

INTRODUCTION

A pond is a dynamic and ever-changing community of plants and animals. Ponds may be natural, year-round, or seasonal, or they may be human-influenced in that ditches and dikes provide, hold or bring water to an impoundment. These ponds become more natural year after year. We will look at the kinds of birds and mammals that you would expect to see in and near a pond and at the two general classes of plants--submergent and emergent--found in a pond.

THE ACTIVITIES

TIME REQUIRED

| | |
|----------------------------------------------------------|------------|
| Describe a Pond | 20 minutes |
| Observe a Pond Environment | 10 minutes |
| Identify Pond Plants and Record Their Distribution | 20 minutes |
| Observe and Identify Pond Vertebrates | 20 minutes |
| Construct a Food Web | 45 minutes |
| Observe and Infer Daily and Seasonal Differences | 20 minutes |
| Measure Water Volume of a Pond | 45 minutes |



COMBINING THE ACTIVITIES

The activities in this chapter are displayed singly. Depending upon your objective, time, and level of knowledge of your audience, you may want to combine selected activities. Here are some suggestions.

Title: Demonstrate the cause and effect relationship between animals and their habitat in a stream.

Introduction: We are going to collect and identify aquatic life in a specific water environment and then use the kinds of life found to make predictions about the physical characteristics of the water. We then will use some simple testing equipment to validate our predictions.

Activity: Collecting Aquatic Life

Transition Statement: Use the Pond Life books and drawings of aquatic life on the back of the activity sheet to identify as many of the aquatic animals collected as possible.

Activity: Identifying Aquatic Life

Transition Statement: Based on the aquatic animals found and the tables on the back of the activity, predict the temperature, pH, and dissolved oxygen content of the water.

Activity: Predicting Water Characteristics From Aquatic Animals

Transition Statement: Let's check out our predictions using some simple water test kits.

Activity: Measuring Water Characteristics to Test Predictions

Closure: What can we say about the characteristics of this stream? Which activities helped you discover these ideas?

Title: Demonstrate the interaction between plants and animals in a pond by constructing a food web.

Introduction: The plants and animals found in a pond are always interacting. We are going to investigate some of those interactions by collecting and identifying some of the plants and animals and constructing a food web.

Activity: Identify Pond Plants

Transition Statement: Animals are also important members of a pond community. We are going to collect and identify some of the invertebrates found here.

Activity: Collecting and Identifying Aquatic Life

Transition Statement: Vertebrates (animals with backbones) also live in and around ponds. Next, we are going to look for these animals and evidence of their presence.

Activity: Pond Vertebrates

Transition Statement: The lives of all the different kinds of plants and animals we have found are interconnected. We can get some idea of their interactions by constructing a food web.

Activity: Construct a Food Web

Closure: What are some things we can say about organisms in this pond?



Title: Demonstrate the importance of water to people

Introduction: Water is essential for the lives of people and for society.

Not only is water important for drinking and bathing, but it is needed for industry, food preparation, and recreation.

Activity: Determine Watershed Boundaries

Transition Statement: Now that we know something about the land that drains water into this part, we will determine how much water there is, and how many people it will support.

Activity: Measure Water Volume of a Pond

Closure: We have learned how many people could be supported by the water in this pond. But water is valuable for other uses as well. What would happen if we were to take all the water from this stream for people? What other resources might be affected?

CURRICULUM RELATIONSHIPS

Social Studies

1. Explore a pond that has died (filled up with organic and inorganic matter). Talk to old-timers about what they remember about the pond so you can trace the history of its death.
2. Research which government agencies are involved in water quality management.
3. Research national and state wetland regulations.
4. Research wetland issues in your local community.

Science

1. Study how aquatic life has adapted differently to a stream environment and a pond environment.
2. Construct a chart showing some aquatic animals that can stand various degrees of water pollution, as related to the degree of pollution.
3. Conduct some studies of temperature, pH, dissolved oxygen, plant and animal life, through a 24-hour period or throughout the year.
4. Contact Saturday Academy or your State Environmental agencies to find out how the class can be involved in ongoing water quality monitoring.

Mathematics

1. Read about the various units of measurement in water work.
2. Develop a pH scale range correlated with some common water products such as orange juice, vinegar, bleach, etc.

Language Arts

1. Write a poem or story about the death of a pond.

Creative Arts

1. Sketch a section of a pond at different times of the year.
2. Draw detailed sketches of the different plant and/or animal life in or near a pond.



STEP 1: DESCRIBE A POND

| | |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCEPT | System |
| PRINCIPLE | People often have different ideas about what a pond is. This activity will help the students in the class reach a common definition which will serve as a base for their investigations. |
| OBJECTIVE | <ul style="list-style-type: none">• The student will be able to define the word pond and list some characteristics of a pond. |
| PREPARATION | Select a pond for study. Ecologists usually describe a pond as a quiet body of water which is shallow enough that plants often grow all the way across it. A lake is usually larger and deeper than a pond. The definition is not precise, and what some people call a pond, others may call a lake, a wetland, or a marsh. |
| MATERIALS NEEDED | <ul style="list-style-type: none">• Activity Sheet A: Describe A Pond.• Blackboard or easel and chart paper. |
| PROCESSES USED | <ul style="list-style-type: none">• Define Operationally• Communicate |
| TIME | 20 minutes. |



DOING THE ACTIVITY (indoor)

A. Set Stage:

Today we will be doing an investigation of a pond. To make sure we are all talking about the same thing, we need to develop a common understanding of what a pond is.

B. Procedure:

1. Take 10 minutes to write, in as much detail as possible, a description of a pond with which you are familiar. Hand out Activity Sheet A.
2. Now, in groups of three, compare your descriptions, and write a one sentence definition of a pond.

C. Retrieve Data:

Have the groups read their definitions. As they read them, list on the blackboard the kinds of things they use to describe a pond; e.g. depth, size, plants and animals. When all groups have shared their definitions ask: What are some of the similarities and differences in your definitions? What are some of the things that seem to be common to all of your definitions?

CLOSURE

Share the ecologists' definition of a pond. Ecologists usually describe a pond as a quiet body of water shallow enough that plants often grow all the way across it. A lake is usually larger and deeper than a pond. The definition is not precise, and what some people call a pond, others may call a lake, a wetland, or a marsh. Discuss the definition and develop a group consensus on a definition to be used for the day's investigations.

TRANSITION

We now have a definition of a pond with which we can all agree. We also have listed a number of characteristics of ponds. Now let's look at a particular pond and see how all of the components of the pond fit together.

ACTIVITY A: Describe a Pond

10 min.
individual

Think of a pond with which you are familiar. In as much detail as possible describe the pond.

In groups of three, compare your descriptions. What things are similar? What things are different?

