WETLAND ECOSYSTEMS I

HABITATS, COMMUNITIES AND THE DIVERSITY OF LIFE

EDUCATOR'S

GUIDE

ELEMENTARY LEVEL SCIENCE GRADES 4 to 6

PRESENTED BY Ducks Unlimited Canada

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Ideas
for using the project guide

In this unit, wetlands found close to most communities across North America are used to demonstrate a wide variety of ecological concepts. Through the activities and lessons provided, students can develop the foundation for literacy in the life sciences. You can help students enhance their understanding of the environmental, technological and social aspects of science and encourage them to work together to solve problems. At Ducks Unlimited, it is our hope that students in the elementary level (grades four through six) will develop an appreciation for science and a sense of wonder about wetlands.

The list of suggested individual and group projects, on page iii of the student journal, is a selection of activities which students (alone or in teams) can complete to demonstrate their understanding of the concepts presented during the study of **habitats, communities and the diversity of life.**

These activities may be used in a number of ways:

- to encourage students to work in a group
- to outline concepts for the students
- as items to summarize the lesson unit for evaluation

Suggested Approach

When determining how the list of projects will be used, consider:

- What skills and knowledge do you wish to assess?
- What content do you expect students to include in their pieces?
- What skills for completing the projects do your students have?
- What instructions do they need in order to successfully communicate their understanding of content?

Students may be asked to select several projects from the list. In order to provide diverse feedback from students, they may be asked to complete at least one written piece, one 3D piece and one graphic piece, or another configuration which may include fiction, nonfiction, poetry or graphics.

On pages iv and v of the student journal, the students are given an outline of how their projects and presentations will be evaluated. This will not only help them understand what you are looking for but allow them to assess their own projects and provide guidance to fellow students.

Guidelines

for descriptive writing

This section offers guidelines for your students in developing some of the projects suggested on page iii of their journal.

There are five main elements in the development of narrative writing:

- Plot
- Setting
- Character
- Theme
- Viewpoint

PLOT

Beginning/Middle/End

When developing a narrative, authors should ensure that the three parts of the story will be easily identified (introduction, development or complication, resolution). In the beginning, the characters are introduced, setting described and problem presented. These **characters**, setting and events are used to develop the plot and sustain the **theme** (e.g. good vs evil). Conflict is introduced and roadblocks for the characters are developed which they attempt to solve. In the end the reader learns whether or not the characters are successful in their struggles.

Conflict

Conflict is the tension of opposition between forces and is usually the element that keeps readers interested in the story.

Conflict usually takes one of four forms (Lukens, 1991):

- Conflict between character and nature
- Conflict between character and society
- Conflict between characters
- Conflict within a character

Plot Development

The plot is established in four steps:

1. A problem introducing a conflict is presented at the beginning of the story.
2. Characters face roadblocks as they attempt to solve the problem in the middle of the story.
3. The high point of the action occurs when the problem is about to be solved. This high point separates the middle and end of the story.
4. With the roadblocks overcome and the problem solved, the characters move on to other activities.

Guidelines

for descriptive writing

SETTING

Dependent on the type of story, setting can be relatively unimportant or the most significant element within the story. Following are common settings:

Location
Weather/Season
Time (includes both time of day and passage of time within a story)
Time Period (when the story happens such as past, present or future)

VIEWPOINT

First Person
The first person is used when authors choose to tell the story through the eyes of one character using the first person pronoun I. This style allows the reader to live the story as the narrator sees it, but the narrator is an eyewitness rather than a participant.

Omniscient
In this form, the author is all-seeing and all-knowing. The author tells the readers about the thought processes of each character without explaining how the author has found out this information.

Limited Omni
Authors overhear the thought without being all-knowing and all-seeing. The story is told in the third person and concentrates on thoughts, feelings and past experiences of the main character or other important character.

Objective
This viewpoint is written as if the author is using a camera and a tape recorder and only reports what is visible and audible in the immediate scene. Readers are eyewitnesses but are not given any insights into the motivation of the characters other than the reader's own personal experiences.

Lesson one

Water, water everywhere

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Though each lesson has been aligned to a primary curriculum statement, lessons have been designed to include support for parts of this program. The designated lesson does not refer to a single class period for presentation and completion, though some lessons will be of this duration. The designation refers to all activities organized around the central curricular statement.

Grouping Students
The decision to group students for the purpose of completing these activities belongs to the teacher. Lessons have been designed to apply to any grouping strategy. Each lesson includes recommended strategies but does not prescribe their use.

Questions for Discussion
Questions for discussion are included in each lesson. They have been placed where they are most likely to focus student attention on the significant concepts.

Curriculum Alignment
Recognize and describe one or more examples of a wetland ecosystem (marsh, bog, swamp or fen) found in the local area.

New Vocabulary
Wetland, ecosystem, organism, biotic, abiotic

Materials
Charts on pages one and two of the student journal

Activity Description
1. Ask students to generate a list of the places they would likely find water within 100 km of the school. Record all ideas on the blackboard. Note: Students may list things like the tap, the bathtub, a pitcher in the fridge, a river, as well as a marsh, lake, etc.

2. Once the list has been generated, get students to select and record in their charts on page one of the student journal (see diagram 1.1 below) the names or locations of three **wetland ecosystems** where they think they would most likely find living things on, in and around the water. Students should also include the kinds of organisms that live in these locations (names or descriptions are acceptable). Refer the students to pages 3, 4, 7, 8 and 9 of their journal for examples of wetland organisms.

3. Encourage students to share their charts with others. Provide appropriate time to discuss the locations and the living things they have listed.

4. Ask students to share what they think the term *wetland ecosystem* means. Draw attention to the two words: **wetland** and **ecosystem** (see page two). Have them consider and share what each of the words means individually. For comparison, contrast with other ecosystems like forest, grassland, desert, marine, etc. Lead a session that allows for each student's input. Lesson two in the student journal provides additional information.

Name or location of a wetland ecosystem	Organisms that live in the water	Organisms that live on the water	Organisms that live beside the water
I POND	1) FRESHWATER SHRIMP	MALLARD DUCKS	GARTER SNAKES
	2) COONTAIL	DUCKWEED	WILLOW
	3)		
	4)		
	5)		

DIAGRAM 1.1

Lesson one continued

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Wetland Ecosystems

Wetland is a term that refers to the partial flooding of an area of land for short or long durations in which a close relationship between the water and land organisms exists. A defining feature of natural wetlands is the type of plants living on aquatic soils and the transition zone between water and land, where there is a large diversity of living things. *Ecosystem* refers to the relationships which exist among the living (biotic) and nonliving (abiotic) components of an environment.

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BIOTIC:
All living things present in an ecosystem

ABIOTIC:
All those nonliving factors present in an ecosystem (light, water, soil, heat, chemicals, etc.).

5. When the class has completed the discussion, place the definition for wetland ecosystems on a piece of chart paper. Draw attention to the term *natural* which distinguishes the impact of humans on the environment from that of other organisms. Today there are few natural wetland ecosystems. Many have been impacted negatively by humans although some have been protected and restored.

6. Groups of students can choose one of the wetland ecosystems and generate a list of all the living (biotic) and nonliving (abiotic) factors they believe are present in that ecosystem on page two of the student journal.

Culminating Activities

Refer to the list of suggested projects on page iii of the student journal for ideas. You may now choose to assign one of those or several of the following:

1. Individual students may design a wetland ecosystem cover page for the unit.

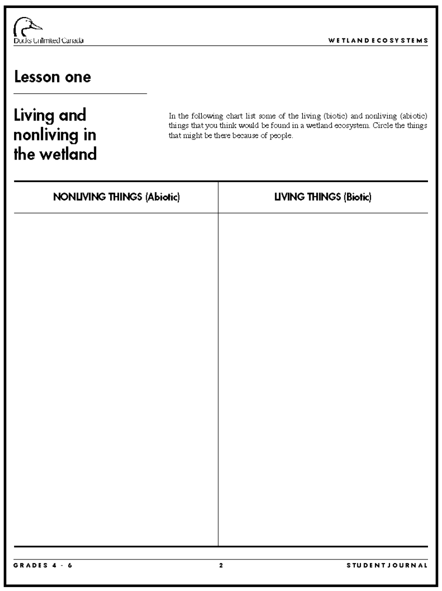
2. Groups of students may design and paint a large mural of a wetland ecosystem of their choice.

3. Each student may write and research a report on an organism living in a wetland ecosystem.

4. Students may research, define and produce a poster for each of the following terms – marsh, swamp, bog and fen.

Lesson two

Together we stand, divided we fall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Lesson one

Living and nonliving in the wetland

In the following chart list some of the living (biotic) and nonliving (abiotic) things that you think would be found in a wetland ecosystem. Circle the things that might be there because of people.

NONLIVING THINGS (Abiotic)	LIVING THINGS (Biotic)

GRADES 4 - 6 2 STUDENT JOURNAL

STUDENT JOURNAL PAGE 2

Curriculum Alignment

Understand that a wetland ecosystem involves interactions between living and nonliving things, both in and around the water.

Materials

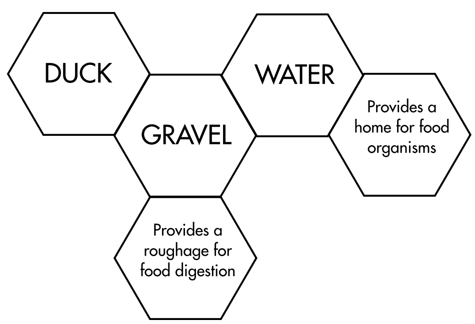
Paper hexagons (see template on page 24 of this guide), student journal.

Activity Description

1. Get students to share their generated lists of living and nonliving things present in a wetland ecosystem from the previous lesson.

2. The students should read pages three and four in their journals and identify the living and nonliving things described in the piece. Ask students to look for and identify any interactions between the living things and other living things, living things and nonliving things, and nonliving things and nonliving things in the ecosystem.

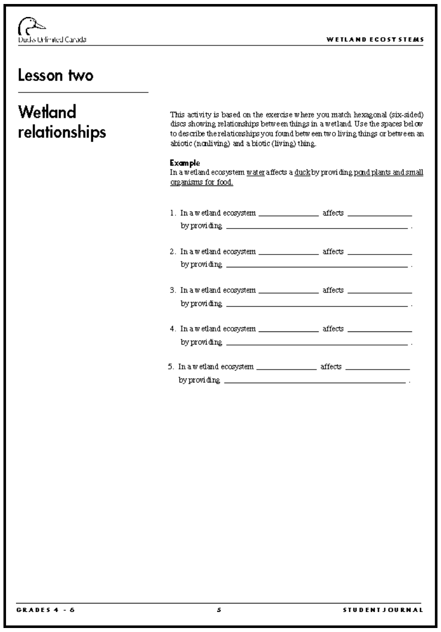
3. Provide students with cardboard hexagonal discs (see template on page 24) on which to write their ideas (red discs for animals, green discs for plants, blue discs for nonliving things and white discs for the explanation of the relationship between things) and a large space on which to attach the hexagonal discs. They should communicate their knowledge of these interactions using the following guidelines:
   - Students should be encouraged to generate several relationships.
   - Students should be encouraged to list relationships they know exist in wetlands.



Example:

In a wetland ecosystem ___water___ affects ___a duck___ by ___providing pond plants and small organisms for food___.

Lesson two continued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Lesson two

Wetland relationships

This activity is based on the exercise where you match hexagonal (six-sided) discs showing relationships between things in a wetland. Use the spaces below to describe the relationships you found between two living things or between an abiotic (nonliving) and a biotic (living) thing.

Example
In a wetland ecosystem water affects a duck by providing pond plants and small organisms for food.

1. In a wetland ecosystem ________ affects ________ by providing ________________.
2. In a wetland ecosystem ________ affects ________ by providing ________________.
3. In a wetland ecosystem ________ affects ________ by providing ________________.
4. In a wetland ecosystem ________ affects ________ by providing ________________.
5. In a wetland ecosystem ________ affects ________ by providing ________________.

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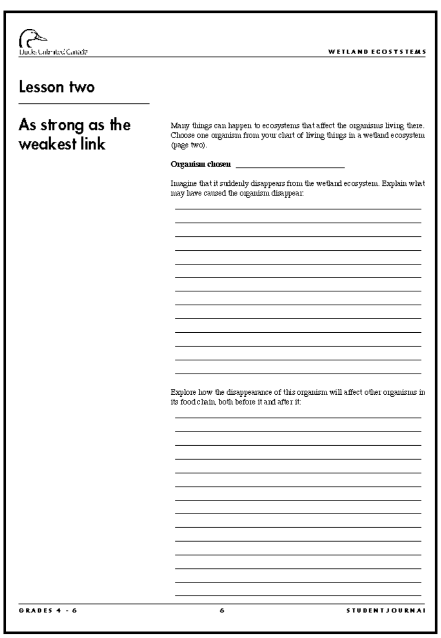
STUDENT JOURNAL PAGE 5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Lesson two

As strong as the weakest link

Many things can happen to ecosystems that affect the organisms living there. Choose one organism from your chart of living things in a wetland ecosystem (page two).

