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Introduction

It has been recognized that there is enormous potential for incorporating environmental management practices and outdoor education programming at Camp Samac, Oshawa, Ontario. The focus of the programming would be the value of environmental/ outdoor education and the role of all Scouting Youth/Scouters in the protection and enhancement of such values.

Environmental/outdoor activities lead to discovering and valuing the world, to seeking deeper knowledge, and then to making choices from that position. This is true whether the users are children, youth, or adults. This can be accomplished three ways by:

- developing respect for the outdoor spaces and a commitment to the protection of natural resources in these spaces;
- acquiring environmentally-oriented social values and through these, develop an environmental ethic;
- developing an understanding of the role of an individual within society by pursuing their environmental ethic.

The long-term impact of outdoor activities is the development of positive attitudes towards participation in such outdoor activities. The novelty element of the outdoor experience is the key to the provision of an effective learning experience.

The Role of the Outdoor Centre

Effective learning is often heightened in a natural setting (Fig. 1). In this urbanized age where much information comes to us through technology, outdoor learning has meaningful, first-hand experiences with the living world. Such natural explorations lead Scouting Youth to understand and remember important concepts. With confidence gained first-hand in relatively small-scale local field experiences, Scouting Youth can more effectively visualize ideas that involve caring about the outdoors in the global ecosystem.

A successful outdoor program in an outdoor centre is accomplished by channeling a Scouting Youth's energy and knowledge into meaningful activity.

An outdoor centre provides:

- Opportunities to study and live in the outdoors and become part of the interrelationships existing between people, plants, animals, and the physical environment;
- Exposure to new environments and experiences that lead to greater self-understanding and the opportunity to become involved in activities and modes of expression that tap the total human potential;
- Active participation in the identification and solving of environmental problems in the community;
- Success and accomplishments in meaningful and challenging adventure activities;
- Group living experiences, particularly in residential outdoor centres;
- Exposure to such activities as hiking, birding, tree and plant identification, stream study, survival skills, orienteering, canoeing, and nature crafts.



Fig. 1. Outdoor Centre

The Role of a Scouter

The Scouter serves as a link between the Scouting Youth and the site. Therefore, the Scouter must have a thorough knowledge of the activity site. They must know the cultural history and understand the universal complications. This requires a good understanding in the sciences and the humanities. But even more important is the first-hand knowledge that can be gained only in the field. If you are going to be a spokesperson for the environment, you must know what the environment has to say.

The Scouter is a person whose responsibility is to:

- provide stimulating experiences for Scouting Youth and create conditions in which the Scouting Youth can make personal meaning from those experiences;
- have a critically thoughtful view of their own work, tending to make corrections and changes when necessary;
- provide Scouting Youth with the opportunities to be outside, where they share their sense of curiosity about, and love and enthusiasm for nature.

The outdoor places that Scouting Youth seem to find most meaningful are areas Scouters need to become aware of. They must find ways to use these Scouting Youths' experiences in outdoor activities. By channeling these activities through experiences that the Scouting Youth love and enjoy in the outdoors, the Scouter will be able to motivate and give the Scouting Youth ownership into the concerns for the future of the natural world.

It really does not matter whether the Scouter take courses in Outdoor Education or not. What does matter is the total of their personal positive experiences with the outdoors, the attitudes, and commitments they bring to sharing these experiences, and the quality and character of *their* Scouters. In short, *what a Scouter is, may be more important than what a Scouter knows.*



The Outdoor Code

- Keep group sizes small. Remember, the ecological impact of a group is not necessarily a function of numbers. Two careless people can do far more damage than twelve careful ones. Carrying capacity varies, so the number of people should depend on the characteristics of the site, i.e., size, sensitivity.
- Prepare carefully. Be familiar with activity areas.
- Use existing trails and stay within their confines. Conduct a careful study of the environmental implications before blazing new trails.
- Avoid wearing lug-soled footwear (footgear with pronounced ridges on soles). This type of boot tends to disturb vegetation to a considerable degree and generally leads to unnecessary erosion.
- Use existing campsites. Keep heavy use to a confined area (because of soil compaction). Keep fires small.
- Waste that is carried in must also be carried out. Burn it, bash it, bag it, bring it back.
- Because you are a guest in someone's home, act accordingly.
- Obey all fish, game, and forestry laws and regulations.
- Do not pick edible wild foods except where they are abundant. Do not pull up roots when using only leafy parts of plants, or when there are not many of a specific species in the area.
- If you want to pick something pick a friend to share your experience.



Trees

Native trees fall naturally into two groups:

- **Gymnosperms:** also known as conifers, evergreens, or softwoods.

All gymnosperms do not have proper flowers and they carry their seeds in cones. They are mostly evergreen and have scale-like or narrow, needle-like leaves. The leaves of a coniferous tree stay on the tree all year. The leaves are adapted for conserving water so it is not necessary for them to shed their leaves in the winter. The one exception to this rule of not shedding its leaves is the tamarack or eastern larch. Each year as autumn approaches, the tamarack's leaves turn yellow first and fall away from the tree.

The wood of most coniferous trees is "softer" in density, resinous, and ideal for pulp and paper. Coniferous forests are home to many fur-bearing mammals that do not migrate in the winter.



Coniferous means "cone-bearing"

The most common coniferous trees in Ontario include:

eastern white pine	eastern white cedar
red pine	eastern hemlock
scots pine	white spruce
jack pine	tamarack or eastern larch
balsam fir	

Descriptions of the leaves, bark, cone, form, site, and uses for these coniferous tree species can be found in the Appendix on pages 204-212.

- **Angiosperms:** also known as deciduous, broadleaf, or hardwoods.

All angiosperms are flowering plants (although a tree's flowers are not always easy to see). They carry their seeds in a fruit and have broad leaves. The leaves of a deciduous tree do not stay on the tree all year. A deciduous tree must shed its leaves in the winter in order to conserve water.

The wood of deciduous trees is "harder" in density, heavy, non-resinous and is used for furniture and flooring. A hardwood log in your fire will burn longer and hotter than a softwood log of the same size.



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Deciduous means "to fall away."

The most common deciduous trees in Ontario include:

hard maple	white ash
red oak	ironwood
white elm	trembling aspen
basswood	largetooth aspen
American beech	balsam poplar
black cherry	willow
white birch	

Descriptions of the leaves, bark, twig, bud, form, site, and uses for these deciduous tree species can be found in the Appendix on pages 213-225.

Why Deciduous Trees Lose Their Leaves

Trees serve an important purpose in the environment. They are natural filters. Trees absorb carbon dioxide from the atmosphere. Carbon dioxide is a greenhouse gas which contributes to global warming. Trees also provide shade, which in turn, reduces our exposure to harmful ultraviolet radiation.

But trees are also aesthetically pleasing. They are wonderful to look at, especially in the fall when their leaves change colour. A mixture of deciduous and coniferous trees adds a multitude of colours to the environment around us. As a rule, deciduous trees are the trees that change colour each year and then lose their leaves.

The word deciduous means "to fall away," and every autumn, deciduous leaves fall off the tree. Normally in the summer during growing season, trees draw tremendous amounts of water (liquid) out of the ground through their roots, which in turn, travels up the tree to the leaves. The water is used for photosynthesis. Photosynthesis is a chemical reaction that occurs within a leaf in the presence of light. The purpose of photosynthesis is to make food (glucose) for the tree. A by-product of the chemical reaction is the oxygen that we breathe. Once the water reaches the leaves, some of it is lost in the form of water vapour (gas) in a process called transpiration. The loss of water from the leaves helps to pull water from the ground throughout the tree. This process of "pulling" water is called capillary action (Fig. 2).

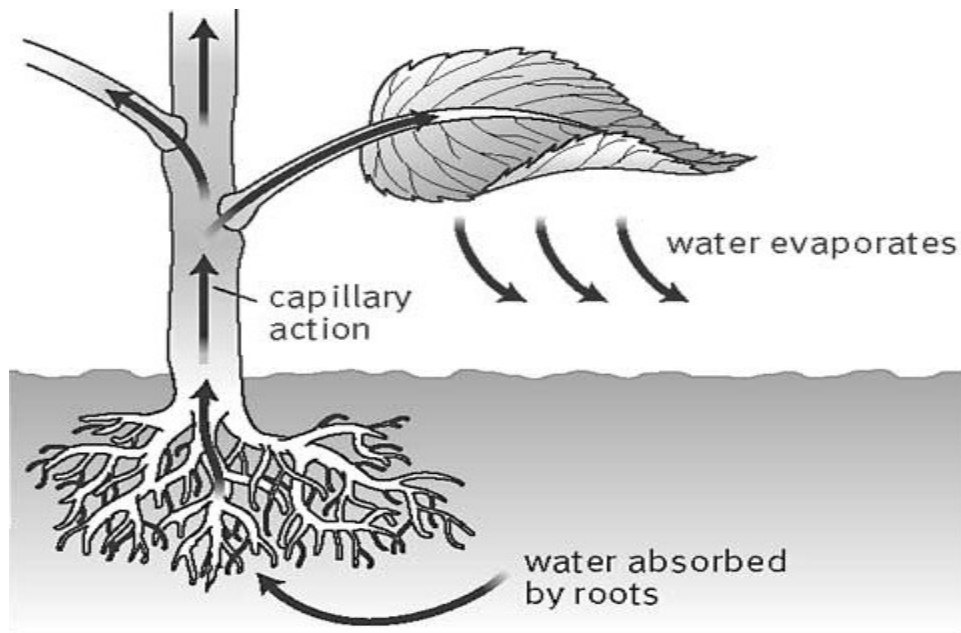


Fig. 2. Movement of Water Through a Tree

Therefore, with deciduous trees, the leaves must fall off the tree to ensure a water supply is maintained throughout the tree during the winter months. One can assume now that a tree cannot produce food throughout the winter months. After a lengthy growing season and food and water have been stored, the fall season approaches. Factors such as moisture levels, temperature, food stored in the roots, and the genetics of the tree signal the deciduous tree to shut down and prepare for a dormancy period. With coniferous trees, the rate of transpiration is much lower because their leaves are waxy and needle-like. This unique adaptation enables coniferous trees to keep their leaves and ensures a plentiful water supply throughout the winter.

During the fall season, the leaves begin to show their brightest colours. These colours are already present in the leaves all year. However, they are masked by a green pigment. The leaves appear green because of the presence of this green pigment called chlorophyll. Chlorophyll is necessary for photosynthesis to occur. Towards fall, as the production of chlorophyll stops, the existing chlorophyll in the leaf is slowly burned away by sunlight. Two other groups of coloured pigments that already existed in the leaf will now begin to show (depending on the species of tree). One group of pigments called carotenoids, make up the orange and yellow colours, and another group called the anthocyanins, make up the red and purple colours. As chlorophyll production stops and it is burned away, the other pigments start to show and become more dominant. During this time, trees are ablaze with colours ranging from bright yellow or orange to deep purple or red and all the colours in-between. Cool nights accompanied with bright, sunny days produce the most colourful fall seasons. Sometimes, an early frost will kill the leaves before they change colour and fall off. This causes the leaves to turn a dull brown colour and they remain attached to the branch well into the winter. This is particularly evident on American beech and oak trees.

As the leaves are peaking in colour, another change occurs at the point of attachment between the leaf stem (petiole) and the branch of the tree. In deciduous trees, an abscission zone, also called a separation zone, is formed at the base of the leaf stem. It is a single layer of cells that separates the petiole and the branch and it gradually starts to weaken. Eventually, the leaf falls off under its own weight or in the blowing breeze (even if that breeze is very gentle).

Leaf, Twig, and Bud Arrangement in Deciduous Trees

To learn to identify deciduous trees, it starts with the arrangement of the leaf, twig, and buds. This is the primary distinction of the most common tree species. You can eliminate major blocks of trees just by observing the tree's leaf, twig, and bud arrangement.

All trees and shrubs have either opposite or alternate arrangement with their leaves, twigs, and buds (Fig. 3). Alternate arrangement means the leaves, twigs, and buds typically alternate placement along the stem. Opposite branching occurs when the leaves, twigs, and buds grow off a main branch in pairs opposite to each other. ALL maples, ashes, dogwoods, and *Viburnums* are examples of opposite arrangement. ALL OTHER deciduous trees are examples of alternate arrangement.

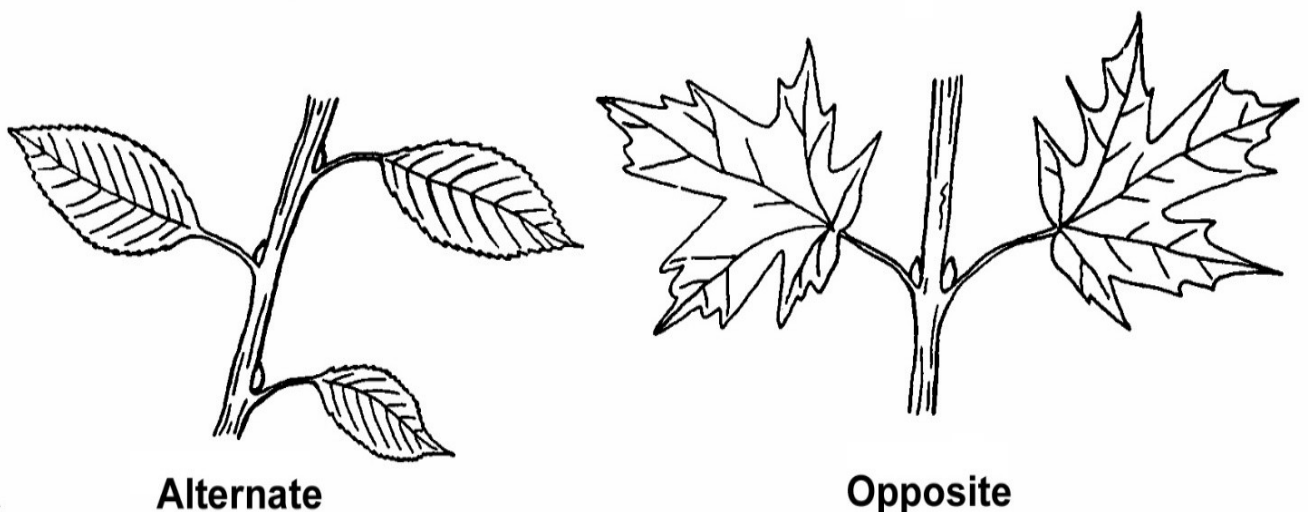


Fig. 3. Opposite or Alternate Arrangement with Leaves, Twigs, and Buds

Simple and Compound Deciduous Leaves

Simple Leaves

All trees have a leaf structure that can be classified as either simple or compound. A simple leaf (Fig. 4) is singular and never divided into smaller leaflet units. It is always attached to a twig by its stem, or petiole. The margins or edges of the simple leaf can be smooth, serrated (toothed), or lobed.



Fig. 4. Simple Leaf

Compound Leaves

In contrast to a single leaf, the compound leaf (Fig. 5) has leaflets, which are attached to the middle vein and have their own stalks. Envision a bunch of single leaves, all attached to the main stem, which is then is attached to a twig.

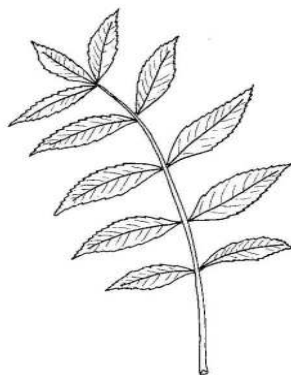


Fig. 5. Compound Leaf

*******Be sure to check out the Tree Identification activity on page 159.**

Woodland Plants

Not many Scouters/Scouting Youth will be able to identify all the plants that grow at Camp Samac, but it is important to learn those that will be commonly seen. Not all plants will be found in the same area. Plants, like animals, live in different places, or, habitats. Some may grow in shaded woods, others in wet, muddy places, and others in open fields. Where the plant is found is important for its identification. When identifying a plant, consider the following questions:

- Where is the plant growing? (the habitat type)
- What month is it?
- What colour is the flower? Is it all the same colour?
- How many petals does the plant have?
- Are there any leaves? How many are there?
- What do the edges of the leaves look like?

Most early spring blooming plants live in woods where the trees drop their leaves. Because they need sunlight for their blooming and food-storing period, it is necessary for them to flower early before the leaves of the trees grow and reduce the amount of sunlight reaching the forest floor.

Plants normally grow best in particular environments to which their species has become adapted. These adaptations enable them to obtain air, light, water, nutrients, and space to grow. Without these special adaptations, they would be unable to survive. Leaf structure, for example, varies from species to species. Plants that grow in the shade are thinner (in cross-section) and broader than those that grow in full sunlight. Likewise, plants that grow in humid, warm conditions are tall and possess broad leaves that allow excess moisture to evaporate from them. Plants that grow in harsh, colder environments are short with small leaves that retain moisture.

Most wildflowers are very fragile and should not be picked. Picking the flowers of the trillium for example, will remove the food-producing parts of the plant and the roots may die of starvation. In order to see woodland plants alive with beauty each spring, wild flowers should be left in their own home for all to enjoy.

The following is a list of common woodland plants that may be found at Camp Samac:

Common Woodland Plants That May Be Found at Camp Samac

<u>Colour of Flower</u>	<u>Plant</u>	<u>Scientific Name</u>	<u>Time of Flowering</u>
white	blood root	<i>Sanguinaria canadensis</i>	early April-May
	Canada anemone	<i>Anemone canadensis</i>	late May-early July
	Canada mayflower	<i>Maianthemum canadense</i>	May-early June
	catnip	<i>Neptea cataria</i>	June-September
	cut-leaves toothwort	<i>Dentaria laciniata</i>	June-September
	dutchman's breeches	<i>Dicentra cucullaria</i>	April-May
	false solomon's seal	<i>Smilacina racemosa</i>	mid-May-mid-June
	hepatica	<i>Hepatica americana</i>	early April-May
	honeysuckle	<i>Lonicera canadensis</i>	mid-May-mid-June
	large toothwort	<i>Dentaria maxima</i>	April-May
	mayapple	<i>Podophyllum peltatum</i>	mid-May-mid-June
	red baneberry	<i>Actaea rubra</i>	mid-May-mid-June
	solomon's seal	<i>Polygonatum biflorum</i>	mid-May-late June
	spring beauty	<i>Claytonia virginica</i>	April-early May
	tick trefoil	<i>Desmodium</i> spp.	July-mid-August
	virgin's bower	<i>Clematis virginiana</i>	July-September
	white avens	<i>Geum canadense</i>	June-August
	white baneberry	<i>Actaea pachypoda</i>	mid-May-mid-June
	white snakeroot	<i>Eupatorium rugosum</i>	July-October
	white trillium	<i>Trillium grandiflorum</i>	April-early June
	wild leek	<i>Allium tricoccum</i>	June-mid July

<u>Colour of Flower</u>	<u>Plant</u>	<u>Scientific Name</u>	<u>Time of Flowering</u>
yellow	early meadow-rue	<i>Thalictrum dioicum</i>	April-May
	buttercup sp.	<i>Ramnunculus</i> spp.	April-May
	smooth yellow violet	<i>Viola pensylvanica</i>	may-mid-June
	trout lily	<i>Erythronium americanum</i>	April-early May
	yellow wood sorrel	<i>Oxalis stricta</i>	late May-October
pink/red	herb-robert	<i>Geranium robertianum</i>	May-October
	phlox	<i>Phlox glaberrima</i>	late April-late June
	red trillium	<i>Trillium erectum</i>	April-mid-May
	wild geranium	<i>Geranium maculatum</i>	mid-May-early June
	wild columbine	<i>Aquilegia canadensis</i>	May-mid-June
green	jack-in-the-pulpit	<i>Arisaema atrorubens</i>	May-late June
	poison ivy	<i>Rhus radicans</i>	July
	stinging nettle	<i>Urtica dioica</i>	June-September
brown	wild ginger	<i>Asarum canadense</i>	may-June
violet/blue	blue cohosh	<i>Caulophyllum thalictroides</i>	April-June
	common blue violet	<i>Viola papilionacea</i>	April-June
	deadly nightshade	<i>Solanum nigrum</i>	June-mid-Sept.
	hound's tongue	<i>Cynoglossum officinale</i>	May-July

Edible Wilds

As more and more Scouting Youth take to the trails, or go canoeing into the back country, a knowledge of what plants can be eaten and which ones cannot should be of great value. This could allow the Scouting Youth can travel more lightly and vary his/her diet with items that have a different taste.

