Ducks Unlimited's

TEACHER'S GUIDE TO WETLAND ACTIVITIES

Green Wing
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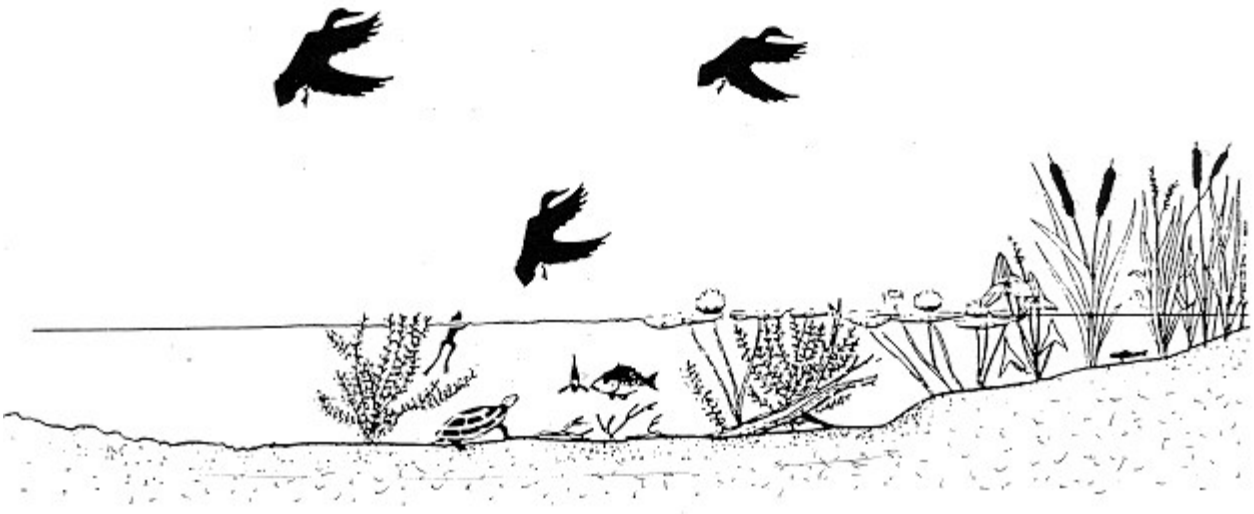
TEACHER'S GUIDE TO WETLAND ACTIVITIES - Preamble

In this guide, wetlands as a key ecosystem found close to most communities across North America, are used to demonstrate a wide variety of ecological concepts and learning outcomes. Through the activities and lessons provided, students will be helped to develop the foundations required for their literacy in the Life Sciences. Students will enhance their understanding about the environmental, technological and social aspects of science while working together to solve problems, and plan and implement scientific inquiries. It is our hope that through this guide, students at the elementary school level (Grades 4-5) will enhance their knowledge while developing an appreciation for science and a sense of wonder about wetlands.

An excellent complement to the classroom activities in this guide, would be a field trip to a local wetland ecosystem. The field trip can be undertaken at any point in the unit but timing will depend most on season, weather conditions and opportunity. If a field trip is not possible, the classroom lessons and other activities may be used in a stand-alone format.



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Introduction

Wetlands are an incredibly important resource for wildlife, the public and to you as educators. These productive and diverse ecosystems can be used to teach young people about many different topics including the water cycle, food chains, food webs, the importance of habitat, human impacts and how to get involved in conservation activities.

This guide is a collection of background information and activities relating to wetlands. Use it in conjunction with the other literature to create a "wetland unit" for your students. The activities are easy, interactive, and can be conducted in your own classroom or school yard with materials that are readily available.

Thank you for intoducing your students to the fascinating world of wetlands!

I) IMPORTANCE OF WATER

Water covers more than two thirds of the Earth's surface. It is the basis of all life in this world. Without it nothing lives, nothing grows.

Water is a home for thousands of animals and plants. It also transports minerals and nutrients that feed the animals and plants. Water is also vital to human survival. Living things, including humans need clean water to survive and that is where **wetlands** play a vital role.

Wetland vegetation acts as a natural filter in many streams, lakes and drainage basins. As water flows through wetlands, it is slowed down by the vegetation. Suspended solids in the water are trapped by the stems and root masses, and as much as 80 - 90% of this material may drop out into the wetland or be taken up by vegetation. When the water flows out of the wetland, or percolates into the groundwater, it is much cleaner.

Source: Modified from Ontario Children's Groundwater Festival, Teacher's Guide

II) THE WATER CYCLE

Water is a vital element of our environment. It determines the existence of a wetland and is in turn influenced by the wetland. One of the characteristics of all wetlands is naturally changing water levels. Depending on the location, the water level may fluctuate with rainfall, run-off and the activities of wildlife and people.

Water travels from the air to the earth through living organisms and back to the air in a continuous cycle. There are three major routes that water can follow when it reaches the ground:

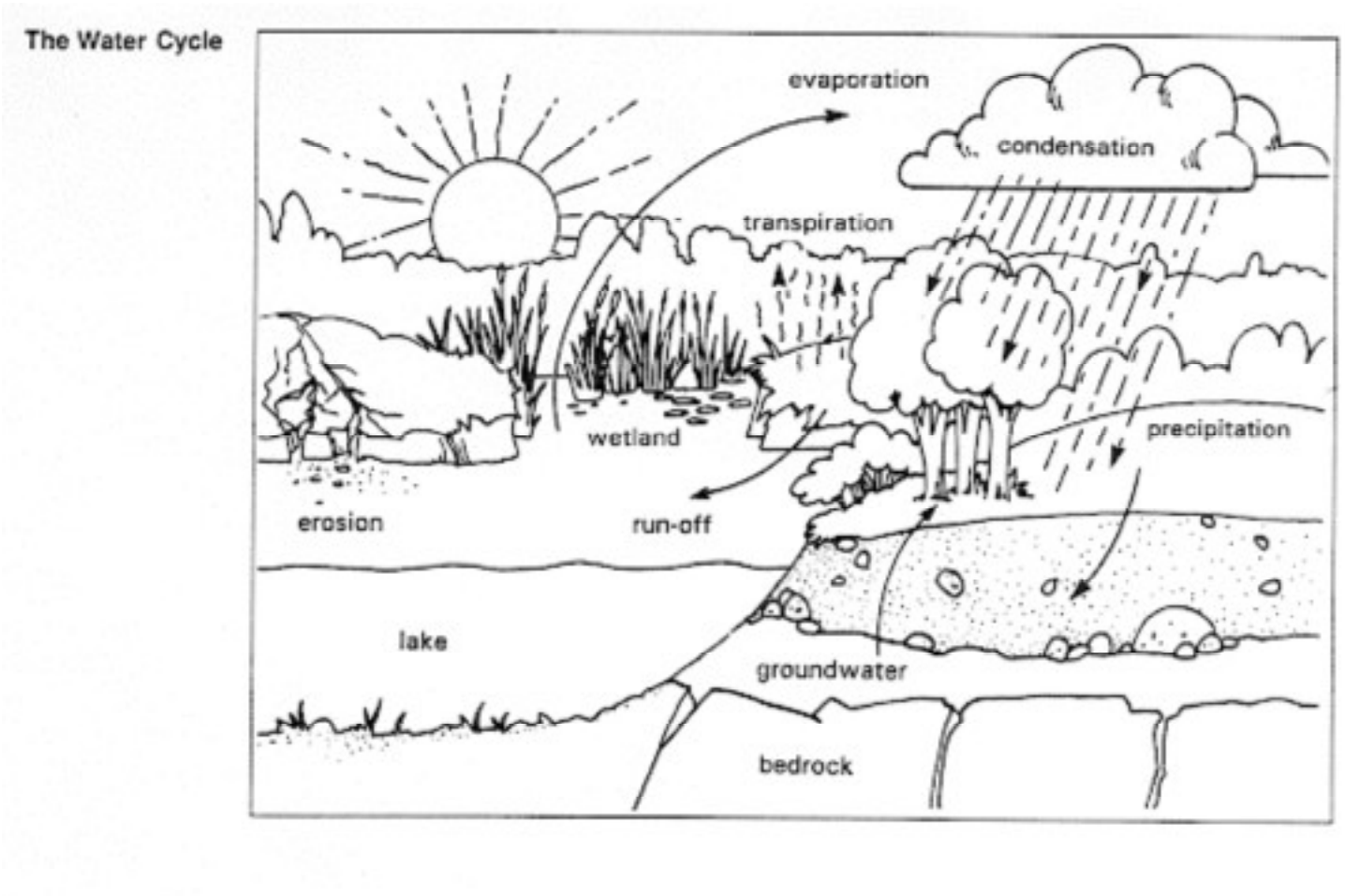
1. It can be absorbed into the **topsoil**. This water may then be used by plants in order to grow.

2. It can seep through the topsoil and collect above the bedrock. This is called **groundwater** and is the source of springs and wells.

3. It can flow from the surface of the ground into nearby lakes, rivers streams and wetlands. This is called **run-off**. If the run-off carries soil away with it, the process is called **erosion**.

Water returns to the air as a gas (water vapor) via **evaporation** from land and open water. Plants and animals also release water, a process called **transpiration**. This water also evaporates. As the water vapor rises, it cools and turns back into a liquid. This process is called **condensation**. The water droplets collect around minute dust particles to form clouds. When the clouds can no longer hold the moisture, there is **precipitation**. This is the **water cycle**.

Humans have greatly affected the natural water cycle. Many wetlands have been drained or filled in. This reduces water in some areas and increases it lower down in the drainage basin. Large reservoirs and dams have flooded many acres of land. Plants, animals and our environment have been greatly affected by these changes to the natural water cycle.



Source: Modified from Why Wetlands?, Federation of Ontario Naturalists

ACTIVITY #1 MAKING CLOUDS

There are two things needed for clouds to form: tiny particles (like dust, soot, or pollen) and warm, moist air that is cooled. Make your own "cloud" in a bottle.

BACKGROUND

Clouds form when warm moist air rises and cools. Cooler air cannot hold as much water vapor as warmer air. As the air cools, the water vapor condenses (changes from a gas into a liquid) to form water droplets (or ice crystals); this is similar to water condensing on the outside of a glass of cold water on a hot, humid day. For clouds to form, the water vapor must have something to condense around. There are all sorts of microscopic particles in the air (e.g. dust, soot, pollen, bits of rock, salt from the oceans, as well as particles added by humans through car exhaust and smoke from factories). Billions of particles with tiny water droplets on them make up a cloud. When you make a "cloud" in a bottle, the smoke provides the microscopic particles. You condense the water vapor by lowering the air pressure in the bottle; squeezing the bottle increases the air pressure and then immediately releasing the bottle lowers the pressure. Air pressure is related to the formation of clouds because the higher into the atmosphere you go, the thinner the air and the lower the air pressure.

Water droplets may persist at temperatures well below freezing (such droplets are said to be "supercooled"). Clouds made up mainly of water droplets have sharp, well-defined edges. Those made up chiefly of ice crystals appear to be fuzzy and diffused. Clouds aren't as light as you might think. A mid-sized cloud can have the mass of as many as five elephants. The inside of a cloud is similar to what it's like on a very foggy day.

MATERIALS

2 litre clear plastic pop bottle with screw-on cap; warm water; match.
Optional; plastic bags, twist ties.

PROCEDURE

1. Fill the bottom of a plastic pop bottle with about an inch of warm water.

2. Lay the bottle on its side. Light a match and, after it burns for a couple of seconds, blow it out.

3. Hold the match in the opening of the bottle so that smoke drifts into the bottle. You may want to push down on and then release the bottle to help suck smoke inside.

4. Screw the cap on the bottle. Swish the water around to rinse down all parts of the bottle.

5. Hold the bottle up toward a bright window or lamp. Squeeze the bottle for a moment and then let it go. What do you see inside the bottle? You should see a faint "fog". How is this like a cloud in the sky? Does "fog" form each time you squeeze and release the bottle? Why?