Organism chosen ________________

Imagine that it suddenly disappears from the wetland ecosystem. Explain what may have caused the organism disappear:

Explore how the disappearance of this organism will affect other organisms in its food chain, both before it and after it:

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STUDENT JOURNAL PAGE 6

4. Students must write out the wetland relationships on page five of their journals.

5. When the relationships and explanations have been completed, have students post them on a large display board (1.3 m x 2.6 m). If two or more students select the same living thing, the hexagonal shape for the organism should be placed over the existing one and the other information appropriately spaced.

6. Have students do the *As strong as the weakest link* exercise on page six of their journal. Explain the concept of habitat acting as a home for organisms that provides them with the necessities of life (food, water and cover).

Questions for Discussion

- Is there a living thing associated with the wetland ecosystem that is entirely independent of all other things, living and nonliving?
- How do living things serve to promote the survival and growth of other living things in a wetland ecosystem?
- How do the nonliving things in a wetland ecosystem serve to promote the survival and growth of living organisms?
- How do nonliving things affect other nonliving things in a wetland ecosystem?
- How do the living things affect the nonliving things in a wetland ecosystem?
- Are all of the factors natural or have some been introduced by people? What is the effect of this?
- Ask students to define the word *habitat.*

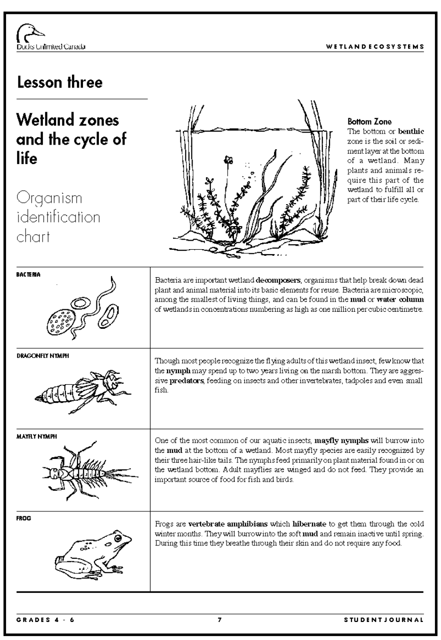
Lesson three

Wetland zones and the cycle of life

CYCLE OF LIFE CARD GAME

Refer to the second lesson note at right and materials on pages 25 to 32. Two to four players pick up and match cards (an animal card with its corresponding life cycle description card) in sets of two until all their cards are placed on the table.

1. Deal six cards to each player. Turn the top card over.
2. The player to the right of the dealer may pick up the turned card or may select from the top of the deck.
3. Players must discard one card during each turn.
4. Players, in turn, may choose to pick up the overturned card, the pile of discards or the card on the top of the discard pile.
5. As players collect sets of matching cards, they lay them on the table in front of them.
6. The game continues until one player has put all of their cards on the table in sets.
7. Scoring: Each set placed down on the table counts as two points. Each card remaining in the players' hands are counted as negative points (-1 per card remaining in the hand).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Lesson three

Wetland zones and the cycle of life

Organism identification chart

Bottom Zone
The bottom or **benthic** zone is the soil or sediment layer at the bottom of a wetland. Many plants and animals require this part of the wetland to fulfill all or part of their life cycle.

BACTERIA	Bacteria are important wetland **decomposers**, organisms that help break down dead plant and animal material into its basic elements for reuse. Bacteria are microscopic, among the smallest of living things, and can be found in the **mud** or **water column** of wetlands in concentrations numbering as high as one million per cubic centimetre.
DRAGONFLY NYMPH	Though most people recognize the flying adults of this wetland insect, few know that the **nymph** may spend up to two years living on the marsh bottom. They are aggressive **predators**, feeding on insects and other invertebrates, tadpoles and even small fish.
MAYFLY NYMPH	One of the most common of our aquatic insects, **mayfly nymphs** will burrow into the **mud** at the bottom of a wetland. Most mayfly species are easily recognized by their three hair-like tails. The nymphs feed primarily on plant material found in or on the wetland bottom. Adult mayflies are winged and do not feed. They provide an important source of food for fish and birds.
FROG	Frogs are **vertebrate amphibians** which **hibernate** to get them through the cold winter months. They will burrow into the soft **mud** and remain inactive until spring. During this time they breathe through their skin and do not require any food.

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STUDENT JOURNAL PAGE 7

Curriculum Alignment

Organize a field trip to a wetland in your area. Have the students use their field trip sheet on page ii of the student journal. Identify some plants and animals found in different zones at the wetland site and describe the life cycle of these plants and animals. Refer to lesson three in the student journal, pages 7 to 9. Alternatively, use resource reference material to conduct this lesson in class.

Lesson Note

1. Though this lesson has been designed to combine the classroom with a field trip, it is possible to cover the concepts in an interesting manner by following the recommendations for the classroom only.

2. Reproduce, cut out and laminate the life cycle cards located in the appendix (pages 25 to 32 of the educator's guide). Play the game as described at left.

Materials

For field trip only: white foam egg cartons, one clipboard and pencil per student, organism charts (pages 20 to 22), one coat hanger per pair of students (required at least one day before field trip), used pantyhose for netting material, pliers (for teacher), hand lens, stereoscopic microscope (optional), white plastic containers with lids (recycled margarine or sour cream tubs), underwater scope (optional – see instructions on page 23). Small aquarium nets available in pet shops are an inexpensive alternative to the coat hanger net or you may simply bind a small plastic flour sieve to a hockey stick. You will also need to refer to pages 7 to 12 of the student journal.

Activity Description

Classroom

1. Review the organisms described in lessons one, two and three. With students working in pairs, have each group identify one plant and one animal that live *in* the wetland, one plant and one animal that live *on* the wetland and one plant and one animal that live *around* the wetland. Once species have been identified, students conduct research and discuss the life cycle of each of the organisms selected.

2. Each pair will explain how the wetland ecosystem is essential to the survival of each of their selected organisms.

3. Distribute decks of the *Cycle of Life* game cards to students. The game is played with two to four students per set of 52 cards. The purpose of the game is to assemble sets of *Cycle of Life* cards for several organisms.

Lesson three continued

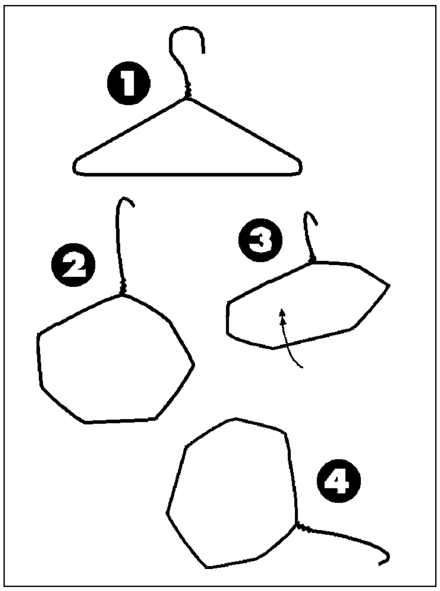


DIAGRAM 3.1

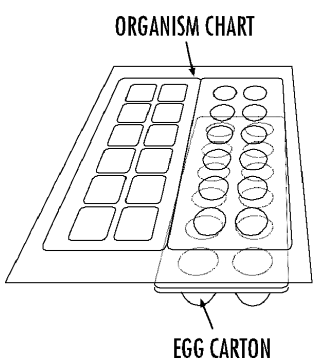


DIAGRAM 3.2

Field Site

Preparations

- Select a safe wetland site and, if necessary, request landowner permission for your visit.
- Send home field trip permission forms and request that students come prepared with appropriate clothing and waterproof footwear. Stress the need for safe and respective behaviour while on the field trip.
- Prepare wire hanger dip nets as shown in diagram 3.1. Be careful to bend wire safely and tape over any sharp wire points. See page five for other inexpensive alternatives.
- Prepare the wetland identification kits as follows: Cut laminated organism charts (pages 20 to 22) to fit the top of white foam egg cartons as shown in diagram 3.2.
- Prepare the underwater scope as indicated on page 23 (optional).
- Obtain four to six magnifying glasses and hand lenses, and provide each group with white plastic containers (recycled margarine or sour cream tubs).
- Establish field trip work groups with four students each.
- Discuss the expectations for working in the field with students.

1. Place students in groups of four. Have students look at the wetland ecosystems organisms identification chart on pages 7 to 12 of their journal. Give each group two nets, two plastic containers and a set of three wetland identification kits (egg cartons with organism charts).

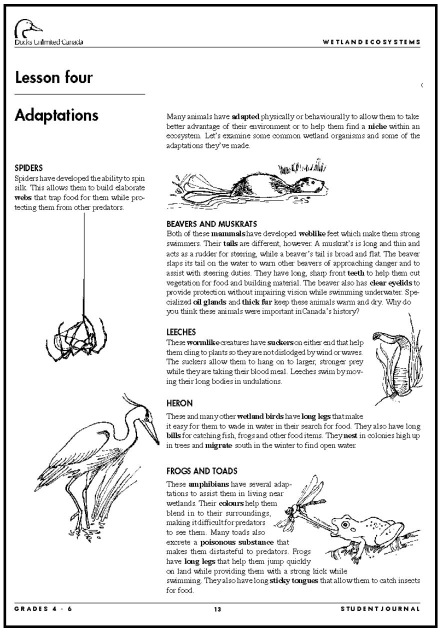
2. *Task*
Each group is to collect, correctly identify and place a sample of organisms collected from the wetland into the egg carton space matching the organism on the organism chart. Discuss the adaptations of each organism for feeding, breathing and locomotion (see lesson four). Students are to attempt to identify and collect various stages in the life cycles of several organisms. Have the students record information on *Field Trip Notes* on page ii of their journal.

You may wish to bring a representative sample of organisms back to a properly established aquarium in your class for use in other lessons. Equip your aquarium with soil, plants and water to provide important habitat features. Safely release the remaining organisms back into the wetland.

3. Have individual students in each group choose one organism and trace its life cycle with words and diagrams. Students should be able to explain the adaptive value of each stage in their organism's life cycle. Refer the students to lesson four, pages 13 and 14.

Lesson four

Adaptations



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Lesson four

Adaptations

Many animals have **adapted** physically or behaviourally to allow them to take better advantage of their environment or to help them find a **niche** within an ecosystem. Let's examine some common wetland organisms and some of the adaptations they've made.

SPIDERS
Spiders have developed the ability to spin silk. This allows them to build elaborate **webs** that trap food for them while protecting them from other predators.

BEAVERS AND MUSKRATS
Both of these **mammals** have developed **weblike** feet which make them strong swimmers. Their **tails** are different, however. A muskrat's is long and thin and acts as a rudder for steering, while a beaver's tail is broad and flat. The beaver slaps its tail on the water to warn other beavers of approaching danger and to assist with steering duties. They have long, sharp front **teeth** to help them cut vegetation for food and building material. The beaver also has **clear eyelids** to provide protection without impairing vision while swimming underwater. Specialized **oil glands** and **thick fur** keep these animals warm and dry. Why do you think these animals were important in Canada's history?

LEECHES
These **wormlike** creatures have **suckers** on either end that help them cling to plants so they are not dislodged by wind or waves. The suckers allow them to hang on to larger, stronger prey while they are taking their blood meal. Leeches swim by moving their long bodies in undulations.

HERON
These and many other **wetland birds** have **long legs** that make it easy for them to wade in water in their search for food. They also have long **bills** for catching fish, frogs and other food items. They **nest** in colonies high up in trees and **migrate** south in the winter to find open water.

FROGS AND TOADS
These **amphibians** have several adaptations to assist them in living near wetlands. Their **colours** help them blend in to their surroundings, making it difficult for predators to see them. Many toads also excrete a **poisonous substance** that makes them distasteful to predators. Frogs have **long legs** that help them jump quickly on land while providing them with a strong kick while swimming. They also have long **sticky tongues** that allow them to catch insects for food.

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STUDENT JOURNAL PAGE 13

DIRECT	INDIRECT
water	trees

DIAGRAM 4.1

Curriculum Alignment

Identify and describe adaptations that make certain plants and animals suited for life in a wetland. Recognize that some aquatic animals use oxygen from air and others from water. Identify examples of each. Recognize the variety of the adaptations for feeding and locomotion.

Lesson Note

As in lesson three, this lesson has been designed to combine classroom and field activities. It is possible to cover the concepts in an interesting manner by following the recommendations for the classroom only.