For some, the gathering of wild plants evokes the same excitement as stream fishing for trout. Like fishing, you become immersed in your surroundings, acutely aware of the plants and the processes that affect them. You anticipate what plants will be present, and where. Of course, the joy does not end with the discovery, or, in fishing with the catch. Beyond lies the satisfaction of preparing the food and eating it.

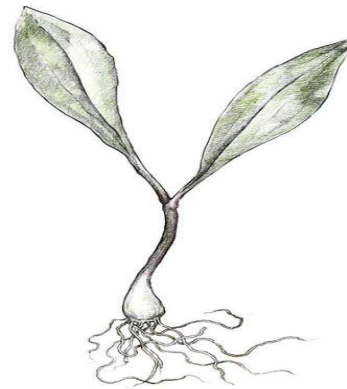
Being able to identify and forage for wild edibles can be a great skill for any Scouting Youth to acquire. **Always** do your research and **never** eat a plant that you are not 100% sure is edible. There are numerous benefits to eating wild edibles, such as:

- they are free;
- most edible plants are more nutritious than store-bought produce;
- they are beneficial for the immune system;
- picking your own means you get exercise, Vitamin D (sunshine) and get to be in a natural, relaxed setting.

There are too many edible wilds in Ontario to list. Two of the more common edible plants to find in the wild are fiddleheads (*Pteretis pensylvanica*) and wild leeks (*Allium tricoccum*).



fiddleheads



wild leek

Five Poisonous Plants of Southern Ontario You Should Avoid

There are several plant species that grow in southern Ontario that can cause serious health issues if touched or ingested. Some of these plants may look harmless and sometimes even beautiful, but contact with these plants can cause symptoms ranging from severe itching, or painful rashes to extreme pain if ingested, and even possible death. You do not have to look far to find them; in public parks, conservation areas, camp grounds, or hiking/biking trails. To an unassuming outdoors-person, what could possibly start out as a fun-filled afternoon, could easily bring on illness or even hospitalization by encountering a poisonous plant. Take preventative measures and learn how to identify, avoid, and treat reactions from the following five poisonous plants common to southern Ontario. Poison oak is NOT found in Ontario.

1. Poison Ivy (*Rhus radicans*)

"Leaflets three, let it be" is all you need to know to avoid this noxious plant. The leaves are glossy green, alternate, and have three leaflets with the middle leaflet having a longer stem than the other two. **Poison ivy has a woody main stem.**

Poison ivy contains an oil called urushiol to which 60-80% of people who are exposed to it will react to it. It is a common trigger of allergic contact dermatitis or inflammation of the skin. All parts of the plant are toxic - **even in winter**. Symptoms include a red, swollen, itchy rash that develops within hours to days of contact. The contact site then forms blisters that may leak a clear, yellow liquid before becoming crusty.

If you come in contact poison ivy, immediately rinse the area with soap and cool water. Do not use hot water; it may cause the oil to spread on your skin. You can also try antihistamines, drying creams and ointments, a cold compress, and an oatmeal bath.



2. Giant Hogweed (*Heracleum mantegazzianum*)

Giant hogweed can grow to 4-5 m in height. It has a purple stem that measures 5-10 cm in diameter. A cluster of its flowers can measure over 1.0 m across.

Giant hogweed contains a watery sap in which organic compounds called furocoumarins are found. When absorbed by the skin, then exposed to U.V. light (sunlight), the furocoumarins get activated and begin destroying skin cells. This causes a serious skin irritation called phytophotodermatitis. With contact, a person could experience severe burning to their skin. If the sap gets in the eyes, it could cause temporary or permanent blindness.

If the sap comes in contact with skin, wash it with soap and water immediately and keep the exposed area away from the Sun. If blisters or dermatitis appears, seek medical attention immediately.

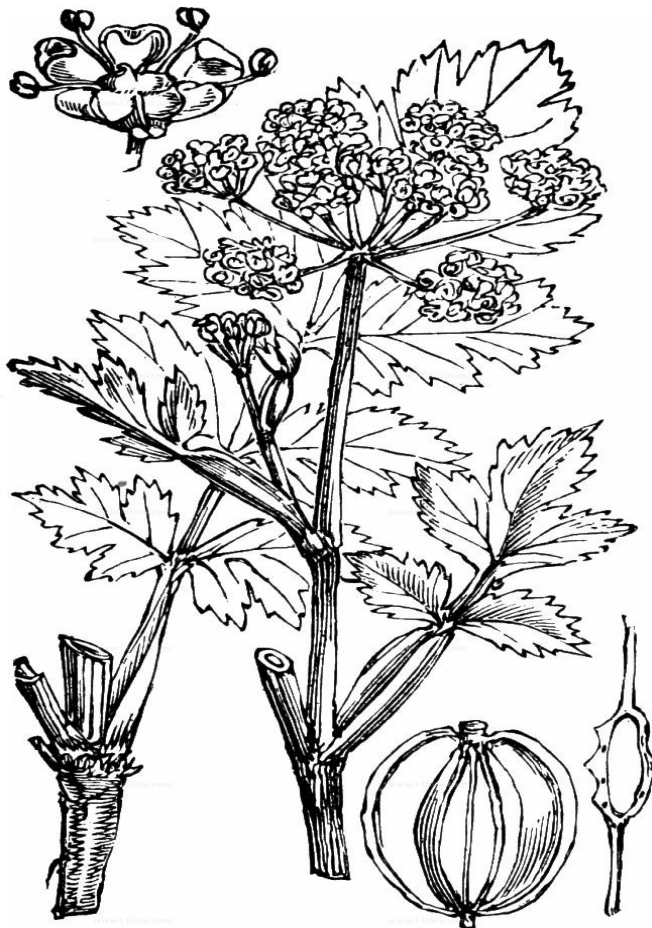


3. Wild Parsnip (*Pastinica sativa*)

Wild parsnip can grow 50-150 cm high. It has compound leaves, with alternate arrangement, and sharply-toothed leaflets that are shaped like a mitten. It has yellowish-green flowers with umbrella-shaped clusters that are 10-20 cm across. It has a distinct parsnip odour.

Wild parsnip also contains a watery sap in which organic compounds called furocoumarins are found. When absorbed by the skin, then exposed to U.V. light (sunlight), the furocoumarins get activated and begin destroying skin cells. This causes a serious skin irritation called phytophotodermatitis. With contact, a person could experience severe burning to their skin. If the sap gets in the eyes, it could cause temporary or permanent blindness.

If the sap comes in contact with skin, wash it with soap and water immediately and keep the exposed area away from the Sun. If blisters or dermatitis appears, seek medical attention immediately.



4. Pokeweed (*Phytolacca americana*)

Pokeweed has a red, trunk-like stem that becomes hollow as the plant ages. It has large, egg-shaped, dark green leaves (25 cm long) that are alternately arranged on the stem by a red stalk. The flowers are green to white. The fruit is green but turns a deep purple to black as it ripens.

If not boiled twice (for medicine or tea) to remove toxins, all parts of the pokeweed plant are poisonous to humans. Symptoms of pokeweed poisoning include: abdominal pains, blurred vision, sweating, low blood pressure, irregular breathing, vomiting, bloody stool, weakness, and unconsciousness.

Call 911 if you experience any of the above symptoms after eating or coming in contact with pokeweed. Unless directed by a doctor or someone from poison control, DO NOT induce vomiting as this can risk inhalation of vomit/poison into the lungs.



5. Water Hemlock (*Conium maculatum*)

Water hemlock can grow to 2.2 m tall. It has small, white flowers that look like an upside-down umbrella. It has alternately arranged, coarse-toothed leaves on a stout, green stem spotted with purple. When cut, the stem will seep a yellow, oily liquid.

Water hemlock contains cicutoxin, a toxic alcohol that attacks the nervous system. Poisoning occurs after eating any part of the plant, which includes the seeds, leaves, flowers, or fruits. Symptoms of poisoning occur within 30 minutes of ingesting the plant. The severity depends on how much of the plant is ingested. Symptoms include extreme salivation, violent convulsions, intense abdominal pain, and delirium. More serious complications may include respiratory failure, central nervous system depression, and death.

There is currently no antidote for hemlock poisoning. If any adverse reactions occur after touching, tasting, or eating a poison hemlock, seek medical attention immediately. Treatment depends on the severity of the symptoms. For example, if you experience seizures, treatment with an anti-seizure medication may be given.



6. Stinging Nettle (*Urtica dioica*)

Stinging nettle is NOT a poisonous plant, but it deserves mention here. Only because the effects of coming in contact with it by rubbing against it can cause extreme discomfort. The stems, leaves, and flowers of stinging nettle are covered by structures that look like delicate, hollow hairs. The tips of these long hairs are easily broken off when you rub against them. The fine, hollow shaft that remains punctures the skin releasing a watery secretion that enters the skin, The result is a VERY painful sting. The contact site produces a small, reddish swelling with severe itching and numbness that could last for days.

If you come in contact with stinging nettle, hot temperatures and scratching just intensify the irritation more. Apply cool compresses. Try dabbing aloe vera or a paste made from baking soda and water. If symptoms persist or worsen, such as vomiting, shortness of breath or tightening of the chest or throat, seek medical attention immediately.



The Wildlife Around Us

To appreciate and understand the diversity of wildlife that Ontario has to offer, it is important to recognize how animals are distinguished from each other. In doing so, it is important to identify similarities in physical characteristics. These similarities are important for understanding how animals survive and adapt to changing conditions. For example, the backbone is a characteristic used for separating animals into two groups: the invertebrates (animals without a backbone) and the vertebrates (animals with a backbone). Other characteristics are then used to further divide these groups into smaller groups with similar characteristics.

The Invertebrates

The six main groups of invertebrates include: sponges, coelenterates (*Hydra*, jellyfish), worms, molluscs (octopus, clams), echinoderms (starfish, sand dollar) and arthropods (insects, spiders, crustaceans).

Arthropods contain the largest number of living things on Earth, in terms of species and abundance.

Insects

Insects are considered the most successful animals on Earth for three reasons.

- they reproduce often and lay many eggs;
- they vary in size, shape, and colour so they can live practically everywhere - these variations have allowed different insects to adapt to the changing conditions on land, air, freshwater, and even saltwater;
- their specialized mouthparts allow them to eat almost anything.

Although all insects begin life as an egg, they undergo several changes in body size and shape. The series of changes, or growth stages, is known as metamorphosis. Insects are important pollinators of plants and provide a food source to many other animals. For example, a little brown bat consumes its body weight in mosquitoes every night - approximately 8 000 mosquitoes! About 1 million species of insects exist.

Characteristics of Insects

All insects possess the following:

- a segmented body, divided into three parts: a head, thorax, and abdomen;
- three pairs of jointed legs;
- one pair of antennae;
- usually two pair of wings;
- a trachea for breathing;
- a hard, outer exoskeleton.

Insect Life Cycles

With insects, metamorphosis can occur two different ways. In both cases, each life cycle begins with an egg. Metamorphosis is the transformation of the egg into an adult form.

Some insects, such as the monarch butterfly, go through a four-stage metamorphosis from egg→larva→pupa→adult. This is referred to as complete metamorphosis (Fig. 6). The egg develops into the larva. The larva looks nothing like the adult. When the larva stage is complete, it becomes a pupa, chrysalis, or cocoon (depending on the species). During the pupal stage, the insect remains dormant, while its internal structures are replaced by those of an adult. Ninety percent of all insects go through complete metamorphosis.

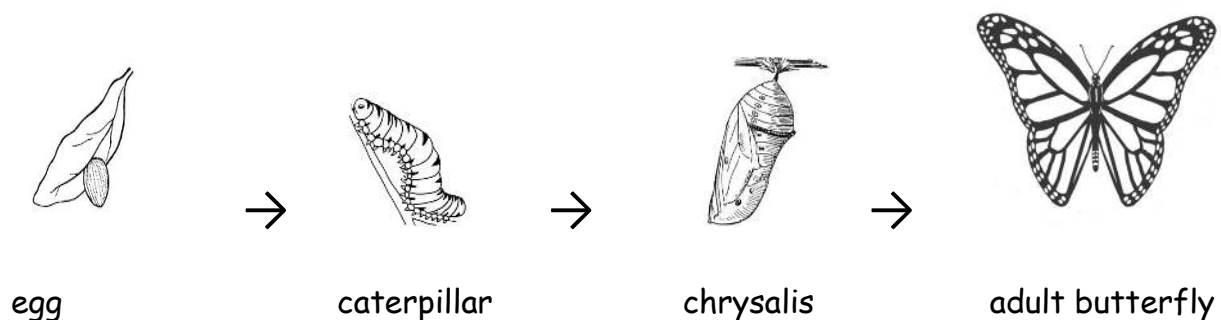


Fig. 6. Complete Metamorphosis - The Monarch Butterfly

Some insects, such as dragonflies, cockroaches, and grasshoppers, undergo a series of gradual changes from an intermediary nymph stage to an adult. This is known as incomplete metamorphosis, occurring in three stages: egg→nymph→adult (Fig. 7). The nymph looks similar to the adult. The time it takes for each species to undergo incomplete metamorphosis varies. The stonefly, for example, spends one to 3 years in the nymph stage.

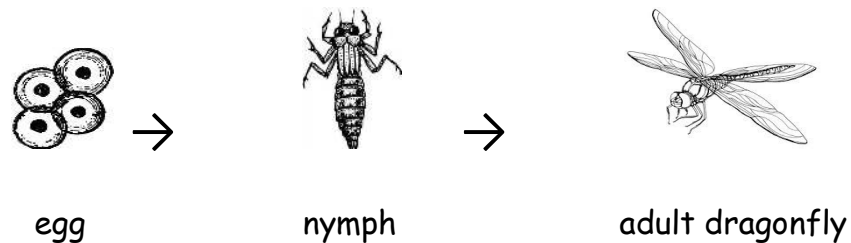


Fig. 7. Incomplete Metamorphosis - Dragonfly

Monarch Butterfly Life Cycle

The monarch butterfly (*Danaus plexippus*) may be the most familiar North American butterfly, and is considered an iconic pollinator species. Its wings feature an easily recognizable black, orange, and white pattern, with a wingspan of 8.9-10.2 cm (3½-4 in). The viceroy butterfly is similar in color and pattern, but is markedly smaller and has an extra black stripe across each hind wing.

Monarch butterfly annual migrations rank high on the list of amazing insect accomplishments. It migrates 4 500 km from eastern Canada to its wintering sites in Mexico, with a corresponding multi-generational return north. For an animal with a body length of about 3 cm (0.03 m), flying 4 500 km is an accomplishment. Each year hundreds of millions of butterflies make their way across North America. The western North American population of monarchs west of the Rocky Mountains often migrate to sites in California but has been found in overwintering Mexican sites as well.

There is increasing concern related to the ongoing decline of monarchs. In February 2015, a study found that nearly a billion monarchs have vanished since 1990. One of the main reasons cited was the herbicides used by farmers and homeowners used to control milkweed, a plant used as a food source, a home, and a nursery by the monarch butterfly.

The Milkweed Plant

Named for its milky juice, the milkweed plant is poisonous to many animals - but not to the monarch butterfly. Female monarchs normally lay one egg per milkweed leaf. As they grow, caterpillars eat the leaves and fill themselves with milkweed poison. It is not harmful to the caterpillar and remains in their bodies forever. The bitter taste of their orange and black wings serves as a reminder to predators that they should not be eaten. Its works; they are rarely eaten by predators.

A perennial that generally blooms between May and August, the milkweed plant (Fig. 8) prefers soil that is rocky, sandy, and clayey. It is a hardy and beautiful plant, and as a butterfly breeding ground, milkweed will enhance your home garden with its bright flowers along with the natural presence of the butterflies the plant attracts.

*******Be sure to check out the Monarch Butterfly Life Cycle activity on page 161.**



Fig. 8. Milkweed Plant

Biodiversity: Why is it so Important?

Biodiversity includes all living things. When most people think of biodiversity, they think of animals such as fish, amphibians, reptiles, birds, and mammals. These are animals that have a backbone. Of all the animals that zoologists have identified, only 3% have a backbone. The other 97% of animals that do not have a backbone are the animals known as invertebrates. Invertebrates are equally important animals, as they are major food source for all the animals with backbones.

Biodiversity is a source of strength in an ecosystem. And a lot of that strength comes from the other living things that are included with biodiversity - plants. Plants and animals are very closely connected. For example, most flowering plants rely on invertebrates such as insects for pollination. Without insects to pollinate plants, most trees, crops, flowers, and weeds could not reproduce. A pond or marsh that contains many different types of plants will attract a wide variety of animals. An ecosystem with only one plant species, such as a corn field, will attract only a few species and may become weakened or even wiped out should disease spread throughout the crop. With each different ecosystem, comes unique plants/animals that are very well adapted for living there. The snapping turtle can find and obtain food easily using its strong legs and webbed feet (for swimming), its long neck (for reaching for food) its powerful jaws (for biting and grabbing), and its hard and rough shell (for protection). Because of the unique plants/animals, different ecosystems, such as fields, forests, wetlands, and deserts perform different functions. For example, wetlands filter water; forests remove excess carbon dioxide from the air to produce oxygen. If an ecosystem is thrown out of balance by pollution, an exotic species, or overhunted, the interrelationships among the remaining, unique plant/animal species will never be the same. The balance of nature has changed. Rarely, (if ever) does a change in the biodiversity of an ecosystem happen for the better. For years, humans have been trying to "fix" ecosystems, with the understanding of knowing how an ecosystem works. Humans cannot fix what Mother Nature created.

The Earth has incredible biodiversity - a vast variety of life. Living things can be found in every corner of the world, including some of the coldest and hottest places.

What is a Living Thing?

Living things come in many sizes, from a microscopic one-celled bacterium to a gigantic whale. Biologists know that all living things have certain similarities. They use certain characteristics to distinguish between living and nonliving things; a nonliving object may have one or more of these characteristics, but only a living thing has *all* these characteristics.

1. All Living Things Are Made of Cells

Cells not only "build" living things, but they also perform the life functions that living things need to do in order to live.

2. All Living Things Reproduce: They Reproduce Their Own Kind

This is one of the ways that nature maintains a balance. Cats only reproduce cats; oak trees only reproduce oak trees.

3. All Living Things Grow and Develop

Growing and developing does not mean just getting bigger. It also means becoming more complex. For example, many insects start as eggs, hatch into a larva, form a cocoon, then later come out as an adult.

4. All Living Things Respond to Their Environment

Anything that affects the activity of a living thing is called a stimulus. The response of a living thing can be an action, movement, or behaviour change. Many stimuli help the living thing survive.

5. All Living Things Use Energy

Living things eat food, which is used to complete their daily physical and biological activities.

The Needs of Living Things

All living things have certain needs in common - food, water, energy, gases, and space.

- food - all living things need food because it provides the energy and the chemicals needed to live. Different living things need different energy and chemicals, so they eat foods that contain the energy and chemicals they need.
- water - without water, living things would die. Water is necessary for all body functions. Our blood, which is mostly water, contains dissolved minerals and nutrients that are carried throughout our bodies.
- energy - living things use energy to grow, build a nest, grow leaves, or run and play. The Sun is the main source of energy for living things. Plants use energy from the Sun to make their food, and then animals (or people) eat the plants to obtain energy.
- gases - all living things need certain gases. Most living things need oxygen to survive. Plants need carbon dioxide to survive. Plants use this carbon dioxide for photosynthesis, a process that produces the oxygen that we breathe.
- space - living things defend their territory because they need space. Any given amount of space only offers a certain amount of food, water, and shelter, so, only a certain number of living things can survive in that space.

Using Biodiversity

It is easy to recognize that our lives rely on living things that come from such industries as agriculture, forestry, fishing, and tourism. A considerable amount of a person's income is likely to be spent on resources here in Canada. Hunting and fishing are popular activities, along with nature photography or birding. It is therefore important that all Canadians understand the impact that humans have on the environment when using its natural resources.