Together, write a description of a pond with which you can all agree.

Investigating Your Environment
Ponds



STEP II: OBSERVE THE POND ENVIRONMENT

| | |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCEPT | System |
| PRINCIPLE | This activity will help the students get an overview of the pond to be studied and to see how well the previously developed definition fits that particular pond. |
| OBJECTIVE | <ul style="list-style-type: none">• The student will be able to describe the pond and compare it to the previously developed definition. |
| PREPARATION | Make a reconnaissance trip to the pond to determine access, logistics, and safety considerations. Inform the students of proper clothing needed for the investigation. |
| MATERIALS NEEDED | <ul style="list-style-type: none">• Activity Sheet B: Observe The Pond Environment. |
| PROCESSES USED | <ul style="list-style-type: none">• Observe• Define Operationally• Communicate |
| TIME | 10 minutes. |



DOING THE ACTIVITY

A. Set Stage:

We will be spending two to three hours at the pond. The first activity will give you an overview of this pond environment, and provide an opportunity to see how well this pond fits the definition of a pond that you developed in the classroom.

The pond environment is very fragile. What are some ways that we can avoid damaging the pond and its surroundings?

B. Procedure:

1. Hand out Activity Sheet B. As you approach the pond, take 5 minutes to record your observations on Activity Sheet B.

C. Retrieve Data:

1. What are some of the things you listed?

ACTIVITY B: Observe a Pond Environment

5 min.
individual

Work by yourself.

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

PLANTS _____

ANIMALS _____

AIR _____

SOIL AND ROCKS _____

WATER _____

OTHER _____

Investigating Your Environment
Ponds 

CLOSURE

Ask the class:

1. How well does this pond fit the definition we developed in the classroom?
2. Do we need to change our definition?

TRANSITION

You have observed some of the particular components of the pond environment. Now we will do some activities which focus on these components and how they fit together.



STEP III: IDENTIFY POND PLANTS AND RECORD THEIR DISTRIBUTION

| | |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCEPT | Cause/Effect, Population, Order, System, Interaction |
| PRINCIPLE | By collecting and recording data about plants and animals and their environment, relationships are often made obvious. This activity gives students the opportunity to explore the pond and begin to draw some conclusions about the way the environment affects the organisms living there. |
| OBJECTIVE | <ul style="list-style-type: none">• The student will be able to identify the growth forms of pond plants and describe their habitats. |
| PREPARATION | <p>The distribution and abundance of plants and animals is determined in large measure by the availability of suitable habitat. The habitat for a particular species is characterized by the presence of physical, chemical, and biological conditions such as temperature, moisture, soil nutrients, and, in the case of animals, food sources.</p> <p>Proper clothing and equipment are necessary for successfully completing this activity.</p> |
| MATERIALS NEEDED | <ul style="list-style-type: none">• Activity Sheet C: Pond Plants and Their Distribution• Plant illustrations and <u>Pond Life</u> books.• Hip waders.• Buckets for collecting plants.• Yard sticks (longer poles would be better).• Plant presses (optional).• (A small boat or inflatable raft would be a helpful tool in deeper ponds.) |
| PROCESSES USED | <ul style="list-style-type: none">• Observe• Measure• Use Numbers• Infer• Classify |
| TIME | 20 minutes |



C. Retrieve Data:

1. What kinds of plants did you find? You may want to compile a master list on an easel chart.
2. Prepare a large outline map of the pond (or the portion of it which was studied), and have the students mark the distribution of the various kinds of plants.

CLOSURE Ask the class:

1. Can you determine any relationships between and among growth patterns, depth of water, and distance from shore?
2. We have learned some things about the distributions of various kinds of plants growing in and near the pond. What can we say in general about where plants live?

TRANSITION Animals are also found in habitats which provide for their needs.
Next, we are going to look at insects and other invertebrates found in the pond, and try to determine some of their habitat requirements.



STEP IV: OBSERVE AND IDENTIFY POND VERTEBRATES

| | |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCEPT | Organism, Interaction, System |
| PRINCIPLE | Vertebrates are often the most important animals found in a pond, particularly for sportsmen. Their presence is often an indicator of the health of the pond. The evidence of an animal's presence is more easily found than the animal itself. |
| OBJECTIVE | <ul style="list-style-type: none">• The student will be able to find and identify vertebrates and evidence of vertebrates in and around the pond. |
| PREPARATION | None. |
| MATERIALS NEEDED | <ul style="list-style-type: none">• <u>Pond Life</u> books.• Binoculars.• A seine or dip nets can be used to catch fish.• Activity Sheet D: Pond Vertebrates. |
| PROCESSES USED | <ul style="list-style-type: none">• Observe• Infer• Classify |
| TIME | 20 minutes |



DOING THE ACTIVITY

A. Set Stage:

In addition to insects and other aquatic invertebrates, vertebrates (animals with back bones) also consider the pond to be home. Vertebrates include fish, amphibians, reptiles, birds and mammals. Often these animals are important to people, particularly to sportsmen. They are also an important member of the pond community from an ecological stand point.

B. Procedure:

1. In your small groups spend 10 minutes looking for vertebrates and evidence of vertebrates. Use the Pond Life books to help you identify your discoveries.
2. Pass out Activity Sheet D and go over the instructions with the students.
3. Have the students do the investigation and record their observations.

ACTIVITY D: Pond Vertebrates

10 min.
groups

| Name or Description | Evidence | Where Found | Abundance (abundant, common, uncommon) |
|---------------------|----------|-------------|----------------------------------------|
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |

C. Retrieve Data:

1. Discuss the discoveries with the students. What kinds of animals did you find? Where did you find them? What evidence of other kinds of animals did you find?

CLOSURE

Based on what you know about the pond, how do you think these animals fit into the pond community?

TRANSITION

You have identified many plants and animals found in and around the pond. In the next activity, we will try to figure out some of the interactions between these organisms.



STEP V: CONSTRUCT A FOOD WEB OF POND LIFE

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCEPT | Organism, Interaction, Order, System |
| PRINCIPLE | Various kinds of plants and animals interact as links in a food web. A food web shows the feeding relationships between the various plants and animals. Food webs in a pond can be very complex, and to construct a complete web would be a difficult task. However if the students have collected a fairly good sample of plants and animals, they can identify at least a few links in the web. |
| OBJECTIVE | <ul style="list-style-type: none">• The student will be able to construct a food web of pond life. |
| PREPARATION | Complete Identification of Pond Plants, Collect and Identify Aquatic Life, and Observe and Identify Aquatic Vertebrates. Write the names of all of the plants and animals identified on 5" x 7" cards. (If the student's discoveries are too few to do this activity successfully, you may wish to add some other organisms you know are likely to be present in and around the pond.) |
| MATERIALS NEEDED | <ul style="list-style-type: none">• 5" x 7" Index cards.• <u>PondLife</u> books, identification sheets from Identify Pond Plants and Collect and Identify Aquatic Life lessons and other reference books.• Blackboard.• Tape. |
| PROCESSES USED | <ul style="list-style-type: none">• Infer• Question• Interpret Data |
| TIME | 45 minutes. |



DOING THE ACTIVITY (indoor)

A. Set Stage:

The plants and animals living in and around the pond interact in many ways. One of the most important interactions is as links in a food web. A food web shows which animals eat which other plants and animals. In this activity you will be able to construct a food web for the plants and animals you identified at the pond.