6. Extension: Blow up two plastic bags and twist tie the bags shut. Each bag is filled with warm, moist air from your breath. Put one bag into the freezer and leave the other bag at room temperature. After about 15 minutes, take the bag out of the freezer. Compare the two bags. Which bag has condensed water vapor inside? Why? Leave both bags at room temperature for half an hour. What happens to the condensed water vapor? How does the temperature of air affect the formation of clouds.

NOTE: You make clouds on cold days without even knowing it. When you breathe out warm, moist air, it cools in front of you and briefly forms a little "cloud".

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ACTIVITY #2 MAKING RAIN

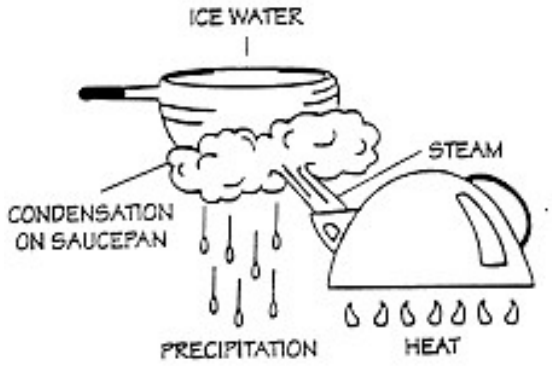
BACKGROUND

When lakes, oceans and rivers are heated by the sun, invisible water vapor rises into the air (some of the water turns from a liquid into a gas). This is "evaporation". There are a number of factors that affect evaporation. The hotter water gets, the faster its molecules move, and the faster it evaporates. When a greater surface area of water is exposed (e.g. shallow pan of drinking water containing the same volume of water as a drinking glass), the water evaporates faster because more of it is in direct contact with the air. Finally, wind makes water evaporate faster because it "pushes" molecules on the water's surface into the air faster.

As water vapor rises, it cools and condenses into tiny droplets of water around microscopic particles floating in the air. Billions of particles with water droplets combine and become so heavy that air currents can no longer hold them up. Or, a cloud grows and reaches up into the higher, colder parts of the atmosphere and some droplets turn to ice. The ice crystals grow at the expense of liquid droplets, which are attracted to the ice and freeze on it. The ice crystals eventually become too large to be held up by air currents, and begin to fall. Depending on the temperature near the ground, the moisture from clouds falls as either rain, snow, hail, or sleet. Much of the precipitation that falls on land eventually flows back into lakes and oceans. So, the cycle continues.

MATERIALS

Kettle (ideally electric, otherwise you will also need a stove)
small sauce pan
shallow pan
water
ice cubes



PROCEDURE

1. Heat some water in a kettle.

2. Put some cold water and ice cubes into a saucepan.

3. When the water in the kettle is boiling, hold the saucepan full of cold water just above the steam. Put a shallow pan underneath the saucepan to prevent a mess. (Keep your hands out of the steam because it can cause severe burns). Watch water droplets form on the bottom of the saucepan. Some of the droplets will become large enough to drip off. When this happens, it's "raining"!

4. How is your model of rain like the water cycle? What does the kettle of boiling water represent? Where are the clouds in the model? How can you make a "rain shower" develop more quickly? Can you affect the size of the drops that fall from the saucepan? Can you create a "downpour"?

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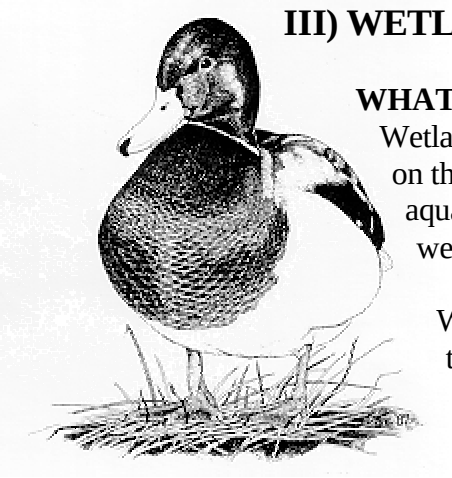


III) WETLANDS

WHAT ARE WETLANDS?

Wetlands are exactly that - "wet lands" - where there is standing water on the ground for at least part of the year, producing characteristic aquatic plants, e.g., mosses, sedges, cattails, bulrushes, lily pads, pond weed, etc.

Wetland soils are either full of water or under water, and the plants that live there are adapted to growing in very wet conditions. You can find wetlands along the edges of rivers, streams, lakes or ponds, and between dry land and deep water.

There are four basic types of wetlands: **marsh**, **swamp**, **bog** and **fen**. (See the accompanying information sheets in this section). Wetlands are divided into these different types depending on where they are located, what kinds of plants grow in them and the soil composition.

IV) WHY WETLANDS ARE IMPORTANT?

Wetlands have many important roles:

1. The stems and roots of shoreline vegetation stabilize stream and lake shores by buffering wave action and binding the soil together. This helps to reduce erosion.

2. Plants help to filter suspended solids out of water flowing through the wetland. Suspended solids in the water are trapped by the stems and root masses, and as much as 80 - 90% of this material may drop out into the wetland or be taken up by vegetation. When the water flows out of the wetland, it is much cleaner.

   Some of this material provides food for plants and micro-organisms and may come from waste disposal, agriculture, industries or storm sewers. It can enter the wetland through erosion and run-off, dumping, direct discharge or even precipitation (via the Water Cycle).

   When there are large amounts of suspended solids, the water is unable to support its natural plant and animal life. Sediment can smother fish eggs, while suspended particles might clog the gills of fish or reduce the amount of sunlight reaching submerged plants. The greatest damage is done during the warmer months when most animal species are active and plants are growing.

   Although wetlands can help maintain good water quality, there is only so much that they can absorb. Decreasing the amount of pollution entering the water is the best way of keeping it clean.

3. Wetlands can help prevent floods and droughts in some areas by storing water. Wetlands found along streams and rivers can act as large, shallow basins where flood water can spread out. This reduces the volume and speed of the water in the stream or river, thereby reducing flood damage. Better water control can also reduce droughts in some areas since streams will not dry out as rapidly. Maintaining water in streams is also important for plants and wildlife that depend upon it, as well as farmers who require it for irrigation.

Wetlands act like a sponge, absorbing excess water and holding on to it for awhile. Later in the season it can act as a recharge for groundwater and other streams and/or rivers nearby. This helps to maintain a longer-lasting, more reliable water source.

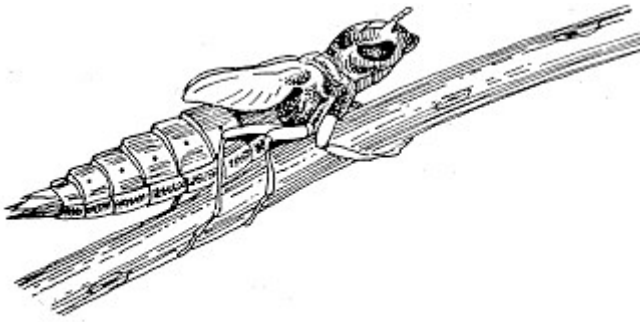
4. Wetlands can be important in replenishing groundwater supplies. Since wetlands retain water longer than other areas, it can slowly seep into the ground and help refill underground streams and pools. Many communities rely on this groundwater to supply their drinking water.

5. Wetlands are vital habitats to hundreds of species of plants and animals. They provide shelter and protection, as well as feeding, drinking, cooling off, breeding, nesting and nursery sites for many species. They are also used as migratory stopovers for many bird species.

   The plants in a wetland provide food for many animals which, in turn, provide food for larger animals.

   Wetland vegetation is vital to the safety of wildlife. A variety of fish, amphibians and invertebrates lay their eggs among the plants in order to hide them from predators. The young of many animals (e.g. turtles, ducks, frogs, etc.) find shelter in shoreline vegetation to escape predators such as mink, otter and owls. Mallards, teals and other waterfowl hide among the plants while molting, in order to escape danger during this flightless period in their lives. Many insects shelter on the stems and leaves of plants when they are undergoing metamorphosis, in order to hide from their predators.

6. Wetlands provide people with a source of livelihood, rec
   Aboriginal people harvest plants like wild rice and cranbe
   as trap animals for their meat and fur. This supports their
   livelihood, as well as the economy. Wetlands are also po
   places to hike, canoe, photograph wildlife, hunt and fish.



Source: Modified from Why Wetlands?, Federation of Ontario Naturalis

SWAMPS

SWAMPS are wetlands that are predominated by shrubs or trees. Swamps can have hardwood trees growing with “wet feet”, or, as in cedar swamps, with the water just below ground level.

Wooded swamps provide important habitat for many types of plants and animals. White-tailed deer use dense coniferous swamps for winter cover. An abundant supply of winter food is critical for white-tail survival, and swamp vegetation such as red maple, dogwood, and cedar forms an important part of the deer diet.

Other animals that use swamps for food or cover include hawks and owls, rabbits and hares, raccoons, coyotes and wolves, black bears and a variety of songbirds. Wood ducks often nest in hollow trees in open swamps.

Carrs are swamps predominated by shrub thicket, usually willow, dogwood, or alder. Woodcock often live in alder thickets where they probe the moist earth for earthworms, their main food. Many songbirds nest in carrs and feed on the berries and seeds that are abundant in the fall.

Swamps are important water storage areas. They help prevent flooding in spring by acting as natural reservoirs. Swamps can also help prevent drought conditions by slowly releasing water during dry summer months.

MARSHES

MARSHES are the most productive of all our wetland types. They usually have open water in them up to 6 1/2 feet deep, and are predominated by lush vegetation growing in or out of the water. Common vegetation of the marsh includes emergent plants such as cattail and bulrush, floating-leaved plants such as water lily, and submerged plants such as coontail.

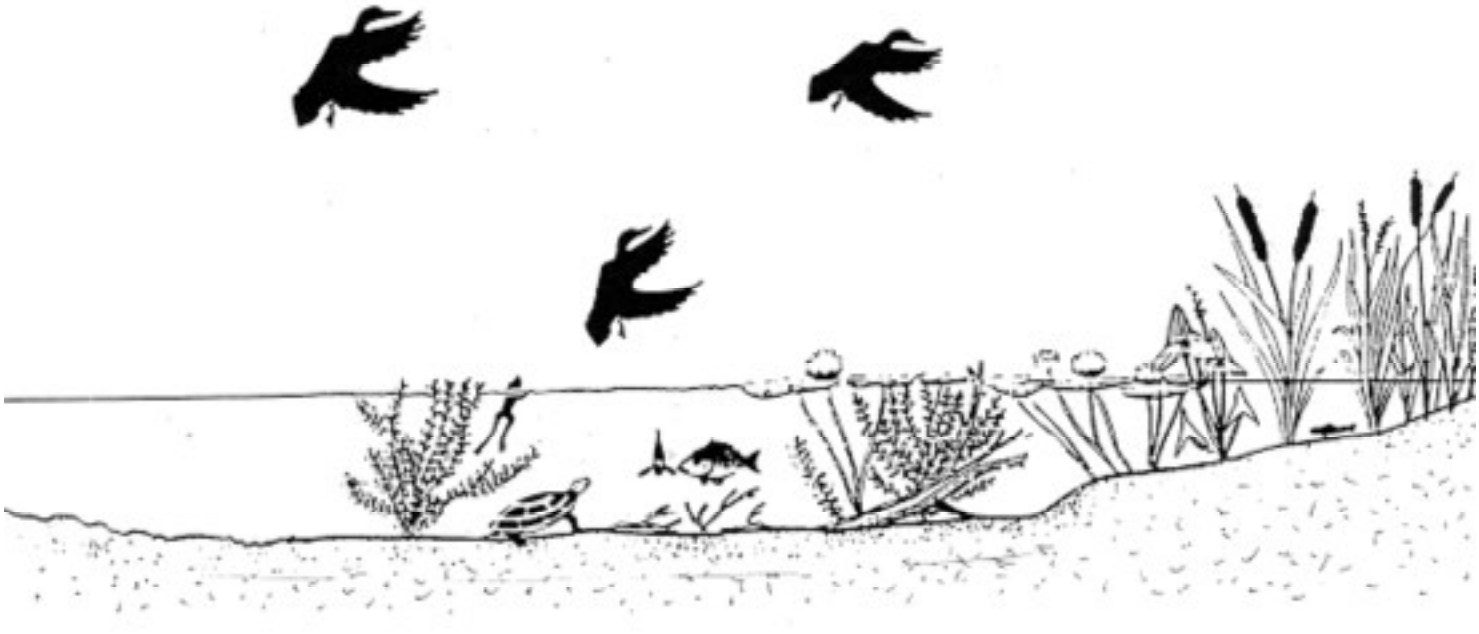
Freshwater marsh plants use sunlight to convert water and nutrients into living matter (biomass) more efficiently than most other ecosystems, including forests and farmlands. Because of this high productivity, marshes provide food for a remarkable variety and abundance of fish and wildlife.