When the population of a species has dropped considerably to relatively a few numbers and its survival is seriously threatened, it is said to be endangered. If all the members of a species die, the species is extinct. Today, many species of living things are in danger of extinction and humans are the major reason for their extinction. Perhaps the greatest single cause for the decline any living thing is habitat loss. The increasing demand for living space and the use of chemical poisons have destroyed many habitats. Other reasons include the poaching of animals, the collection of animals for the pet trade, and the introduction of exotic species into native habitats.

Humans must practice conservation. Conservation is the protection and responsible use of nature and of all living things.

******* Be sure to check out the *What's in the Box?* activity on page 163.**

Preservation vs. Conservation

Preservation is a term that emphasizes protecting large areas of public lands or any species against any form of economic development or environmental degradation. It identifies habitats that are safe from human encroachment and where environmental conditions will be left wild and unchanged. Conservation is a term that emphasizes the use, management, and protection of resources so they will not be degraded or unnecessarily wasted and will be available to present and future generations.

There are 5 main reasons which are to be considered for the preservation of a species:

Compassion You would be an unusual person indeed if you did not feel sorry for the chimpanzees, mountain gorillas, tigers, and other species which will soon exist only in zoos. Diane Fossey once described the death of Digit, one of a family of mountain gorillas she was studying. Digit died at the hands of hunters, buying time for his escaping family. He fought off dogs and a hunting party of six men until he was eventually killed with spears. The people who killed him were neither poor nor hungry. Someone had offered them \$20 for his head and hands. Actions such as this evoke in many of us a deep sense of compassion for the species which is sure to vanish as comparable acts continue.

Aesthetics Can you imagine the world not graced by the beauty of tropical fish, flowers, butterflies, birds, redwood trees, and elephants? Yet, there is a form of beauty that goes beyond this common physical aspect: people who get to know a species will see beauty in form and function. Scientists describe whales as "delightful and charming". Zookeepers call a hippopotamus "gorgeous". Entomologists refer to beetles as "extraordinarily attractive". The migration of monarch butterflies has been described as "the most beautiful process on Earth". The fact that we plant flowers and trees, enjoy birds, and go on nature trips is proof that we value the aesthetic aspect of a species.

Economic Worth Animals, plants, and other organisms provide all our food. They contribute to over half the drugs and medicines that keep us well and promote the economy. They provide a vast array of renewable resources such as construction materials, fuels, and paper. And so far, we have used only a small fraction of nature's bounty. For example, less than 1% of all plant species have been studied for their medicinal benefits. There is no doubt that many species considered useless today, will become valuable in the future. If species are allowed to go extinct, our economic options in the future are reduced.

Life Support Systems Plants and algae provide the oxygen we breathe. Plants remove carbon dioxide from the air and convert it into materials we use such as food and fuel. Plants, animals, fungi, and bacteria replenish and maintain topsoil. Fungi and bacteria decompose our wastes. Insects pollinate our crops. Because all species are interconnected, generally in ways we do not understand, we must protect all species, not just those which provide services for us.

Ethics The most important reason for preserving a species is an ethical one. It is based on the premise that each species is a unique and irreplaceable product of evolution that has an intrinsic right to exist on Earth and to fulfill its genetic potential. The species that share the Earth with us are possibly our only living companions in the entire universe. They are fellow passengers on spaceship Earth. And like humans, they have a right to exist.

Most of us have within us, the roots of the right-to-exist ethic. This ethic is devoid of all human-centred selfishness. It treats all species - beautiful and ugly, valuable and valueless, useful and useless - with the same compassion and care.

It cannot be proven scientifically that other species have a right to exist. Nor for that matter, can it be proven scientifically that humans have a right to exist. In this sense, humans are just one species among millions but with one major difference. We have the power to dominate and destroy other species. This power obligates us morally to show stewardship over the rest of the living world.

Wildlife Conservation

Plant and animal extinction results from many human activities. The top five include:

1. habitat alteration - includes damage resulting from human activities such as urban sprawl, farming, mining, road construction, and timber cutting.
2. commercial hunting and harvesting - includes large scale harvesting of wild animals such as whales, gorillas, elephants, rhinos, and the world's fisheries.
3. hunting for sport and subsistence - trophy hunting diminishes the genetic stock of a population; and killing endangered animals for survival.
4. introduction of alien species - includes species that are purposely or accidentally introduced into new territories that outcompete native species for food and space.
5. pest and predator control - DDT and other pesticides have taken a huge toll on wildlife; and the killing of predators creates an ecological backlash as the prey populations are thrown out of balance.

In Canada, the Federal-Provincial Wildlife Conference coordinates the efforts of monitoring the status of species populations. A standing committee of that organization, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), reviews, reports, and assigns status according to five categories: extinct, extirpated, endangered, threatened, and vulnerable.

Sustainability - Why Should Canadians Care?

Natural resources are products of the Earth that are useful to people. All parts of the Earth including soil, water, plants, and animals are natural resources. Natural resources can be:

- renewable - they can be replaced quickly, such as plants and animals;
- non-renewable - they cannot be replaced quickly, such as oil and gas.

The way we look at products found in nature changes as we find uses for them. Objects that are part of the natural world often become valuable when they can be sold for profit. The development of trade and manufacturing made the fish, furs, forests, and minerals of the world valuable natural resources. Throughout the world, some renewable resources, such as fish, have been badly overused. Some fish stocks have been depleted because too many mature fish were caught at one time. This resource depletion makes it very difficult for the remaining fish to reproduce and replace themselves.

Ecologists speak of sustainable resource use. This means using resources at a pace that leaves enough available for future generations. Nations have ignored sustainable resource use as they develop these resources for profit. Indigenous peoples around the world have shown ongoing respect for the Earth in their traditions and daily lives. This is because they have depended directly on the Earth's resources to sustain their lives. This type of respect is called stewardship. A steward is a person who carefully looks after resources or property. Stewards are people who use forests and streams wisely, and interact with wildlife with care.

The use of the Earth's resources for profit has often been at the expense of future generations. In the future, all nations must carefully examine how to use the planet more wisely. Should Canadians care? The answer is YES!

Poaching

Poaching has traditionally been defined as the illegal hunting, killing, or capturing of wild animals. Until the 20th century, most poaching was performed by impoverished peasants for illegal harvesting of wild plant species. With trading up to 23 billion dollars annually, poaching has become the world's second most profitable crime activity behind the illegal drug trade.

Environmental scientists have now proposed the concept of poaching as an environmental crime, defining any activity as illegal that contravenes the laws and regulations established to protect renewable natural resources including the illegal harvest of wildlife with the intention of possessing, transporting, consuming, or selling it and using its body parts. Scientists have considered poaching as one of the most serious threats to the survival of plant and animal populations. Wildlife biologists and conservationists consider poaching to have a detrimental effect on biodiversity both within and outside protected areas. As wildlife populations decline, species are depleted locally and the functionality of ecosystems is disturbed.

Acts of Poaching

The following violations and offenses are considered acts of poaching:

- Hunting, killing or collecting wildlife that is listed as endangered by the International Union for Conservation of Nature (I.U.C.N) and protected by law such as the Endangered Species Act, the Migratory Bird Treaty Act of 1918, and the Convention on International Trade in Endangered Species (C.I.T.E.S.).
- Fishing and hunting without a license.
- Capturing wildlife outside legal hours and outside the hunting season; usually the breeding season is declared as the closed season during which wildlife is protected by law.
- Prohibited use of machine guns, poison, explosives, snare traps, nets and pitfall traps.
- Prohibited use of baiting with food, decoys or recorded calls in order to increase chances for shooting wildlife.

- Hunting from a moving vehicle or aircraft.
- Shining deer with a spotlight at night to impair its natural defenses and thus facilitate an easy kill is considered animal abuse.
- Taking wildlife on land that is restricted, owned by, or licensed to somebody else.

Effects of Poaching

Poaching causes various negative effects. Its most direct impact is extinction, either globally or within a given locality. The conclusion is that no matter the reason why an animal is killed, all types of over-hunting or poaching have led to extinction of species, and if uncontrolled many more animals will become extinct. The detrimental effects of poaching can include:

- Loss of forests: predators, herbivores and fruit-eating vertebrates cannot recover as fast as they are removed from a forest; as their populations decline, the pattern of seed predation and dispersal is altered; tree species with large seeds progressively dominate a forest, while small-seeded plant species become locally extinct.
- Reduction of animal populations in the wild and possible extinction.
- The effective size of protected areas is reduced as poachers use the edges of these areas as open-access resources.
- Wildlife tourism destinations face a negative publicity; those holding a permit for wildlife-based land uses, tourism-based tour and lodging operators lose income; employment opportunities are reduced.

*******Be sure to check out the *Poaching of Black Bears in Canada* activity on page 164.**

Vertebrates: The Fish, Amphibians, Reptiles, Birds, Mammals

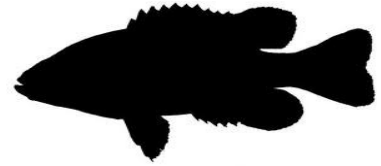
Vertebrates, such as fish, amphibians, reptiles, birds, mammals, are animals that have backbones. A backbone is important to the animal because it supports the body and gives it shape. With such support, animals can lift themselves off the ground. The separate bones that make up the backbone are called vertebrae. Inside the vertebrae is a nerve cord that attaches to the brain. This cord makes it possible for an animal to respond to stimuli.

Some vertebrates, like fish, amphibians, and reptiles, cannot maintain a constant body temperature all the time. Their body temperature changes with their surroundings. Fish, amphibians, and reptiles maintain a body temperature considerably higher than their surroundings. These animals are referred to as ectothermic, taking most of their heat from the environment. It is incorrect to call these animals "cold-blooded." Most ectotherms are limited to the warmer parts of the world. Being ectotherms, they are largely dependent on their external environment for body heat (such as the Sun), and therefore, cannot not thrive in cold regions.

Many ectothermic animals live in water. Water is the perfect environment for these animals to live because changes in water temperature occur slowly, allowing the animal to adjust slowly to the changes. For ectothermic animals that live on land, they must protect themselves from sudden temperature changes. During periods of excessive warm temperatures, they bury themselves in mud, or find shady, cool places. As colder temperatures approach, ectothermic animals (except fish) must hibernate, or else their bodies would freeze.

Likewise, it is incorrect to call birds and mammals "warm-blooded." Birds and mammals are endothermic, generating most of their body heat by their metabolism (from food they eat). Birds and mammals cannot survive long periods without food. As their body burns off the food they eat, this generates the heat required to keep their bodies warm. Their body temperatures remain constant and do not often rise above or drop below the constant value. Birds and mammals can be active at any time, which gives them an enormous advantage over ectothermic animals.

*******Be sure to check out the Ectothermic Word Search activity on page 166.**



Fish

Fish are animals that are dependent upon an aquatic environment to live and reproduce. They were the first group of vertebrate animals to evolve. Most fish possess an air bladder that enables them to swim at different depths. Fish that do not possess an air bladder are either continually on the move or remain resting on the bottom. Lampreys, hagfish, sharks, rays, and skates, along with the more common freshwater species make up the group of vertebrates known as fish. About 21 000 species of fish exist.

The key physical feature that separates fish from all other vertebrates: paired fins.



Amphibians

Amphibians are not as dependent on water as fish are, but do require it for the laying and development of their eggs. Amphibian bodies (toads excepted) are covered with a thick, loose skin that is normally moist, a necessary condition since they can use their skin for breathing. The skin is coloured and usually spotted to help camouflage the animal. Amphibian skin possesses glands that produce a distasteful, sometimes poisonous substance to ward off predators. Almost all amphibians have two pairs of legs with feet that are often webbed. The majority move by walking, hopping, or swimming. The legless caecilian can be found in warmer regions of the world burrowing in the ground, or, in stream bottoms. Types of amphibians include frogs, toads, salamanders, newts, and caecilians. About 3 500 species of amphibians exist.

The key physical feature that separates amphibians from all other vertebrates: smooth, moist skin.



Reptiles

Reptiles were the first land animals. Unlike amphibians, reptiles are not dependent on water to complete their life cycle. Reptiles are well adapted to living on land with their protective body coverings. All reptiles have a thick, scaly skin that is tough and often rough and dry. They may be found in water, but are mainly land animals breathing air through lungs. Except for snakes, all reptiles have feet with clawed toes. They move by walking, creeping, or swimming. Types of reptiles include tortoises, turtles, snakes, lizards, crocodiles, alligators, caimans, gharials, and tuataras. About 5 000 species of reptiles exist.

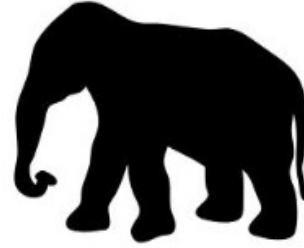
The key physical feature that separates reptiles from all other vertebrates: dry, scaly skin.



Birds

Birds are a very large, successful group of vertebrate animals. Their success is based on the number of species and individuals, their adaptations to a variety of habitats, and their distribution throughout the world. Most birds are capable of flying. Only the ostrich, emu, penguin, and the kiwi do not. The ability to fly is a great advantage. It enables birds to move over great distances to avoid unfavourable climate changes or food shortages. Many birds are at home on land, water, and in the air. No other vertebrate animal occupies such a variety of environments. About 8 500 species of birds exist.

The key physical feature that separates them from all other vertebrates: feathers.



Mammals

Because of their large brains and well-developed sensory organs, mammals are the most highly developed vertebrate animals. Mammals can be divided into three main categories:

- monotremes - mammals that lay eggs, such as the duck-billed platypus and the echidna (spiny anteater).
- marsupials - mammals that develop and grow in their mother's pouch, such as the kangaroo, koala bear, wombat, wallaby, Tasmanian devil, and the Virginia opossum.
- placental mammals - mammals that are nourished by the mother's body through a placenta. Includes 95% of all mammals.

After birth, **all** mammals are suckled by the mother on milk produced in the mother's mammary glands. Mammals are incredibly versatile and have adapted to nearly every environment on Earth from scorching deserts to icy oceans. About 5 000 species of mammals exist.

The key physical feature that separates mammals from all other vertebrates: hair or fur.

Table 1. shows the characteristics of the five different types of vertebrate animals.

*******Be sure to check out the Camouflage activity on page 167.**

Table 1. Characteristics of the Five Different Vertebrate Animals

Class	Characteristic	Examples
Fish	<ul style="list-style-type: none"> • cold-blooded • have scales (absent on some species) • have covered gills • live in water • 2-chambered heart • paired fins (not present on some fish) 	<ul style="list-style-type: none"> • lamprey • hagfish • sharks • rays • skates • all freshwater fish
amphibians	<ul style="list-style-type: none"> • cold-blooded • smooth moist, skin without scales • young have gills but develop lungs as they grow • most adults live on land, but eggs are laid in water • 3-chambered heart • 2 pairs of limbs not suited for fast movement • feet are often webbed • toes lack claws 	<ul style="list-style-type: none"> • frogs • toads • salamanders • newts • caecilians
reptiles	<ul style="list-style-type: none"> • cold-blooded • dry, rough skin with scales • live on land • have lungs • eggs have tough covering and are laid on land • 3-chambered heart • 2 pairs of limbs suited for fast movement (except snakes) • toes have claws 	<ul style="list-style-type: none"> • snake • lizard • turtle • tortoise • crocodile • alligator • caiman • gharial • tuatara
Birds	<ul style="list-style-type: none"> • warm-blooded • have feathers, wings, and beaks • live mainly on land • have lungs • 4-chambered heart • forelimbs are wings, supported by 2 hind limbs 	<ul style="list-style-type: none"> • penguin • ostrich • robin • duck • woodpecker • owl
mammals	<ul style="list-style-type: none"> • warm-blooded; have hair • have lungs • mothers feed young milk from mammary glands • live on land or in water • 4-chambered heart • 2 pairs of limbs 	<ul style="list-style-type: none"> • anteater • elephant • humans • whale • dolphin • platypus

*****Be sure to check out the Vertebrate Animals Crossword activity on page 168.**



Leave it to Beaver!

The beaver is the most recognized animal in North America. Most people carry one in their pocket! (on the back of a Canadian nickel). The beaver is the largest rodent in North America. It can weigh up to 32 kg and be 1.3 m long. It is the second largest rodent in the world (the capybara of South America is the largest).

Historically, the beaver was responsible for the development of Canada. When Europeans arrived in North America in the early 1600s, a strong demand for beaver pelts to make hats pushed fur traders farther and farther into Canada. Samuel de Champlain, Radisson and Groseilliers, and the Nor'westers canoed throughout Canada in search of beaver pelts. The Hudson's Bay Company was established in 1670 for the purpose of trading beaver fur. Canada now celebrates the beaver as its national symbol.

No other animal has had such an impact on North American ecosystems than the beaver. An animal that has such an impact by creating or maintaining a habitat for other plants and animals is known as a keystone species. Usually, a keystone species is dominant predator, however, the beaver is considered a keystone species. The beaver is unlike any other animal because it has the ability to change its environment. In a very short time, it can change a fast, flowing stream into a beaver pond, thus creating new homes for other plants and animals. Beavers do not like the sound of running water, so they instinctively build a dam (Fig. 9) whenever and wherever they hear running water. As time goes on, the landscape continues to change.

When beavers dam moving water, the flow of water slows down or stops completely. The water behind the dam now floods the land into the nearby forests. This creates a pond for the beaver to live. He has lots of water to live in, he is close to food, and he can escape predators easily.

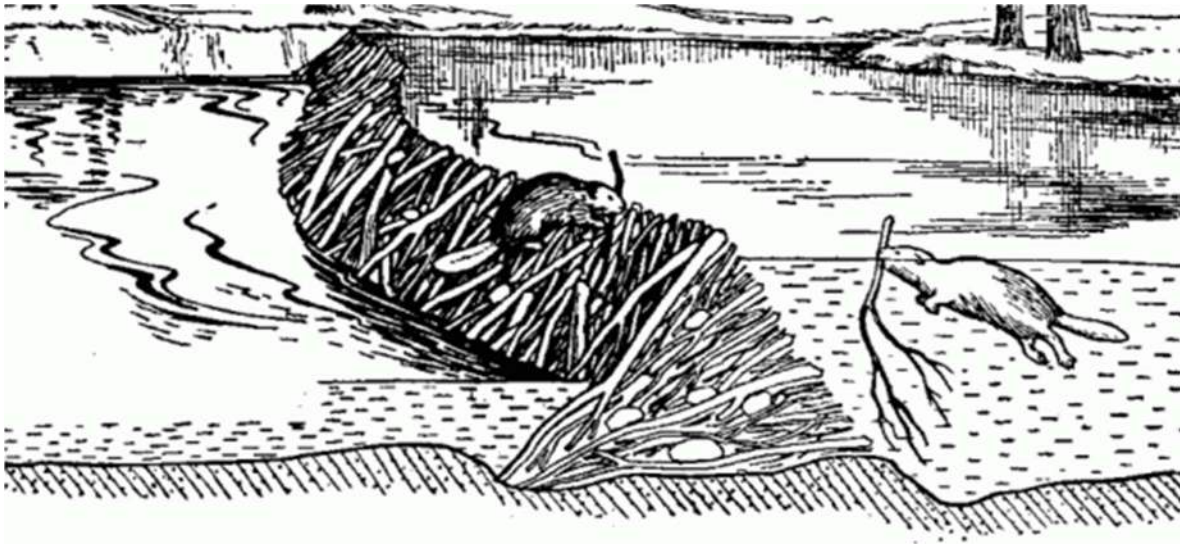


Fig. 9. Beaver Dam

Once the water is deep enough so that it does not freeze solid in the winter, the beaver can now build a lodge and food cache (Fig. 10). The lodge is where the beaver family sleeps and where it stores food in the winter. The lodge is a pile of sticks, branches, and mud about 2 m high in the middle of the pond or on the bank of the pond. The beaver usually builds two underwater entrance tunnels and a hole in the top for fresh air. Underwater near the lodge, the beaver will gather a large pile of branches called a cache. These branches are kept here during the summer so that the beaver family will have food to eat in the winter. Throughout the winter, the beavers will peel off the bark to eat, along with the buds and leaves that are on the branches. A beaver's favourite tree to eat is the trembling aspen.