B. Procedure:

1. Pass out the cards with the names of the pond plants and animals on them.
2. Using the Pond Life books, the identification sheets from the lessons, and other reference books, try to find out what each animal eats and what eats each kind of plant and animal. Write what the animal eats below the animal's name on the card.

Write what eats the animal or plant above its name on the card. Remember most animals eat more than one kind of food.

C. Retrieve Data:

1. Have the students tape the names of the plants across the bottom of the backboard.
2. Next have the students tape the names of animals that eat plants, above the plants names and draw lines to the kinds of plants they eat.
3. Finally, have the students tape the animals that eat other animals, above the other cards, and draw lines to their food sources.

Note: Not all animals and plants may be connected to others. This may be because not all of the kinds of plants and animals present were collected and identified. Also, it may mean that the students were not able to locate the food sources for some of the animals.

CLOSURE

Ask the student:

1. What can you say about the food web in the pond?
2. Why do you think some of the plants and animals don't connect to any others?
3. What would we need to do to complete the web?
4. Are there other kinds of interactions between the various plants and animals in the pond?



STEP VI: OBSERVE AND INFER DAILY AND SEASONAL DIFFERENCES

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCEPT | Cause/Effect, Change, Cycle, Population, System |
| PRINCIPLE | Unless the studies of a pond or stream extend over a period of several weeks or months, the observations and measurements the students make will be representative of one particular time. One characteristic of bodies of water, just as with the terrestrial environment, is differences over the course of a day or through the seasons of the year. In this activity the students will use evidence they find around the pond, and their past experiences, to draw inferences about changes that may occur over time. |
| OBJECTIVE | <ul style="list-style-type: none">• Using observations and drawing on prior experiences and knowledge, the student will be able to draw inferences about daily or seasonal pond or stream conditions and the effects these conditions have on life in the body of water. |
| PREPARATION | None. |
| MATERIALS NEEDED | <ul style="list-style-type: none">• Activity Sheet E: Daily and Seasonal Differences. |
| PROCESSES USED | <ul style="list-style-type: none">• Observe• Infer• Hypothesize |
| TIME | 20 minutes. |



DOING THE ACTIVITY

A. Set Stage:

You have done your investigation on just one day, and the observations and measurements you made were only for that one time. At different times of day and in different seasons you might find the conditions very different. Even the weather can affect the aquatic environment. To help us more fully understand a pond or stream, we should look for evidence of differences and how they affect life here.

B. Procedure:

1. Hand out Activity Sheet E. Spend about 10 minutes exploring the pond and its surroundings, looking for evidence of differences at other times of the day or year. Record your observations on the top of the Activity Sheet."

C. Retrieve Data:

1. What are some of the things you discovered that indicated conditions were not always the same at other times of the day or year?
2. What would be different about the pond or stream.
3. Using your past experiences and knowledge can you think of other things that might be different. Write these on the bottom part of the Activity Sheet.
4. Hand out Activity E: Temperature Layering and discuss with the group.

ACTIVITY E: Daily and Seasonal Differences In a Pond

10 min.
individual

1. Walk around the pond and look for evidence of differences in this environment at other times. Record your observations below.

| Evidence | How was the environment different? | How would the difference affect life in the pond? |
|----------|------------------------------------|---------------------------------------------------|
| | | |

2. Based upon your knowledge of the weather and other conditions in this area what other differences would you expect to find at other times of the day or year? Record your ideas below.

| How would the environment be different? | Cause of the difference? | How would this affect life in the pond? |
|-----------------------------------------|--------------------------|-----------------------------------------|
| | | |

Investigating Your Environment
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CLOSURE Ask the class:

1. What effect would these differences have on life in the pond?
2. What sorts of investigations could you set up to test your hypotheses? Prepare an investigation which states:
 - a. Your hypothesis,
 - b. The kind of information you would collect to test the hypothesis,
 - c. How you would collect the information, and
 - d. A form for recording the information.

TRANSITION We have not talked about how people use water. Everyone needs water to live. We will now try to figure out how many people could be supported by the water in this stream or pond.



STEP VII: MEASURE WATER VOLUME OF A POND

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONCEPT | Quantification, Interaction |
| PRINCIPLE | Using mathematical skills, participants measure the volume of their body of water and calculate how many people could live off that water volume. |
| OBJECTIVE | <ul style="list-style-type: none">• The student will be able to measure and calculate water volume for a pond.• The student will be able to determine how many people could live off the water volume. |
| PREPARATION | Locate the study site. |
| MATERIALS NEEDED | <ul style="list-style-type: none">• Measuring tape.• Yard stick or other vertical measuring device, such as weighted rope.• Hip waders.• Activity Sheet F: Determine Water Volume of a Pond.• Small stakes. |
| PROCESSES USED | <ul style="list-style-type: none">• Measure• Use Numbers• Communicate• Design Experiments• Interpret Data |
| TIME | 45 minutes. |



DOING THE ACTIVITY (outdoors)

A. Set Stage:

We've looked at the pond ecosystem and investigated its various parts. In this next activity, we will consider the volume of water in this pond. How many people could live off the water in this pond? What measurements do you need to know in order to determine the amount of water in this pond so you can validate your predictions?

B. Procedure:

1. Hand out Activity F and tell them they will be working in small groups.

20 min.
small groups

ACTIVITY F: Determine Water Volume of a Pond

Work in groups.

Instructions for collecting and recording volumes of water in ponds or lakes.

a. Find the average diameter (distance across) of the pond. Measure the length and width of the pond. You may have to take several length and width measurements and get the average of them.

Pond width _____ feet.
 Pond length _____ feet.
 Total _____ feet \div 2 = _____ ft. (average diameter)
 Average diameter _____ ft. \times 3.14 (_____) \div 4 = _____ sq. ft. surface
 (area of pond)

b. Find the average depth of the pond or lake. Measure the depth in 3 places along a line (transect) across the pond, as near the middle as possible. Add these depths and divide by 4 (see explanation below) to get the average depth. (If additional accuracy is desired, repeat this process along additional transects and average the results.)