Activity Description

Classroom

1. Introduce and discuss the term *life* with students. Ask them to help develop a definition of what a living thing must have to be considered alive (i.e. require nourishment, take in or produce food, respond to environmental stimuli, grow and reproduce). Contrast biotic and abiotic features discussed in lesson one.

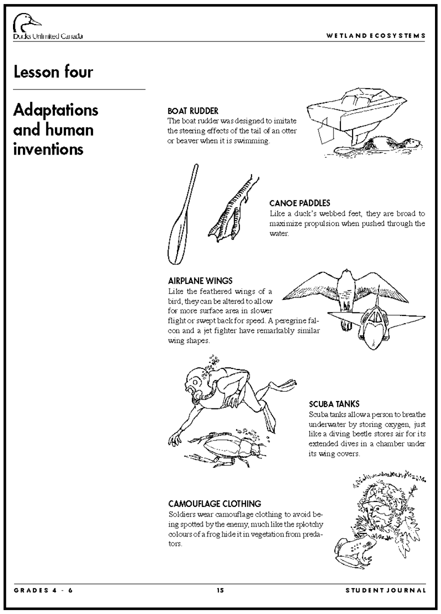
2. Introduce/review (depending on whether students have been taken to a wetland site or not) the concepts related to adaptation to the environment. Ask students what things directly or indirectly affect the lives of organisms that exist in a wetland ecosystem. This activity might be done by using the following procedure:

   - Make a T-chart on the blackboard, chart paper or overhead (see diagram 4.1).
   - Put the headings *Direct* and *Indirect* on the top of the chart.
   - Begin by saying "water has a direct influence" and writing the word *water* on the *direct* side. Then write *trees* in the *indirect* column.
   - Continue to provide students with things that have a direct influence and things that have an indirect or weaker influence until students begin to offer their own ideas. Give each student a chance to suggest at least one example of a direct or an indirect wetland influence.
   - Activity continues until all things that have a direct influence are included (a time limit may be used).

3. Have students turn to lesson four in their journal (pages 13 and 14). Have them select an environmental factor to research and discuss – such as water – that affects the lives of wetland organisms in different ways. Discussion should investigate how a variety of organisms have used different means to adapt to this factor (e.g. webbed feet in ducks, oarlike legs in water boatmen, house structure for beaver, etc.)

4. Choose a characteristic of life (e.g. feeding) and compare how a variety of organisms meet their needs in a wetland ecosystem (e.g. dragonfly larva, mallard duck, great blue heron, cattail, duckweed). Use the library or Internet to provide supplementary information.

Lesson four continued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Lesson four

Adaptations and human inventions

BOAT RUDDER
The boat rudder was designed to imitate the steering effects of the tail of an otter or beaver when it is swimming.

CANOE PADDLES
Like a duck's webbed feet, they are broad to maximize propulsion when pushed through the water.

AIRPLANE WINGS
Like the feathered wings of a bird, they can be altered to allow for more surface area in slower flight or swept back for speed. A peregrine falcon and a jet fighter have remarkably similar wing shapes.

SCUBA TANKS
Scuba tanks allow a person to breathe underwater by storing oxygen, just like a diving beetle stores air for its extended dives in a chamber under its wing covers.

CAMOUFLAGE CLOTHING
Soldiers wear camouflage clothing to avoid being spotted by the enemy, much like the splotchy colours of a frog hide it in vegetation from predators.

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STUDENT JOURNAL PAGE 15

5. Have students read *Adaptations and Human Inventions* on page 15 in their journal. Discuss whether they know of any other inventions that have been copied from nature.

Supplementary Activities

a. Have students form groups of four. Have them play the *It's Just Like* game as described on page 16 of their journal. See appendix on pages 33 to 38.

b. Have students, individually or as a group, choose an organism and pantomime how it gets oxygen. Students may create a whole wetland scene by performing their oxygen gathering together for different species.

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Students play the *It's Just Like* game by comparing an animal or plant adaptation to something used by humans (e.g. a paddle for a boat compared to a beaver's tail or a duck's webbed feet; a raincoat compared to a duck's feathers).

Lesson five

Produce, consume or decompose

Curriculum Alignment

Understand and appreciate that all animals and plants, not just the large ones, have an important role in a wetland community. Identify the roles of different organisms in a wetland.

Producers	green plants that make their own food using sunlight, air and water
Consumers	animals that eat living plants and/or animals
Decomposers	organisms that reuse and recycle materials that were formerly living (decomposers include moulds, fungi, insects and worms)

Identify examples of each of the above within a wetland ecosystem.

Lesson Note

As in lessons three and four, this lesson can be discussed while on the field trip or using the aquarium specimens collected on the field trip. Coverage of the concepts in an interesting manner can be achieved by following the recommendations for the classroom only.

Activity Description

Classroom

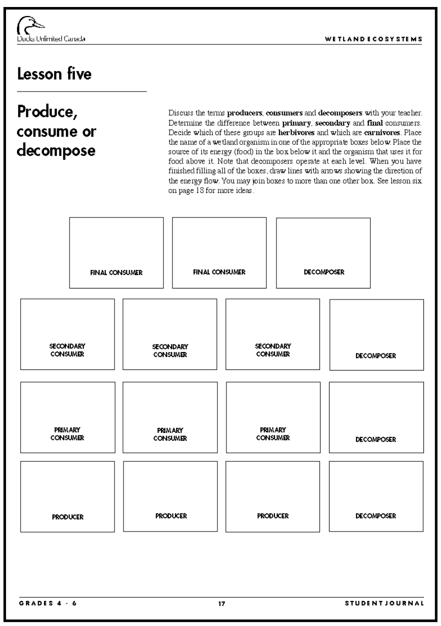
1. Have students look at the organisms that appear on pages 7 to 9 of the student journal. Ask them to observe these organisms (pictures or living specimens) to determine likely food sources. Direct attention to the following terms: producer (green plants), primary consumer (animals that eat plants only), secondary consumer (animals that eat other animals – though they may also eat plants) and decomposers (living things that help to break down dead things). Discuss the terms *herbivores, carnivores, omnivores, predators* and *prey*.

2. Students should list the names of organisms under the correct term for food procurement.

3. Pair students and get each group to make a selection of one or more organisms on which to conduct research. Students should be aware their research should help them answer the following questions:

   - What is the primary environment for the organisms you have chosen?
   - Can your organism exist in any other environment?
   - Describe the characteristics of the environment (abiotic features such as temperature, general surroundings, etc.) in which your organism lives.
   - In what ways do your organism's young differ from the adults?

Lesson five continued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Lesson five

Produce, consume or decompose

Discuss the terms **producers**, **consumers** and **decomposers** with your teacher. Determine the difference between **primary**, **secondary** and **final** consumers. Decide which of these groups are **herbivores** and which are **carnivores**. Place the name of a wetland organism in one of the appropriate boxes below. Place the source of its energy (food) in the box below it and the organism that uses it for food above it. Note that decomposers operate at each level. When you have finished filling all of the boxes, draw lines with arrows showing the direction of the energy flow. You may join boxes to more than one other box. See lesson six on page 18 for more ideas.

FINAL CONSUMER | FINAL CONSUMER | DECOMPOSER

SECONDARY CONSUMER | SECONDARY CONSUMER | SECONDARY CONSUMER | DECOMPOSER

PRIMARY CONSUMER | PRIMARY CONSUMER | PRIMARY CONSUMER | DECOMPOSER

PRODUCER | PRODUCER | PRODUCER | DECOMPOSER

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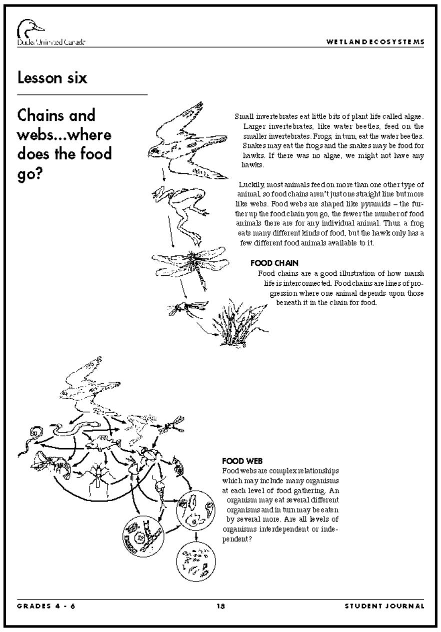
STUDENT JOURNAL PAGE 17

- What are the chief sources of food for your organism?
- What is the greatest source of danger for your organism?
- What special adaptations does your organism exhibit for survival?
- How would the disappearance of your organism affect other organisms in the wetland ecosystem?

4. Have students present their research to the class. As each organism is discussed, have the class fill out the chart on page 17 of the student journal.

Lesson six

Chains and Webs... where does the food go?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Lesson six

Chains and webs...where does the food go?

Small invertebrates eat little bits of plant life called algae. Larger invertebrates, like water beetles, feed on the smaller invertebrates. Frogs, in turn, eat the water beetles. Snakes may eat the frogs and the snakes may be food for hawks. If there was no algae, we might not have any hawks.

Luckily, most animals feed on more than one other type of animal, so food chains aren't just one straight line but more like webs. Food webs are shaped like pyramids – the further up the food chain you go, the fewer the number of food animals there are for any individual animal. Thus, a frog eats many different kinds of food, but the hawk only has a few different food animals available to it.

FOOD CHAIN
Food chains are a good illustration of how marsh life is interconnected. Food chains are lines of progression where one animal depends upon those beneath it in the chain for food.

FOOD WEB
Food webs are complex relationships which may include many organisms at each level of food gathering. An organism may eat several different organisms and in turn may be eaten by several more. Are all levels of organisms interdependent or independent?

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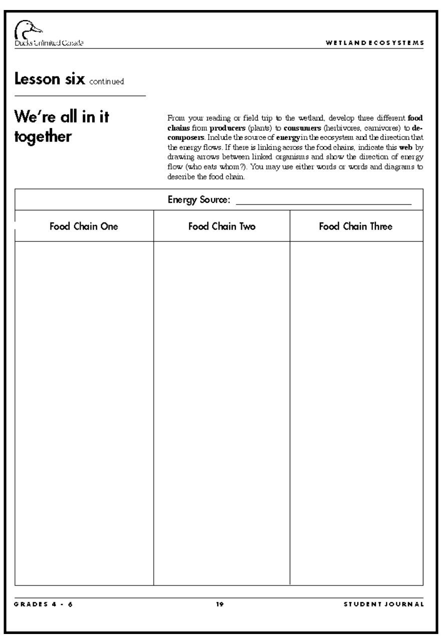
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Lesson six continued

We're all in it together

From your reading or field trip to the wetland, develop three different **food chains** from **producers** (plants) to **consumers** (herbivores, carnivores) to **decomposers**. Include the source of **energy** in the ecosystem and the direction that the energy flows. If there is linking across the food chains, indicate this **web** by drawing arrows between linked organisms and show the direction of energy flow (who eats whom?). You may use either words or words and diagrams to describe the food chain.

Energy Source: ______		
Food Chain One	Food Chain Two	Food Chain Three

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Curriculum Alignment
Draw a diagram of food chains and food webs and interpret the diagrams.

Materials
Wetland ecosystems charts (student journal, page 17), pond web board, chart paper, thick coloured pens.

Activity Description
1. Have students read about food chains and food webs on page 18 of their journal.

2. Refer to page 19 of the student journal and have the students complete this exercise. Briefly introduce the terms *energy, producers and consumers* and *food webs.*

3. Review placement of organisms in the food chain chart that students finished on pages 17 and 19.

4. Assign students to small groups to share ideas about these charts.

5. Give each group a large piece of chart paper and have them build food webs from the food chains they noted after conducting research on a wetland organism.

6. Explain that in nature most animals have several food sources. If they did not, the decrease in populations of their only food source could lead to their decline and eventual extinction. Having adaptations that allow a wider variety of food sources provides an important safety factor for many species. Are species that are omnivores more successful? Consider species like black bears, raccoons and humans. Talk about the interdependence of organisms in a food web.

Lesson seven

Water, water everywhere...but where, oh where is air?

info ZONE

Oxygen is of great importance to most living things, both in its use and its production. Terrestrial organisms (those living on land) possess lungs, a sponge-like bag that is heavily filled with capillaries for gas exchange. The lung works much like a sponge, soaking up large quantities of air, absorbing oxygen and expelling carbon dioxide. With the atmosphere composed of 21 per cent oxygen, it is easily procured. Aquatic organisms, on the other hand, must employ other means to procure necessary oxygen. Though it is not immediately apparent, oxygen is present in water as dissolved particles (oxygen and other gases do dissolve in liquids such as water). Because of the largely reduced amount of oxygen available, different methods are required and generally involve organs located outside or close to the outside of the organism's bodies. These organs function by enabling a great deal of water flow over their blood-filled surfaces so that oxygen may diffuse into the blood cells and carbon dioxide may diffuse back into the water. The blood then carries the oxygen to other body tissues via the circulatory system.