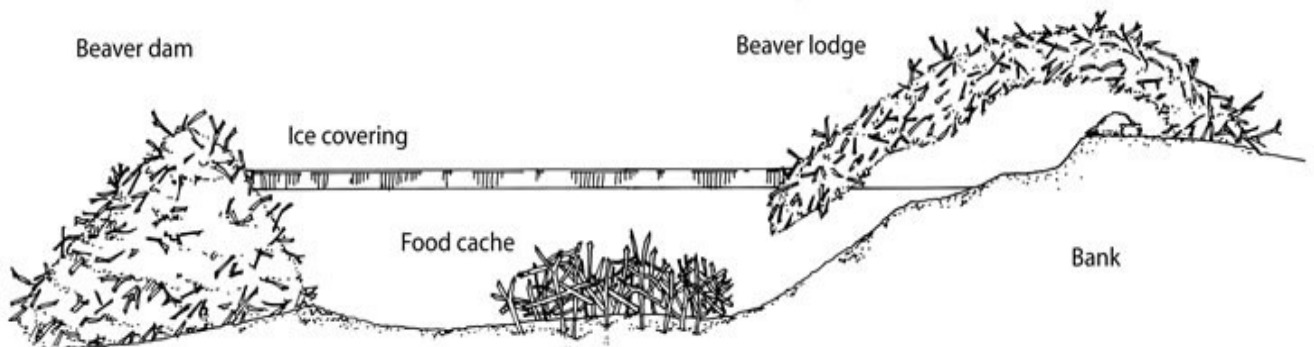


Fig. 10. Beaver Dam, Lodge, and Food Cache in Winter

A beaver's body has remarkable adaptations for living in its watery habitat. It has:

- small, beady eyes for excellent sight, including transparent eyelids that enable it to see clearly underwater;
- valves in its ears and nose that can be closed when it dives underwater;
- a wide, flat tail that it uses for swimming, and to communicate with other beavers (it slaps its tail to warn other beavers of danger);
- its lips are behind its front teeth so that it can close its mouth and still gnaw on trees underwater;
- it has long, sharp, strong incisor teeth that it uses to chew bark off trees and cut trees down;
- it has waterproof fur that keeps its skin dry and warm while under water;
- it has large, webbed hind feet that it uses for swimming.

During the fur trade, up to 106 000 beaver pelts were being shipped to Europe on a yearly basis. By the 1800s, people started noticing that beavers were becoming scarce throughout North America. Without adequate protection, any bird, mammal, or fish can become extinct by human exploitation. As a result, the beaver conservation movement began in the late 1930s. The government closed the trapping season on beavers for many years. In order to maintain large and healthy beaver populations, good conservation plans had to be put into place with the cooperation of trappers. Today, beaver populations thrive all over North America. The wise use of a resource is a sound management principle that maintains the healthy population of a species.

*******Be sure to check out the *Belonging to a Community* activity on page 169.**

Holy Bats, Man!

Bats are the only mammals capable of true flight. With extremely elongated fingers and a wing membrane stretched between, the bat's wing anatomically resembles the human hand. Almost 1 000 bat species can be found worldwide. In fact, bats make up a quarter of all mammal species on Earth! Bats can be found almost anywhere in the world except the polar regions and extreme deserts. To survive the winter some species of bat migrate, others hibernate, and yet others go into torpor (regulated hypothermia that can last from a few hours to a few months).

About 70% of a bat's diet is insects, sharing a large part of natural pest control. There are also fruit-eating bats; nectar-eating bats; carnivorous bats that prey on small mammals, birds, lizards, and frogs; fish-eating bats, and perhaps most famously, the blood-sucking vampire bats of South America.

For their size, bats are the slowest reproducing mammals on Earth. At birth, one pup is born that weighs up to 25% of its mother's body weight, which is like a human mother giving birth to a 31-pound baby! Offspring typically are cared for in maternity colonies, where females congregate to bear and raise the young. Male bats do not help to raise the pups.

Contrary to a common myth, bats are generally not blind at all. In fact, their small eyes are well adapted to low-light conditions. Because bats are nocturnal, they are actively hunting for food at night. They rely on echolocation to pinpoint exact locations of prey (Fig. 11). The bat makes high-frequency yells and analyzes the location of objects around it by perceiving where ultrasonic sounds are emitted specifically to produce echoes (how the sound bounces back off the object). By comparing the outgoing pulse with the returning echoes, the brain and auditory nervous system can produce detailed images of the bat's surroundings. This allows bats to detect, localize, and even classify their prey in complete darkness.

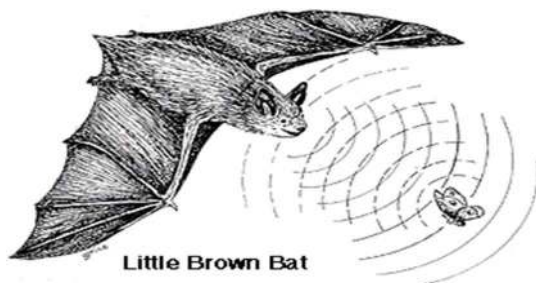


Fig. 11. Echolocation

The populations of some bats number in the millions. Others are dangerously low or in decline. Many bat species around the world are threatened with extinction. The Red List from the International Union for Conservation of Nature identifies more than 250 species as endangered, vulnerable or "near threatened. Bulmer's fruit bat is the world's most endangered bat. It is only found in one cave in Papua New Guinea. There are only around 160 individuals left in this colony.

A fungus that causes a disease called white-nose syndrome has devastated bats in North America. This white, powdery-looking fungus, a member of a group of cold-loving fungi called *Geomyces*, coats the muzzles, ears and wings of bats and has meant death for hundreds of thousands of the animals in the northeastern United States.

Bats need their habitat and they need warm climates to survive and many of the bat species are vulnerable to extinction due to deforestation, habitat loss, and excessive use of insecticides. Providing bats with bat houses can help to control the population decline by arranging areas for them to roost, hibernate and raise their young pups.

*******Be sure to check out the Holy Bat! activity on page 172.**

Holy Bat Trivia!!

- Bats are the only mammals that can fly.
- In one summer, 100 bats can eat over 2 million mosquitoes.
- The tongue of a nectar-feeding bat is $\frac{1}{4}$ as long as the bat's body.
- The red bat has an average speed of 64 km/h (40 mph).
- Different kinds of bats eat insects, fruit, fish, nectar, rodents, frogs, blood, and even other bats.
- The largest bat in the world is the flying fox of Malaya which has a wing span of 1.2-1.5 m (4-5 feet).
- A bat cave in Texas was home to over 8 million bats.
- A single little brown bat is one of the world's longest-lived mammals for its size, with life spans of almost 40 years.
- Some horseshoe bats can hover and pluck insects from spider webs.
- An anticoagulant in vampire bat saliva has been adapted for use in increasing blood flow in patients with stroke or heart disease.

Scientific Names

There are nearly two million species of organisms that exist on the Earth today which have been named and described. Because some plants and animals are very common and found worldwide, they are known by different names, depending on which part of the world they are in. In much of Canada, for example, a spring flower with yellow petals and purplish-brown mottled leaves is found. It is known by many different names. Early settlers thought the mottled leaves looked like the markings on a brook trout, so they called it "trout lily". To others, the two upright leaves looked like the ears of a deer, so they called it "fawn lily". Indigenous people thought the root looked like the canine tooth of a dog, so they called it "dog's-tooth violet". Other people thought that the leaves, when emerging in spring, looked like the forked tongue of a snake, hence the name "adder's tongue". So, as you can see, this plant has many different names. As interesting as these names are, it is important to have a single, unique, *scientific name* that can be used in all languages and countries throughout the world - an internationally accepted name. This eliminates any doubt about the identity of the plant mentioned. Therefore, the plant with several previously mentioned names has just one, single scientific name - *Erythronium americanum*.



trout lily

Can you think of an animal that has more than one common name? How about the eastern cougar? It has several common names, depending on where you live in the world. It is also known as puma, panther, mountain lion, or catamount. But, it only has one scientific name - *Felis concolor*.

The scientific names of plants and animals tend to be difficult to pronounce and understand. That is because they are written in Latin. Latin was the chosen language because it is the most recognized language in the world. Although most people think scientific names are boring, they tell a great deal of information about the species. The Latin names are precise and always refer to a very specific thing, such as the appearance of the organism, its behavior, where it is from, or its way of life. Common names often vary or refer to a variety of organisms. There is also the problem of some animals having misleading names, for example, a jellyfish is not a fish, nor is it made of jelly. The silverfish is not a fish. It is an insect.

A scientific name is made up of two words. The first word is called the *Genus*. The second word is called the *species*. When writing a scientific name, the genus always has a capital letter and the species a lower-case letter. The names are always in *italics* when typed and underlined when written. For example, *Canis latrans* or *Pinus strobus*. Read the following names of animals to learn how their scientific name was determined.

- long-tailed weasel - *Mustela frenata*
Mustela - from two Latin words *mus* (a mouse) and *tolla* (to carry off)
frenata - means "bridled", referring to a white patch on its face that looks like a bridle
- lynx - *Lynx canadensis*
Lynx - means "the sharp-eyed one"
canadensis - means "Canadian"
- eastern chipmunk - *Tamias striatus*
Tamias - from the Latin that means "seed distributor"
striatus - means "striped", referring to the black and white stripes on its back

Identifying Birds

- In North America, 1 out of every 20 people is a "birder";
- North America is a better than average place to study and enjoy birds;
- About 1780 species of birds, representing 97 bird families, live and breed in North America;
- North America is home to less than 10% of all known birds - this number represents 20 billion birds, a fifth of the world's total.

Birds are a joy to watch, but they can be tricky to identify. Learning the parts of a bird (Fig. 12) will get you started to improve your bird identification skills. The clues to identifying any bird are basically the same: silhouette, plumage (unique field marks), flight pattern, range and habitat, behavior, and song.

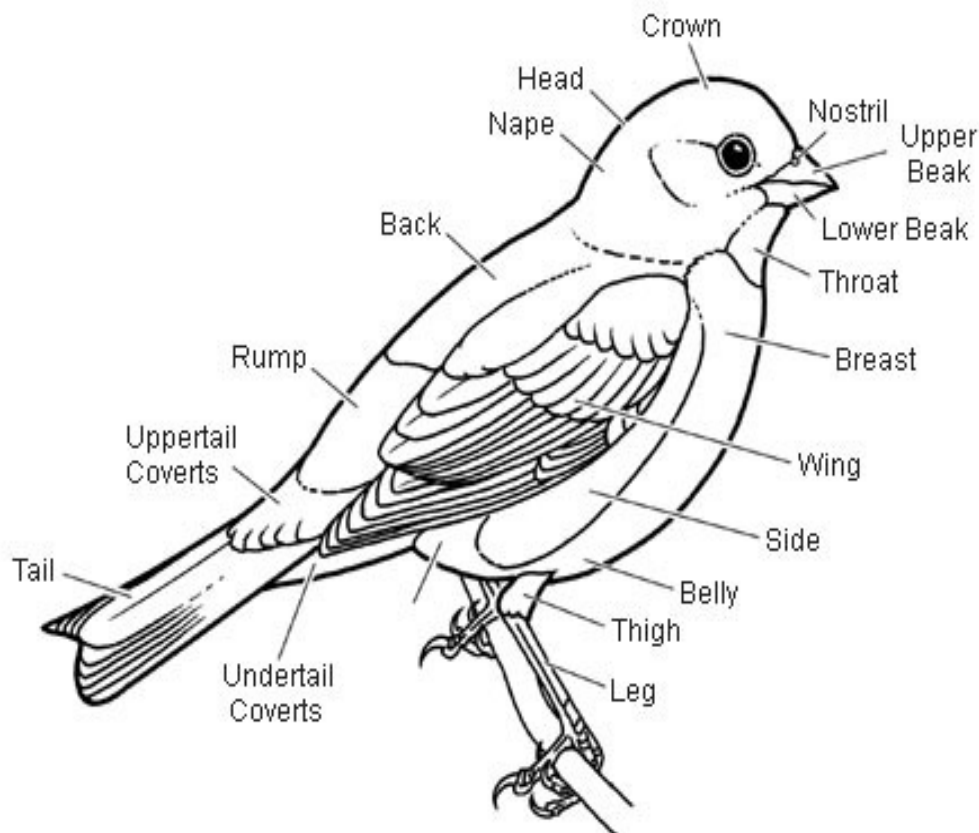





Fig. 12. The Parts of a Bird





The following criteria will be useful in identifying birds:

1. Silhouette - each bird has a characteristic size and shape.

- a. size - three standards are commonly used for comparisons. Comparing the size of the unknown bird to that of common ones such as a sparrow, robin, or crow is helpful. This is known as finding a relative size.

Sparrow Size	Robin Size	Crow Size
		
13.3 cm, tail to beak	21.6 cm, tail to beak	42.5 cm, tail to beak

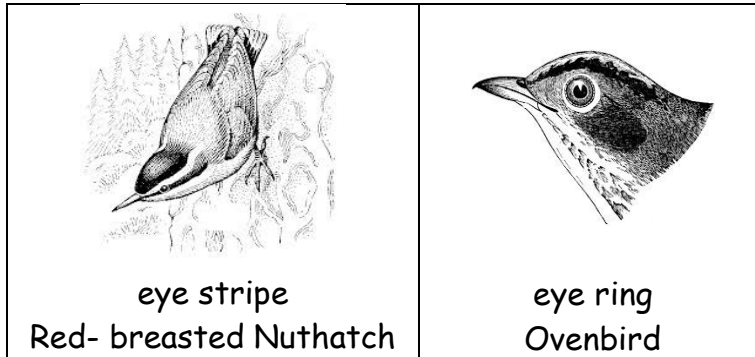
- b. shape - four shapes are commonly used for comparisons. Observe live birds to become familiar with these shapes.

 chunky as a meadowlark	 plump as a grouse
 slender as a swallow	 bulky as an owl

2. Plumage - characteristic markings; these are known as "field marks".

- key field marks are often concentrated on the head;
- identification of the bird can also be made by observing the tail;
- plumages may vary, depending on season and the bird's age and sex.

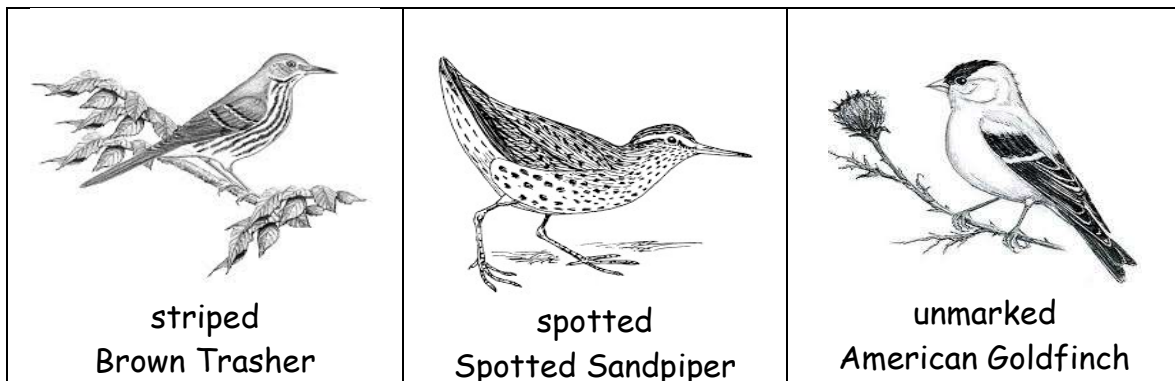
a. Does the bird have an eye stripe or an eye ring?



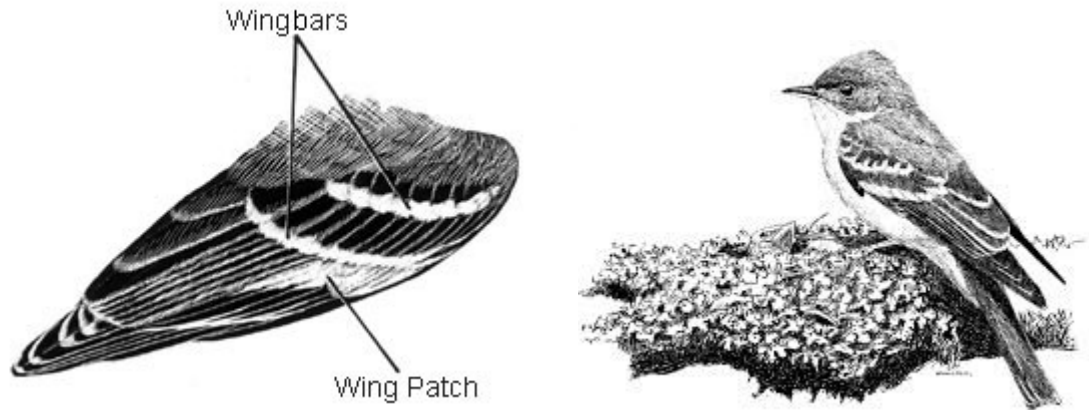
b. Does the bird's head have a crest, crown patch, or stripes?






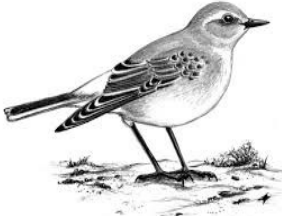
c. Is the breast striped, spotted, or unmarked??



d. Does the bird have wing bars or a wing patch?



e. Does the tail have:

outer, white tail feathers	white tail tips	tail band	white rump patch
			
Vesper Sparrow	Northern Shrike	Eastern Kingbird	Northern Wheatear

3. Behaviour - many species, and sometimes entire families, exhibit unique mannerisms or behavioural quirks as they perch, fly, or hunt for food.

- Does the bird have an undulating (up and down) flight like the American Goldfinch?
- Does the bird "teeter" or "bob" like a Spotted Sandpiper?
- Does the bird have a habit of cocking its tail and dropping it slowly when perched like the Hermit Thrush?
- Does the bird climb down a tree headfirst like the White-breasted Nuthatch?
- Does the bird ascend a tree spirally from the base like a Brown Creeper?

4. Flight Pattern - most birds use a combination of at least two of these types of flight patterns:

- a. flapping - many birds use flapping flight in which both wings beat up and down together. Example, American Robin, Blue Jay, Great Blue Heron.



- b. soaring - some birds travel great distances without any visible wing action. They ride on updrafts of air. Example, vultures, hawks, and eagles.



- c. gliding - when ducks or geese decide to land, they often descend in a long, gliding motion.



- d. hovering - this type of flight needs help from a fresh headwind. The bird appears to stand still in the air, tail fanned out with wings moving. Example, Rough-legged Hawk, Belted Kingfisher, and American Kestrel.



e. fluttering - this is like hovering, but the bird remains fixed in one place without the help of a headwind. Example, Ruby-throated Hummingbird.



5. Range and Habitat - all birds have specific geographic ranges from which they seldom stray. Within that range, each bird has its own specific habitat where it spends most of its time. This habitat contains the right kind of food for the bird.

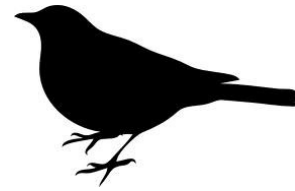
Bird	Habitat
American Robin	urban areas, around home
Red-winged Blackbird	marshes, wet areas
Red-tailed Hawk	open field areas
Belted Kingfisher	lakes, waterways
Brown Creeper	forested areas
Eastern Meadowlark	open field areas



6. Song - each species of bird has its own specific song/call. Typically, bird families have similar sounds. Example, the nagging cries of jays, the flute-like whistle of thrushes, the rattle of kingfishers.



FUN FACT: All bird names are spelled with capital letters.



Attracting Winter Birds

Attracting birds in your backyard over the winter can be a lot of fun. Despite many species of birds migrate south in the winter, several other species typically remain behind. Sometimes, your backyard will provide the natural food and cover that birds prefer. But as the weather turns cold and natural food sources become scarce, our feathered friends are sure to appreciate access to an accessible food (and water) source. Being able to watch and study birds close-up adds immeasurably to our everyday lives and contributes to a sense of well-being. There are three concerns that should be taken into consideration while attracting birds in the winter.