First measurement _____ feet.
 Second measurement _____ feet.
 Third measurement _____ feet.
 Total _____ feet \div 4 = _____ ft. (average depth).

NOTE: The reason you take 3 depth measurements then divide by 4 is to take into account the shallow areas of the pond. It can be explained by the following example of a drawing of a pond cross-section. If depth in 3 places is A(5'), B(10'), C(5'), (total 20'), find an average by dividing by 3 ($20 \div 3 = 6.23$). Now look at the mean or average depth (D) which is 5'. Take total of depths and divide by 4 ($20 \div 4 = 5$), the correct average depth.

c. Formula for computing number of gallons of water in pond.

1. _____ \times _____ = _____ cubic feet
 area of pond average depth volume in cubic feet

2. _____ cu. ft. \times 7.48 = _____ no. gals. water in pond
 volume in cu. ft. no. gals. water in pond

NOTE: A cubic foot of water is the water in a container 1-foot wide, 1-foot high, and 1-foot long. It contains 7.48 gallons.

d. Formula for computing the volume using acre-feet of water.

1. (surface) _____ \times _____ = _____
 area of pond in feet average depth in feet volume cu. ft.

2. _____ + 43,560 = _____
 volume cu. ft. (sq. ft. in an acre) acre-feet of water.

3. _____ \times _____ = _____
 acre-feet gal./acre-foot no. gallons in pond

e. In order to find out how many people could get their domestic needs for one day from the water in the pond, complete the following calculations.

_____ \div _____ = _____
 gallons of water in the pond amount of water one person uses per day total no. people who could live one day from this water

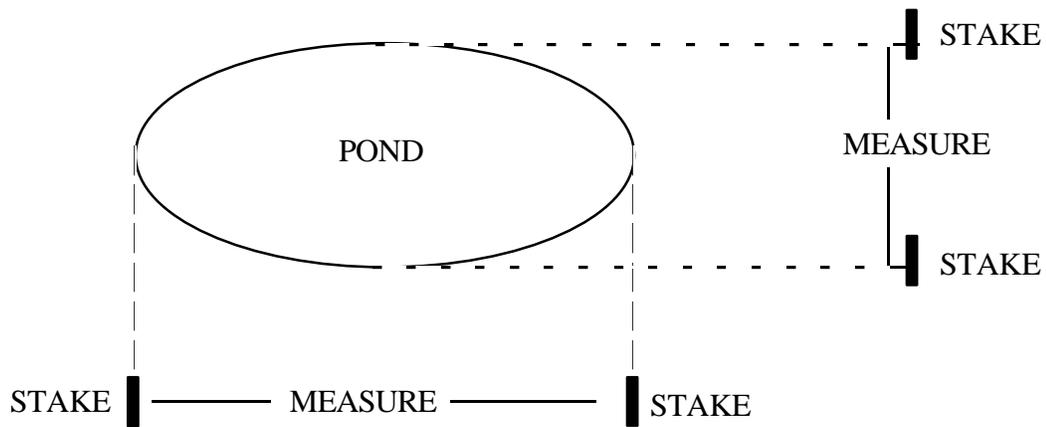
*The average person uses about 200 gallons of water a day for home use. This does not reflect each person's share of water used for industrial, public services, and commercial. (U.S. Office of Education figures.)

Investigating Your Environment
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2. Describe a couple of ways that the diameter of the pond can be measured if you cannot get across the pond on the water.



- Offset measurements: Using small stakes, mark edges of pond on dry land next to pond.



- Offset angle: This is also called the "Napoleon hat brim" method, if you cannot walk around the pond, but can get to 2 sides. Stand on one side and shade you eyes with your hand. Move your head until the far side of the pond is lined up with the edge of your hand. Holding your head rigid snap your head around until the bottom of your head lines up with the land. You now are as far from the pond as the pond is wide. Do this for both the width and length of the pond.
 - Rock on a rope! Throw the rock across the pond and mark where the near edge lines up with the rope. Measure the length of the rope.
3. Describe ways in which the depth of the pond can be measured.
 - Weighted rock.
 - Measuring stick.
 4. Ask the group if they have other ideas on how to measure the width and depth of your pond.
 5. Have the individual groups work on their activity sheet.

C. Retrieve Data:

Ask them some questions:

1. What measurement techniques did you each use? How were the individual group's answers different?
2. How many people could live off the pond?
3. How did your predictions compare with your calculations?
4. How would we determine how much water should be left in the pond and how much should go to human use?
5. What other things would we want to know about the pond before we made any decisions?

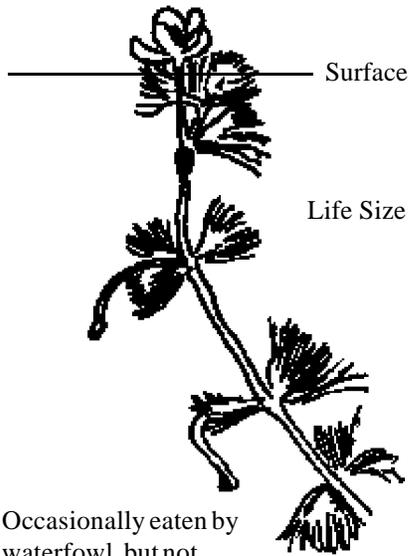
CLOSURE

Ask the class:

1. A pond is a unique water environment - its plants, animals, and characteristics. Look back at your original description of a pond. Can you expand on that now?

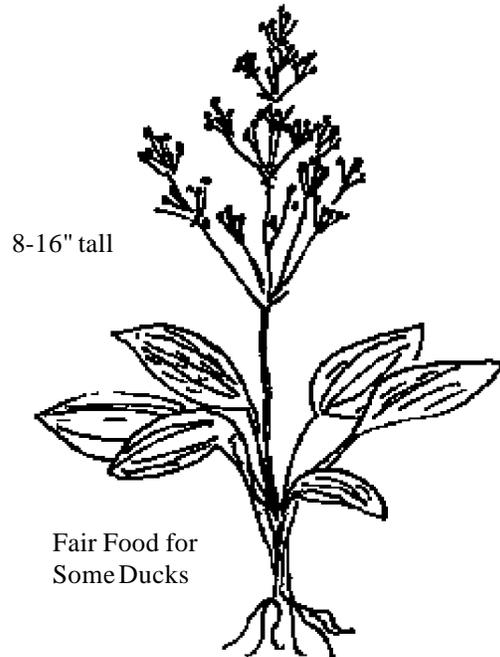
ACTIVITY A: Pond Plant Identification Sheet (3 of 4)

WATERBUTTERCUP



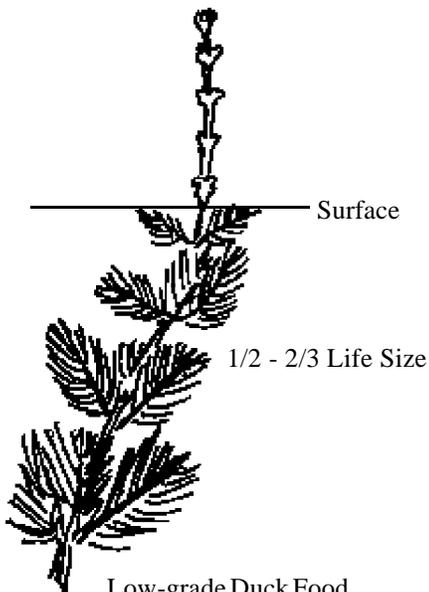
Occasionally eaten by waterfowl, but not important food item.