In all ecosystems, plant life forms the base of the food chain. In marshes this base is exceptionally large, so more food is available for more insects, amphibians and reptiles, fish, birds, and mammals.

Marshes are important to our freshwater fisheries as they provide feeding and spawning grounds for many species. The warm shallow waters of marshes provide spawning grounds for minnows, sunfish, bass, pike, and muskellunge. Marshes are also important to the health of lakes as they filter silt and pollution from the water.

A diverse community of wildlife depends on marshland. Loons nest among the emergent vegetation beside open water. Osprey and kingfishers dive in the shallow waters for fish. Muskrat build lodges and channels among cattails, and create openings for ducks, rails and bitterns. Mink prey on the abundant frogs, young birds, and small mammals in the marsh.

In the autumn, marshes provide important feeding and gathering areas for migrating ducks and geese. Puddle ducks, such as mallards and blue-winged teal, feed on wild rice and shallow aquatic plants. Diving ducks, such as ringnecks and goldeneyes, feed on small aquatic animals and plants in deeper water.



BOGS

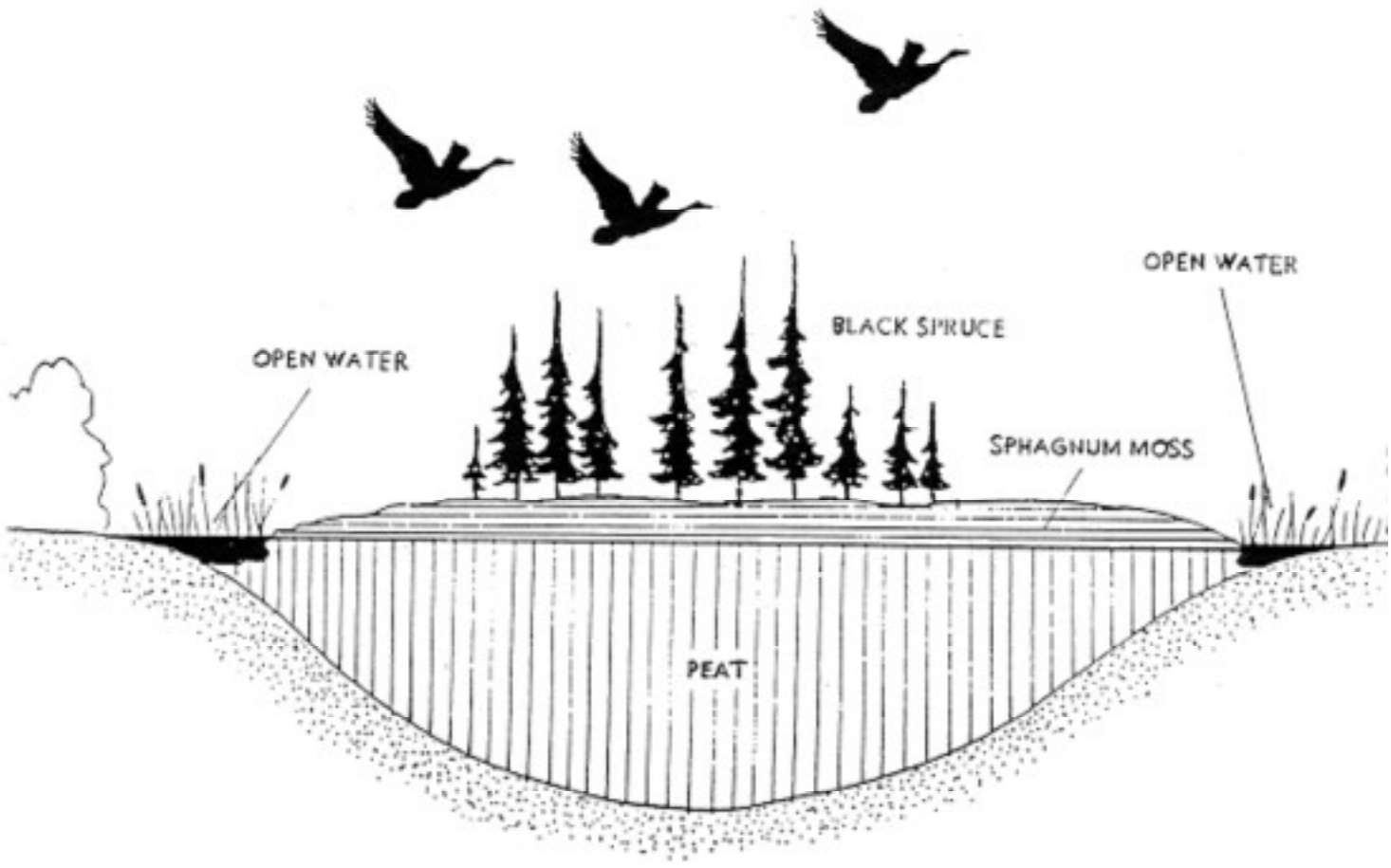
BOGS are more common in northern regions and are relatively rare in the south. Where they occur, bogs are fascinating wetlands.

Bogs are "old" wetlands, occurring where drainage and water circulation is poor. Most of the nutrients that enter a bog come from rainwater, and not from adjoining lakes, creeks, or rivers. Bogs are "nutrient poor" ecosystems which are not as productive as marshes or swamps. The low productivity of bogs is reflected by the smaller number of animals that live in them.

Plants that live in bogs are unique because they have adapted to the acidic, nutrient-poor soils. Carnivorous plants, such as the pitcher plant and sundews, get the nutrients they need from insects they trap in their leaves. Bogs provide the only habitat for a number of uncommon wildflowers, orchids, and insects.

Sphagnum moss forms the vegetative mat in most bogs (commercial dew worms are often packed in sphagnum moss). Sometimes this mat floats over water, as in quaking bogs. Trees, if present, are usually black spruce or tamarack. They grow slowly in bogs, and seldom reach a large size.

Bogs provide habitat for weasels, foxes, owls and a variety of small mammals. Many songbirds, including the white-throated sparrow and Wilson's warbler, inhabit bogs. Moose often feed along the edges of bogs.



FENS

FENS, like bogs, are more common in northern regions. Fens are wetlands predominated by sedges– a group of grass-like plants with triangular stems. Fens occur in slightly acidic or alkaline water. Many rare wildflowers and orchids require the unique chemistry of fens to grow. Like bogs, fens are not very productive wetlands, but they are important for the unique life forms found within them.

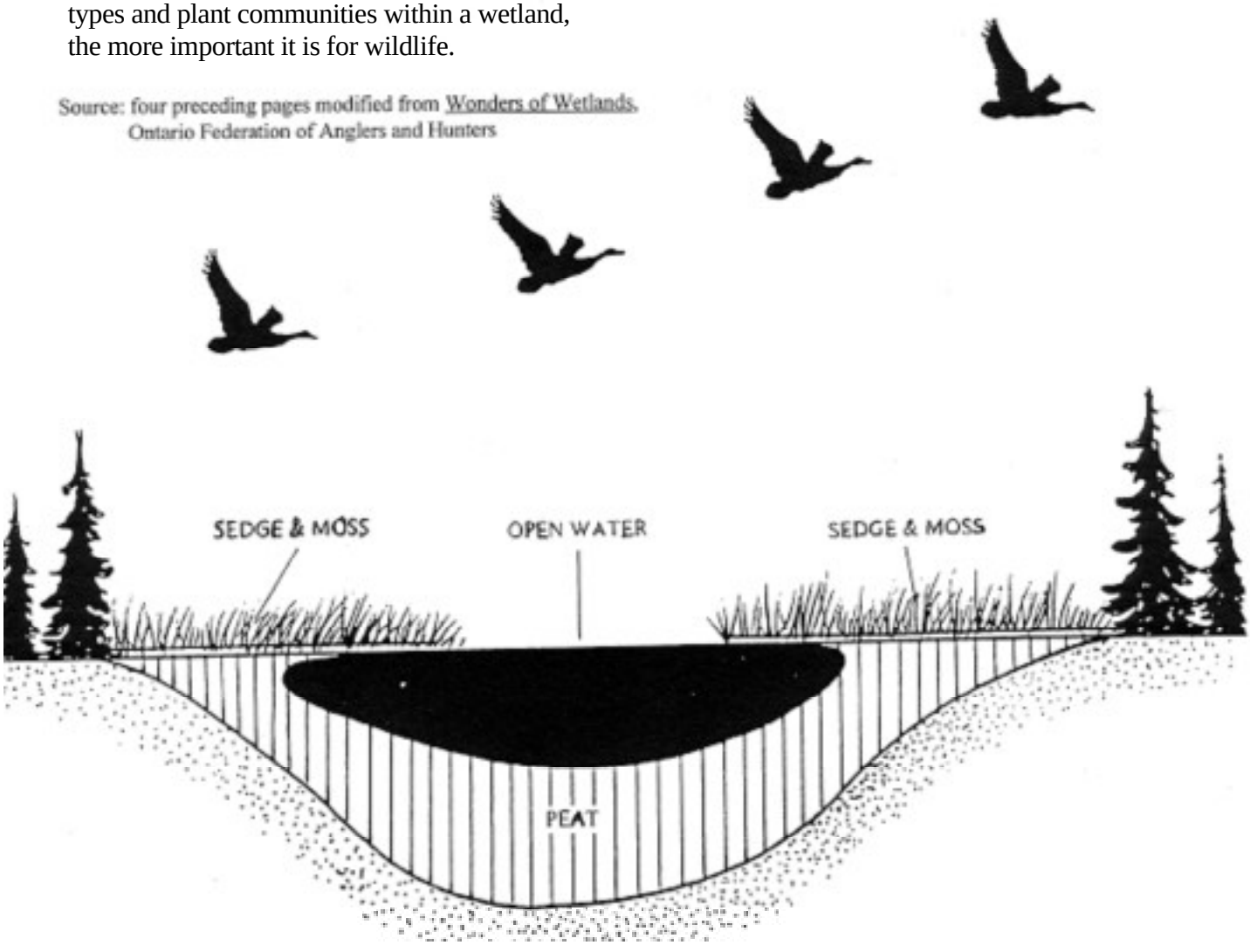
Trees, if present in fens, are usually cedar or tamarack.

Marshes, swamps, bogs and fens are the types of wetlands found in Canada. Any single wetland can be made up of any combination of these four wetland types. The more variety of types and plant communities within a wetland, the more important it is for wildlife.