Food The first concern for birds in the winter is finding food. To maintain their body temperature, birds spend much of their time searching for food. Birds have no teeth. Instead, they have beaks which are used for obtaining food. The shape and size of the beak is adapted for eating a particular food - fruit, nuts, seeds, insects, nectar, or small mammals. Birds exhibit distinct preferences in their food requirements. They are well equipped to find food and the size and shape of a bird's beak determines what foods they eat. Some birds prefer berries, while others prefer nuts and seeds. Some eat insects. It is important to note the differences in beaks between species, as a bird can only eat what its beak allows it to.

Likewise, a bird's feet are also an indication of how it might search for food, where it lives, or how it moves about. Some birds search for food exclusively on trees, while others search on the ground. For example, when was the last time you saw a woodpecker searching on the ground for food? So, remember, when putting food out or planting, birds can only eat and obtain their food based on the beaks and feet type they possess. The greater the variety of food you provide, the greater diversity of birds you will attract. Other factors that affect the diversity of birds attracted to your feeder are the geographical area that you live, the habitat, and the weather.



During the winter months, your provision of food will help ensure birds make it through the winter. Once you begin to put out food, it is important to maintain the feeding, as birds become accustomed to this food source. Neglecting to put out food could result in birds dying, especially if temperatures become extremely cold. Birds require enough food to maintain their high metabolic rates which keep them warm. When spring rolls around, newly hatched insects and budding plants will attract many of the birds away from your feeder. At this time, their diet is now replaced by more valuable food sources offered by nature.

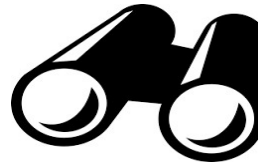
Deciding what to feed your birds is easy, as most of the food they require you may already have. Suet is a favourite year-round food for insect-eaters. It provides a quick energy source and helps maintain a high metabolism to keep birds warm. Set it out in chunk form; the bigger the better. You can use half inch wire mesh, onion bags, small holes drilled with 2.54 cm (1 inch) holes, or pine cones. Peanut butter is a high energy source, also providing some salt. It is important to mix the peanut butter with equal amounts of cornmeal for granular consistency to prevent a bird's mouth from becoming closed shut. Commercial seed mixtures are probably the most common food provided; however, they tend to be expensive and not all seeds get eaten by the birds at your feeder. To determine seed preferences, section off the feeder into equal sized areas and then fill each section with measured amounts of the various seeds you want to test. As nature's food supply diminishes, fruits, berries, and nuts become a welcomed treat. Nuts help keep a bird's metabolism at a high rate. Peanuts and walnuts are the least expensive. Kitchen scraps such as bread, cake, doughnuts, stale cookies, crackers, and potato chips all provide salt which the birds need. For insect-eaters, use cheese, bacon scraps, diced raw meat, or dry dog food. And lastly, non-edible roughage or grit is important for the digestion of foods. Sand particles, crushed eggshells, or bits of old mortar (which are included with these foods), will also get consumed. NEVER feed bread, crackers, popcorn or other human snack food items to birds. They have zero nutrition, and give birds the artificial feeling that they are full.

Shelter The second concern for birds in the winter is shelter. To attract as many kinds of birds as possible, try placing feeders in different places close to shelter, such as trees or bushes. Remember, the bird's beak and feet limit the bird to the type of food it can eat and the method to obtain it. Regardless, most birds seem to feel more comfortable eating at feeders near trees or bushes, as they can perch and hide from predators. Cover is important! For birds who feed on the ground, simply scatter seeds near cover. Food to be scattered includes sunflower seeds, cracked corn, peanuts, or mixed seeds. For feeders at a window, use sunflower seeds shelled peanuts, seed mix, raisins, or currants. For birds that are considered trunk feeders, which spend most of their time searching on or under the bark of a tree, use suet or suet cakes.

Water The third concern for birds in the winter is the availability of water to drink. Birds do need a source for water in the winter. Bird baths can provide a water source and (if possible) heated to help prevent the whole bath from freezing. Placing the water bath in the Sun may help prevent freezing.

A simple bird feeder can make a Scouting Youth's winter far more enjoyable. Obtain a pair of binoculars, a field guide for birds, and a Scouting Youth can start keeping a list of all species recorded over the course of the winter. Keep this list on file and compare lists from year to year, always making notes of new species sighted. A Scouting Youth's "yard list" could easily reach twenty species annually. Once they realize how easy it is as they become an experienced "birder", a Scouting Youth can enjoy a walk through a conservation area or forested area and see how much bird activity exists throughout a winter.

*******Be sure to check out the Milk Carton Feeder activity on page 173 and the Suet Log Feeder activity on page 174.**



Winter Birds of Ontario

<u>Species</u>	<u>Feeding Level</u>	<u>Preferred Food</u>
Blue Jay	ground, window, pole	sunflower seeds, corn, peanuts
Gray Jay	window, pole	sunflower seeds
Black-capped Chickadee	window, pole	sunflower seeds
Northern Cardinal	ground, window, pole	sunflower seeds
Rufous-sided Towhee	ground, window, pole	sunflower seeds
House Sparrow	ground	all seeds
Song Sparrow	ground	millet
Tree Sparrow	ground	all seeds
White-throated Sparrow	ground	all seeds
Evening Grosbeak	pole	sunflower seeds
American Goldfinch	hanging, pole	niger seeds
Pine Siskin	hanging, pole	niger seeds
Purple Finch	window, pole	sunflower seeds
House Finch	window, pole	sunflower seeds
Dark-eyed Junco	ground	millet, small seeds
Common Redpoll	window, pole	sunflower seeds
Hairy Woodpecker Downy Woodpecker	tree trunk	suet
Red-breasted Nuthatch White-breasted Nuthatch	window, pole, tree trunk	sunflower seeds

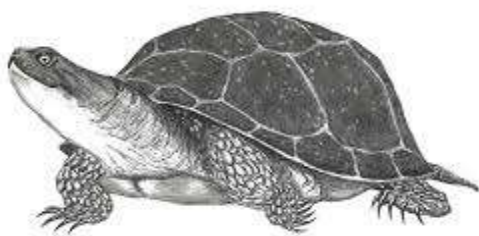
More About Amphibians and Reptiles

The study of amphibians and reptiles is known as herpetology. Both amphibians and reptiles are grouped together and collectively known as herptiles. There are almost 50 different species of herptiles in Ontario. Ontario is one of the warmest regions in Canada, reaching an average daily temperature of 12° C with the strong winters and warm summers. But it rarely gets warm enough to support a greater diversity of herptile species. Though 50 different species sound like a lot, it really is not. And locating any of these 50 species can be a task. Unlike birds or mammals which are easy to locate (by sight or sound), herptiles are very secretive animals and are hard to find. They are small and hard to spot and most do not vocalize. But, with approximately 35% of Ontario's amphibians and 75% of its reptiles now listed as "species at risk", the chances of spotting any of these rare, hidden animals becomes even more impossible. Threats, such as habitat loss, traffic mortality, and persecution are contributing to the decline of herptile populations. The following lists a herptile's ecological value to various habitats throughout Ontario:

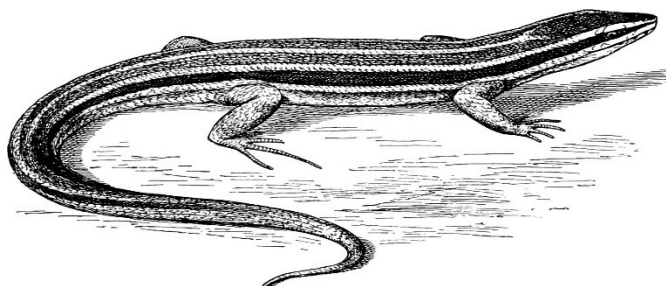
- the many predator-prey relationships with game birds and mammals;
- beneficial because they maintain insect and rodent populations;
- some fill niches (ecological roles) in ecosystems not otherwise used (salamanders).

Herptiles are a much-maligned group of animals (especially reptiles) so all Scouting Youth/Scouters should have enough knowledge to counteract the general public ignorance.

Blanding's turtle



five-lined skink



Amphibian Life Cycle

Amphibians are vertebrates that live a double life. Frogs, toads, salamanders, newts, and caecilians are familiar amphibians. When they are young, they live in fresh water and breathe with gills. But when they become adults, they live mainly on moist land. As adults, amphibians breathe with lungs and through their skin.

All amphibians require a body of water to reproduce. The amphibian egg must remain moist. In a dry environment, the egg loses water quickly through the delicate coating that surrounds it. All amphibians undergo a metamorphosis. The young pass through a larval stage and then physically change to an adult. Striking changes in an amphibian's form and appearance occur during metamorphosis. Young amphibians look quite different from the adults. After the eggs hatch, the young pass through a larval stage and then physically change to an adult (Fig. 13). During the larval stage, they live in water and during the adult stage, they live on land. During the larval stage, the "tadpoles" are noticeably fish-like in appearance.

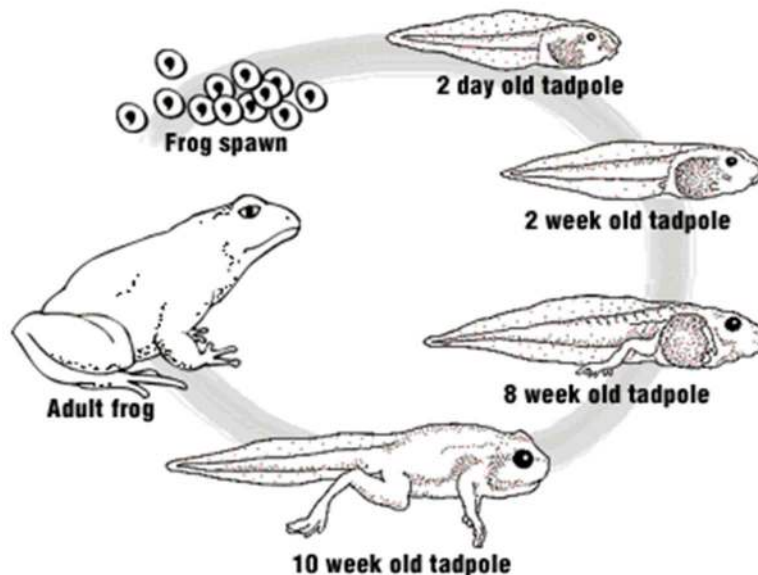


Fig. 13. Amphibian Life Cycle

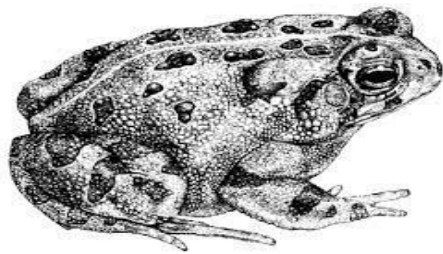
Ontario's Amphibians

Of all the Canadian provinces, Ontario boasts the most amphibian species with twenty-six. The following table lists the amphibian species found in Ontario:

Table 2. Amphibian Species Found in Ontario

Frogs	Toads	Salamanders
American bullfrog	American toad	allegheny mountain dusky salamander
boreal chorus frog	Fowler's toad	central newt
gray treefrog		eastern tiger salamander
mink frog		Jefferson salamander
northern leopard frog		northern dusky salamander
spring peeper		red-spotted newt
wood frog		spotted salamander
green frog		blue-spotted salamander
northern cricket frog		eastern red-backed salamander
pickerel frog		four-toed salamander
western chorus frog		Mudpuppy
		northern two-lined salamander
		small-mouth salamander

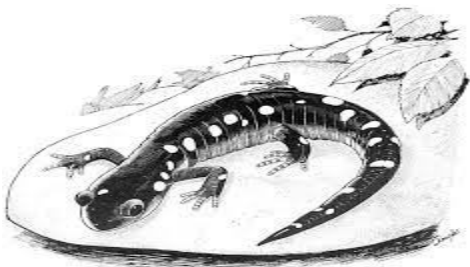
Fowler's toad



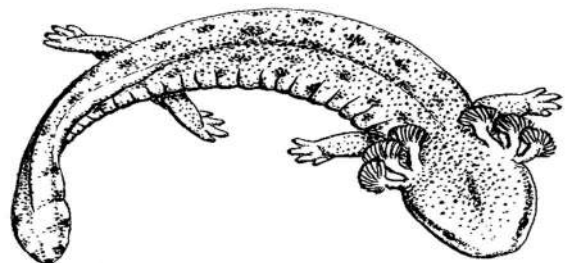
spring peeper



spotted salamander



mudpuppy



Reptile Life Cycle

Reptiles are not dependent on water for reproduction. In fact, reptile eggs will not survive if laid in water. The eggs have a leathery shell that contains more stored food compared to fish or amphibian eggs. This allows more time for the developing reptiles to grow in their shells. As a result, when the eggs hatch on land, the reptiles are fully formed; they do not pass through a larval stage. In a reptile life cycle, baby reptiles are born looking like smaller versions of their parents (Fig. 14). Although a few reptile species give birth to live young, most reptiles hatch from eggs. Female reptiles often build nests on land to lay their eggs, usually burying them in sand to protect them. Some reptiles may bear their young alive. Certain species of lizards and snakes keep the eggs inside their bodies while the embryos are developing. The eggs hatch inside the mother and then the young are born live.

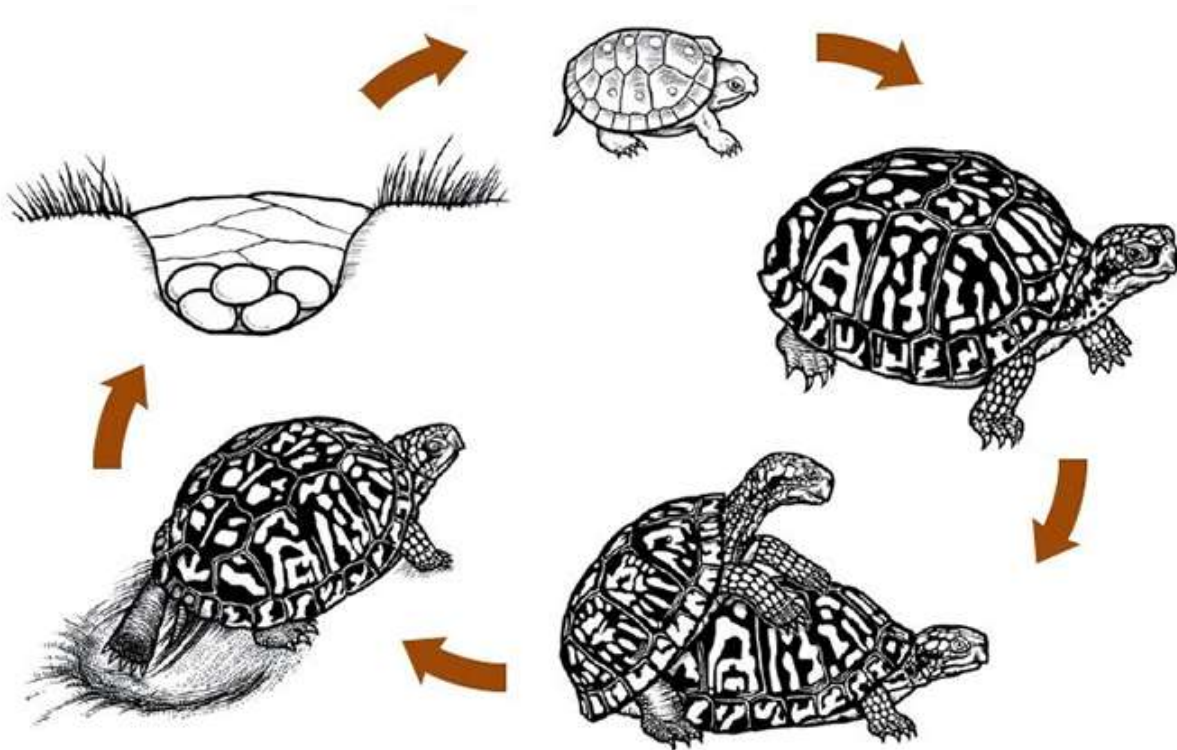
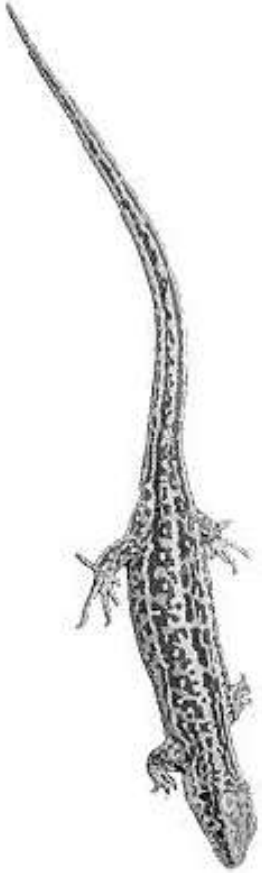
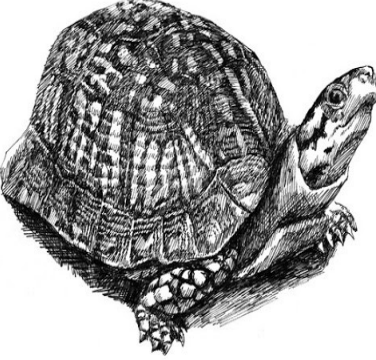


Fig. 14. Reptile Life Cycle

Ontario's Reptiles

Of all the Canadian provinces, Ontario boasts the most reptile species with twenty-four. The following table lists the reptile species found in Ontario:

Table 3. Reptile Species Found in Ontario

Turtles	Snakes	Lizards
snapping turtle	northern brown snake	five-lined skink
stinkpot turtle	northern redbelly snake	
midland painted turtle	northern water snake	
map turtle	queen snake	
Blanding's turtle	eastern garter snake	
spotted turtle	Butler's garter snake	
wood turtle	northern ribbon snake	
eastern spiny softshell turtle	eastern hognose snake	
	northern ringneck snake	
	smooth green snake	
	blue racer	
	eastern fox snake	
	black rat snake	
	eastern milk snake	
	eastern massasauga rattlesnake	

Why Do Herptiles Hibernate?

Because all herptiles are ectothermic, these animals have evolved and adapted incredible strategies to ensure surviving the freezing temperatures that occur throughout winter. One important adaptation is brumation. Brumation is a hibernation-like state that ectothermic animals undergo during very cold weather, similar to what mammals do. Brumation is necessary because reptiles cannot raise their body temperatures like birds and mammals as environmental temperatures drop. During brumation, reptiles stop eating and their heart and respiratory rates slow significantly. The major difference between hibernation and brumation is that during hibernation, a mammal does not eat or drink. But during brumation, the reptile needs to drink water. Brumation is an amazing survival strategy. Scientists theorize that these long periods of inactivity may lengthen the lives of many ectothermic animals.

Where Do Herptiles Hibernate?

Terrestrial Turtles: must find an area with soft enough soil to dig a burrow as deep as possible, below the frost line.

Aquatic Turtles: bury themselves in the deep bottoms of ponds and lakes (deep in the mud) below the frost line where water does not freeze.

Lizards: will burrow like terrestrial turtles in rotten wood, or, may find a deep crack, or cave in a rocky area for their winter home.

Snakes: take refuge underground for the winter, often in large groups where they share the little warmth between each other. Usually, many individuals congregate together in a hibernaculum. A hibernaculum is simply a place where the same species of snake, or, even different species of snakes spend periods of winter weather. Burrows, rock crevices, caves, and deep holes are a few examples. A hibernaculum must provide the right temperature and humidity conditions for the *whole* winter.

Frogs: most frogs hibernate in water. They bury themselves in the deep bottoms of ponds and lakes (deep in the mud) below the frost line where water does not freeze.

The wood frog, chorus frog, and spring peeper all hibernate in leaf litter on the surface of the ground. They each produce a natural antifreeze in their blood made of glucose and glycogen. This antifreeze prevents the water in their cells from freezing. Up to 70% of their body freezes. In the spring, they thaw out.