WATERPLANTAIN



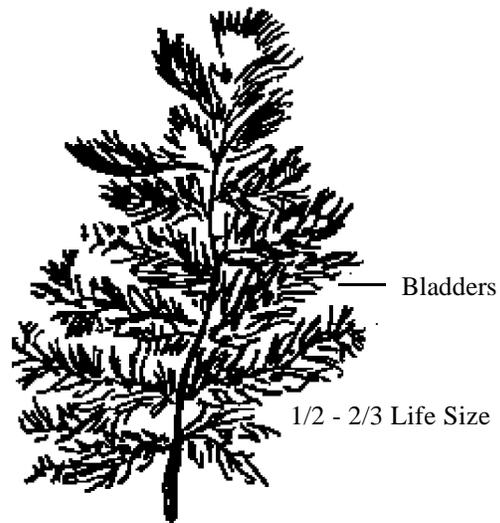
Fair Food for Some Ducks

WATERMILFOIL



Low-grade Duck Food
Often considered a weed.

BLADDERWORT



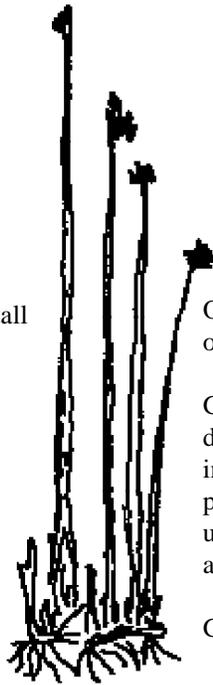
Little or no food value for waterfowl.
A carnivorous plant—bladders catch small invertebrates.

ACTIVITY A: Pond Plant Identification Sheet (2 of 4)

HARDSTEMBULRISH

“Tule”

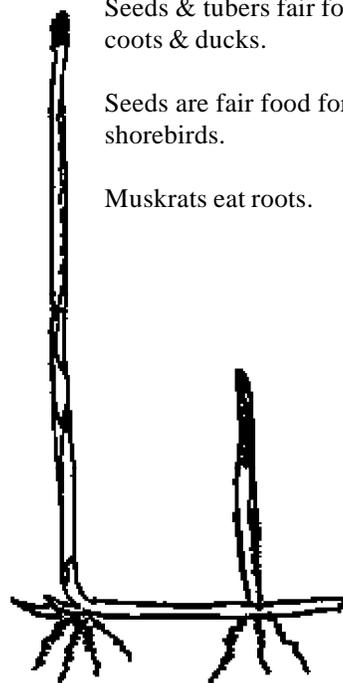
4-6' tall



One of the most conspicuous plants in the marsh.
 Good food & cover for ducks, geese, & coots when in small clumps. Dense patches become almost useless because food isn't available to birds.
 Good cover & food for

muskrats.
 Good cover for blackbirds & marsh wrens.

1-2' tall

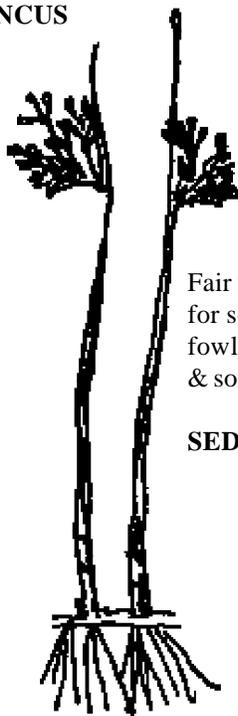


Seeds & tubers fair food for coots & ducks.
 Seeds are fair food for shorebirds.
 Muskrats eat roots.

SPIKE RUSH

RUSH or JUNCUS

1-3' tall



Fair food & cover for some waterfowl, marsh birds & song birds.

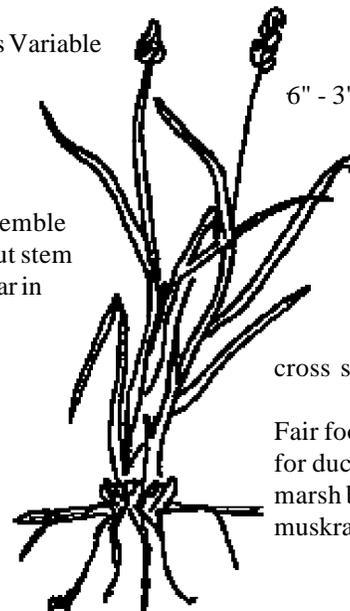
SEDGE or

CAREX

Heads Variable

6" - 3' tall

May resemble grass, but stem triangular in



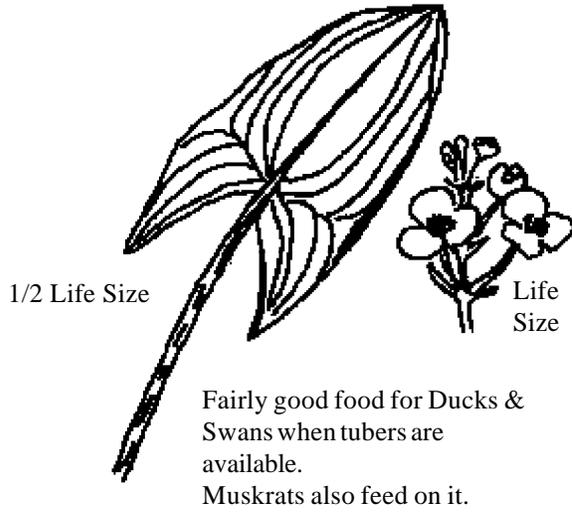
cross section.

Fair food & cover for ducks, other marsh birds & muskrats.