Succession

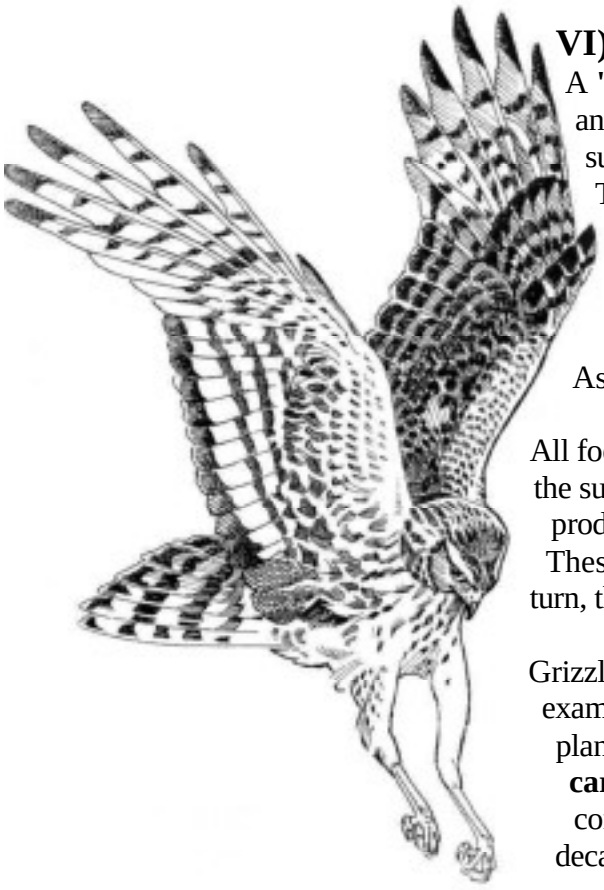
Wetlands are not static systems -- they constantly change through the process of natural or human influenced succession. Ecologically, marshes are the youngest wetlands -- a fact which enables marshes to be created in a relatively short time. Marshes sometimes succeed into swamps, and in some cases to a fen or bog over many years. Fens gradually become bogs as peat accumulates and acidity increases in the wetland. Because of their ecological age, fens and bogs are more sensitive to disturbances.

Source: four preceding pages modified from Wonders of Wetlands, Ontario Federation of Anglers and Hunters



V) FOOD CYCLES

All life is connected in delicate balances called "ecosystems." Living things do one of three different jobs to maintain ecosystems - they are either - **producers**, **consumers** or **decomposers**. **Producers** are green plants. They use the sun's energy to manufacture their own food from **abiotic** (non living) elements; this process is called **photosynthesis**. Green plants provide food and oxygen for other living things. "Consumers" are living things that eat other living things. Some consumers eat producers and/or other consumers. **Decomposers** "break down" dead plant and animal material into abiotic elements. Decomposers are recyclers; the abiotic elements return to the soil, water and air for use again. Decomposers include bacteria, fungi, earthworms and snails. (It's important to note that decomposers can also be consumers, e.g., snails also eat plants). **See Appendix #1 for student activity sheets.**



VI) FOOD CHAINS

A **"food chain"** consists of a series of animals that eat plants and other animals. Ask your students what they had for supper last night. Most likely someone will have eaten meat. Trace the meat back to its source. For instance, if a student ate roast beef, the food chain would be:

hay or grass → cow → student

Ask your class how many levels there are in this food chain.

All food chains begin with plants that get their initial energy from the sun. Plants use the sun's energy for **photosynthesis** to produce sugars. The sugars are then used by the plants to grow. These plants provide food for **herbivores** in the community. In turn, the herbivores are eaten by omnivores and carnivores.

Grizzly bears, raccoons, skunks and many human beings are examples of **omnivores**. An omnivores diet consists of both plants and meat. Weasels, hawks and owls are examples of **carnivores** and they are meat eaters. Of interest, vultures and condors are referred to as **scavengers** because they eat dead, decaying animals.

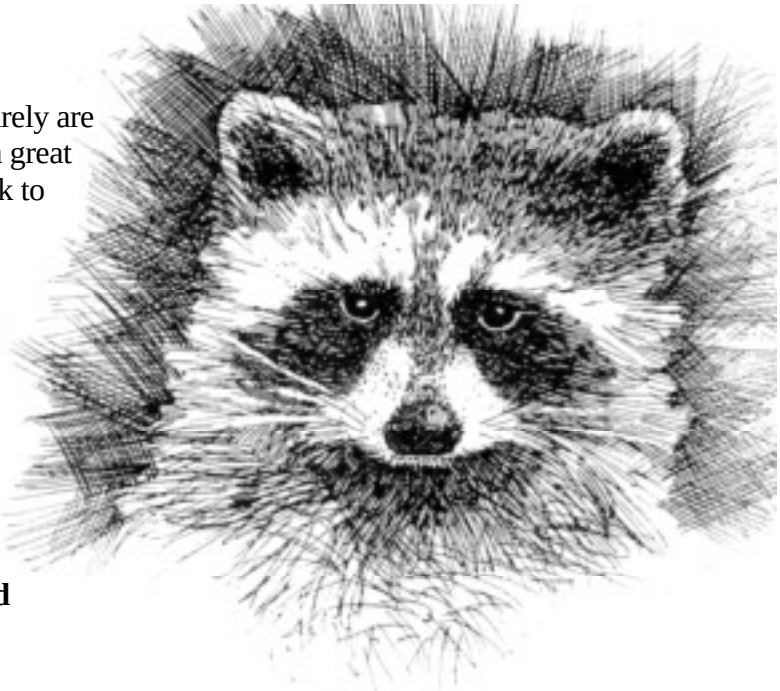
Now, using the "Web of Life" activity, have your students practice building food chains or see Appendix #1 for student activity sheets.

Here are some examples of food chains:

i) plant nectar → butterfly

ii) clover → rabbit → fox

iii) clover → grasshopper → frog → snake → hawk



Many food chains have only three or four links; rarely are there more than five or six links (largely because a great deal of "food energy" is lost in going from one link to another).

An example of a wetland food chain is:

algae → water boatman → fish → raccoon

Although this shows a simple line of progression from algae to raccoon, things are not so simple in nature. Since animals generally eat more than one kind of food, food chains overlap to form **food webs.** More of this will be discussed later on.

Humans may also be part of a wetland food chain. Fish, ducks, moose, deer and other game animals that use wetlands are eaten by people. Several wetland plants such as wild rice, cranberries and blueberries are part of the diet of many communities. In addition, many fur-bearing mammals, including beaver, muskrat, mink and otter are harvested by trappers as a source of income.

Source: Why Wetlands?, Federation of Ontario Naturalists

VII) FOOD WEBS

Most animals have several sources of food. Therefore, food chains are not really distinct, but interconnect to form a **food web**. A food web is always shaped in the form of a pyramid. The number of plants, or producers, greatly exceeds the number of animals, or consumers.

The larger web of life incorporates the limiting **LAWS** in ecosystems: **L**ight (from the sun), **A**ir, **W**ater and **S**oil. Decomposers complete the cycle in the web of life. The web of life represents the fragile ties that underlie an ecosystem. No matter how distant the relationship may seem, all things are connected.

Due to this connection, changes in any link in a food web will be felt by many species. Using the example below, ask your students how the decline in the frog population might affect the ecosystem.

The decline in frogs would cause its **predators** to shift to other **prey** species, such as minnows. This could result in too much feeding pressure on the minnows, causing their population to crash. Either another prey species would be selected, or the pike would decline due to lack of food. This, in turn, would lead to a decline in herons and raccoons. It is possible, also, that the decline in frogs could lead to less pressure on the water boatman population. More water boatmen would eat more algae and the base of the food web would shrink. This would mean that fewer species could be supported in the ecosystem.

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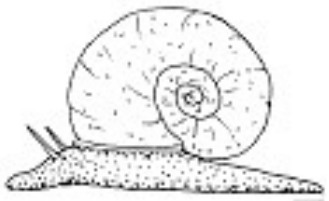
See Appendix #1 for student activity sheet entitled Wetland Food Webs.

ACTIVITY #3 THE WEB OF LIFE



MATERIALS
Plant and animal name tags and a ball of string.

HOW TO PLAY
1. Prepare a variety of name tags (or picture cards) with each depicting one component of an ecosystem (e.g., sun, soil, water, air, grass, cattails, duckweed, muskrat, beaver, rabbit, grey squirrel, hawk, duck, fox, raccoon, skunk, human, snail, crayfish, earthworm, bacteria, algae, etc.) Each person picks a name tag and becomes that component.

2. Everyone sits in a circle to symbolize the ecosystem. Begin with a few simple food chains. For example, the sun person holds the end of the string and you ask who needs the sun? Algae; so the ball is thrown/rolled to the algae person. Who eats algae? Snail; so the ball gets passed to the snail and so on until the chain is complete. Try a few different chains.

3. Now form a web. Starting with any one component, use the ball of string to connect the component to another related component. The relationship may be that the second component eats the first (e.g., plant connected to rabbit.) Or, the relationship may be that the first component needs the second to survive (e.g., plant connected to soil).

4. Connect the second component to a third (e.g., rabbit eaten by fox, or rabbit needs water). Continue in this way until everyone is connected to several people in several ways. As you go along, discuss what each connection or relationship is. Also, discuss interdependence.

5. Once everyone is connected, remove one component of the web (e.g., there is no water because it was drained). The water person shakes his or her strings. All members who feel the shake then shake their strings as well. This continues until it's demonstrated that every component is affected. Discuss how the various components are affected when one component of the web is removed.

6. What would happen if a chemical spill destroyed all the plants (plants tug their strings)? The plant eaters would starve, which would cause the meat eaters to starve. The web would be destroyed -- at least temporarily.

7. What would happen if the water became badly polluted?

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ACTIVITY #4 ECOSYSTEM TAG (a little more challenging but worth the effort!)

MATERIALS

Beanbags, pinnies, 2 - 4 hula hoops or boxes, and 4 pylons

HOW TO PLAY

1. Divide students into 3 groups: decomposers, consumers (about twice the number of decomposers), and producers (about twice the number of consumers). To establish the groups, have the students line up and count off up to 7. All the ones become decomposers, the twos and threes are consumers and the rest (fours to sevens) are producers. Each group wears a different colour pinnie.

2. Using the pylons, set a boundary for a large playing area. Use beanbags to represent abiotic components. The number of beanbags equals the number of producers. Place beanbags in two or more piles inside the hula hoops, within the playing area.

3. The game involves the basic chain of abiotic components to producer, producer eaten by consumer, and consumer broken down by decomposer to return abiotic components to the environment. The overall idea is to maintain the ecosystem, while each group fulfills its goal.

4. Producers are the only players who can take beanbags from the piles. A safety zone (one foot inside the hula hoop) around the pile protects a producer from being tagged while he or she is picking up an object. The goal of the producers is to get all the beanbags (or as many as possible) out of the safety zones and hold onto them.

5. Consumers get beanbags by making a two-handed tag on a producer holding one. The goal of consumers is to get as many beanbags as possible from producers and keep them.

6. Decomposers can only get beanbags by making a two-handed tag on a consumer holding one. When decomposers get a beanbag, they return it to the safety zone. The goal of decomposers is to get all the beanbags (or as many as possible) back to the safety zones.

7. Players can hold only one beanbag at a time. When players are tagged, they must give up the beanbag they are holding. Players can toss and pass beanbags to members of their own group.

8. Producers start the game by running to collect beanbags. Consumers are allowed into the playing area a few moments after the producers. Decomposers enter the area last. Play continues as long as you wish (producers keep taking beanbags, decomposers keep returning them). Adjust the number of beanbags used in the game or players in each group if play is not progressing smoothly.