Toads: hibernate on land in burrows that are often 50 cm deep, putting them below the frost line.

Salamanders: terrestrial salamanders hibernate in old rodent burrows, cracks in rocks, log piles, and compost heaps; anywhere that prevents them from freezing.

The only aquatic salamander, the mudpuppy, is active all year round, even in winter.

*******Be sure to check out the Build a Hibernaculum activity on page 177.**

Reptile Bites

Most reptiles are not venomous (especially in Canada). Although a reptile bite may be frightening, most do not cause serious health concerns. A bite from a small reptile might leave teeth marks, a minor scrape, or a puncture wound without other symptoms. Home treatment often relieves symptoms and helps prevent infection. Most reptiles, especially lizards, will bite in self-defense when threatened but only effective against their smallest predators. Some Ontario turtles, particularly the eastern spiny softshell turtle and the snapping turtle, bite frequently and vigorously.

Snake bites tend to be more frightening. If the threatening posture of a snake does not drive an enemy away, then many snake species will become aggressive. For example, the northern brown snake will strike, but with its mouth closed. The eastern hognose snake will strike with its mouth open but not bite you. Many snakes will strike and bite viciously. The northern water snake will not hesitate to strike and inflict a very painful bite.

Venomous Snake Bites

Then, there are the venomous snakes. Venomous snakes are more commonly referred to as rattlesnakes, or pit vipers. They all have long, hinged fangs. They are called pit vipers because they possess "pits" (tiny openings) on either side of the face (Fig. 15). The pits act as infrared receptors detecting heat energy released by their prey (small mammals).

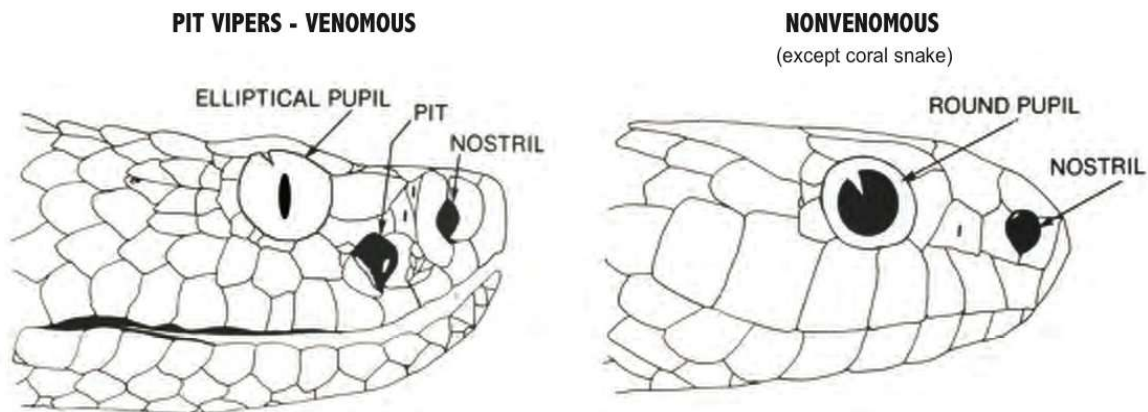


Fig. 15. Location of Pits on a Pit Viper

There are only three venomous snakes native to Canada, all are rattlesnakes: the western rattlesnake (British Columbia), prairie rattlesnake (Saskatchewan, Alberta and British Columbia), and the massasauga rattlesnake (southern Ontario).

Most venomous snake bites occur when people carelessly handle snakes, not from random encounters in the wild. A rattlesnake usually bites in self-defense. The severity of a rattlesnake bite depends on the species and if it is a dry or wet bite. A dry bite contains no venom. Venom is not always released in a bite. It needs to be conserved for other situations, such as when the rattlesnake needs to kill its prey or injure predators. After biting its prey, the prey is immediately released so it cannot bite back. The bitten prey may scurry off, but will eventually die. The injected venom causes intense swelling, pain, and limited blood flow. Death usually occurs from a dramatic collapse in blood pressure. The rattlesnake then uses the pits to find its food.

Another recognizable feature of a venomous snake is the "rattle" on its tail. The rattle of rattlesnakes represents horny pieces of skin that stick to the base of the tail (Fig. 16). These are not lost when the snake sheds its skin. Each molt adds a new rattle. The number of rattles, therefore, does not represent the age of the snake in years. In older rattlesnakes, the terminal rattles are often lost and therefore the total number of rattles does not even indicate the total number of molts.



Fig. 16. Rattle at the Base of a Pit Viper Tail

If you are bitten by a venomous snake, the bite should be treated seriously; it is a medical emergency. Stay calm. The bites are rarely fatal, but could be if left untreated. The venom works by damaging tissue (destroying skin tissue and blood cells) and affecting your circulatory system (internal hemorrhaging).

Some snake bites might be mistaken for rattlesnake bites when they are not. The first sign of a rattlesnake bite is one or two puncture marks which are left by the snake's large fangs. Pain, tingling, or burning sensations may also be felt in the bite area. Swelling, bruising, or discolouration may also occur. Other common symptoms include:

- changes in heart rate or breathing
- nausea or vomiting
- a metallic, rubbery, or minty taste in your mouth
- sweating
- light-headedness/weakness
- blurred vision

Once bitten, the venom takes only seconds to get into your bloodstream. You need to seek medical help within 30 minutes. If left untreated, within days, body functions start decreasing which could result in organ damage or even death. The first thing to do is move away from the snake. It could bite again. Do not waste time trying to catch the snake, trap the snake, or trying to take a picture of it for identification. If you are in Ontario, it is a massasauga rattlesnake. **GUARANTEED!**

There are many misconceptions about what to do just after you have been bitten So, the following outlines what to do and what not to do while waiting for medical attention.

What to Do	What NOT to Do
remain as calm as possible; panic increases heart rate	do not raise the area bitten above your heart; the venom will reach the heart faster
stay as still as possible; increased movement increases blood flow	do not wash the wound; any available venom can be used to identify the snake
remove any tight clothing or jewellery to anticipate swelling	do not cut into the wound; it could cause an infection
let the wound bleed; it will release venom	do not suck the venom from the wound; it will now be in you
if you show signs of shock, lay down, raise your feet slightly, and keep warm	do not use a tourniquet, apply ice, a compress, or water



Let's Talk About Snakes

A snake's main adaptation to life is its very form. With no legs, arms, ears, or other appendages, it can slither through grass or among rocks unnoticed without causing any disturbance. It can enter narrow holes in the ground made by rodents, find those rodents and eat them. If you think that having no legs causes mobility problems for a snake, you have never seen how fast a snake can move in most environments.

Snakes cannot bite food so they must swallow it whole. Snakes have an unusually flexible jaw mechanism that enables them to swallow food several times the snake's own diameter. The bones of their mouth are specially adapted to be loosely joined to their skulls. A stretchy strip of tissue called a ligament holds together the two halves of the lower jaw. When snakes swallow their prey, their mouths can stretch wide open. The lower jawbones spread apart and each bone moves separately to pull the prey into the mouth. Snakes usually swallow their prey headfirst which causes the prey's legs to fold back, making it more streamlined and easier to swallow.

Along the edge, and just inside of a snake's mouth, are tiny, white, teeth. These teeth curve backward which prevent the prey from escaping. This adaptation encourages food entering the mouth to continue in the right direction - toward the stomach. Since much food swallowed by snakes is still alive (and doing what it can to escape), you can understand how such teeth would help the snake. As a snake works its food down its throat, the glottis (windpipe) displaces itself which allows the snake to continue breathing while the snake is swallowing. Unlike mammals, the reptile glottis is always closed unless it is taking a breath. Snakes are able to extend their glottis out the side of their mouth while they are swallowing to allow for breathing. It is usually long and supported by cartilaginous rings.

Snakes have forked tongues, which they flick from their mouths quite often. This tongue-flicking is how the snake "smells" its surroundings. When the tongue is outside its mouth, odor particles stick to it. Then the tongue is drawn back into the mouth and inserted into a special section of the nasal cavity called the Jacobson's organ, where the odor is sensed and translated by the brain.

Snakes come in an incredible variety of colors and patterns. Often, the colors and patterns serve to camouflage the snake. Other times, the bright colors and patterns make the snake more clearly visible which acts as a warning sign so that other animals will see it and stay away.

Other adaptations are unique to individual groups of snakes or species. For example, in Ontario, rattlesnakes have "rattles" on their tail that can be shaken to make a very loud and disconcerting warning sound. The common garter snake is another example of a snake with a unique adaptation. It is equipped with glands that exude a very smelly substance when the snake is picked up and disturbed.

Some of the most interesting snake adaptations are behavioral. The eastern hognose snake is about as harmless as snakes get. It can spread its head so that it looks much larger than it is. Moreover, as it does this, it hisses! If this does not scare you away, it will change strategies. It will flip onto its back and with its mouth wide open, writhe pitifully as if having convulsions. Then, it will just lie there looking dead as can be. But, if you sit down next to it and are quiet, in a few minutes it will raise its head, look around, and if it looks safe, slither away!

An extraordinary adaptation of the rat snake is the ability to climb tree trunks to look for food - birds and eggs. It can climb trees because of the way it is shaped. In cross section, it is shaped like a loaf of bread - a rounded top with straight sides meeting the flat bottom at right angles. Those squared sides pressed against a tree's bark irregularities give the snake a bit of hold, like a tire with a good tread holds to the road better than a smooth tire. But it is not a very firm hold. Rat snakes fall out of trees a lot, and that can be very surprising if you happen to be daydreaming below!

Depending on the type of snake, a snake will feed one of three ways:

- Some snakes have a venomous bite that is used to immobilize or kill their prey. The venom is modified saliva, delivered through fangs. The snake waits for their prey to die before they eat it; eg. cobras, vipers, rattlesnakes.
- Some snakes kill their prey by constriction. They first strike at the prey, grabbing it with their teeth and then proceeding to constrict the prey until death before consuming it whole. Unconsciousness and death likely result from shutting off vital blood flow to the heart and brain. This would lead to unconsciousness and death very quickly; eg. boa constrictor, python.
- Some snakes ambush their prey and swallow it whole and alive. Their backward-pointing teeth also help force the animal down the throat while muscles then move it toward the stomach; eg, garter snake, water snake, (basically all other snakes).

After eating, snakes become dormant while the process of digestion takes place. Digestion is an intense activity, especially after consumption of large prey. Being ectothermic, the surrounding temperature plays a large role in snake digestion. The ideal temperature for snakes to digest is 30 °C (86 °F). Often, a snake that has been disturbed after recently eating will often regurgitate its prey to be able to escape the perceived threat. When undisturbed, the digestive process is highly efficient, with the snake's digestive enzymes dissolving and absorbing everything but the prey's hair (or feathers) and claws, which are excreted along with waste.

Here are some other fun snake facts:

- Snakes do not have eyelids.
- Snakes have internal ears but not external ones.
- Snakes are covered in scales; their skin is smooth and dry.
- Snakes shed their skin a few times a year in a process that usually lasts a few days.
- Anacondas are large, non-venomous snakes found in South America that can reach over 5 m (16 ft) in length.
- Python reticulatus can grow over 8.7 m (28 ft) in length and are considered the longest snakes in the world.
- Snakes are the only vertebrates that can go for a "long" time without eating (up to a year).

********Be sure to check out the How to Attract Snakes to Your Backyard activity on page 179. The Scouting Youth can also be encouraged to try this conservation activity at home.***

********Be sure to check out the Toilet Paper Snake activity on page 181.***



Ophidiophobia

Snakes usually stir up strong feelings in people - either fascination or fear. Ophidiophobia is the abnormal fear of snakes. It is sometimes called by a more general term, herpetophobia, fear of reptiles. The word "ophidiophobia" comes from the Greek words *ophis* (snake), and *phobia* (fear). About one third of adult humans are ophidiophobic, making this the most common reported phobia.

Much like other specific phobias, a fear of snakes can come from a variety of reasons. Some causes of ophidiophobia include:

- a personal negative experience;
- a learned negative experience;
- movies;
- media;
- parents;
- other persons, some of whom may be grossly prejudiced.

There was a time in the past when people thought that the only good snake was a dead snake. This unfortunate attitude still exists today amongst some ignorant or intolerant people who do not care to appreciate a snake's value in the different habitats that people have encroached.

The natural world is an unlimited supply of beauty and fascination. Most young people will experience this beauty and fascination for the first time at a summer camp, a cottage, Science classroom, or a zoo. It is at these places that these young people discover that the snake is a useful animal and with most varieties, is quite harmless. With proper guidance and instruction, this newly developed attitude helps reduce the negative feelings towards other "slimy" animals, such as frogs and lizards. Today, the people of Ontario have a responsibility to become well-informed. This knowledge, as it is passed down to children, will ultimately determine the survival of Ontario's snakes.

The Eastern Massasauga Rattlesnake

The eastern massasauga rattlesnake (Fig. 17) is Ontario's only venomous snake. It is also known as a "pit viper" because of the paired pits between the nostrils and the eyes. These pits are heat-detecting organs that allow the massasauga to determine the location of their endothermic prey, even in total darkness. Massasaugas are also characterized by the vertical, slit-like pupil of the eye and the rattle on the tail. The sound of the rattle is made when the tail is vibrated, causing the interlocking segments to rub together. The rattle may resemble the sounds of a bee buzzing, a cicada, or a mechanized wind-up toy.

The massasauga rattlesnake was formerly found in most of southwestern Ontario and along the shores of Lake Huron and Georgian Bay. Although human harassment has been responsible for the loss of many massasauga rattlesnakes, the draining of wetlands for agriculture, and the development of shorelines for recreation are the main reasons for their decline. The massasauga rattlesnake hunts primarily along the shores of marshes, swamps, or lakes, although they will also move into adjacent uplands. They feed primarily on frogs and small mammals.

Although they can reach 1.0 m in length, most Ontario massasauga rattlesnakes are between 42-75 cm. They are gray with large brown or black blotches on the back and smaller blotches on the sides. Their belly is black with yellow or white markings.

The massasauga rattlesnake is typically found resting under flat boards, metal, or other discarded material. They often bask in the sunlight in clearings and openings. These snakes are quite timid and pose no threat to people if they are left alone. Snakes do not seek out people to bite; striking and biting is a defensive measure on the part of the snake. The risk of snake bite is highly overrated; annually, more people die from bee stings or lightning strikes than from snake bites.

In the event that one should encounter a massasauga rattlesnake, it does not always sound a warning prior to striking, nor is it necessary for them to coil to inflict a bite. The venom that is released is used to subdue its prey and only secondary to protect the snake from predators. The venom passes through glands in the head to canals in the fangs. The snake can control how much venom is injected.

Once the venom has been injected into its prey, the enzymes of the venom work to break down the fiber and cellular structure of the snake's victim. The rattlesnake is careful not to waste venom. It uses just enough to kill its victim. Although massasaugas can inject enough venom to kill a person, they rarely do. In fact, they prefer to slip away quietly from humans if given the chance.

If a massasauga rattlesnake is confronted and threatened by humans, it may panic and inject larger amounts of venom, sometimes using it all in order to defend itself against the threat. If bitten, venom produces pain, swelling, hemorrhaging, circulatory difficulties, lowering of blood pressure, weakening of pulse rate, allergic shock, unconsciousness, nausea, and increased temperature. If you are bitten by a rattlesnake, seek medical attention immediately.

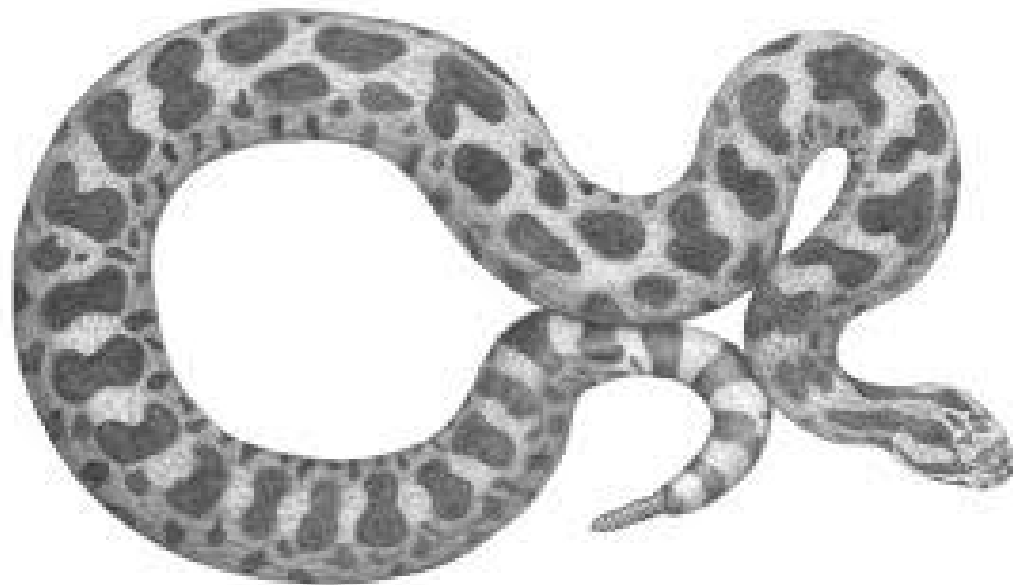


Fig. 17. The Eastern Massasauga Rattlesnake

A Case of Mistaken Identity

In Ontario, many snake species are faced with possible extinction because of the rapid depletion of their natural habitat by urban expansion, new highway construction, and the great increase of wilderness traffic of campers and summer cottagers who simply do not like snakes.

Snakes have been needlessly killed and persecuted throughout the ages, and this senseless, uneconomic slaughter still goes on. Humans will not tolerate any "rattlesnake" close to a campsite, cottage, swimming area, or dock. A person's first instinct is to kill it.

The concern? This human fear of snakes has extended to any species of snake that even looks like a rattlesnake. There are other species of snakes whose numbers are declining simply because of a case of mistaken identity. Reports of the massasauga rattlesnake far from its usual locality are usually cases of misidentification. The northern water snake, eastern milk snake, eastern fox snake, and eastern hognose snake are commonly mis-identified as a massasauga rattlesnake. Because of their similar patterns and colouration, this gives uninformed people another excuse to kill these snakes.

Some people may never learn to like rattlesnakes, and that's okay, but they should try to appreciate the roles rattlesnakes play in the balance of nature. Rattlesnakes are excellent mousers, and in this way, they play an important role in maintaining rodent populations. It is extremely important to properly identify these "cases of mistaken identity" for the rattlesnake's own protection.

There are three things to consider when attempting to identify the massasauga rattlesnake. It will take you less than 5 seconds for a positive identification:

- Location - are you within a narrow 25 km strip along the shores of Georgian Bay, Lake Huron, and Lake St. Clair? If not, it is extremely unlikely you have encountered a rattlesnake.
- Look at the snake's head and eyes. The massasauga rattlesnake has a triangular head, vertical elliptical pupils, and fangs. Non-venomous snakes typically have a rounded head, round pupils, and small, hooked teeth (Fig. 18).
- The massasauga rattlesnake is often found coiled; it does not always rattle its tail. It relies on camouflage and remaining still to go unnoticed.