ACTIVITY A: Pond Plant Identification Sheet (1 of 4)

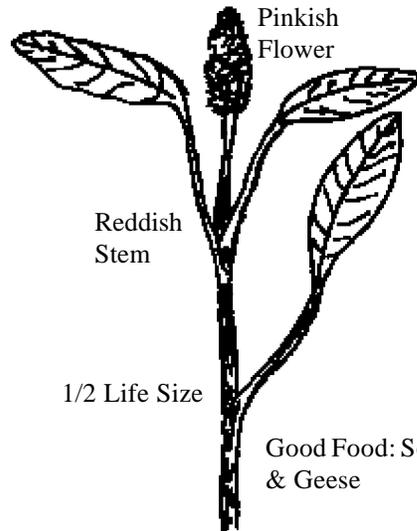
ARROWHEAD



Fairly good food for Ducks & Swans when tubers are available.
Muskrats also feed on it.

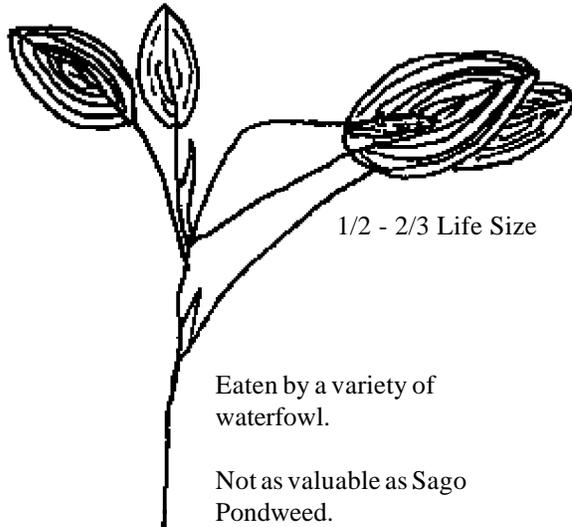
Also called "Duck Potato" or "wapato," it was eaten by Indians and early settlers.

SMARTWEED



Good Food: Some Ducks & Geese

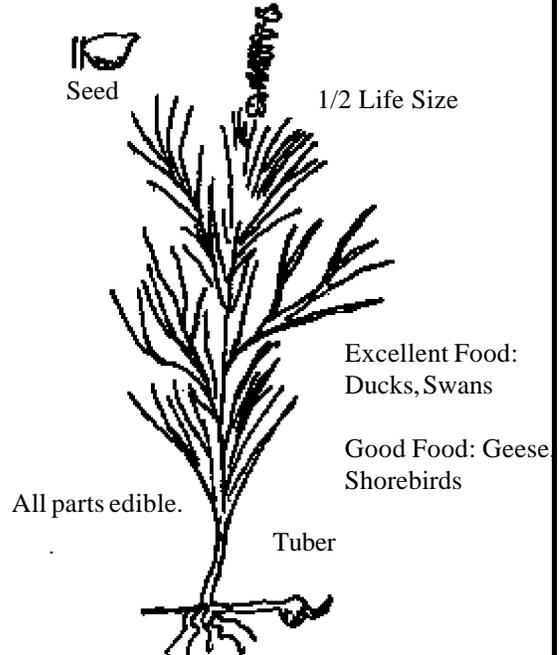
FLOATING-LEAF PONDWEED



Eaten by a variety of waterfowl.

Not as valuable as Sago Pondweed.

SAGOPONDWEED



Excellent Food: Ducks, Swans

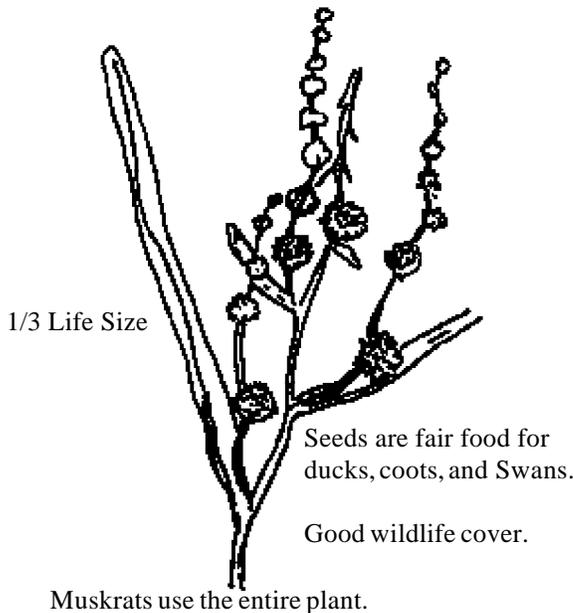
Good Food: Geese Shorebirds

All parts edible.

ACTIVITY A: Pond Plant Identification Sheet (4 of 4)

BURREED

3-6' tall



Underground stem is excellent food for muskrats, good food for geese.



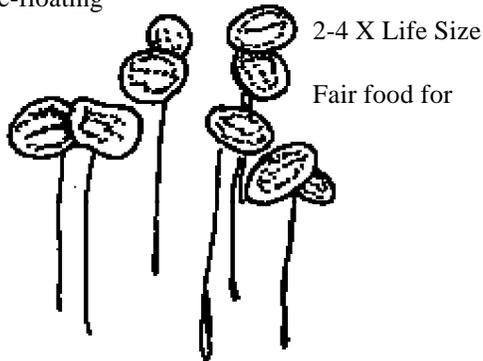
Can become too thick and crowd out other useful plants, thus becoming useless to waterfowl.

Nesting cover for marsh wrens and blackbird.

CATTAIL

DUCKWEED

Tiny surface-floating plants.



some ducks & coots.

CHARA (MUSKGRASS)

Approx. Life Size



An alga with a skunky odor, often a coating of lime, and sometimes prickly-looking.

Good food for some ducks & coots; also harbors many aquatic animals which waterfowl eat.

Other "scummy" algae may serve as fair food for ducks and coots. They can become too thick and thus smother more valuable plants.



ACTIVITY A: Describe a Pond

10 min.
individual

Think of a pond with which you are familiar. In as much detail as possible describe the pond.

In groups of three, compare your descriptions. What things are similar? What things are different?

Together, write a description of a pond with which you can all agree.



ACTIVITY B: Observe a Pond Environment

5 min.
individual

Work by yourself.

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

PLANTS _____

ANIMALS _____

AIR _____

SOIL AND ROCKS _____

WATER _____

OTHER _____



ACTIVITY D: Pond Vertebrates

10 min.
groups

| Name or Description | Evidence | Where Found | Abundance (abundant, common, uncommon) |
|---------------------|----------|-------------|-------------------------------------------------|
| | | | |



ACTIVITY E: Daily and Seasonal Differences in a Pond

10 min.
individual

1. Walk around the pond and look for evidence of differences in this environment at other times. Record your observations below.

| Evidence | How was the environment different? | How would the difference affect life in the pond? |
|----------|------------------------------------|---------------------------------------------------|
| | | |

2. Based upon your knowledge of the weather and other conditions in this area what other differences would you expect to find at other times of the day or year? Record your ideas below.

| How would the environment different? | Cause of the difference? | How would this affect life in the pond? |
|--------------------------------------|--------------------------|-----------------------------------------|
| | | |



ACTIVITY F: Determine Water Volume of a Pond

20 min.
small groups

Work in groups.