Curriculum Alignment

Recognize that some aquatic animals use oxygen from air, others from water. Identify examples and adaptations of each.

Materials

Sponges, paper towels, plastic wrap, other materials to test for absorbency, plastic tubs, water and a balance (triple beam or equal arm).

Activity Description

1. Introduce lesson by asking students:

   - What would happen if all the oxygen on earth suddenly disappeared?
   - Do all organisms require oxygen to live? What is oxygen used for? Give examples of organisms that do not need oxygen to live (e.g. anaerobic bacteria).
   - Why do most living things need oxygen?
   - Ask students to think about plants then briefly explain how plants absorb carbon dioxide and produce oxygen during the photosynthetic process. Plants are important in supplying the oxygen needed by other living things.

2. Display the following question on a blackboard, chart paper or overhead:

   - What behaviours and structures do animals use to increase the amount of oxygen they absorb?

   Students may list ideas such as breathing harder or faster, using lungs filled with tiny sacs (alveoli), constant motion to increase the amount of oxygen passing over the gills (sharks and rays) or constantly pumping water by the gills using gill covers (the operculum in most fish).

Lesson seven continued

3. Explain to students that they are going to conduct tests to identify a material and a procedure to absorb water in ways that demonstrate similar methods of taking in oxygen. Explain that they are using water rather than oxygen because it is easier to observe changes in quantities of water through weighing.

Challenge students to:
- Discover a material and a method that would absorb the greatest possible amount of water.

Guidelines:
- The material used must allow water to escape from it in any position in which it is held.
- The weight of the material will be taken before and after it is placed in the water.
- Students will be limited to 15 seconds to absorb water with the material and procedure(s) of choice.
- The material must be held freely in the air until the water escaping from it is reduced to slow dripping.
- A written procedure must be provided before students are permitted to submit their idea for final testing. See the sample (diagram 7.1) below.
- The material and procedure which retains the greatest amount of water compared to the material's weight will be considered to be the most absorbent.

SAMPLE EXPERIMENT

Material
Five sheets of paper towel.

Procedure
- Stack the towels up to form a pad of towels five thick. Weigh the towels.
- Submerge the paper towel pad in water and drag it slowly around under the water.
- Gently squeeze the pad of towels and open it once more, dragging it through the water.
- Carefully lift the towels from the water by holding onto two corners of the pad.
- Finally, allow the pad to drain until it drips slowly and weigh again.

The experiment can be repeated using a variety of other materials like sponges, plastic wrap, glass, wood, etc.

DIAGRAM 7.1

info ZONE

Oxygen
Oxygen is required by living things to drive respiration, the action in which fuel from the foods the organism ingests is changed from complex chains into simple molecules used to produce energy within each cell of the organism's body. Though the process is a complex one, it basically involves changing a long chain of molecules with the assistance of oxygen into carbon dioxide and water. This process releases the energy that is required by the cells to live. Though many organisms have other means to access fuel (anaerobic), they are only effective for short periods of time and generally produce toxins which are harmful to the organism if they become too concentrated (e.g. lactic acid). The joining of oxygen molecules to food molecules prevents the body from producing these toxins and also provides it with the energy for growth, tissue building and tissue repair. The ability of an organism to use available oxygen plays a significant role in that organism's survival. Long distance runners require the ability to use available oxygen extremely efficiently for extended periods of time, while sprinters place such high energy demand on their tissue that the relatively slow process of aerobic respiration cannot meet the demand. This demand is met, instead, by the anaerobic alactic system which kicks in for only about 10 seconds at a time, allowing explosive responses from muscle tissues. Between 10 seconds and eight minutes of continued strenuous exercise causes the anaerobic lactic acid system to come into play, but this system must be replaced or irreparable tissue damage can be caused by lactic acid build up.

Lesson seven continued

4. Ask students to turn to pages 20 to 21 of their journals and view the ways wetland animals obtain and absorb oxygen. Have them work with other students to discover which species use a similar technique or material to the one that they used during their experiment.

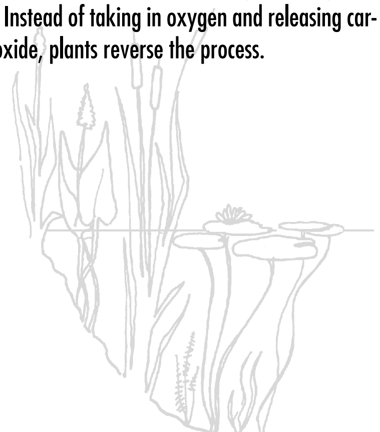
5. Have students develop a chart which matches the method of oxygen absorption to the name of different animals (e.g. gills, lungs, skin surface, snorkel, air bubble).

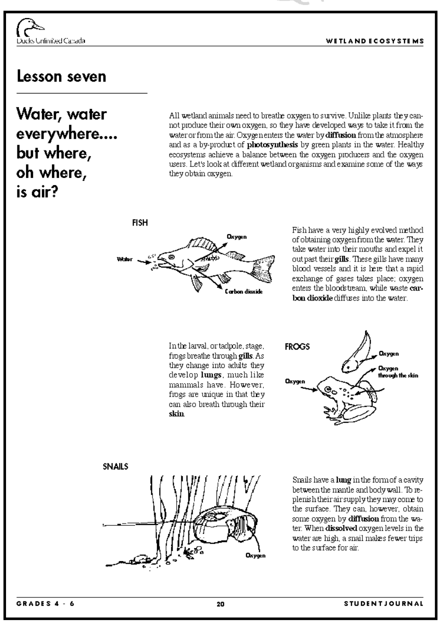
Name of organism	Name of oxygen absorbtion
humans	lungs, alveoli, breathing

info ZONE

Plants

Plants do not require oxygen in the same manner as animals. They are food chain builders and can access food sources as they make them before the chains become so long they are inaccessible. Rather than releasing carbon dioxide and water, they pull apart their molecules using the hydrogen, carbon and some of the oxygen, and release the excess oxygen through the leaves. Instead of taking in oxygen and releasing carbon dioxide, plants reverse the process.





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Lesson seven

Water, water everywhere.... but where, oh where, is air?

All wetland animals need to breathe oxygen to survive. Unlike plants they cannot produce their own oxygen, so they have developed ways to take it from the water or from the air. Oxygen enters the water by **diffusion** from the atmosphere and as a by-product of **photosynthesis** by green plants in the water. Healthy ecosystems achieve a balance between the oxygen producers and the oxygen users. Let's look at different wetland organisms and examine some of the ways they obtain oxygen.

FISH

Water — Oxygen — Carbon dioxide

Fish have a very highly evolved method of obtaining oxygen from the water. They take water into their mouths and expel it out past their **gills**. These gills have many blood vessels and it is here that a rapid exchange of gases takes place; oxygen enters the bloodstream, while waste **carbon dioxide** diffuses into the water.

FROGS

Oxygen — Oxygen — Oxygen through the skin

In the larval, or tadpole, stage, frogs breathe through **gills**. As they change into adults they develop **lungs**, much like mammals have. However, frogs are unique in that they can also breath through their **skin**.

SNAILS

Oxygen

Snails have a **lung** in the form of a cavity between the mantle and body wall. To replenish their air supply they may come to the surface. They can, however, obtain some oxygen by **diffusion** from the water. When **dissolved** oxygen levels in the water are high, a snail makes fewer trips to the surface for air.

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Lesson eight

Wetland stress

Curriculum Alignment

Identify human actions that can threaten the abundance or survival of living things in wetland ecosystems such as adding pollutants or changing the flow of water.

Materials

Student journal, light cooking oil, sponges or other absorbent materials from the previous lesson, tub, water.

Activity Description

1. Have the students read the problem and task one on page 22.

2. Post the following question for discussion by groups of students:

   - What human actions affect wetland organisms?

   Have the groups brainstorm and record their ideas on chart paper. Allow time (5 to 15 minutes) for them to generate ideas. Allow time for sharing ideas with the class.

3. Depending on the general responses by students, ask them if all human interventions are necessarily bad or are necessarily good. Have the groups review their ideas and attach the large, black letter H to the effects that are harmful and a large, green B to those that are beneficial. Students should be prepared to explain their labels. Information should be transferred into the T-chart on page 23 of their journals.

4. After time is provided for students to have completed this activity, introduce the idea of absorption and the influence of pollutants. Ask students how oil would affect the ability of a material to absorb water. After students have given their opinions, demonstrate the following:

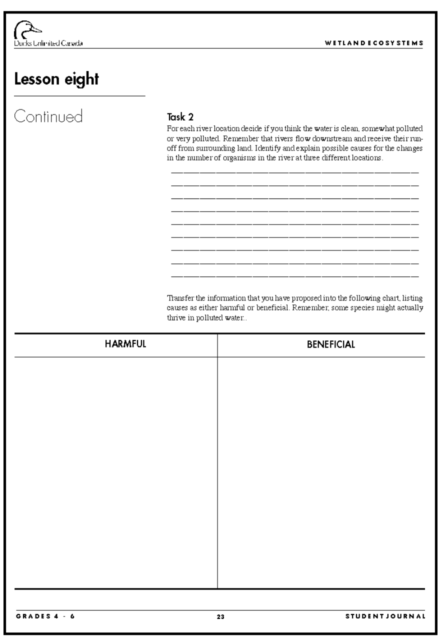
   Pollution Demonstration
   - Weigh the absorbent material (a sponge works well for this).
   - Thoroughly soak the sponge in the oil then wring the oil from the sponge. Weigh the sponge once more noting the difference in weight.
   - Have a student who used a sponge as absorbent material provide the procedure for absorbing water and follow the procedure as given by the student.
   - Weigh the sponge and water and determine the ratio between sponge weight oil dry and sponge weight water absorbed. Is the sponge able to absorb as much water when presoaked in oil as it was when oil was not introduced?

   The addition of oil tends to coat the small air pockets which provide the space for water absorption. As a result the amount of water absorbed tends to be reduced. Oil may have the same impact on wetland animals and for a similar reason it damages the insulating capability of feathers and the under-fur coat used by animals to stay warm.

infoZONE

Temperature

Temperature affects the amount of gas (in this case oxygen) that can be dissolved in a liquid. Unlike solids dissolved in liquids, where raising the temperature increases the amount of material that can be absorbed, gases are the reverse. The lower the temperature, the greater the quantity of gas that can be dissolved and held by the liquid. The reason for the difference relates to the action of the molecules. The faster the gas and liquid molecules move (as they do when they are warmer) the greater the likelihood of gas particles meeting, joining and escaping the liquid. When solids are placed into liquids, the movement of the particles determines the amount and the rate at which the solids dissolve (the greater the temperature, the faster and more energetic the liquid particles move causing them to pull apart the solids more quickly).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Lesson eight

Continued

Task 2

For each river location decide if you think the water is clean, somewhat polluted or very polluted. Remember that rivers flow downstream and receive their run-off from surrounding land. Identify and explain possible causes for the changes in the number of organisms in the river at three different locations.

Transfer the information that you have proposed into the following chart, listing causes as either harmful or beneficial. Remember, some species might actually thrive in polluted water..

HARMFUL	BENEFICIAL

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Lesson eight continued

5. Draw an analogy of oil to other pollutants as they affect oxygen availability in water (see *Info Zone* on page 15). Ask students how the change in the amount of oxygen available to organisms in a wetland ecosystem might change the populations of living things which exist within it. Have students complete task two on page 23 of their journal.

6. Discuss student answers to the two tasks on pages 22 and 23 of the student journal. From the limited data that is presented, what is the most likely natural population existing in the river (likely those existing at the most upstream position at the bridge)?

   What factors could have affected the populations so significantly? For example, organic materials from the sewage plant and dairy farm would place great oxygen demands on the river as decomposition requires oxygen. Runoff of oil and gas from roads may also impact life forms in the stream. As the river flows further from the source of pollution, the effects of the pollution are reduced. Where grassy parklands or forested shorelines exist, runoff of pollutants into the stream is reduced. The marsh at six km has had a positive effect on water quality and the life forms.

7. Ask students if they believe these changes are beneficial or harmful to the wetland organisms. The answer could be both depending upon the point of view. Generally, however, the introduction of pollutants decreases the number of beneficial organisms and increases the number of nonbeneficial or harmful organisms.

8. Point out to students that some of the factors that affect wetland ecosystems are those that are directly imposed on the wetland. Several other indirect factors, such as fertilizing farm crops, soil erosion and acid rain, affect wetlands. Demonstrate the development of a flow chart showing how indirect actions can affect wetland ecosystems (see diagram 8.1).

info ZONE

Several factors influence the quantity of oxygen which is or can be dissolved in water. The two primary factors are water temperature and the quantity of organic matter (organic means the substance has come from a living or once living organism) in the water.