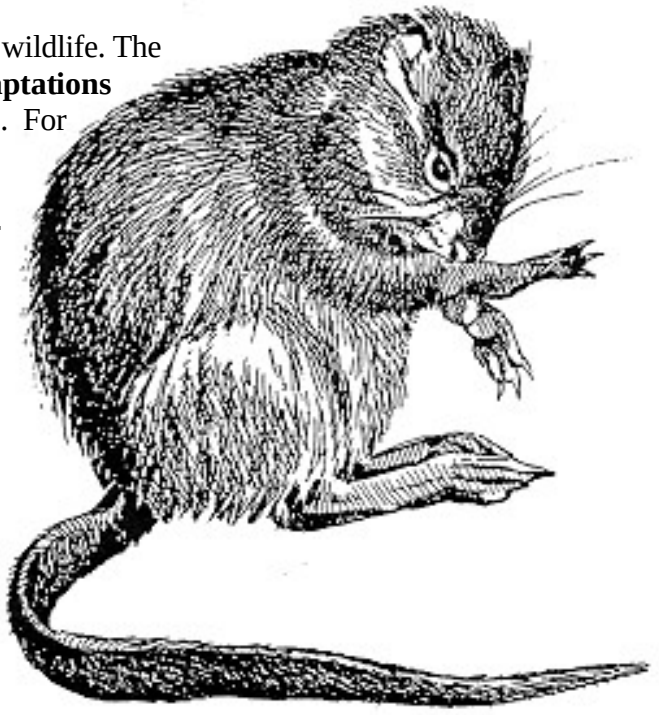
9. How are all the groups dependent on one another? How does each group contribute to the continuous functioning of the ecosystem, (i.e., abiotic components recycled and all groups have food)? Can the ecosystem function without decomposers? Try the game without decomposers and see what happens.

Source: Reprinted with permission from Science Is...A Source Book of Fascinating Facts, Projects and Activities, by Susan V. Bosak. 515 pgs., Copyright 1991. Richmond Hill, ON; Scholastic Canada Ltd., 1-800-268-3848.

VIII) HABITAT

A **habitat** is the place where an organism lives, feeds, breeds and shelters. Using students' homes as an example of a habitat, ask them why their home is important to them.

Wetlands are a home (habitat) for many different types of wildlife. Have your students think of reasons why wetlands are important to wildlife (wetlands provide shelter and protection, feeding, drinking, cooling off, breeding, resting and nursery sites for many species). They are also used by many bird species as gathering places during migration.



Living in a wetland provides many challenges for wildlife. The animals that are successful have many special **adaptations** that enhance their ability to survive and reproduce. For example, semi-aquatic animals such as beaver, muskrat, otter and mink have special natural features that enable them to be better equipped for life in the water. They include:

- layers of fat plus thick, oily fur that act as insulation against cold water
- fur that is waterproofed by oil secreted from special glands
- a streamlined body shape that helps them to move much more easily through water
- webbed feet to swim faster
- tails that serve as rudders while swimming
- special coverings over their mouths, ears and noses to prevent water from getting in when submerged

Ducks and wading birds are also well adapted to life in a wetland. Ducks have webbed feet for swimming. Great Blue Herons have long bills and legs to probe shallow water for food.

Aquatic insects are terrific under-water breathers. By trapping an air bubble under their wing covers or among tiny hairs on their bodies, diving beetles and whirligigs can carry an air supply under water with them, similar to an oxygen tank used by scuba divers.

Wetland animals are also well **camouflaged** in order to blend in with their surroundings. Young water snakes, turtles and insects are dark coloured to enable them to hide in the shadows of marsh vegetation or to blend in with the muddy bottom. The slender shape of adult dragonflies and damselflies helps them rest on vegetation without being seen. The greenish - brown colour of frogs helps them hide amongst the floating vegetation in a marsh, enabling them to avoid predators but to also catch their prey. For many wetland creatures, colour and shape are important keys to their survival.

Source: modified from Why Wetlands, Federation of Ontario Naturalists

ACTIVITY #5 MIGRATION HEADACHE

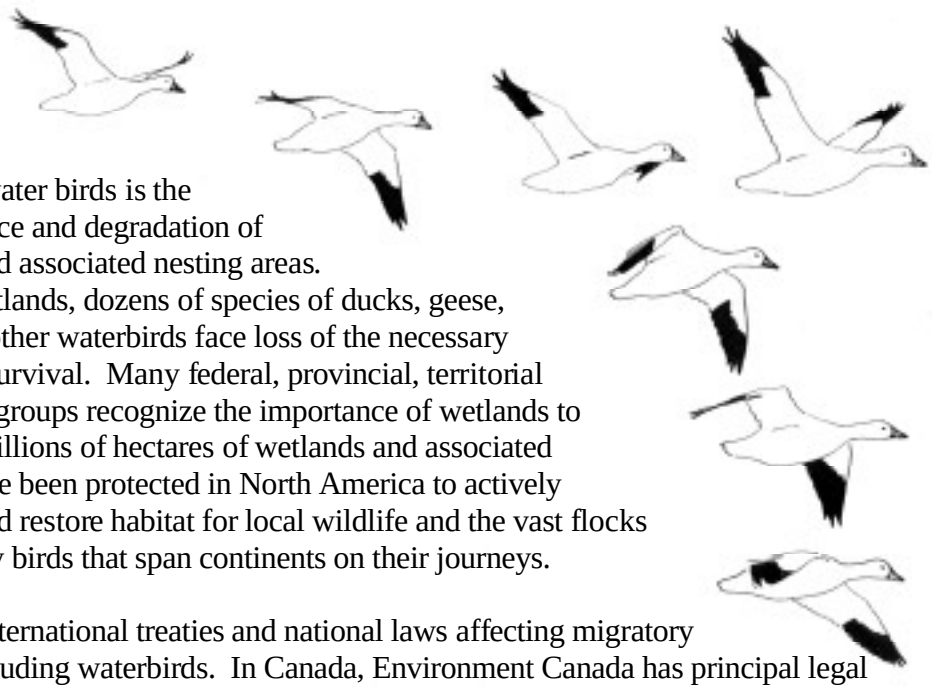
Students role-play migrating water birds travelling between nesting habitats and wintering grounds and are subject to hazards at either end of the migration path, as well as along the way.

BACKGROUND

Migration is a mysterious topic. How do birds, fish, mammals and insects travel the immense distances they do with such exactness? Some travel at night, some during the day, some in the skies and others deep within the sea. Yet they locate habitats necessary for their survival. Scientists have proposed that they use the stars, the sun and even the earth's magnetic field for guidance. Some animals, such as salmon, seem to use smell to guide them home from the sea. Most migrating species probably use a combination of means to guide their journeys.

There is a variety of remarkable migrating birds - ducks, geese, swans, cranes, herons, gulls, terns and shorebirds, for example - that require the presence of wetlands in their breeding habitat and on their wintering grounds. Since these two regions are often thousands of miles apart, they also need wetlands to provide them with food and rest in-between.

The populations of some species of waterbirds are healthy; however, populations of many are showing long-term downward trends. Examples of populations of species that appear to be healthy in most areas are Canada goose, goldeneye, and gadwall. Examples of species that have experienced some decline but are now increasing are wood duck, snow goose, mallard and tundra swan. Examples of species that appear to be or are declining are emperor goose, American bittern, pintail, and black duck. Among the species that are officially listed as endangered in Canada are piping plover and whooping crane.



The primary threat to the survival of migratory water birds is the disappearance and degradation of wetlands and associated nesting areas. Without wetlands, dozens of species of ducks, geese, swans and other waterbirds face loss of the necessary habitat for survival. Many federal, provincial, territorial and private groups recognize the importance of wetlands to wildlife. Millions of hectares of wetlands and associated uplands have been protected in North America to actively conserve and restore habitat for local wildlife and the vast flocks of migratory birds that span continents on their journeys.

There are international treaties and national laws affecting migratory species, including waterbirds. In Canada, Environment Canada has principal legal responsibility for the protection and management of migratory birds. The federal government shares responsibilities with provinces and territories in protecting other migratory animals and their habitats. Under the North American Waterfowl Management Plan, governments from Mexico to Canada have teamed up with non profit organizations like Ducks Unlimited to undertake a major program of habitat conservation for wetland dependant species.

The migration routes, or flyways, of North American waterbirds are the Pacific, Central, Atlantic and Mississippi flyways (see Marsh World for maps). Key wetlands and river systems act as the main guide posts and resting places for birds moving up and down these major flyways.

Wetland habitats - usually found in low, fertile plains along water courses - were historically prized for conversion to farmland and settlements. Today, the journeys of waterbirds take them over lands on which human influences are ever-increasing in scope and magnitude. Economic development and urbanization are reducing the availability of natural wetlands. Pollution, through pesticides effluents and soil erosion reduce the health and safety of wetlands for both wildlife and people. There is new evidence to suggest that acid precipitation may be affecting insect populations, which in turn affects the birds that depend on insects for food. Species like carp and purple loosestrife, that have been introduced from other continents have upset the natural balance of many wetlands. Natural conditions such as predators, weather, disease and fire also influence both the animals and their habitat and when combined with human impacts can be even more devastating.

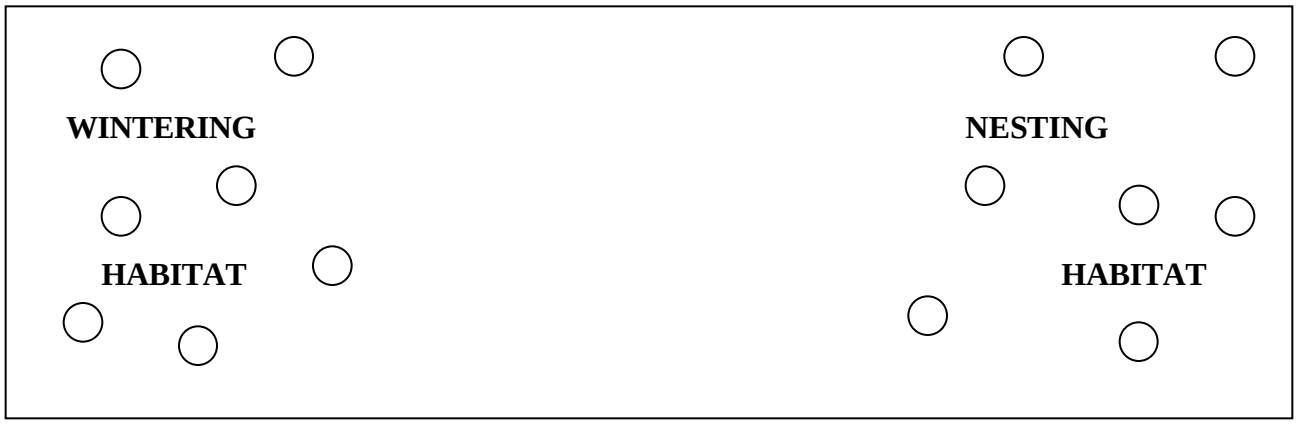
MATERIALS

large playing field or gymnasium

two reusable markers for every three students (e.g., frisbees, plywood, carpet pieces, etc...) Clearly mark the markers to differentiate the top from the bottom.

PROCEDURE

1. Select a large playing area about 20 metres in length. Randomly place the habitat markers in two patches on the playing field as shown below.



Choose the number of markers so that you have one for every three students at each end of the field. Designate one of these areas the "wintering habitat" and the other the "nesting habitat." This means you have two sets of markers; one set at the nesting habitat and one set at the wintering habitat.

2. Explain to the students that they are waterbirds and will migrate between these two areas at your signal. Tell them that the markers represent "wetlands." These wetlands provide suitable habitat for water birds. At the end of each journey, the students must have one foot on a marker in order to be allowed to continue. If they cannot get their foot on a marker, that means they have not found any suitable habitat. They "die" and have to move - at least temporarily - to the sidelines and watch. During migration, the birds may want to "flap their wings", moving their arms like birds in flight.