Instructions for collecting and recording volumes of water in ponds or lakes.

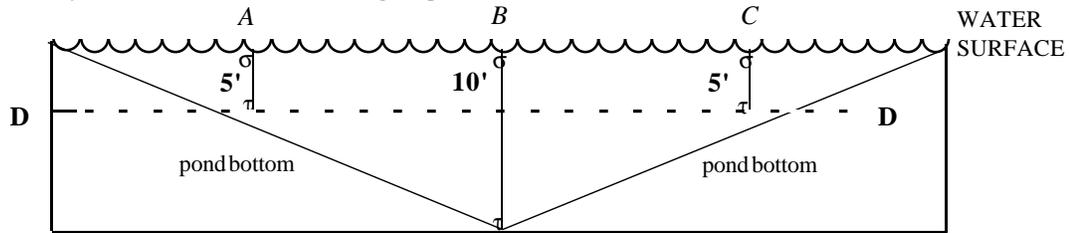
a. Find the average diameter (distance across) of the pond. Measure the length and width of the pond. You may have to take several length and width measurements and get the average of them.

Pond width _____ feet.
 Pond length _____ feet.
 Total _____ feet " 2 = _____ ft. (average diameter)
 Average diameter _____ ft. x 3.14 () " 4 = _____ sq. ft. surface
 (area of pond)

b. Find the average depth of the pond or lake. Measure the depth in 3 places along a line (transect) across the pond, as near the middle as possible. Add these depths and divide by 4 (see explanation below) to get the average depth. (If additional accuracy is desired, repeat this process along additional transects and average the results.)

First measurement _____ feet.
 Second measurement _____ feet.
 Third measurement _____ feet.
 Total _____ feet " 4 = _____ ft. (average depth).

NOTE: The reason you take 3 depth measurements then divide by 4 is to take into account the shallow areas of the pond. It can be explained by the following example of a drawing of a pond cross-section. If depth in 3 places is A(5'), B(10'), C(5'), (total 20'), find an average by dividing by 3 (20' " 3 = 6 2/3'). Now look at the mean or average depth (D) which is 5'. Take total of depths and divide by 4 (20' " 4 = 5'), the correct average depth.



c. Formula for computing number of gallons of water in pond.

- _____ x _____ = _____ cubic feet
 area of pond average depth volume in cubic feet
- _____ cu. ft. x 7.48 = _____
 volume in cu. ft. no. gals water in pond

NOTE: A cubic foot of water is the water in a container 1-foot wide, 1-foot high, and 1-foot long.
 It contains 7.48 gallons.

d. Formula for computing the volume using acre-feet of water.

- (surface) _____ x _____ = _____
 area of pond in feet average depth in feet volume cu. ft.
- _____ " 43,560 = _____ acre-feet of water.
 volume cu. ft. (sq. ft. in an acre)
- _____ x _____ = _____
 acre-feet gal./acre-foot no. gallons in pond

e. In order to find out how many people could get their domestic needs for one day from the water in the pond, complete the following calculations.

_____ " _____ = _____
 gallons of water amount of water one total no. people who could live one day
 in the pond person uses per day from this water

*The average person uses about 200 gallons of water a day for home use. This does not reflect each person's share of water used for industrial, public services, and commercial. (U.S. Office of Education
 ures.)



ACTIVITY E: Temperature Layering in Ponds - Lakes

In summer, the surface water absorbs the sun's heat and warms faster than the water below. The warmed water is lighter than the cold, so it floats on the cool layers. By midsummer there are three distinct layers.

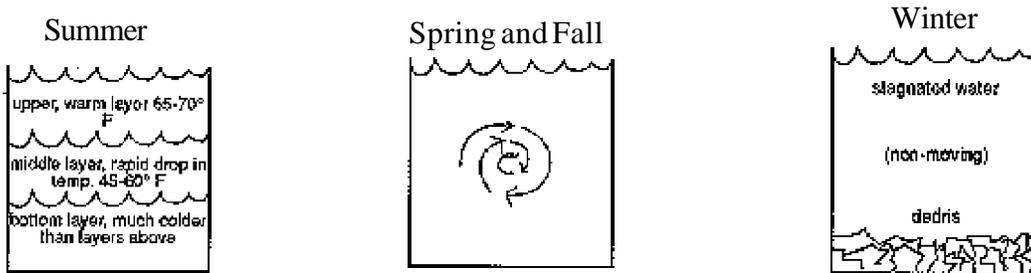
During the summer, mixing or circulation is prevented by these stratified layers of water which act as a barrier.

The upper layer of water cools in autumn until it approaches the temperature of the water in the middle and lower layers. Aided by winds, the surface water sinks causing circulation from top to bottom.

In winter, the cold surface water continues to sink and the water becomes stagnated, photosynthesis slows, and oxygen levels drop.

In spring, aided by winds, another circulation and mixing occurs, called the "Spring Overturn."

1. Seasonal Change Diagram

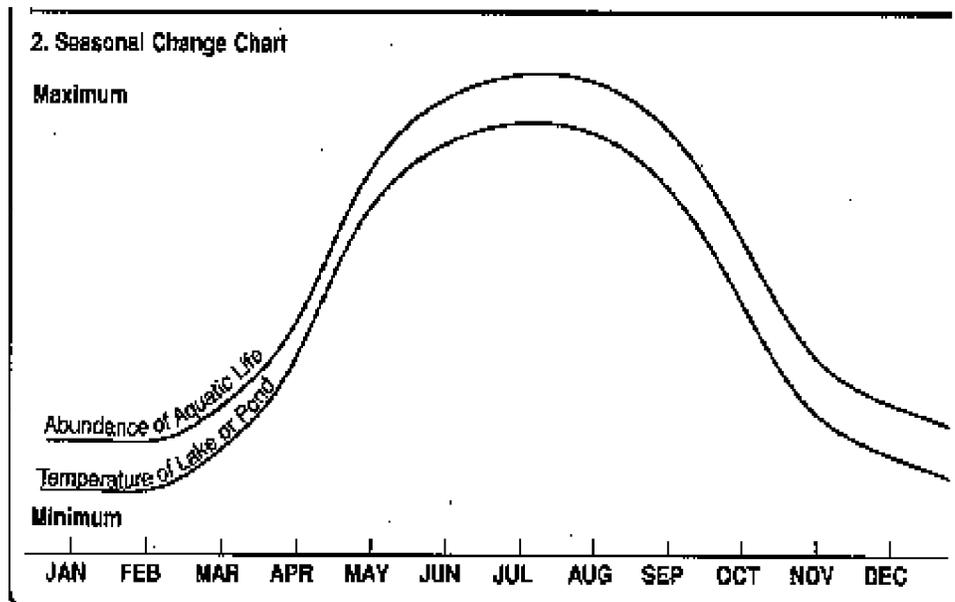


During the summer, fish and aquatic life are most active.