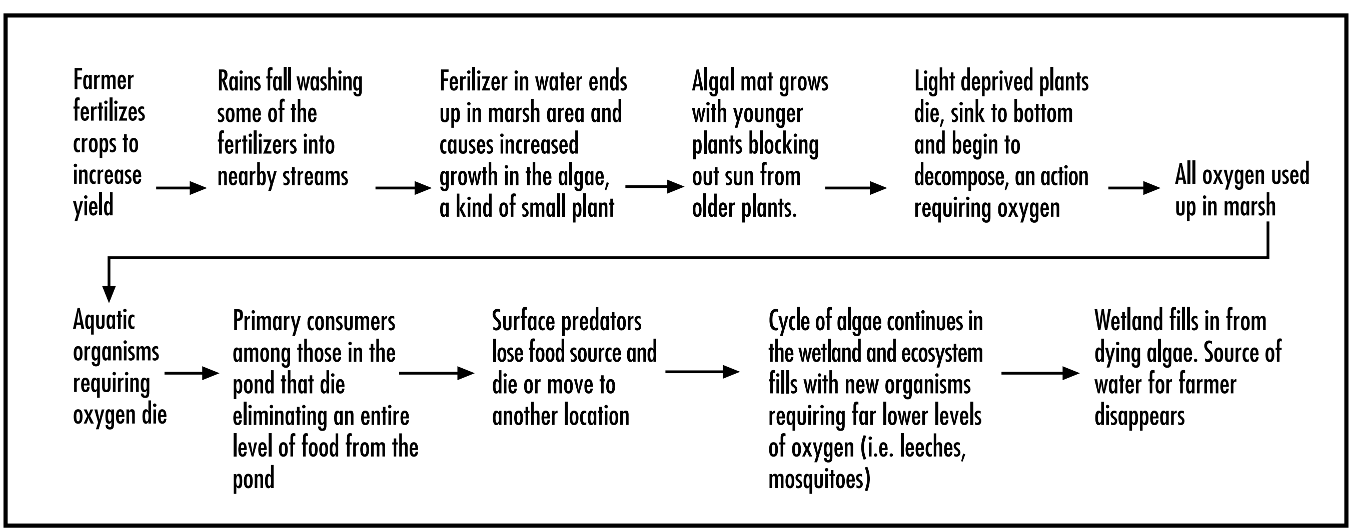

DIAGRAM 8.1

Lesson eight continued

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Lesson eight

Impacts of wetland destruction

Do you remember when we talked about food chains and food webs? When we showed how many animals depend upon one another for survival? This is an important thing to remember when we talk about wetland destruction. Even if the wetland isn't lost, but becomes polluted, the loss of even one kind of animal can affect the lives of many other and different kinds of animals.

Wetlands are ever changing. Many will disappear, either naturally or through impacts caused by people. In fact, it is estimated that more than 70 per cent of the marshes on the Canadian prairies have disappeared and many of those remaining have been damaged. In the St. Lawrence River and Great Lakes regions, up to 90 per cent of the wetlands are gone. Most of these were drained for agricultural, industrial or residential development. Others were filled during times of natural drought, leaving no basin to trap water when wet seasons returned. Wetland organisms are tough, however, and can stand dry periods. In fact, natural wet/dry cycles are important to help keep many of our marshes healthy. But drained, filled or polluted wetlands rarely recover and their loss is usually permanent unless people step in. The effects of these permanent losses are far reach- itself and affect many different organisms.

Wetlands are crucial because they catch the water that runs across our land when the snow melts or after a heavy rain. Without wetlands to slow and trap this water, it runs quickly across much more land. This can cause downstream flooding and erosion of rich topsoil. Without topsoil, farmers need to spend more money on fertilizers to produce a crop. Marshes are nature's best tool for storing floodwaters, recharging clean water for wells and cleaning up pollution. If marshes are drained, pollutants collect further downstream and wells may dry up. Pollutants can cause problems in the wetlands we use for recreation and drinking water. Do you think people are an important part of wetland ecosystems?

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9. Brainstorm other indirect causes of wetland destruction (e.g. deforestation causing increased water temperature, flooding, erosion and siltation, leaking of water from landfills and factories, recreational area development such as parks and golf courses, changing runoff patterns and adding chemicals, roadway building and use, dam building, power lines, pipelines and telephone lines). Assign students to select one of the ideas and develop a flow chart showing how the actions cause disturbances in the wetlands.

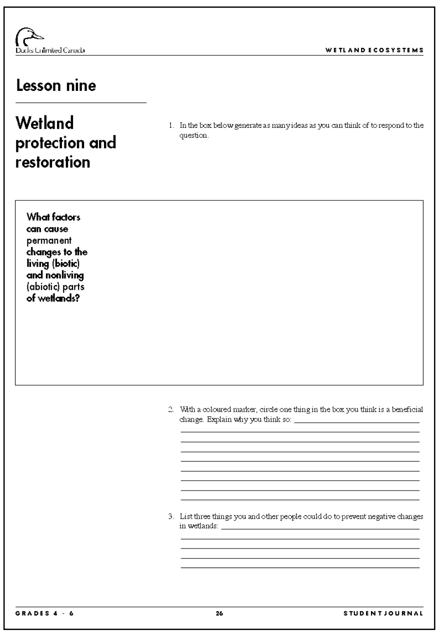
10. Have students read *Impacts of Wetland Destruction* on page 24 and 25 of their journal. Discuss the concepts outlined on these pages (e.g. wetland loss, wetland values).

info ZONE

Significant reductions in oxygen often mean the death of some organisms while promoting an increase in numbers of others (e.g. anaerobic species). Most shifts in the environment result in such changes as conditions for certain species worsen while conditions improve for others due to reduced competition for food or reduction in numbers of predators.

Lesson nine

Wetland protection and restoration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Lesson nine

Wetland protection and restoration

1. In the box below generate as many ideas as you can think of to respond to the question.

What factors can cause permanent changes to the living (biotic) and nonliving (abiotic) parts of wetlands?

2. With a coloured marker, circle one thing in the box you think is a beneficial change. Explain why you think so: __________

3. List three things you and other people could do to prevent negative changes in wetlands: __________

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Curriculum Alignment

Identify human actions taken to preserve, enhance and restore wetland habitats and identify how the student' actions can play a role in conservation.

Recognize that changes in part of an environment affect the whole environment.

Materials

Student journal, Ducks Unlimited video *If you Build it...* (see table of contents for Ducks Unlimited contact information)

Activity Description

1. Discuss the human actions, identified in the previous class, that the students believe are beneficial to wetland ecosystems. When answering, get students to note which groups of organisms the actions are beneficial to (it is important that students consider the larger picture rather than look at how individuals gain).

2. Discuss what could have been done in the example to reverse or prevent the changes to the wetland ecosystem. Many students will likely suggest that they would not allow the farmer to use fertilizer. Remind them that wetlands are on the farmer's property. Without fertilizer, the crops would be weaker, without good crops many farmers may go bankrupt causing disruption of small communities, the loss of other jobs and the uprooting of many families. If food prices were higher, many people could not afford to eat properly. Explain that if buffer zones of grass or forest separate croplands from wetlands, the erosion of soils and fertilizer into the water is reduced. Erosion is also lessened if more cover is left on cropland through practices like zero tillage, rotational grazing and retaining natural grasslands. Also talk about how the destruction of wetlands results in changes for nesting waterfowl, dragonflies, muskrats, marsh birds and many other species of animals radiating outward from the pond (see diagram 9.1 on page 19).

3. Have the students complete the exercises on page 26 of their journal and discuss their ideas with the class. You can mention that species such as purple loosestrife, carp and zebra mussels have been introduced by people into North America's wetlands with significant impact. You might ask students to research these topics and report back to the class with their conclusions.

4. Discuss the terms *preserve*, *enhance*, and *restore* with students. Using the video *If You Build It...*, discuss ways which humans can improve or maintain wetland quality. Ask the following questions:
   - What factors have resulted in the destruction of wetlands?
   - What things are being done to improve overall quality of wetlands?

Lesson nine continued

5. Discuss the value of wetlands with students. Ask the following questions:
   - What are all the organisms mentioned in the video? List them.
   - What actions can humans take to improve wetlands? A marsh clean up, a purple loosestrife dig or putting up nest boxes are things your class could do.
   - Do all organisms benefit from human intervention in the wetlands?

6. Encourage students to choose a strategy for protecting or restoring a wetland ecosystem. Once they have selected a strategy get them to prepare a presentation of the strategy using graphic, written, presentation or dramatic forms (see projects on page iii of the student journal). Be sure that students are aware that they need to address the wider effects of wetland destruction, protection, restoration and enhancement. Refer to the Ducks Unlimited Web site (www.ducks.ca) or call 1-800-665-DUCK to request additional information on wetland conservation, purple loosestrife and conservation farming practices like zero tillage and rotational grazing.

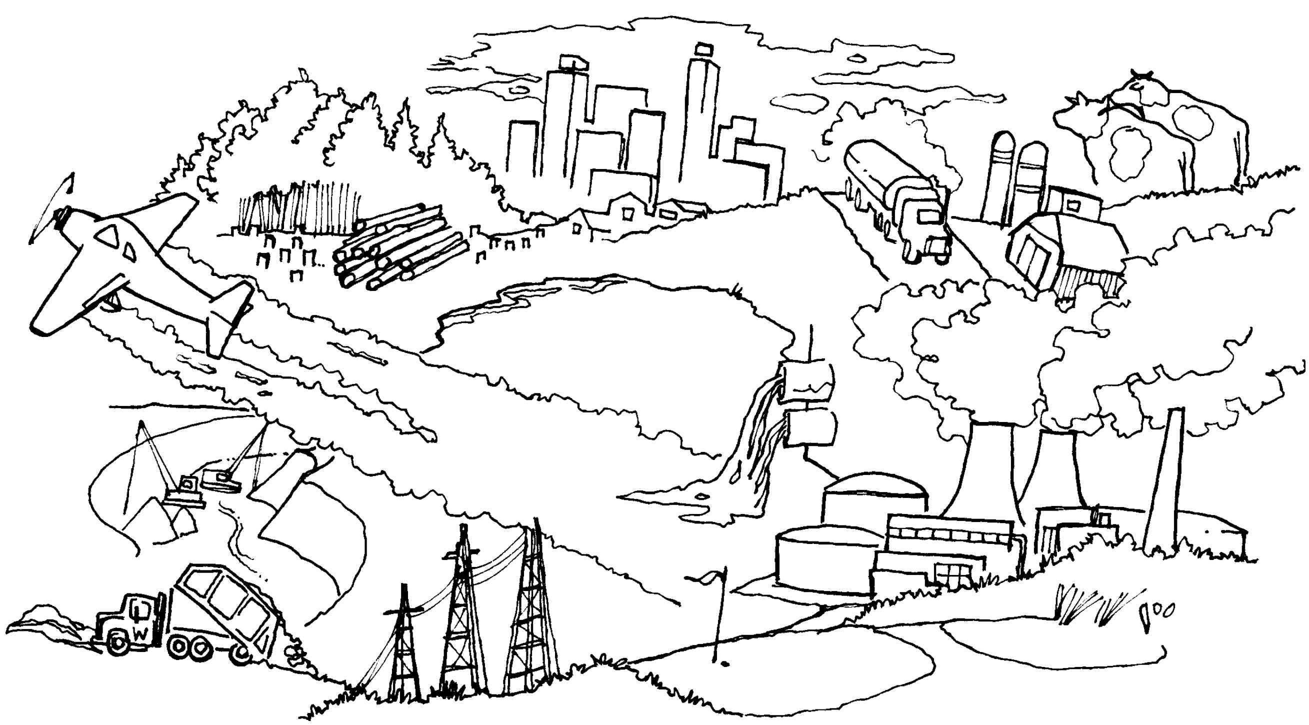


DIAGRAM 9.1

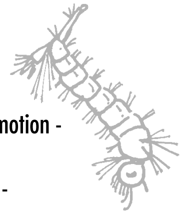
SHALLOW WATER ORGANISMS

CADDISFLY LARVAE

Locomotion -

Food -

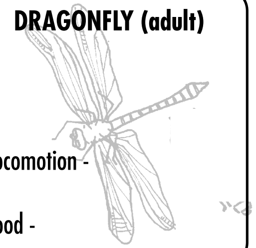
MOSQUITO (larvae)



Locomotion -

Food -

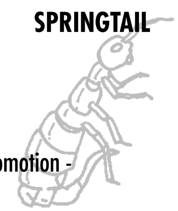
DRAGONFLY (adult)



Locomotion -

Food -

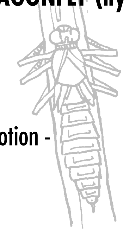
SPRINGTAIL



Locomotion -

Food -

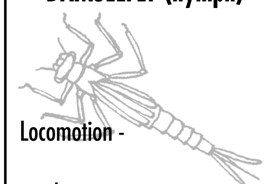
DRAGONFLY (nymph)