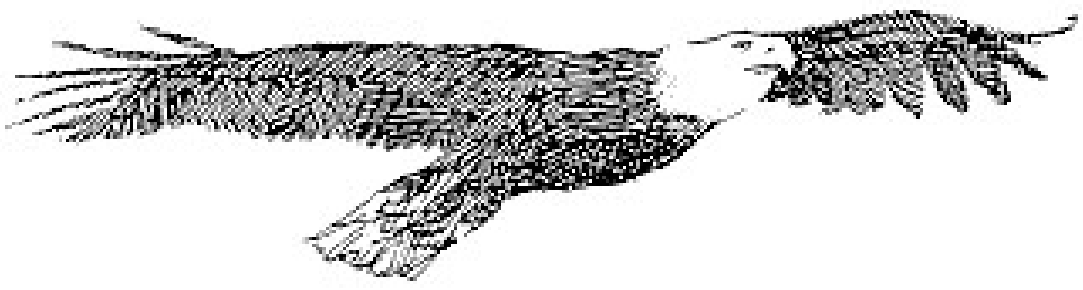
3. Explain to the students that many factors will limit the survival of populations of migrating waterbirds. Some involve changes in the wintering and nesting habitats. There will be times of abundant food, water, shelter and space suitably arranged to meet the habitat requirements of the birds. There will be other times when the habitat is stressed, with many factors limiting the potential for survival. Sometimes the area of available habitat is reduced. Tell the students that for purposes of this activity only three water birds can occupy a "habitat haven" (marker) at any one time.

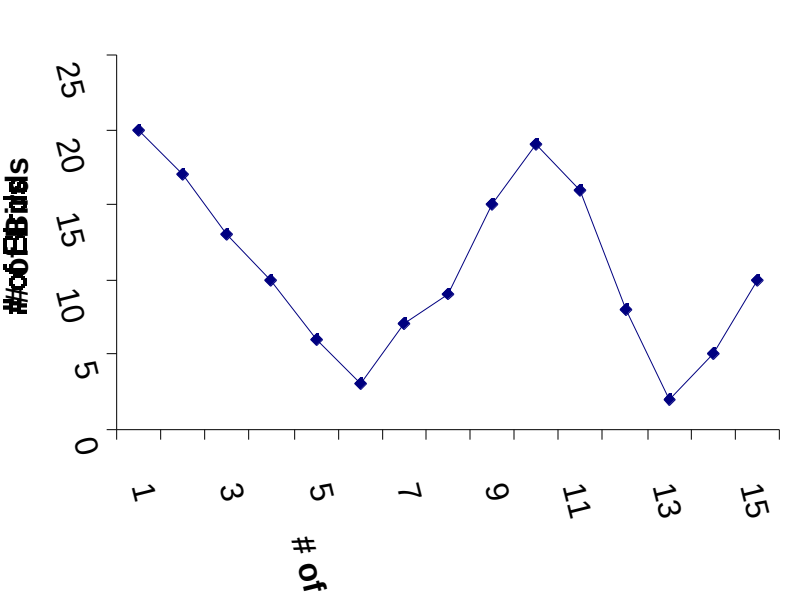
4. Begin the activity with all of the students at the wintering habitat. Announce the start of the first migration. Have the students migrate in slow motion until they become familiar with the process. Then they can speed up. On the first try, all the birds will successfully migrate to the nesting habitat.

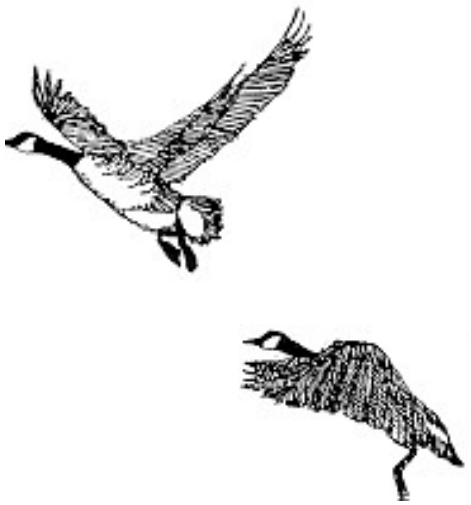
5. Explain that there has been no loss in the area of available habitat. Thus, a successful nesting season is at hand.

6. Before the students migrate toward the wintering habitat, turn over one marker from the wintering region. Explain that a large wetland area has been drained to build a condominium. Repeat the instruction to migrate and send the birds to the wintering habitat. Have the three students that will be displaced stand on the sideline. Tell the students that these three died as a result of loss of habitat. Remind any "dead birds" that they will have a chance to get back into the activity. They can come back as surviving hatchlings when favourable conditions prevail and there is habitat available in the nesting ground.

NOTE: The series of migration cycles can be graphed as shown on following page. This is an excellent method to record the population cycles. The “Y” axis can represent thousands, or hundreds of thousands of ducks, geese or any other migratory bird. Populations rise or decline as changes in habitat occur over the years. Drought or flood conditions can have large scale impacts. Habitat destruction or conservation programs by people can also have affects on a local or continental scale.







7. Before the next migration to the nesting region, turn over four markers in the nesting habitat. This represents a catastrophic loss. Tell the students that this is the result of an oil spill in the local river, severely damaging shoreline habitat. Instruct the students to migrate.

NOTE: This results in a large number of students waiting on the sidelines to re-enter in the nesting habitat. Before many cycles are repeated, provide them with an opportunity for re-entry. Each time, give the students examples of changes in the habitat conditions that could have taken place making it possible for them to survive. Two students can be made permanent monitors to turn the markers over as you instruct them.

8. Repeat the process for eight or ten migration cycles to illustrate changes in habitat conditions with resulting effects on the birds. Give examples of positive and negative factors that might influence the birds' survival.

   Some limiting factors are a natural and dynamic part of any environment (e.g. floods, drought, disease, predation, etc.). This is true of factors favouring survival as well. However, the significant difference in the case of the survival of populations of migratory aquatic birds seem to be the loss or degradation of huge areas of suitable habitat, much of it as a result of human intervention, e.g., draining wetlands, destruction of nesting cover, pollution of water supplies, introduction of carp or purple loosestrife, etc...

   Be sure to create one or more "disaster" years to illustrate catastrophic loss of large areas of available habitat. Remember that overall, the availability of suitable habitats for migrating aquatic birds is diminishing. (The activity should end with fewer areas of available habitat that can accommodate all the birds). There is a general agreement that the greatest long-term threats to the survival of populations of migratory water birds are the loss and degradation of habitat.

   Introduce some positive factors such as creating new wetlands, restoring damaged ones, putting up nest boxes, planting nesting cover, setting aside land for a park, removing purple loosestrife and carp, etc.

9. During the discussion, ask the students to identify the apparent causes of the birds' population decline from year to year. Ask them to try to imagine what seems to be the major factors contributing to habitat loss and degradation. Ask them to make predictions about the effects of these

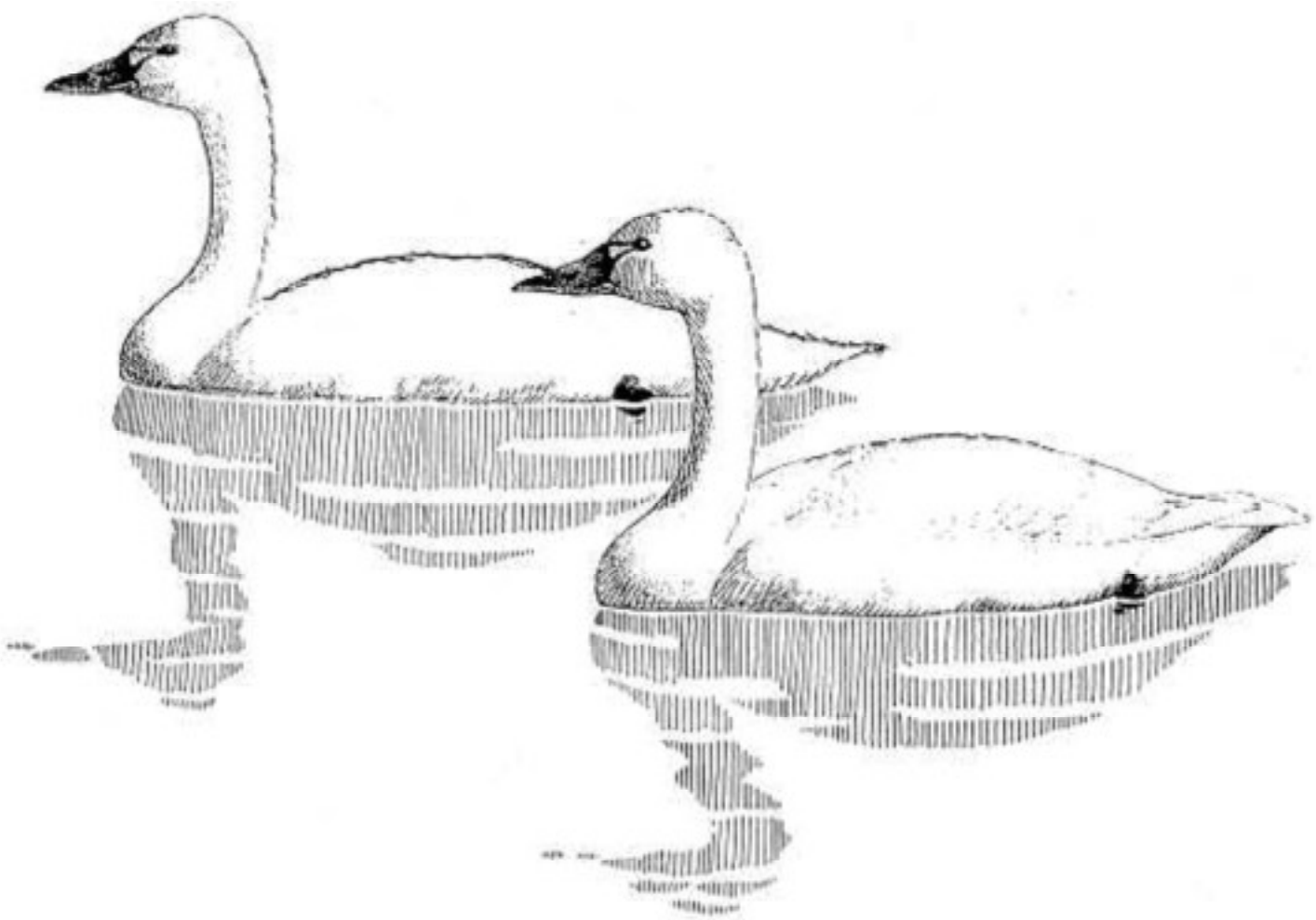
factors. Distinguish between short-term and long-term effects. Distinguish between catastrophic effects and gradual changes. Ask the students to support their hypotheses with evidence, seeking additional information through research, if necessary.

10. Ask the students to summarize what they have learned about some of the many factors that affect the success of aquatic bird migration. List and discuss human-caused factors and environmental factors. Compare similarities and differences between these limiting factors. Highlight those that the students identify as posing the most significant long-term threat to the survival of migrating water birds.

11. What kinds of things can and should be done to protect and restore habitats for migrating water bird populations? Discuss potential trade-offs related to any recommendations.

12. OPTIONAL: Give a couple of students nerf balls and have them stand on the sidelines. As the birds are migrating, the students throw the nerf balls. If hit, they are out of the game. The nerf balls represent "fatal" factors that affect birds while migrating, e.g., the weather, T.V. towers, telephone lines, hunters, high-rise buildings that leave their lights on at night, airplanes, etc...

Source: Modified from Project Wild, Canadian Wildlife Federation



IX) THREATS TO WETLANDS

In a balanced ecosystem, nutrients are recycled between the producers, consumers and decomposers. Oxygen and carbon dioxide are recycled between the plants and animals, and water is cycled through the water cycle. Although many elements in a balanced ecosystem are recycled, there is the constant need for energy input from the sun. Additional nutrients may come from precipitation, run-off and sediments washed into the ecosystem.

