 - 68 degrees F)
Snails, clams	Cold water (less than 55 degrees F)

Activity 4:

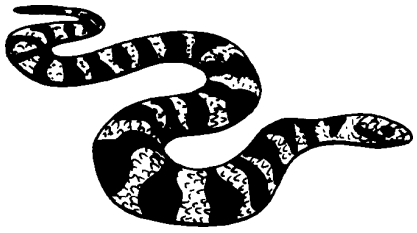
Conducting Water Quality Tests

Use the water test kits provided to determine dissolved oxygen, pH, and temperature of the water and *compare your findings with your predictioins.* In collecting a water sample for the dissolved oxygen test, pick an area that has not been disturbed by dipping. Dipping for aquatic animals stirs up the water and adds oxygen.

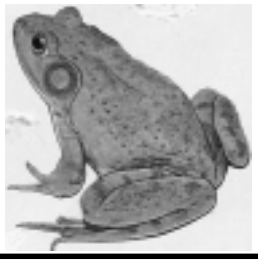
Actual DO: _____ ***Actual pH: _____*** ***Temperature: _____***

Freshwater Pond Key

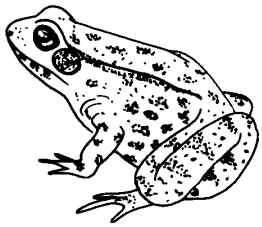
Northern water snake



Bullfrog

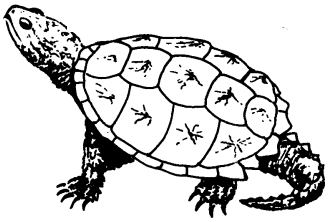


Green frog



Painted turtle

Snapping turtle



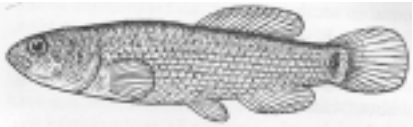
Tadpoles -

toad

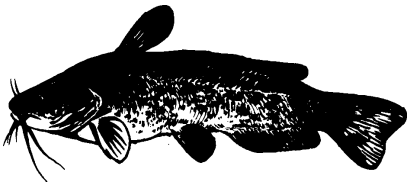
bullfrog

green frog

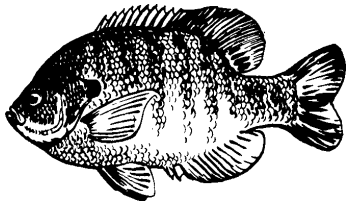
Eastern Mudminnow



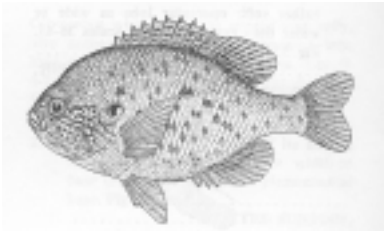
Brown Bullhead



Bluegill



Pumkinseed



American eel

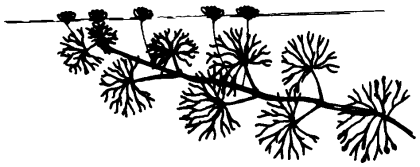
Heron

Egret

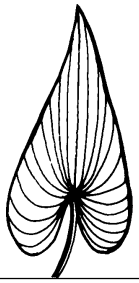
Yellow pond lily

Cattail

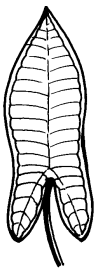
Hornwort



Pickerel weed



Arrow arum



Arrowhead