Locomotion -

Food -

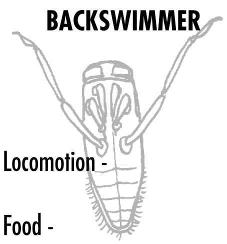
DAMSELFLY (nymph)



Locomotion -

Food -

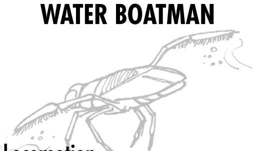
BACKSWIMMER



Locomotion -

Food -

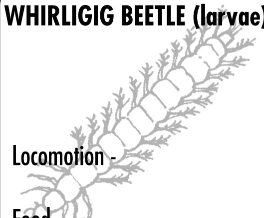
WATER BOATMAN



Locomotion -

Food -

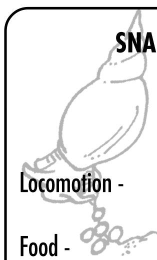
WHIRLIGIG BEETLE (larvae)



Locomotion -

Food -

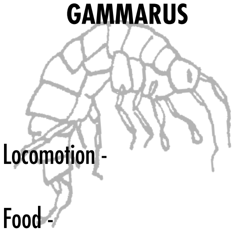
SNAIL



Locomotion -

Food -

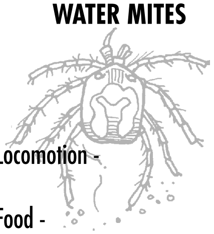
GAMMARUS



Locomotion -

Food -

WATER MITES

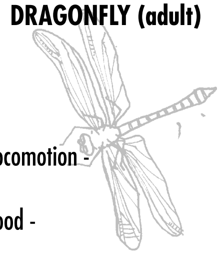


Locomotion -

Food -

DEEP WATER ORGANISMS

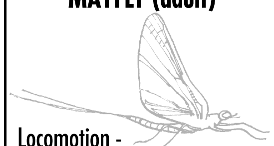
DRAGONFLY (adult)



Locomotion -

Food -

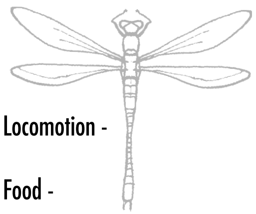
MAYFLY (adult)



Locomotion -

Food -

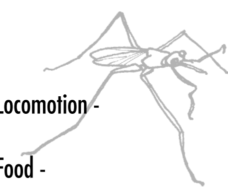
DAMSELFLY (adult)



Locomotion -

Food -

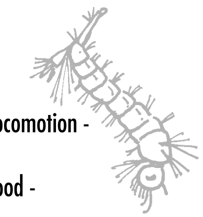
WATER STRIDER



Locomotion -

Food -

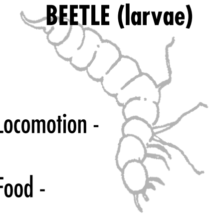
MOSQUITO (larvae)



Locomotion -

Food -

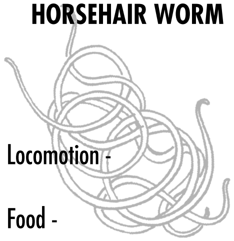
PREDACEOUS DIVING BEETLE (larvae)



Locomotion -

Food -

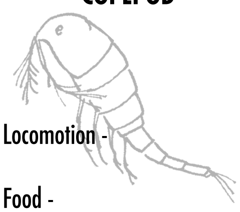
HORSEHAIR WORM



Locomotion -

Food -

COPEPOD



Locomotion -

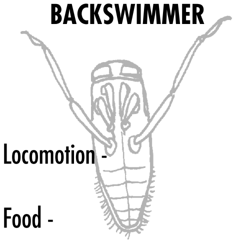
Food -

DAPHNIA (sp)

Locomotion -

Food -

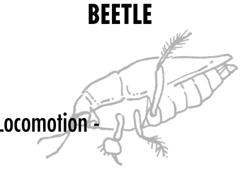
BACKSWIMMER



Locomotion -

Food -

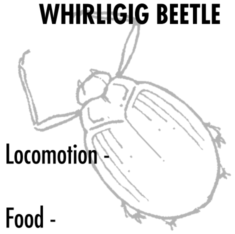
PREDACIOUS DIVING BEETLE



Locomotion -

Food -

WHIRLIGIG BEETLE

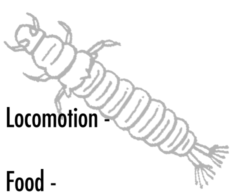


Locomotion -

Food -

BOTTOM ORGANISMS

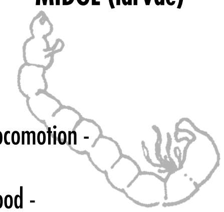
CADDISFLY LARVA



Locomotion -

Food -

MIDGE (larvae)



Locomotion -

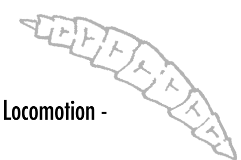
Food -

HORSEFLY (pupa)

Locomotion -

Food -

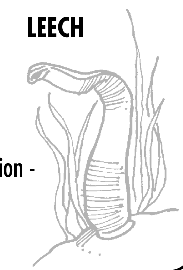
HORSEFLY (larvae)



Locomotion -

Food -

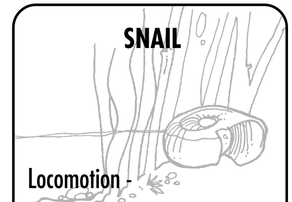
LEECH



Locomotion -

Food -

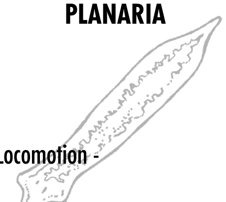
SNAIL



Locomotion -

Food -

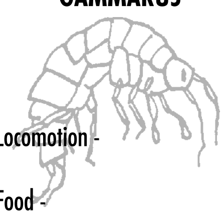
PLANARIA



Locomotion -

Food -

GAMMARUS



Locomotion -

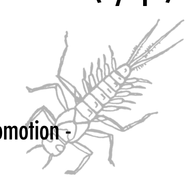
Food -

DRAGONFLY (nymph)

Locomotion -

Food -

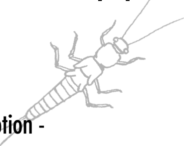
MAYFLY (nymph)



Locomotion -

Food -

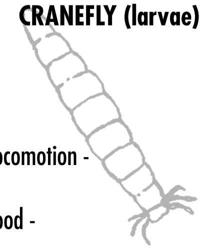
STONEFLY (nymph)



Locomotion -

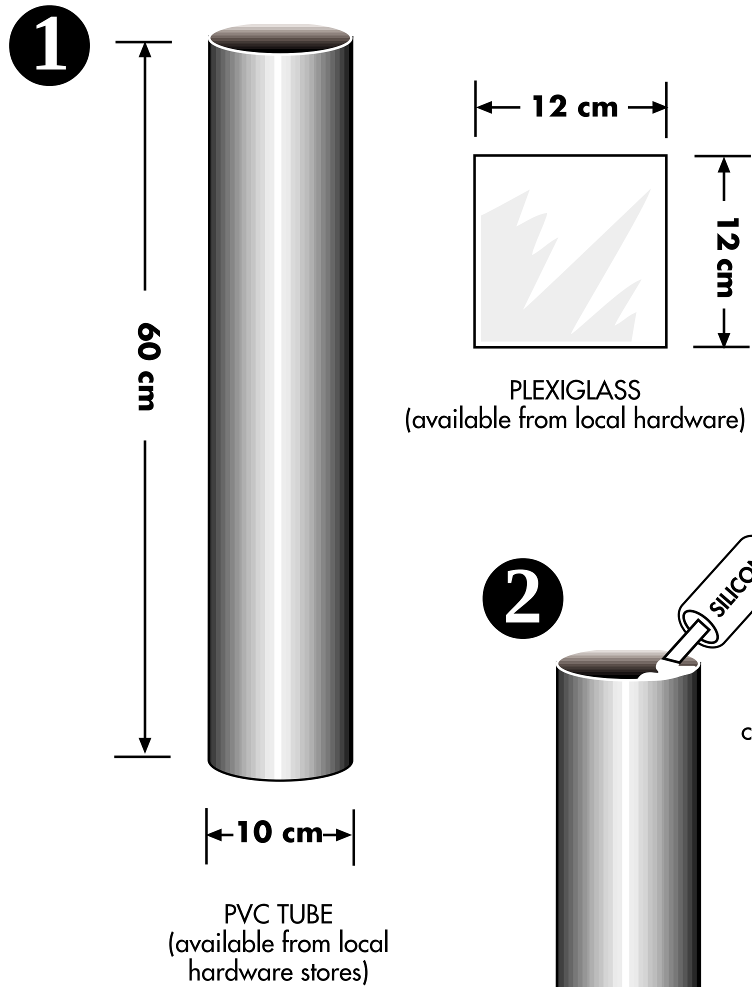
Food -

CRANEFLY (larvae)