During the spring and fall overturns, the temperature of the water is equalized throughout the lake. Fish and other animals are more active than in winter, but less active than in summer.

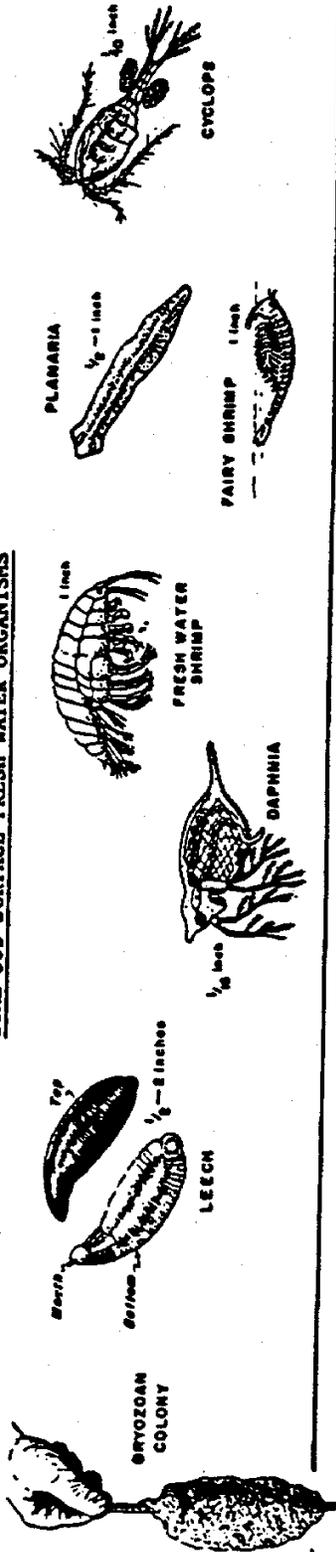
Activity is greatly reduced during the winter. Many animals hibernate in the mud or debris at the bottom.

2. Seasonal Change Chart

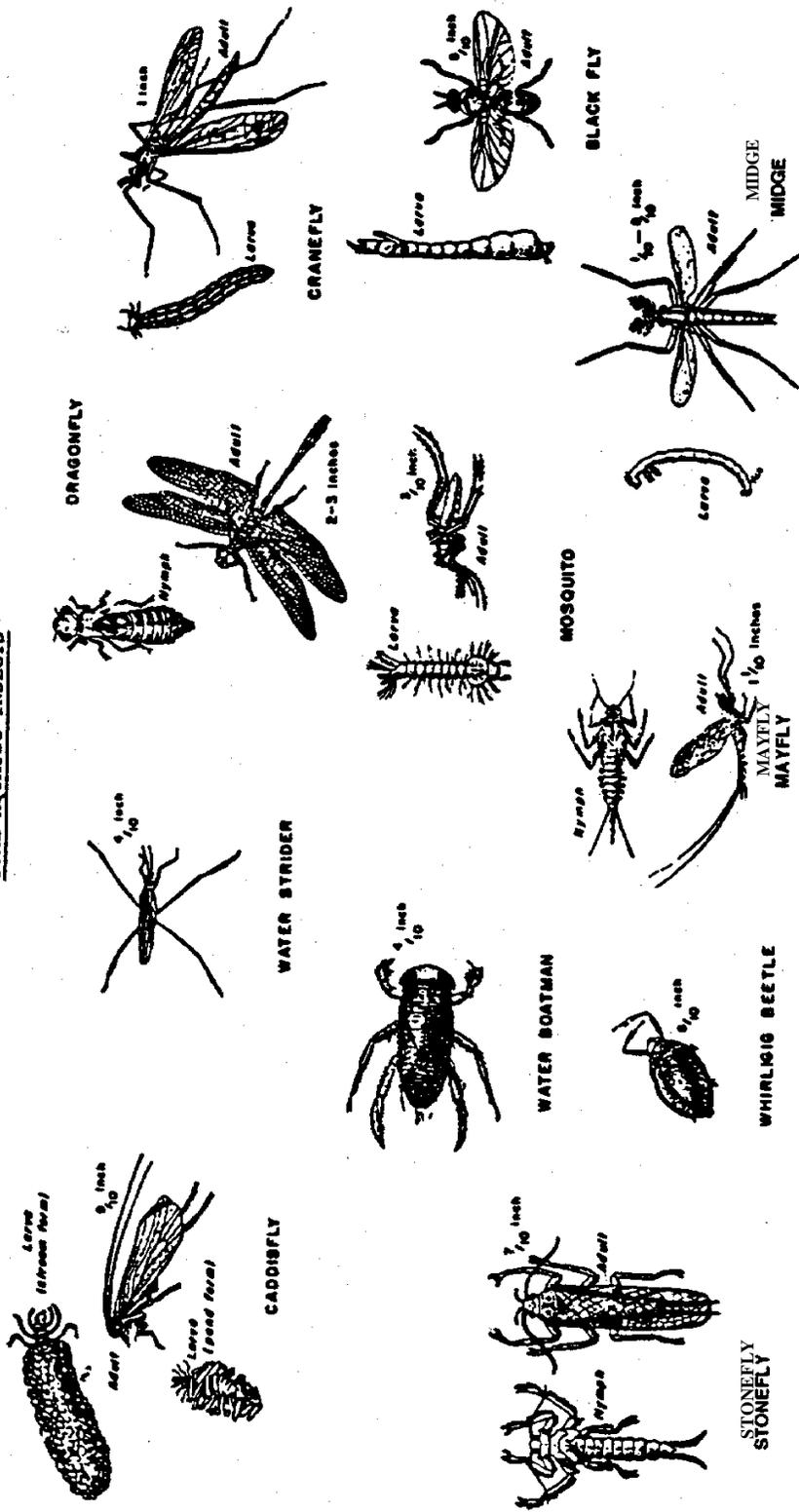


HANDOUT FOR ACTIVITY C: Aquatic Insects

SOME SUB-SURFACE FRESH WATER ORGANISMS



SOME AQUATIC INSECTS



Oregon Department of Fish & Wildlife