When something happens to upset the balance, the effects may range from a slight disturbance to a catastrophe. Nature has some built-in mechanisms that help to keep the balance in check. Unlike humans, wildlife cannot simply grow more food when the supply runs out. The population size must change to match the availability of food.

Although nature can compensate for some of the natural upsets in an ecosystem, there is a limit to the amount of stress that can be placed on an ecosystem before it collapses. In many areas, wetlands are being pushed past their tolerance limit and are being destroyed. Natural catastrophes such as excessive flooding and drought can cause temporary setbacks, but these natural events are actually critical to the long-term survival of some wetlands. In fact, people are the single biggest cause of the destruction of wetlands. In some regions of Canada as much as 90% of the original wetlands are gone!

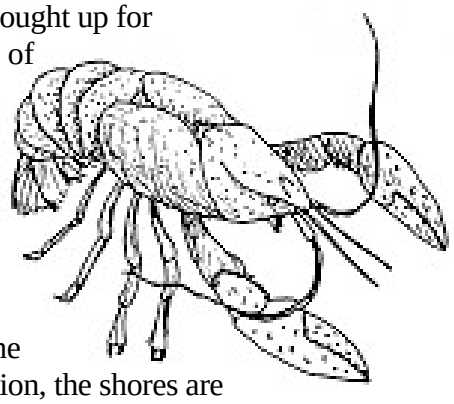
What do students think are the main threats to wetlands? Draining, filling, dredging, polluting and the introduction of exotic, or non-native species are all major threats. Discuss each of the threats with the class and what people can do about stopping or reversing them. How will such changes affect people?

1. Draining

Drainage of wetlands for farmland, or urban development is one of the major threats. Many drainage projects have not been subject to environmental assessments, or cost-benefit analysis. Experts who have studied the draining of wetlands have expressed concern that the benefits that have been gained have not always equalled or surpassed the long term costs involved in the project. While our society requires economic development, it must be done in a sustainable way to ensure both the long term health of our economy and environment.

2. Filling

Wetlands are often filled in for housing projects, highways, factories, airports and other developments. Wetlands have traditionally been areas of cheap land that are bought up for development and filled in. The short-term and long-term costs of the wetland loss have usually not been measured.



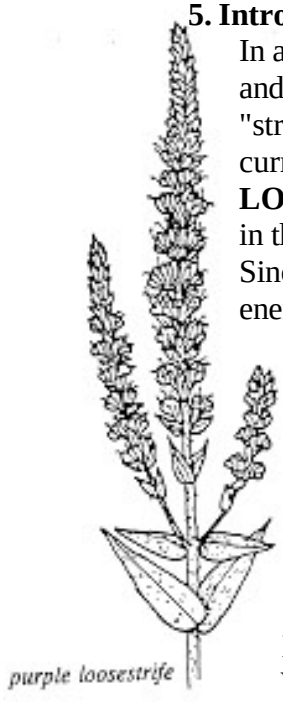
3. Dredging

Shoreline wetlands have been dredged for the construction of marinas and harbours. In addition, cottagers and waterfront owners have cleared shoreline vegetation for docks and "clean-up" purposes. The destruction of the vegetation results in habitat loss, particularly for nesting waterfowl, and the loss of shelter for the young of many species. Without vegetation, the shores are more vulnerable to erosion due to wave action and run-off.

4. Polluting

Air and water pollution contribute to the disruption and potential destruction of balanced wetland ecosystems. The addition of pesticides, industrial and municipal wastes, acid rain and other pollutants can result in the death of plants and wildlife.

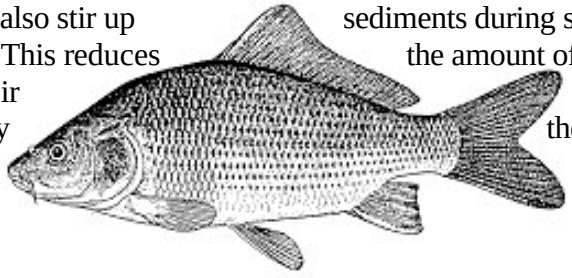
5. Introduction of Exotic Species


purple loosestrife

In a balanced ecosystem, the creatures are adapted to living in the particular habitat and are adapted to co-existing with other members of the habitat. When a "stranger" appears, it can cause many changes. North American wetlands are currently suffering from the invasion of an exotic plant called **PURPLE LOOSESTRIFE**. It was accidentally introduced to North America from Europe in the 1800's. It has now spread at an alarming rate into every Canadian province. Since purple loosestrife does not naturally grow in this country, it has no natural enemies and there is nothing to stop it from spreading.

It is outcompeting indigenous plants such as sedges, bulrushes and grasses so that they can not grow in invaded wetlands. It is filling in open, shallow water so that floating and submerged aquatic vegetation is being choked out. The loss of the open habitat means many species of birds, mammals, amphibians and reptiles that require it will suffer and some may die. Without the indigenous vegetation, many indigenous animals have also lost their shelter and food supply. There is no known wildlife that depends on any part of purple loosestrife for survival. The plant is considered to be a serious threat to wetland.

The invasion of exotic fish species is also a serious problem in marshes. Carp are indigenous to Asia and since their introduction into North America, their populations have exploded. Carp eat most kinds of soft aquatic plants. They also stir up sediments during spawning and feeding, creating very cloudy water. This reduces the amount of light reaching underwater plants and cuts down on their ability to photosynthesize. Carp can completely destroy the submerged plant life in a marsh.



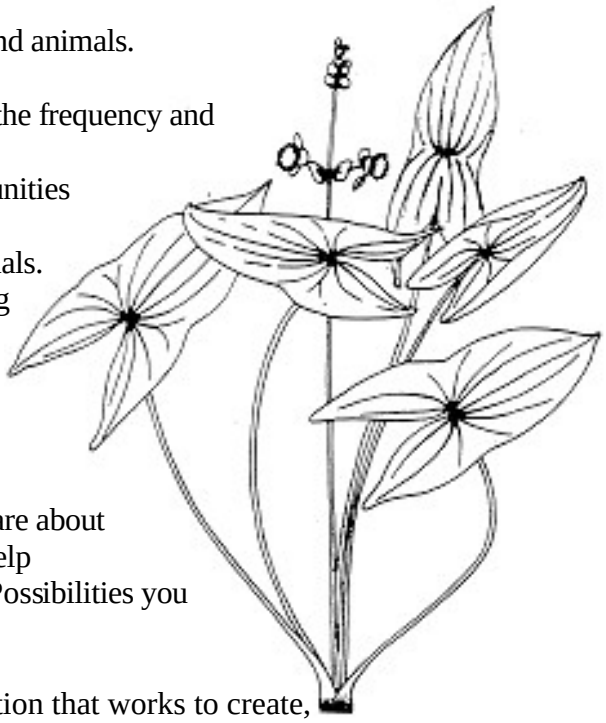
Mute swans are another exotic species that are creating problems in some marshes. They are on the verge of a population boom in parts of southern Ontario and are outcompeting indigenous waterfowl populations for the available resources.

Have the students discuss how they would imagine the world without wetlands and the plant and animal life associated with them. Ask students to make a picture, write a poem or choose another form of expression to explain their thoughts.

Source: Modified from Why Wetlands?, Federation of Ontario Naturalists

X) WETLAND CONSERVATION

Conservation means the wise and sustainable use of natural resources. Discuss this definition with your students and how it is different from simply setting aside or "preserving" natural resources. Have them give reasons why conservation is important. Do the students think wetland conservation is important? List reasons on the board why wetlands should be conserved. Your list might include:



1. They provide habitats for a rich diversity of plants and animals.
2. They help maintain water quality.
3. They provide water storage areas which can reduce the frequency and severity of flooding in downstream areas.
4. They offer a variety of recreation and tourist opportunities (canoeing, fishing, birdwatching, hunting).
5. They provide people with food, medicine and materials.
6. They provide people with income through harvesting plants and trapping.
7. They provide an area for outdoor education.
8. They are areas of scientific interest.
9. They are beautiful!

Now ask the class what might happen if people didn't care about wetland conservation? What can private citizens do to help conserve wetlands? Ask the students for suggestions. Possibilities you might mention include:

1. Get involved with Ducks Unlimited, an organization that works to create, protect, restore and enhance wetlands all over the world. The Greenwing program is Ducks Unlimited's youth education club which teaches its members about the importance of wetland conservation.
2. If you are observing plants and wildlife or temporarily bringing them home, remember to replace them, unharmed, in their original habitat.
3. Work with landowners to fence off sensitive wetland areas from livestock to avoid bank erosion, plant destruction and excessive disturbance of the muddy bottom.
4. Regulate the harvesting of plants and animals in a wetland. Emphasize wise use and sustainability for future generations.
5. Prevent pollution since it can seriously affect the existence of a wetland and its inhabitants.
6. Learn more about wetlands and share what you learn with others who still think wetlands are wastelands.

XI) CONSERVATION ACTIVITIES

Today, people are working cooperatively to protect and restore wetlands through conservation efforts. **Ducks Unlimited** is people committed to wetland restoration, creation, enhancement, and preservation. The conservation of wetlands is being accomplished in many ways:

1. If a landowner would like to ensure that the wetland habitat on their property will be protected forever, a conservation easement can be placed on the land. This is a binding agreement for all future owners to ensure that the wetland is protected. In some cases Ducks Unlimited leases or purchases critical habitats.

2. Working with farmers and landowners to promote sustainable land-use practices **that are good for both farm economics and wetlands** (e.g., reduced tillage, rotational grazing systems, farm waste reduction/treatment/recycling). Long term wetland conservation cannot be successful without the cooperation and help of landowners.

3. Suggest alternative uses for wetland areas on farms, e.g., tourism and recreation, so landowners are encouraged to keep wetland habitat areas on their property.

4. Reduce soil erosion into wetlands by adding cover on adjacent land (restoring buffer areas) and slowing run-off. This cover provides important nesting cover for wildlife and limits salinization of adjacent croplands.

5. Provide more natural hydrology through use of dykes, ditches, dams and pumps. New wetlands can be created and damaged ones restored in this way to improve water quality and hydrology. This mimics a more natural water cycle on impacted areas. To keep wetlands healthy they must be in constant change (water levels up in spring and down in summer). Some wetlands must be protected from excessive, long term flooding which will kill emergent plants. Other wetlands must be periodically dewatered to encourage the germination of aquatic plant seeds. This mimics the natural drought cycle that keeps marshes healthy

6. Mechanically remove overgrown vegetation in wetlands to increase interspersion of plants and water ("overgrown" wetlands do not provide healthy habitat). Many animals rely on a variety of habitats and “edges” to provide the best mix of food and cover.

7. Planting native grasses, aquatic plants and wild rice, which all contribute to the reduction of erosion, as well as providing cover and food for many species of wildlife.

8. Enhancing nesting cover by leaving buffer areas alone, delaying crop cutting until nests hatch, planting dense grass cover in fields that are no longer farmed and by putting up nesting structures for waterfowl (nest boxes and nest tunnels).

9. Controlling exotic species, such as purple loosestrife and carp which destroy our natural wetlands.

10. Foster the public’s support for wetland conservation through educational literature, displays and programs. Involving children in the **"Greenwing Program”** where they learn about the importance of wetlands, increase their understanding and appreciation of wetlands and become involved in projects where they can help to protect and restore wetlands (e.g., purple loosestrife pulls, nest box building, adopting a section of a stream or creek and cleaning it up, creating a wetland in their school yard).

ACTIVITY #5 DRAGONFLY POND

Wetland habitats change as a result of land-use practices. Ideally we seek a balance in providing for the needs of people and wildlife. However, human needs sometimes have negative impacts on wildlife habitat. Wetlands in particular are often seen as obstacles to development or wastelands which need to be improved, filled or drained so that they can be put to "good" use. Homeowners and other people

sometimes want to replace or fill wet or flooded areas so that grass can be cut or grown better. This innocent act may replace the only breeding habitat for wetland species.