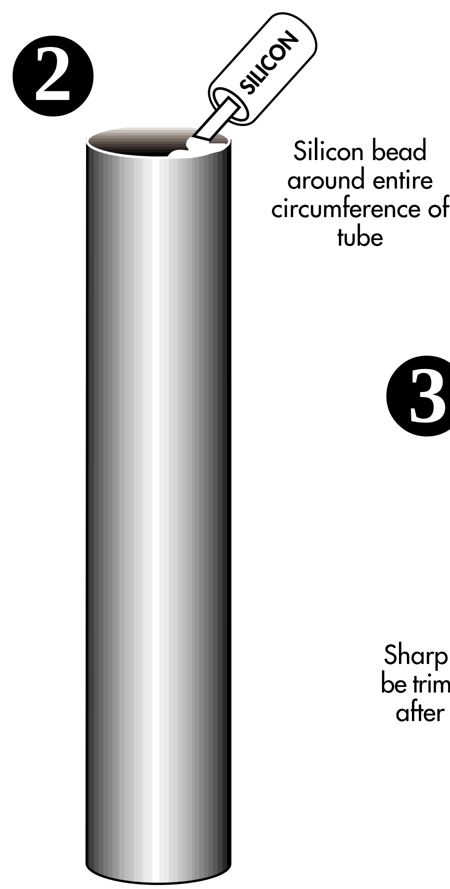
Locomotion -

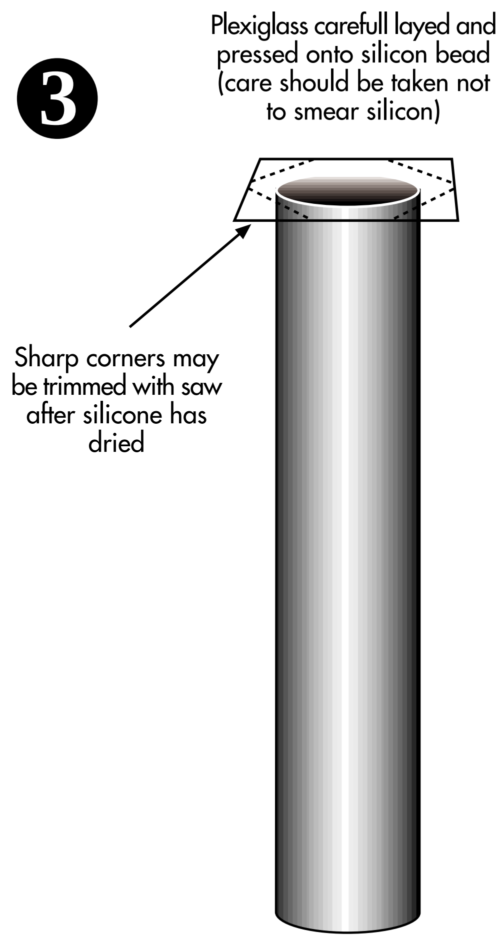
Food -



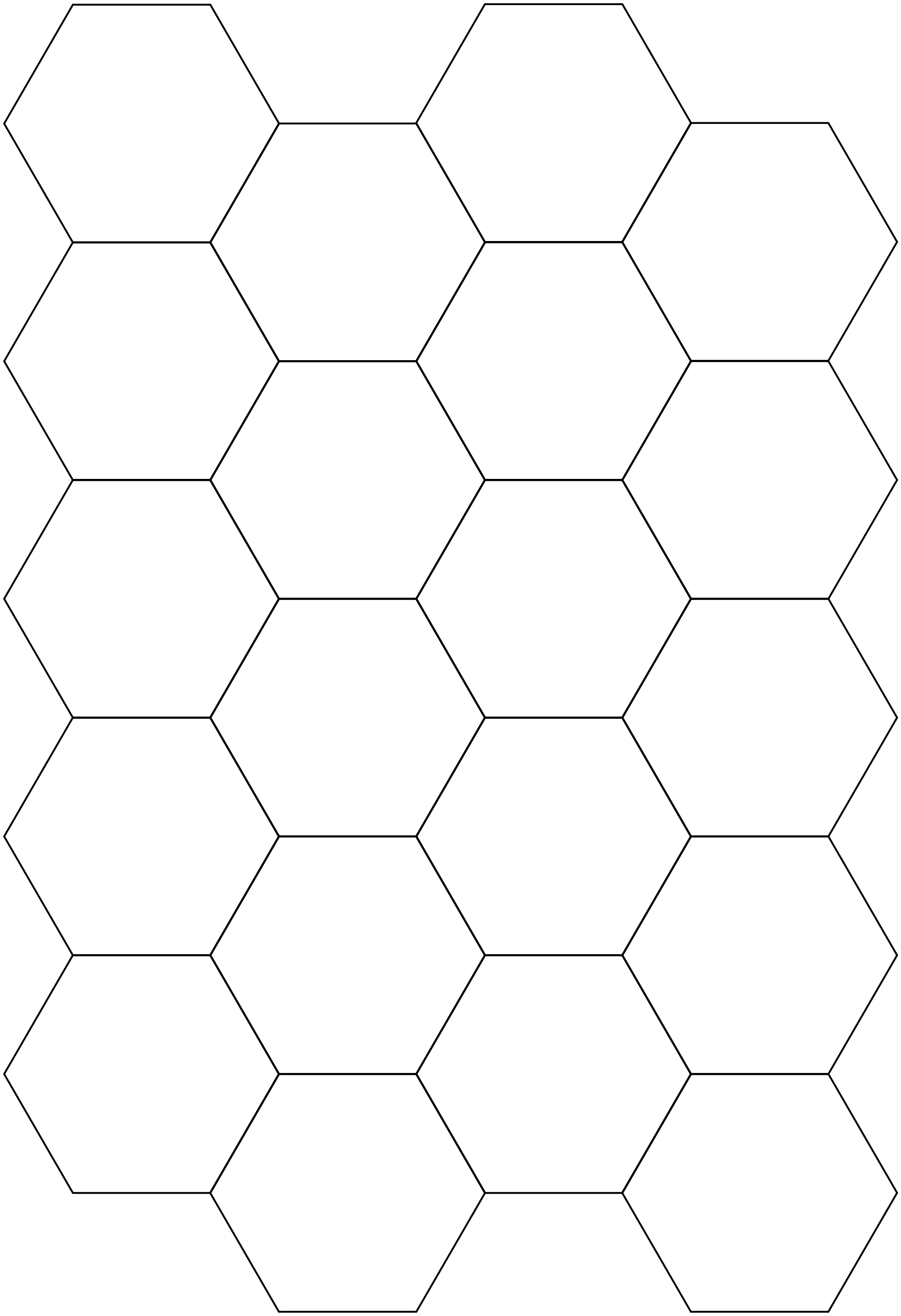
NOTE: If plexiglass is unavailable, heavy, clear plythene can be used and attached with thick elastic bands.

To view underwater life push the plexiglass end into the water at an angle and look through the open end.





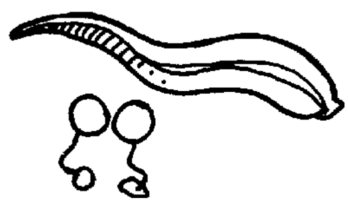
Constructing an Underwater Scope



Cycle of Life

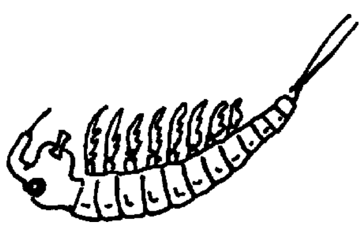
Card fronts

To create one complete deck of *Cycle of Life* cards, make two copies of the card fronts (pages 25 to 31). There are 26 card fronts – a complete deck contains 52 cards. Copy (or glue) the backs of the cards (page 32) onto the other side of the card fronts. Laminate the pages and cut out the cards.



LEECH

Leeches lay eggs in a cocoon which they fasten to a plant or bury in the mud. They hatch looking just like adults.

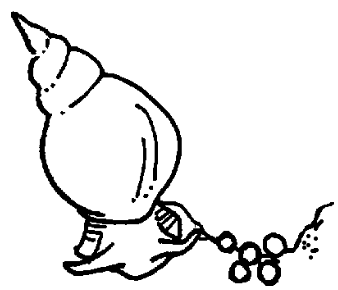


FAIRY SHRIMP

These tiny crustaceans lay eggs which are dropped to the bottom of the wetland by the adult. They hatch into an immature stage which must moult before be-coming an adult.

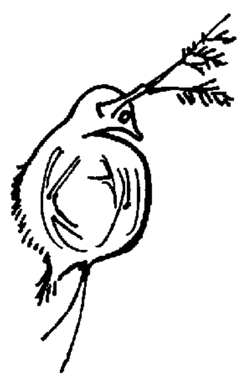
Cycle of Life

Card fronts



SNAIL

Most snails have both male and female organs. Snails lay eggs which hatch into young resembling the adults.



DAPHNIA

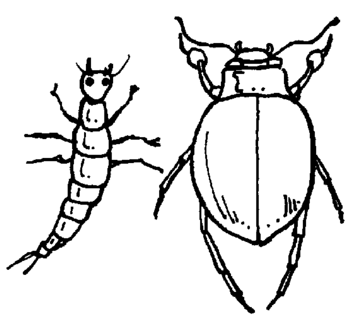
Females carry a number of eggs in their body. They hatch and remain there for several days before being released. These young must moult before becoming adults.

Cycle of Life

Card fronts

SPRINGTAILS

Eggs are laid in the vegetation along shore. The young are different from adults only in colour.

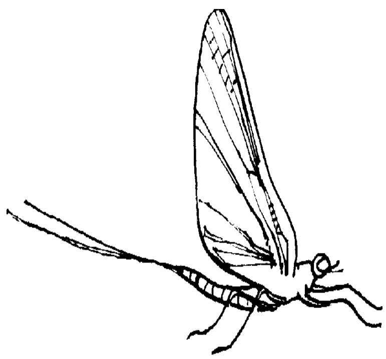


PREDACEOUS DIVING BEETLE

These common wetland insects have a complete metamorphosis, meaning they have a four stage life cycle. The eggs are laid on shore-line plants, hatching into aggressive aquatic larvae. The larvae eventually crawl to shore where they become pupas, hiding under logs or stones. They emerge weeks later as full grown adults.

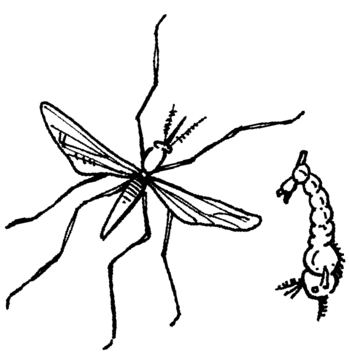
Cycle of Life

Card fronts



MAYFLY

Mayflies show incomplete metamorphosis. They lay eggs in the water which hatch into nymphs. The nymphs live and feed in the water. After some time, the nymphs crawl up on shore where they moult, emerging as flying adults.

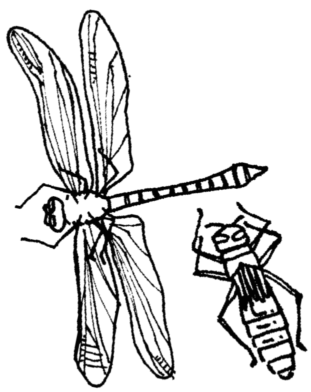


MOSQUITO

Like all true flies, mosquitoes have a four stage life cycle. Their metamorphosis is complete – from egg to larva to pupa to adult. This complete transformation may take place in as little as 10 days or as long as two years.

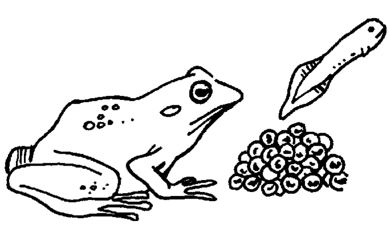
Cycle of Life

Card fronts



DRAGONFLY

These large insects have a three stage life cycle much like that of the mayfly. The eggs are laid in water, where they hatch into nymphs. The nymphs eventually crawl up on shore where they moult into winged adults.

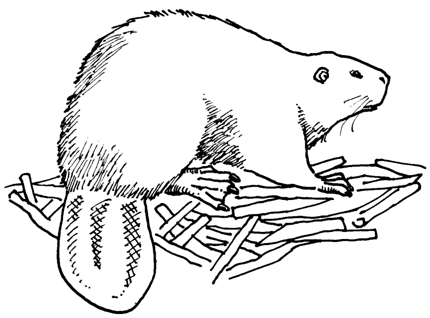


FROGS

Frogs lay their eggs in jelly-like strings or masses in the water. The legless larvae which hatch have gills and are known as tadpoles. The development of legs and lungs takes several weeks, at which time they become adults and move out of the water.

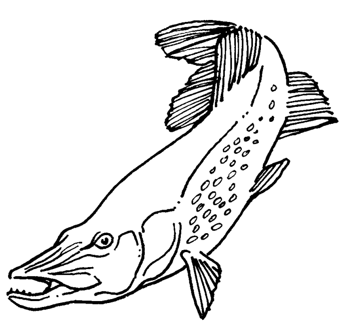
Cycle of Life

Card fronts



BEAVER

These Canadian symbols are born blind and helpless in the beaver lodge in late spring, but look very much like their parents. They grow slowly over the next two years. After their second winter they will find a mate, build their own lodge and have their own young.

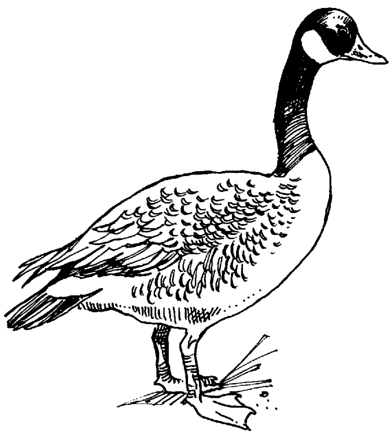


NORTHERN PIKE

Like most freshwater fish, the female pike lays eggs which are then fertilized by the male. These eggs will hatch in a few weeks, with the young looking like the adult.

Cycle of Life

Card fronts

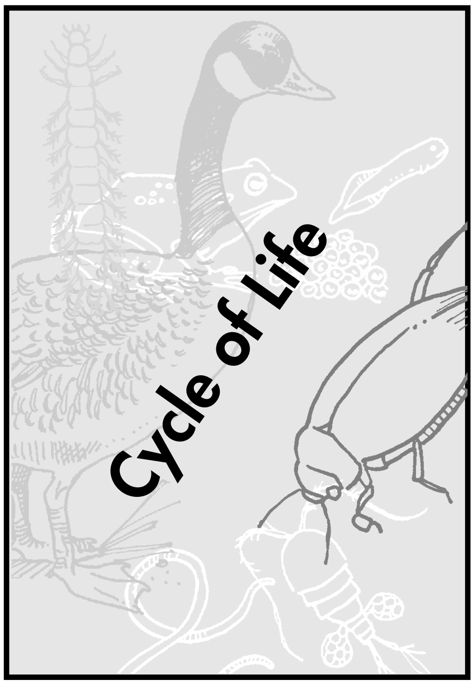


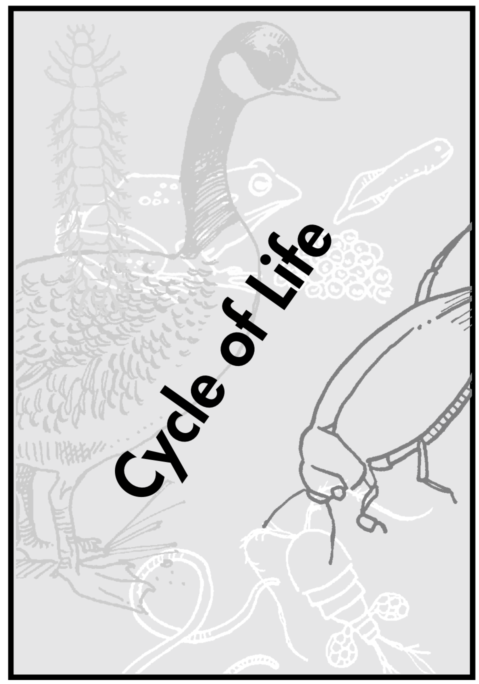
CANADA GEESE

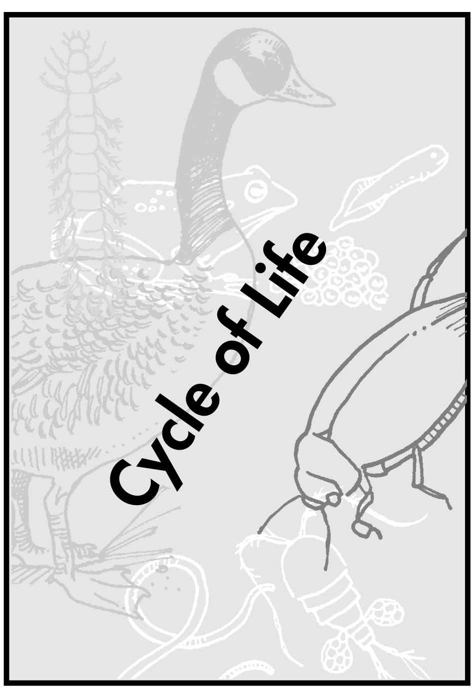
These large geese lay eggs which are incubated by the female for about four weeks before hatching. The young are unable to fly and spend the next couple of months growing a full set of feathers. By fall they are strong enough to fly south to their wintering grounds. Some females return the following spring as adults, ready to nest and lay eggs, though most don't lay eggs until their second year.