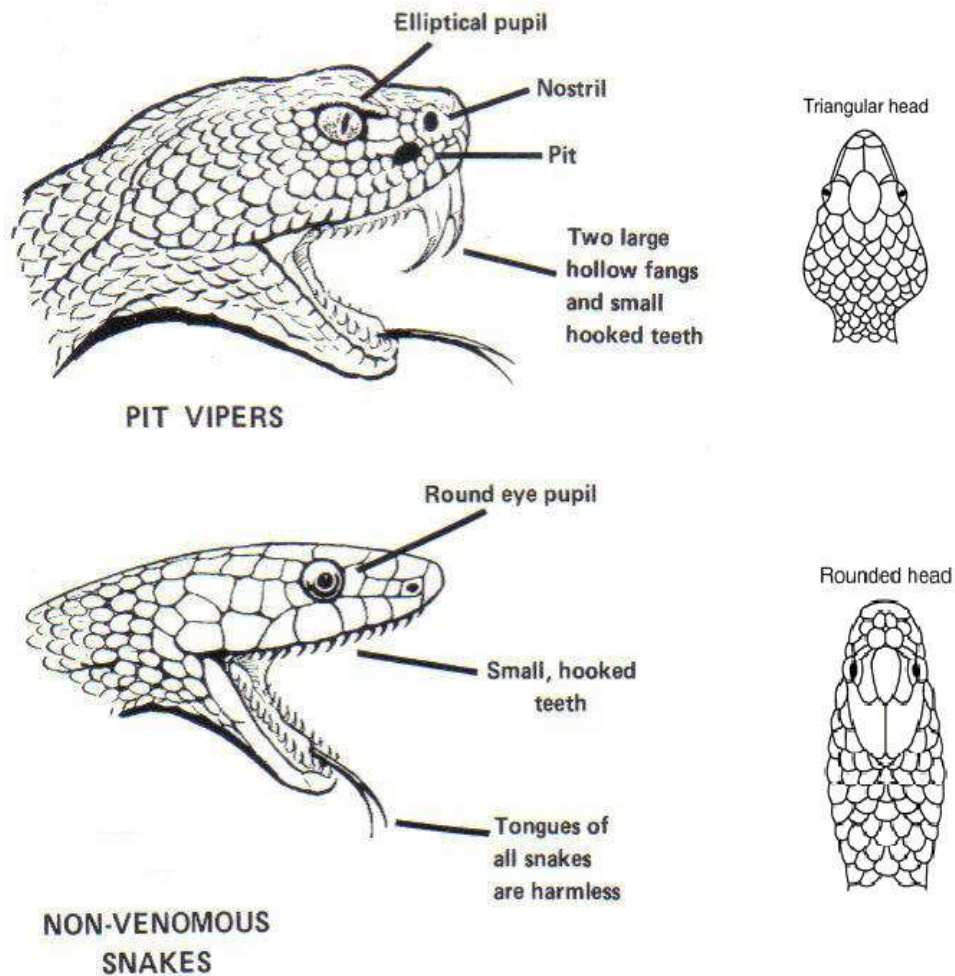


Fig. 18. Comparing Pit Vipers and Non-venomous Snakes

Learn to identify the differences between these species: the northern water snake, eastern milk snake, eastern fox snake, and eastern hognose snake. Knowing the differences could save *their* lives.

Table 4 recognizes the most obvious differences in the field between these snakes and the massasauga rattlesnake.

Table 4. Identifying the Massasauga Rattlesnake, Northern Water Snake, Eastern Milk Snake, Eastern Fox Snake, and Eastern Hognose Snake

Field I.D.	massasauga rattlesnake	northern water snake	eastern milk snake	eastern fox snake	eastern hognose snake
Length	up to 1.0 m; usually 42-75 cm	up to 1.3 m; usually 61-106 cm	up to 1.0 m; usually 61-90 cm	up to 1.8 m; usually 91-137 cm	up to 1.0 m; usually 51-84 cm
Colour	gray	varies; shades of brown or gray	pale to medium gray, brown/cream	yellowish-brown or straw-yellow	olive brown or gray
Pattern	large brown or black blotches on back	black or brown bands on the forward part of body	reddish-brown, saddle-shaped, blotches that are black bordered	large dark blotches on middle of back; smaller alternating ones along the sides	dark blotches down back with smaller ones on sides
Head	triangular, pits on each side of the face between the eye and nostril	large, broad	short, broad; the shape of the letter "Y" on top	slender, copper to reddish-brown with dark band across between the eyes	short, flat, broad with elongated blotches on either side; pointed snout
Belly	black with yellow or white markings	creamy, yellowish with half-moon crescents	white with black checkered pattern	yellow with black checkerboard pattern	yellow-gray with greenish-gray pattern
Tail	bulky, not tapered; distinct segmented rattle	Tapered	tapered; vibrates it when threatened	short heavy, abruptly jointed	tapered; vibrates it when threatened (no rattle though)
Where you will see it	seldom found far from water	rocky shorelines, under, or on large rocks, usually in the water	on land away from water	seldom found far from water, will often be in water	sandy soils away from water

Turtle Conservation

Southern Ontario is the turtle capital of Canada. Ontario is home to eight different species of turtles. Turtles are unique among reptiles because their body is encased in a shell. This shell, which acts as a protective armour, may in part account for their long survival on Earth. The shell varies in shape according to the species, or way of life of the turtle. The top shell of a turtle is known as the carapace; the lower shell as the plastron. Both are fused together at the sides. The horny plates or shields of the carapace and plastron are called scutes (these are lacking in the carapace of the eastern spiny softshell turtle).

Most turtles live in water nearly all the time. (One exception is the wood turtle, which is Ontario's most terrestrial turtle.) All of Ontario's turtles hibernate underwater in ponds, marshes, lakes, and rivers.

All species of turtles lay eggs on dry land. Turtle eggs will die in water. Every year between April and October, both male and female turtles are on the move preparing for the breeding season. Females will travel great distances to locate the "perfect" spot for which to lay her eggs. Road mortality is a major threat. The "perfect" spot must be an open area with sandy or gravelly soil that is easy to dig, far enough or high enough from water to prevent the nest from being flooded out. The eggs must receive the correct amount of moisture so the eggs do not get too dry or too moist during incubation.

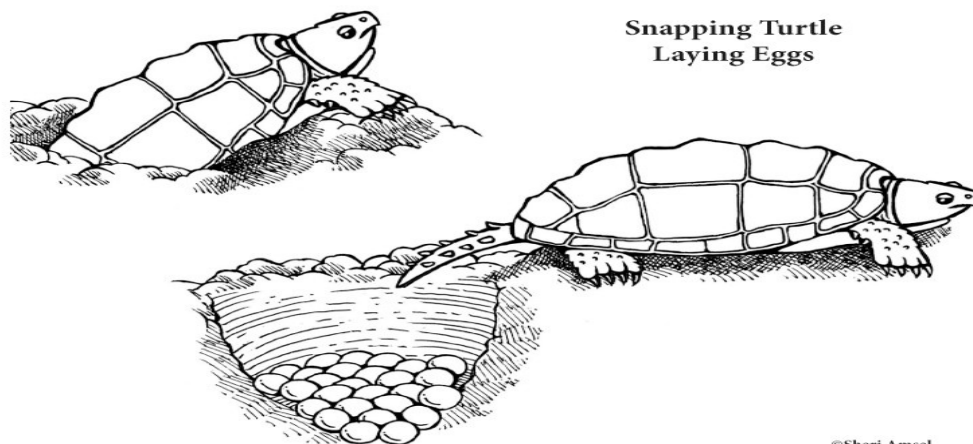
If you see a turtle digging in an area for hours, you know it's a female ready to lay eggs. Its best to leave her alone at this time. After the nest is dug, she deposits the eggs, covers them up, and then leaves. The number of eggs laid in a nest varies from species to species. For example, the eastern midland painted turtle will lay between 3-14 eggs, while the snapping turtle will lay between 30-40 eggs. Unlike birds, turtles do not tend their nests or care for the hatched turtles. This leaves the nest open to predation by predators such as crows, raccoons, skunks, foxes, and coyotes. Even after hatching, the young are easily preyed upon. Less than 1% of all turtle eggs laid will hatch and grow into an adult turtle. It can take 8-25 years (depending on species) before a turtle reaches maturity.

Eggs generally hatch in late summer or early fall. With most turtles, sex is determined by the temperature during incubation. With an optimum temperature of 28 ° C (82° F.), a clutch yields equal numbers of males and females. Hotter temperatures will produce more females while cooler temperature produce more males.

There are strict laws under the Ontario Endangered Species Act and Fish and Wildlife Conservation Act that protect all turtle species in Ontario. Adherence to these laws must be followed. Do not assume you can make up your own rules. It is illegal to disturb or interfere with a natural turtle nest. The nest environment cannot be altered in any way, or, if a man-made nest protector utilized does not allow the hatchlings to leave on their own. Setting up effective nest caging takes a lot of time and consideration, so please think carefully before taking on this responsibility

Two of Ontario's turtles, the spotted turtle, and the wood turtle, are classified by the Ontario government as endangered. The rest of Ontario's turtles are considered threatened or of "special concern," which grants them some level of protection. This list includes the Blanding's, snapping, stinkpot, northern map, spotted, wood, and eastern spiny softshell turtles.

A Scouting Youth can boost the odds of turtle survival by building a nest protector and placing it on private property, or, simply by encouraging others to do the same.



Snapping Turtle
Laying Eggs

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www.exploringnature.org

********* Be sure to check out the *Make a Turtle Nest Protector* activity on page 182.

O.W.L.S (Ontario's Wonderful, Lofty, Strigiformes)

Ontario is home to eleven different species of owls. These eleven owls are divided into two main families:



Family Strigidae

Barred Owl
Boreal Owl
Eastern Screech Owl
Great Gray Owl
Great Horned Owl
Long-eared Owl
Northern Hawk Owl
Saw-whet Owl
Short-eared Owl
Snowy Owl



Family Tytonidae

Barn Owl

The Barn Owl has been separated into its own family, Tytonidae, because of the following physical differences from Family Strigidae:

- the facial disc is heart-shaped (or triangular) rather than round;
- the central talon of each foot has a peculiar serration along the inner edge (absent in other owls);
- the legs are very long (much shorter in other owls);
- the tail is short and square (other owls usually have rounded, rarely square tails).

Owl Characteristics

Owls are large-headed, short-necked birds of prey. They possess flattened faces that form broad facial discs. Many owls are nocturnal (active at night), but some are diurnal (active during the day). Owls are more often heard than seen. Their large forward-facing eyes are immovable so that the entire head must move to look in other directions. Most owls do not migrate (at least not regularly). All owls lay white eggs.

The greatest enemy of owls are humans, who shoot them and trap them out of prejudice, or out of mistaken belief they are economically harmful to game animals.

Figure 19 illustrates the physical characteristics that make owls such unique birds.

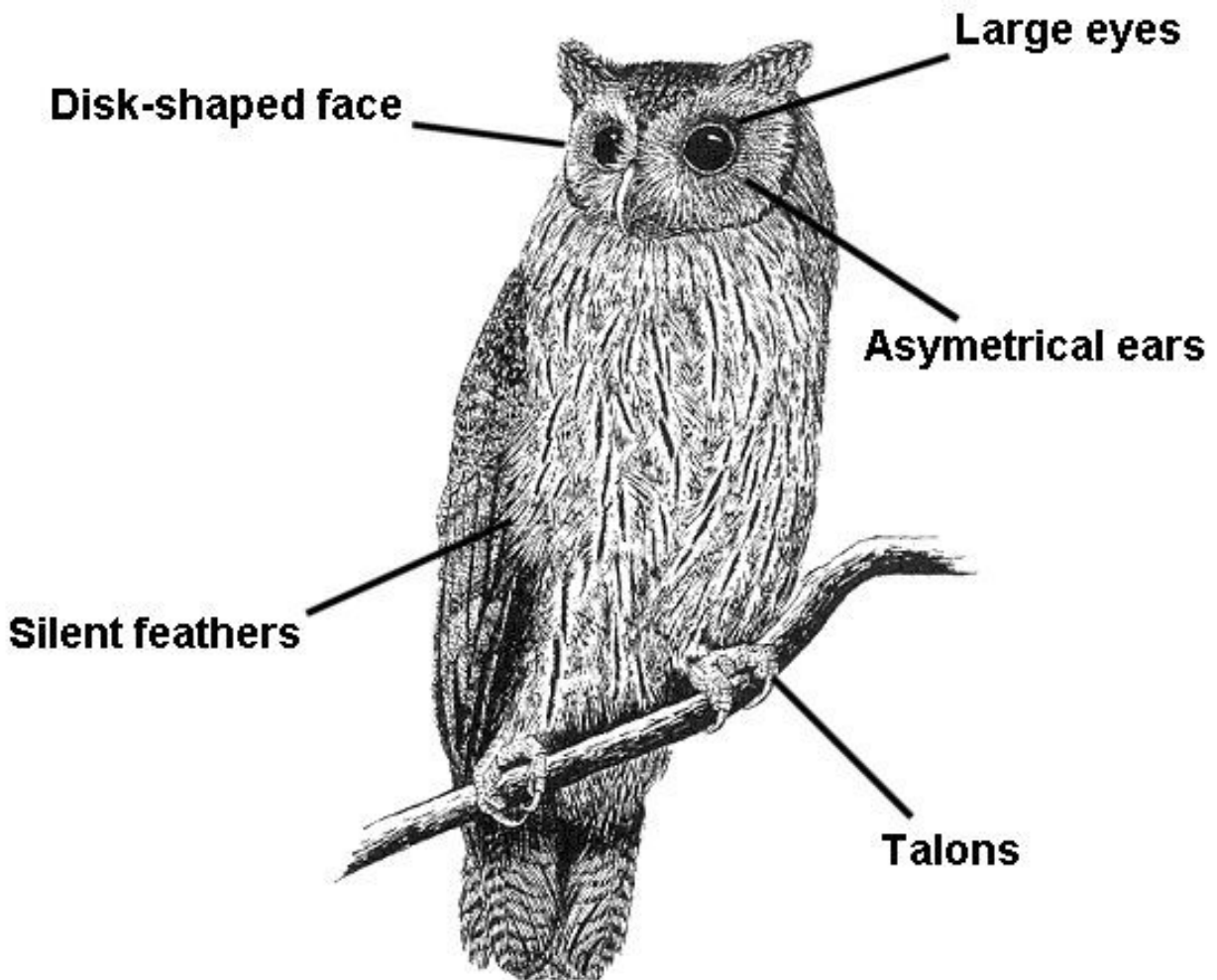


Fig. 19. The Physical Characteristics That Make Owls Such Unique Birds

Sight

An adaptation found in the eyes of almost all nocturnal birds is the great size of the orbit, fully one half of the skull being hollowed out to receive the eyeballs. Owls nearly match humans with the frontal placement of their eyes, but unlike humans, their eyes are almost immovable, locked in their sockets. In compensation for this rigidity, they have flexible necks that allow them to turn their heads around at least 270°. Owls, with their frontal eyes, have a total field of view of 60-70°. The total field of view depends on placement of the eyes, their mobility, and the angle of view that each eye subtends. Pigeons, with their laterally disposed eyes, have a total field of view of about 340°. They can see almost everything around them except the space occupied by their own bodies.

The ability to see well at night is due to the number of rods and cones in an owl's eye. Rods are more numerous than cones. Rods are effective in dull light and receive blurred images. Cones function in bright light, giving sharp, visual details, while also playing a major role in colour vision. Because of the greater number of rods than cones, an owl's eye exhibits superb sensitivity under weak illumination. Even in broad daylight though, the circle of the iris of the eye will contract and enlarge at the will of the bird. Because of this power of adjustment, almost all owls can see very well, even in sunshine. The opaque nictitating membrane, or third eyelid, through adaptation, is well developed to protect the highly sensitive retina of an owl's eye from the bright light of day.

Owls practice "parallactic localization" when locating prey. Owls make oscillating, horizontal movements of the head when locating prey. Raising and lowering the head quickly causes the object viewed to shift its relative position against the horizon, which enables the owl to judge its distance. This adaptation is quite logical when one considers the poor retinal acuity found in owls.



large eyes

Hearing

Owls possess unique refinements in their hearing equipment that accounts for their amazing sensitivity to low intensity sounds. Externally, many species have large, oblong ear openings protected in front with a fleshy, erectile flap or operculum located beneath the feathered facial discs. The whole arrangement resembles, and no doubt, functions like a cupped hand in front of one's ear to reflect and concentrate sounds coming from the rear. (It is believed that the facial disc reflects and concentrates sound waves).



facial disc

A further refinement is seen in the striking asymmetry of the external ears. In many species, the two ear openings are unlike, one being larger and of different shape and location from the other (usually one ear is above and the other ear below the horizontal). This asymmetry of sound-collecting structures helps the owl, as in triangulation, to detect exactly from where (in direction and distance), a sound has come.



The odd arrangement of an owl's ears is usually masked by its feathers

Coupled with these external adaptations, owls have very large eardrums, columellae, and cochlae. Two membranes are stretched across the ear tube and between these, a tiny bone, the columella, is suspended (taking the place of the chain of three bones in the human ear). When sound waves strike against the outermost membrane (or drum of the ear), vibrations are transmitted by the little bony suspension bridge to the inner membrane, and this in turn, troubles the fluid which fills the inner ear. The hair-like endings of the nerve of hearing are affected by the vibrations of the fluid and thus, hearing is accomplished. The wide head of the owl also helps to locate its prey, since the rear openings are far enough apart to create an appreciable time difference in the arrival of the sound they receive.

Owls have the ability to receive sounds slightly quicker than humans. It is this slight time difference that tells an owl that a given sound is at its left instead of its right. An owl is also able to detect the direction of a sound through the differences in intensity with which it strikes each ear. A sound coming from the left, for example, is louder in the left ear than in the right. By means of these two clues, difference in timing and difference in loudness, owls can locate sources of sound with considerable precision.

Digestion

Owls possess sharp, powerful, curved talons and short, strong, hooked beaks. They can move their outer toes backward and forward at will. These toes possess the talons, which are under control of tendons of great strength. The talons are adapted for capturing and holding live prey and then the beak holds the prey to be eaten (Fig. 20). Owls are capable of using their feet to lift food to their beak.

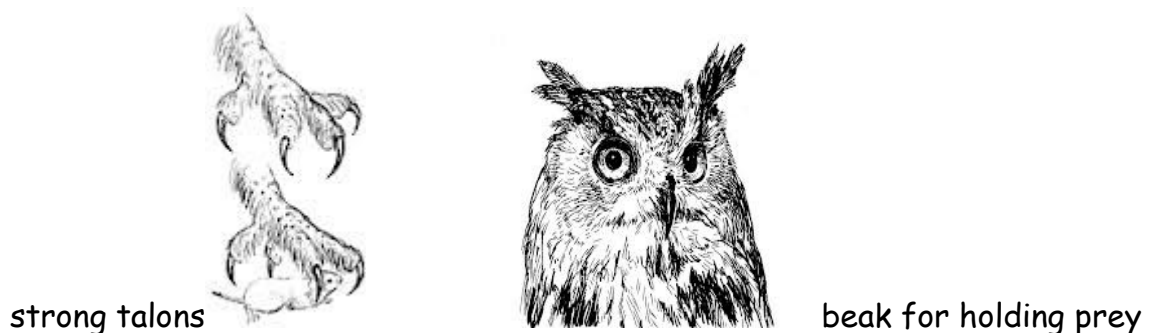


Fig. 20. Owl Adaptations for Obtaining Food

Owls differ from other birds of prey, as they swallow their prey whole, digest the meat from the fur, bones, and feathers, and then cast up this indigestible residue in several cylindrical, felted pellets which are regurgitated once a day. Owls have no crop. Eagles and hawks, on the contrary, tear their food apart, rejecting the fur, feathers, and the larger indigestible parts before swallowing the nutritious parts. Because some of the food often remains as a barrier in the crop, stomach pellets are not regurgitated as often by eagles and hawks as they are in owls.

By dissecting coughed up pellets and studying the contained bones and other indigestible parts, scientists have discovered the presence of animals in places previously unsuspected. Owl pellets are safe to pick up. They only contain undigestible material, hence, do not smell or contain bacteria.



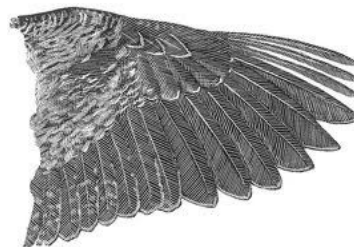
owl pellet

Feathers

An interesting adaptation in owls' wing feathers ensures the silent flight so valuable to a nocturnal predator. Owls excel at hunting and approach prey silently because the leading edges of exposed primaries possess comb-like projections and the trailing edges of the feathers are fringed, somewhat like a shawl. Their plumage is extremely soft and fluffy, facilitating silent flight. Their velvety feathers muffle the sounds of an owl's flight by reducing vortex noise emitted by the flow of air over the wings. Owls rely on this special feature as they make no warning sound in swooping down for a kill.



owl feather



typical bird feathers

Camouflage

Primarily, colours are useful to birds for concealment, recognition, courtship, and other social functions. Owls have a remarkable ability to utilize colour in a wide range of habitats. There are two types of camouflage. First, the female Snowy Owl uses disruptive colouration. This is a bold contrasting pattern of black and white markings on the head, neck, and back which optically breaks up the body into pieces. This disruption of the visible form of the bird helps prevent its recognition as a *bird* by a potential predator.