Natural wetland ecosystems are both in a dynamic balance and self-regulating but few wetlands today are in a natural state. Changes in surrounding land-use have impacted many wetlands. Pollutants or fertilizers are mobile and are carried in groundwater or run-off to be deposited in wetlands and held there when taken up by plants. The loss of wetlands is even more serious for wildlife. It will be a challenge for landowners, planners and homeowners to find ways that they can live with wildlife and we can continue to have development for towns, industries and farms. Resolving conflicting land uses so that everyone benefits is an important lesson for students to consider.

MATERIALS

Each group will need the following:

1. Squares of various sizes, labeled to represent: stores, restaurants, a chemical factory, a gas station, houses with lots, a farm and a cornfield, pastureland, a firehall, a woodlot, a gravel road, a four lane highway, a schoolyard with playing fields, a park, a forest, undisturbed grassland, etc.

2. A large sheet of paper with a drawing of an irregularly shaped pond with inflow and outflow streams and a small adjacent marsh represented by groupings of cattails. Name the pond "Dragonfly Pond" and name the inflow and outflow creek "Dragonfly Creek."

3. tape

PROCEDURE

1. Divide the class into small groups.

2. Provide each group with their large sheet of paper depicting Dragonfly Pond and the squares representing the land-use choices.

3. Designate to each group a special interest they are to take on, such as:
    - i) residents who want to live on the land
    - ii) farmers who need the land for raising livestock and growing corn
    - iii) business people who want to use the land for commerce and to create jobs
    - iv) people who want recreational resources available to the community
    - v) people who want efficient road systems for travel and transporting commercial products
    - vi) gas station owners who want to make a living in servicing and repairing cars
    - vii) conservationists who may want to create habitats to offset losses that may occur from economic developments
    - viii) any others that you think may be locally important

4. Have the students arrange the land-use pieces. They may touch but not overlap. The students must use all the pieces. Students can be encouraged to make land uses of their own. Use small loops of tape to fasten the cutouts so that your students can change their minds and switch pieces around. Guide the students to think about the pros and cons for each land use.

5. Invite each group to volunteer to display and describe their work in progress. Encourage discussion of their choices. In the discussion emphasize that:

i) No land-use can be excluded
ii) Wildlife habitat must be conserved
iii) Everyone must agree

6. Give students more time to work on their land use plans.

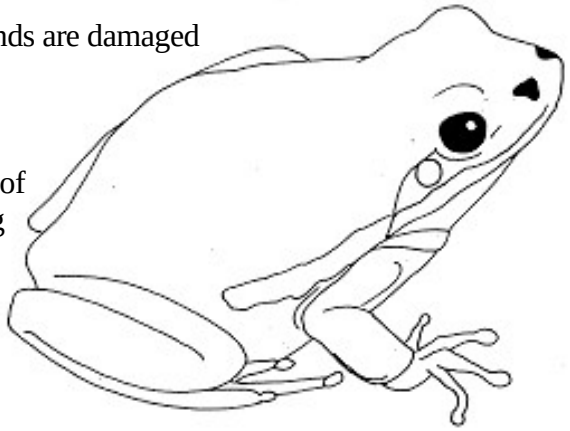
7. Choose one of the groups' completed plans and place it above the blackboard. Next, on the blackboard, continue Dragonfly Pond and Creek downstream. Some students may dump effluent below Dragonfly Pond and let it flow downstream. Show the route the stream might travel. On the blackboard drawing have Dragonfly Creek become another pond and wetland area. Continue the drawing until the creek becomes an estuary or large river dumping into a lake.

8. Ask the students to brainstorm possible problems that could be faced within each of these aquatic systems as a result of the human activities at Dragonfly Pond. Make inferences and predictions about the potential consequences of these activities.

WRAP-UP

Wildlife habitat can often be conserved by people working cooperatively. In most cases, impacts can be minimized and any losses can be mitigated by creating new habitats or managing degraded habitats to make them more productive. The removal of any industry will have a negative impact on people and the community (i.e., loss of jobs and perhaps the death of a community). Alternately, as the community grows, more homes and then additional schools and more land are needed. Encourage students to discuss their conflicting needs rather than being discouraged by conflicts. Solutions can only be achieved through compromise and working together. The following are examples of some ways impacts may be minimized.

1. Farms provide habitat for many animals. If some wetlands are damaged new areas can be created or enhanced nearby.



2. Consider habitat improvement such as the construction of ponds, planting of nesting cover and building of nesting structures which enhance breeding conditions for wetland wildlife. Such habitats can be set aside or created in towns, parks, on farm lands, in school yards and on industrial lands. Workers, farmers, towns people, schools and children's groups can all take on many of these projects in their own communities. Contact groups like Ducks Unlimited for help and advice.

3. Tunnels allow amphibians and reptiles to cross under roads along important migration routes.

4. Clean up polluted areas and remove exotic species such as purple loosestrife that can be harmful.

5. Find ways to create win/win land use solutions. For example rotational grazing produces more livestock and creates better habitats for wildlife.

6. Research the habitat requirements of wetland animals so that impacts of development can be considered

Source: Modified from, Adopt A Pond, Metro Toronto Zoo, Original version in Project Wild, Canadian Wildlife Federation.

APPENDIX #1 - STUDENT ACTIVITY SHEETS

The following four activity sheets can be copied and used as in-class exercises for students, to highlight the concepts of interdependency and interaction of organisms in a wetland ecosystem.

Wetland Plants and Animals Sheet

This sheet includes images of a variety of common wetland plants and animals. Students can cut out pictures from this source sheet and use them to complete the other activity sheets.

Wetland Energy Flow Sheet

Using images cut out from the Wetland Plants and Animals sheet or other sources (e.g. old magazines, newspapers, etc…) complete this activity by pasting the images in the appropriate category. Students can use their Marsh World books to research what the animals eat to help them decide whether they are a herbivore, carnivore, omnivore or scavenger. Students can also sketch pictures instead of cutting and pasting.

Wetland Food Chains Sheet

Ask students to create three different wetland food chains by pasting or drawing pictures of wetland plants and animals in the correct space. Start each food chain at the bottom of the sheet with a producer (plant) and indicate what may eat it on the line above. Continue until the food chain is complete. Encourage students to share their results with the rest of the class to show the variety of possibilities.

Wetland Food Webs Sheet

To show the complexity of interactions among living organisms in a “real” wetland ecosystem, ask your students to create their own wetland food web. Instruct them to paste or draw pictures of a variety of different wetland plants and animals in the space provided and afterwards show the relationships between them by drawing arrows. The arrows should show the flow of energy from one level of the food web to the next. For example a Northern Pike may eat a frog, duckling, snake, dragonfly or even another Northern Pike and it in turn may be eaten by a Great Blue Heron a hawk or humans. Again, encourage students to share their results with other classmates.

Wetland Energy Flow

Scavengers/Decomposers

Omnivores

Carnivores/Secondary Consumer

Herbivores/Primary Consumer

oducers

Wetland Food Chains

Sun's Energy

eaten by

eaten by

eaten by

eaten by

eaten by

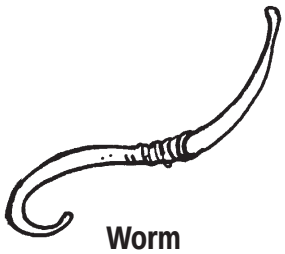
eaten by

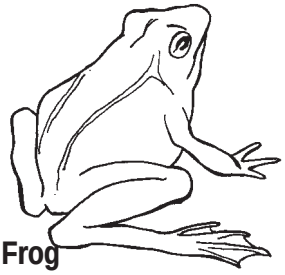
eaten by

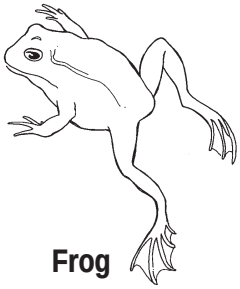
eaten by

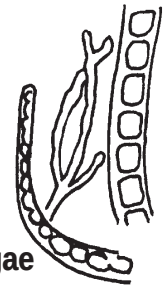
Wetland Food Webs

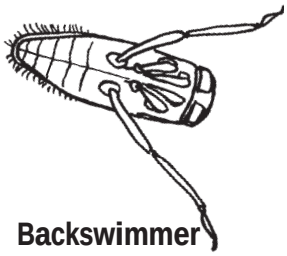
Wetland Plants and Animals


Worm

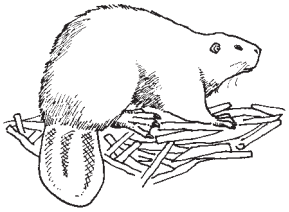

Frog


Frog


Algae


Backswimmer

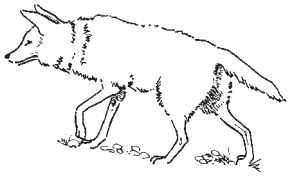

Snake

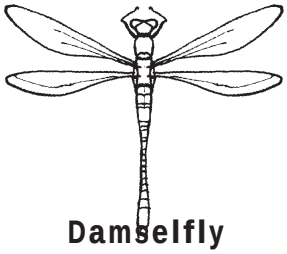

Beaver


Leach

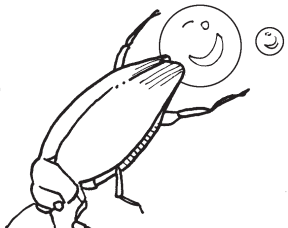

Canada Goose


Hawk

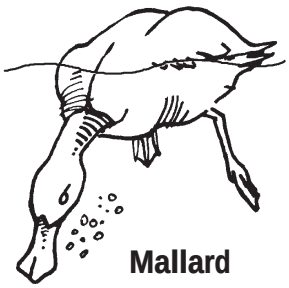

Coyote


Damselfly

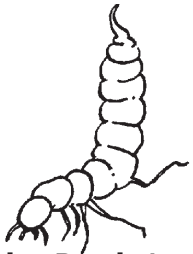

Dragonfly

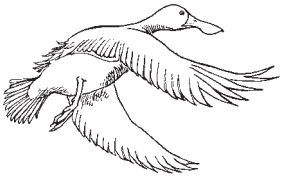

Diving Beetle


Great Blue Heron

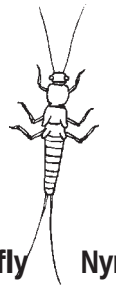

Mallard


Plants

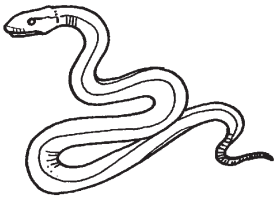

Diving Beetle Larva

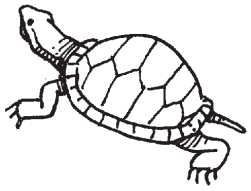

Shoveler

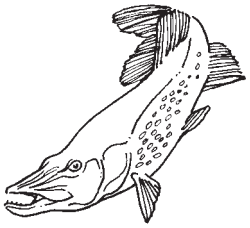

Cattails

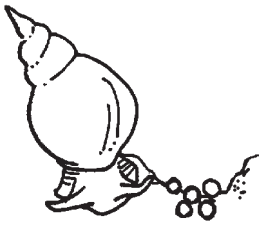

Mayfly Nymph


Plants


Garter Snake

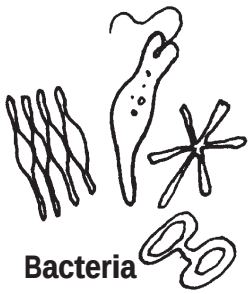

Turtle


Northern Pike


Snail


Humans


Humans


Bacteria


Plants