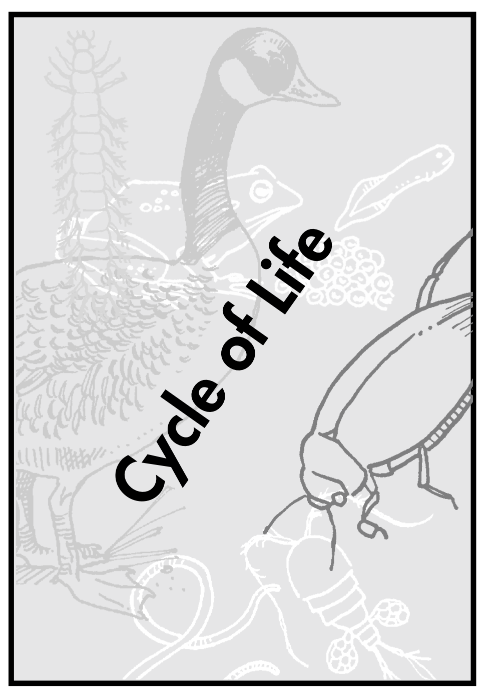
Cycle of Life

Card backs







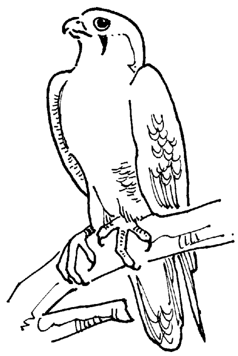


It's Just Like

Card fronts

Rules for the *It's Just Like* game are outlined on page 16 of the student journal. Fold and glue the card on the right to the back of the card on the left. Laminate the pages and cut out the cards. Each card should have a human invention on one side and an animal or plant adaptation on the other.

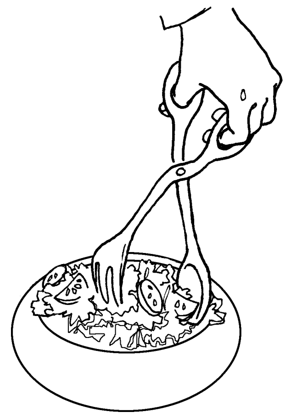
ADAPTATION



HAWK'S TALONS

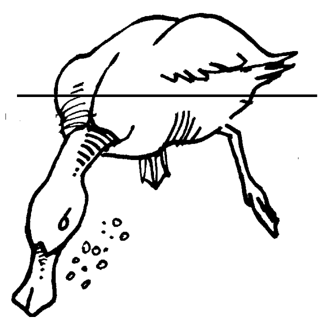
A hawk uses its talons to kill prey and pick up objects that are soft enough for the talons to stick into.

HUMAN INVENTION



SALAD SET

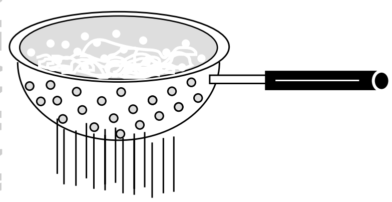
ADAPTATION



DUCK'S BILL

A duck's bill is designed like a flat strainer which enables it to run a great deal of water through it and collect a great deal of suspended material from the pond.

HUMAN INVENTION

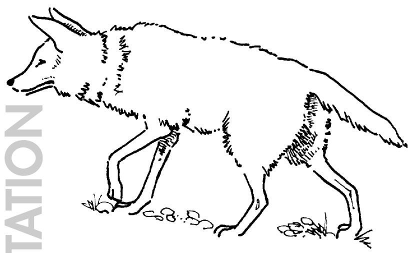


STRAINER

It's Just Like

Card fronts

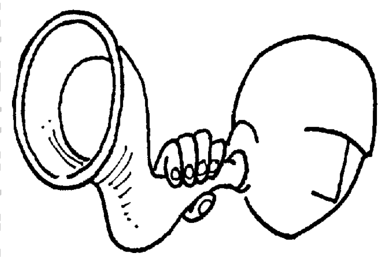
ADAPTATION



COYOTE'S EARS

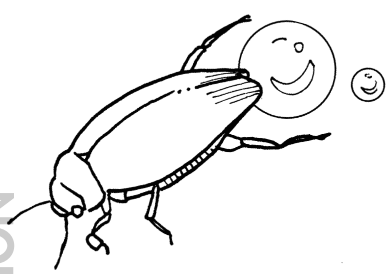
A coyote uses its keen sense of hearing which is aided by the erect funnel shape of the ears which pull sound into the hearing canal.

HUMAN INVENTION



MEGAPHONE

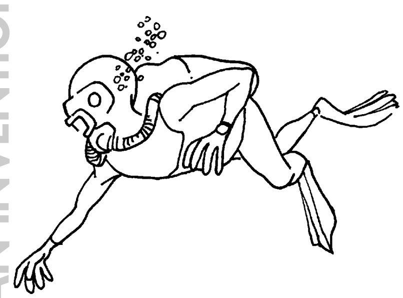
ADAPTATION



DIVING BEETLE'S AIR BUBBLES

Like many other air breathing, wetland insects, the diving beetle requires a supply of air and unlike fish it breathes air in through the sides of its body. Air is taken below the surface in a bubble that is attached to the back end of the beetle. With this air the beetle can stay underwater hunting for several minutes at a time.

HUMAN INVENTION

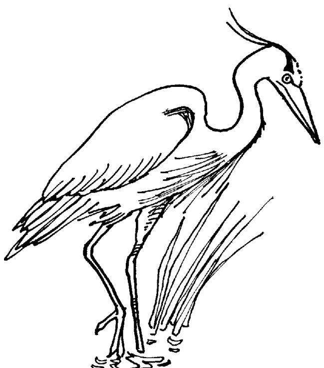


SCUBA GEAR

It's Just Like

Card fronts

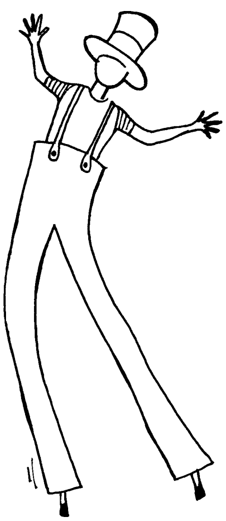
ADAPTATION



HERON'S LONG LEGS

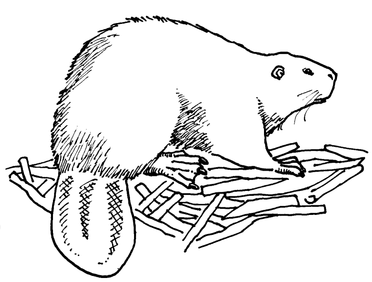
The heron stands in water on its long, sticklike legs. These legs enable it to wade deep into the water in search of the tastiest morsels of food.

HUMAN INVENTION



STILTS

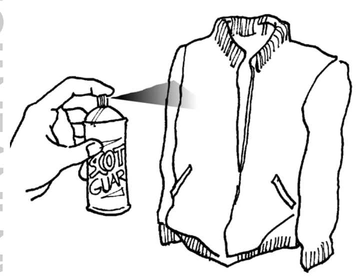
ADAPTATION



THICK OILY FUR

The beaver is able to swim underwater on the coldest days because of its dense under fur which is thickly covered with long guard hairs and body oil. The thick fur keeps the body's heat in and the oil stops the cold water from getting through to the skin of the beaver.

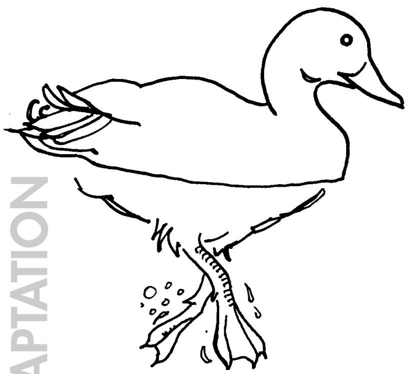
HUMAN INVENTION



SCOTCH GUARD

It's Just Like

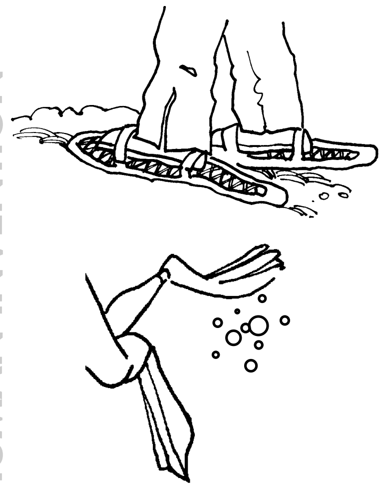
Card fronts



ADAPTATION

DUCK'S FEET

The webbed foot of the duck is a very important tool for propelling effortlessly through the wetland, whether walking on soft wet ground or paddling quickly through open water.



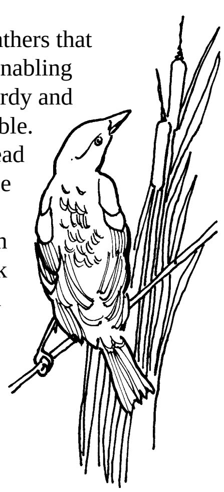
HUMAN INVENTION

SNOWSHOE/ DIVER'S FINS

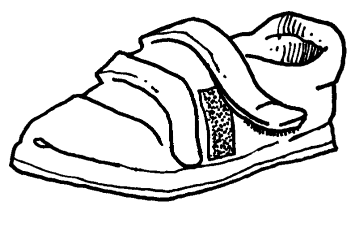
ADAPTATION

WING FEATHERS

Birds have feathers that zip together, enabling them to be sturdy and yet quite flexible. Birds can spread and clean these feathers with their beak then pull them back together when flight is required.



HUMAN INVENTION

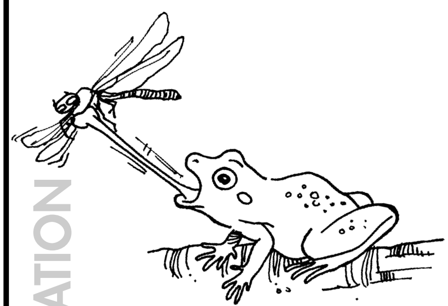


VELCRO

It's Just Like

Card fronts

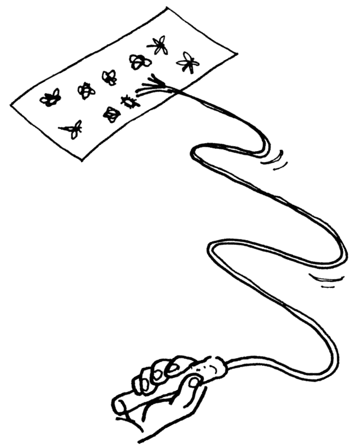
ADAPTATION



FROG'S TONGUE

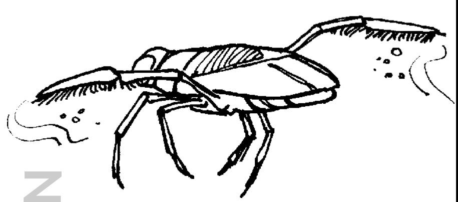
Frogs have remarkable marksmanship with their sticky tongues which are attached at the front of the mouth rather than at the back of the throat. The sticky end enables the frog to pull in most things that it can touch.

HUMAN INVENTION



SNAPPING WHIP

ADAPTATION



WATER BOATMAN

These marsh insects have a set of oarlike legs that move them through the water much faster than other insects. This helps them catch their prey while escaping animals who would like to eat them.

HUMAN INVENTION

BOAT PADDLE

It's Just Like

Tokens

Rules for the *It's Just Like* game are outlined on page 16 of the student journal. Tokens are awarded to players who correctly identify the plant or animal adaptation of the corresponding human invention. Make several copies of this page on coloured paper. Laminate and cut out the tokens.

It's Just Like

It's Just Like

It's Just Like

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