Second, the Eastern Screech Owl uses cryptic colouration. It stretches upward making its feather pattern look like tree bark, erects its "horns", closes its eyes, and perches snugly against an upright branch. The patterns of complex bands and spots causes the appearance of the owl to become part of its background.

Owl Calls

There are 11 different species of owls that can be found in Ontario. To find owls in Ontario, look for dense deciduous or coniferous forests at dawn or dusk. The best way, however, to observe owls is to listen for their calls instead of trying to see them up close. In fact, it is safer to listen for them. Owls are very territorial, especially during the breeding season. They vigorously defend their nest and surrounding feeding territory against other owls, other birds who compete for the same resources, and humans. Owls will attack you.

Owl calls are very species-specific so positive identification can be made by simply listening. Many owls vocalize at a distinctively low frequency, which allows their calls to travel long distances without being absorbed by vegetation. But not all owls hoot. Owls can make a wide range of other sounds, such as screeches, whistles, barks, growls, rattles, and hisses. Female owls generally have higher pitched voices than males. You can often hear owl calls up to a mile away.

Owls call for many of the same reasons other birds do - to claim and defend their territory, to attract mates, and to keep in contact with one another. Because most owls typically claim their territory and find mates during the winter, the best time to hear them is in January and February. But it is possible to hear owl calls year-round.

To respect and protect an owl's well being, please do not:

- Get too close. If an owl stares at you, elongates its body, or flies away, it needs more space.
- Be noisy. Noise will stress the owl and it could potentially leave its territory.
- Play owl recordings. This stresses the owl thinking another bird is nearby in its territory.
- Draw attention to it with a lot of people.

Nothing can be more exhilarating than hearing an owl call at night while sitting by a campfire or laying in your tent. Here are five common Ontario owl species that can be frequently heard and a description of their most common used call.

- **Barred Owl**

This medium-sized, bulky owl has, by far, the most recognized call of all Ontario owl species. It most often consists of three rhythmic phrases, with the last syllable drawn out the longest. It sounds like a raspy "Who cooks for you? Who cooks for you? Who cooks for you-aaalllllll?"

Also, unlike many other owls, the Barred Owl can be frequently heard throughout the day as well as night. It will be the first one you hear as night approaches.

- **Eastern Screech Owl**

This small owl has two main calls. One is a high-pitched, descending, almost horse-like whinny that it uses to defend its territory. The second is an extended, monotonic, high-pitched trill that sounds like a constant bouncing ball which is used to attract mates.

- **Great Horned Owl**

This very large owl has a distinctive deep, gravelly, 5-note "hoo" call that sounds like a muffled foghorn from a distance and made by both males and females. The higher-pitched female will call first. The second and third hoots in their series of calls tend to be the shortest.

- **Long-eared Owl**

This medium-sized, skinny owl has evenly spaced hoots, like the sound made by blowing across the top of a bottle. They are rarely heard except during breeding time. They will also make soft, low hoots and whistles, barks, and cat-like meows.

- **Northern Saw-whet Owl**

This very small owl gets its name from the sound it makes. One of their calls, a repetitive "toot-toot-toot-toot" whistle is used by males to define their territory. The call sounds like a saw being sharpened on a whetstone.



Barred Owl

Helping Wildlife - Projects in Conservation

All wildlife requires the following to survive - food, water, shelter, and space; the basic requirements for good habitat. You can help provide these requirements for animals whether you live near a woodlot, on the water, in the city, or even in your own backyard.

Scouters can try the following Projects in Conservation to help benefit wildlife:

- Make a Milk Carton Feeder; page 173
- Make a Suet Log Feeder; page 174
- Build a Hibernaculum; page 177
- Attract Snakes to Your Backyard; page 179
- Make a Turtle Nest Protector; page 182

Wilderness Survival

Nature and the elements are neither your special friend nor your special enemy. They are, in fact, totally indifferent to you. Your attitude and the skills you carry with you will determine whether you live or die in a survival situation.

Nobody expects to get lost and yet it happens frequently. Common sense and preparation are keys to enjoyable outdoor activities. Know your limitations.

Clothing

Wear clothes and footwear appropriate for the terrain and weather conditions you expect to encounter. Always wear or carry headgear (a neckerchief can serve as both a hat and as a sling or a bandage). If you run into bad weather, you will need to conserve body heat and more heat is lost through your head than any other part of your body. Remember: weather and temperatures can change very quickly.

Wool vs. Cotton

Cotton clothing is fine for hot, dry weather. Wool clothing is best in wet or cool weather as it retains warmth even when wet. Clothes made of cotton, such as blue jeans, are worse than useless when soaked and speed up the loss of body heat.

Foot-printing

"Footprint" members of your group before they set out on a wilderness trip. Place a sheet of tinfoil on a piece of soft material such as a towel. Have everyone put on shoes and step on the tinfoil and then mark each set of footprints with the individual's name. Make sure you repeat the procedure for each change of footwear. This way, if someone becomes lost, searchers will be able to distinguish his or her tracks from others in the search area. This will give searchers a clue to the person's direction of travel.

Avoid Fatigue

Slow down. Exertion uses up calories and creates perspiration which wastes body fluids. Both increase your susceptibility to hypothermia.

Shelter

The skill and knowledge to build natural shelters is the most important thing any Scouting Youth can possess. Why? Because adequate shelter is the most critical component for survival in the woods. You can carry many things easily on your person — even without a pack — the loss of which would be at least a serious inconvenience. Cutting tools, combustion devices, and containers can easily be attached to your belt, and cordage can be salvaged or carried in your pockets as well, but adequate shelter is another story.

If for any reason you lose your shelter or it becomes damaged, you must know how to construct one using the materials you have. There are many forms of natural shelters you can construct if you are without a decent tarp or tent. However, understanding what type of shelter to build and what materials to use is the key to maintaining your heat sources. Heat sources are places that are warmer than the things around them, so that heat moves out from them. Heat can be transferred the following ways:

- conduction - when two objects at different temperatures are touching each other heat flows from the warmer to the cooler object. If you have prolonged contact with any surface that is colder than your body temperature, you will get cold. Example; warming someone by transferring body heat through touch.
- radiation - heat in the form of waves from a heat source. It occurs when an object loses heat to its surroundings without physical contact. Example; a fire.

You can stay warm camping by keeping yourself dry, using insulation, and minimizing contact with the ground.

When building any natural shelter, the first consideration is the structural material that is available and workable in the area. Deadfall materials have the least impact on the environment, take the least physical effort, and are the least time-consuming to gather; however, you must ensure that they are structurally safe. Though they are dead, they may need to support considerable weight by the time you are finished. Any main supports (which should be at least 7.6 cm/3 inches in diameter) should be cut green, if possible. External framework not supporting total weight can be constructed from dead fallen material with little risk.

A variety of shelters can be fashioned using materials found in the woods and using natural formations such as caves or fallen trees. Tree branches are very helpful in providing shelter and warmth.

If the weather is fair and you can take advantage of a breeze, a lean-to style shelter is best (Fig. 21). You can make a lean-to by lashing a simple cross pole between trees. Add several more sapling at a 45° angle to the ground on one side, then weave in horizontal vines or cuttings. Once this is accomplished, waterproof the lean-to by adding more cuttings from bottom to top, layering them always with the growth upside down. This will allow water to be channeled away from the shelter. If any cuttings are placed as they grow, water will collect towards the joints and run down into the shelter. Avoid branches that can catch water or rain and drip inside the shelter.

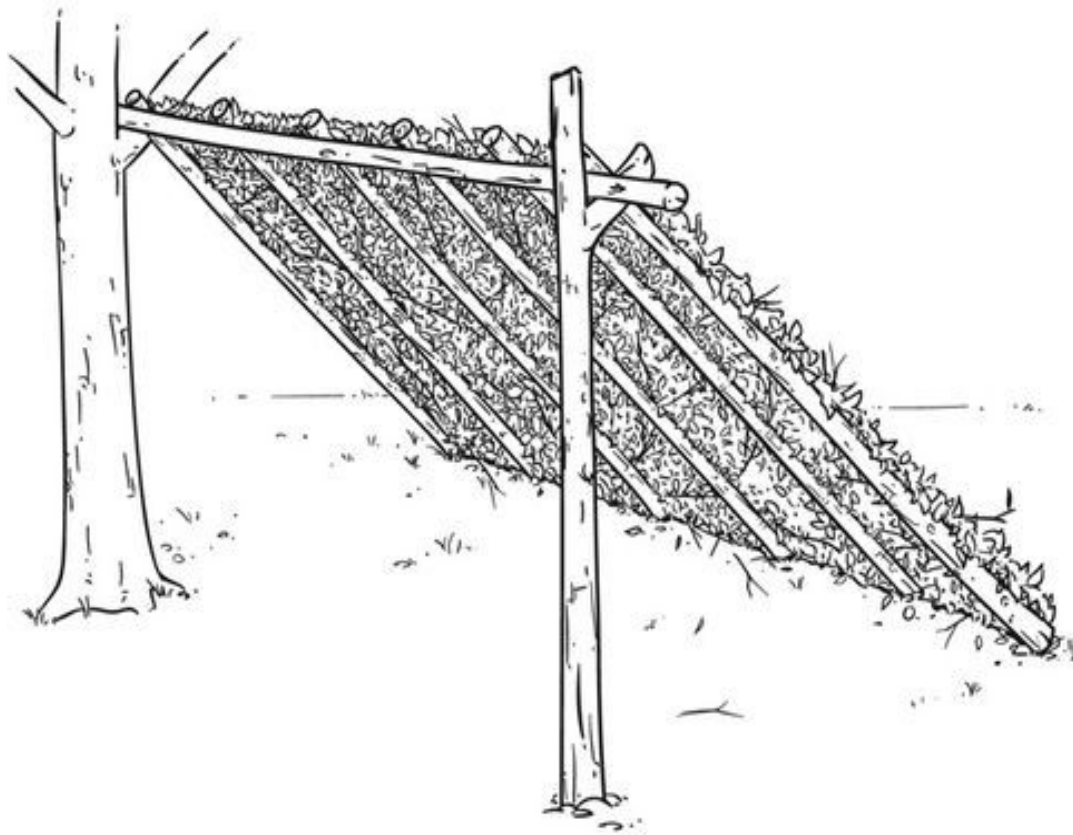


Fig. 21. Lean-to Shelter

For more inclement or stormy weather, add another side opposite to the first on to the lean-to shelter creating an A-frame shelter (Fig. 22) to deflect rain or wind from the two sides. Again, leave no branches or supports from the inside sticking out, or the shelter will collect water. The colder the weather, the thicker the thatching must be, and if you want it to have insulative value, it must be at least 1.0 m (3 feet) thick with leaves and debris.

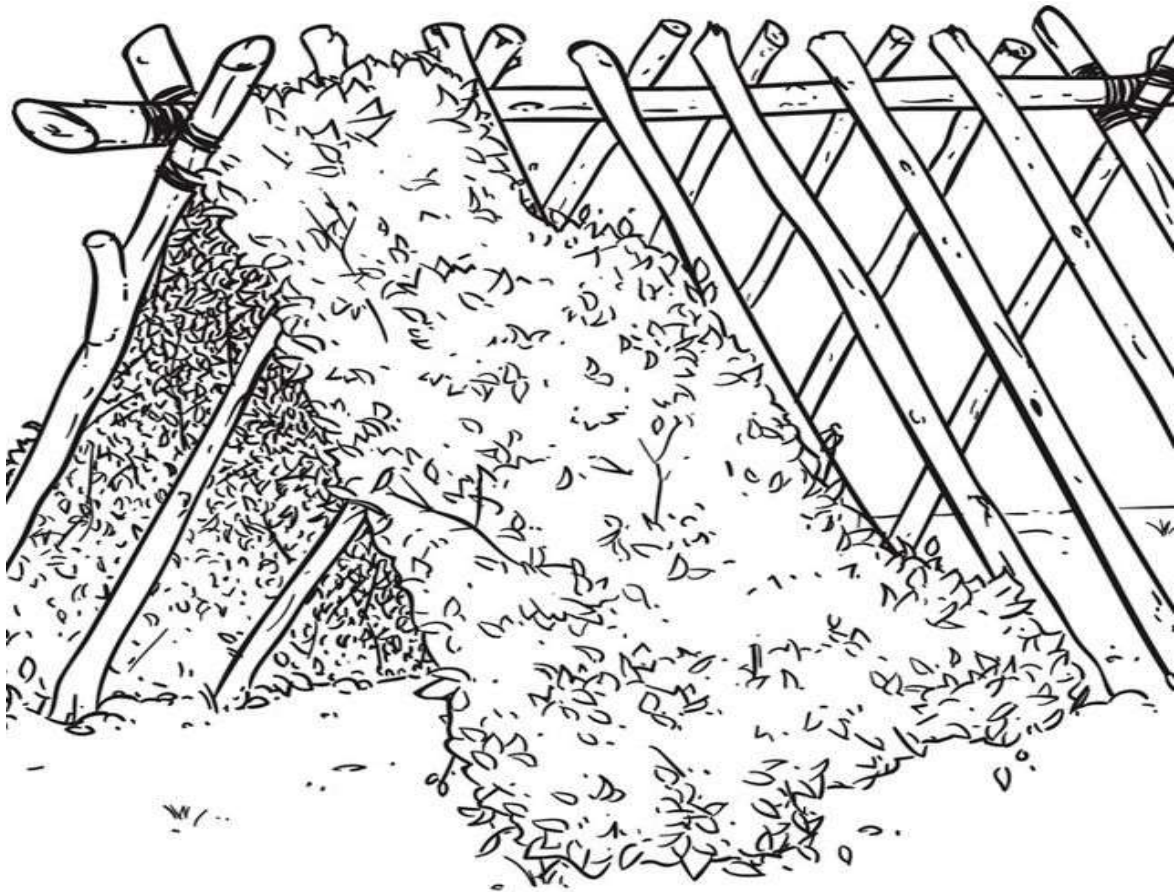


Fig. 22. A-frame Shelter

*******Be sure to check out the Making a Shelter activity on page 184.**

For the coldest of nights, especially if fire is not an option, a debris hut will be a necessity. This is a simple modification of the A-frame, with one end of the ridgepole on the ground creating a closed triangle shelter (Fig. 23) with a small opening (A). Once stable, cover the A-frame with a thick lining of insulative material such as leaves and debris. (B)

The key to these types of shelters is to remember that they only need to be large enough for you - and nothing more. You must restrict space in order to maintain heat on the inside, as it will all come from your body and stay trapped within. A bedding of leaves and debris on the ground of any shelter should at least 10 cm (4 inches) thick when compressed to avoid the effects of conduction (coldness from the ground). Once inside, you can use your pack to close the hole through which you entered, like a trap door.

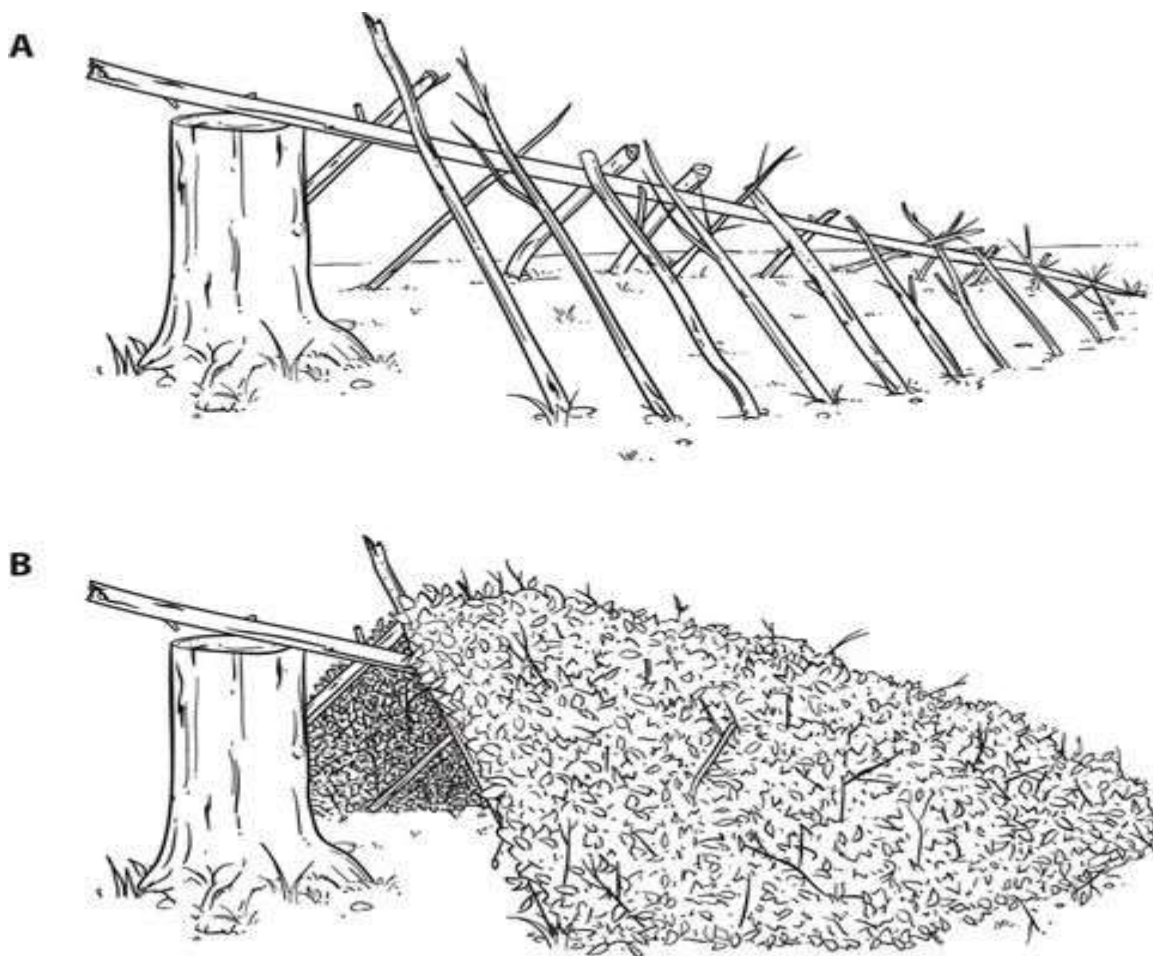


Fig. 23. Closed Triangle Shelter

Tips and Tricks for Smarter Coverage

- When using your tarp for sheltering on the ground in colder weather, use debris or snow to help insulate around the edges. This will reduce any convective breeze from entering in those areas.
- Hammocks make great chairs during the day when you set them up on a tripod lengthwise, with an open crossbar on the tripod.
- If your tarp requires reproofing for water-repelling properties, a simple solution is to rub the entire tarp with a bar made from two parts beeswax and one part tallow or lard.
- When using a browse bag as a mattress, if all available debris is wet, you can line the bag with a 55-gallon trash bag before stuffing to keep moisture from seeping through.
- Never sleep closer than one full step away from any fire to avoid bouncing embers.

Rules for Bush Travelling

Becoming lost or stranded in the wilderness is rarely the intention of a bush traveler; however, the possibility of such a mishap occurring is very real. For anyone planning to venture into the wilderness, the time to develop the attitudes and skills necessary for wilderness survival is now, before a mishap occurs.

A few precautionary rules which all bush travelers should abide by to avoid becoming lost are:

- Never wander into the bush without paying attention to your direction of travel (do not rely on someone else). Use a compass, or at least, determine your direction of travel by the position of the Sun.
- Become familiar with the area in which you intend to travel before entering the bush. Study topographic maps to determine the position of roads and major landmarks (rivers, etc.). Carry the appropriate maps with you.

- Never enter the bush without basic equipment. This consists of a knife and a flint stick (or waterproof matches), and a compass. A tin can to boil water is also advisable.
- Before venturing out, inform someone (preferably not your mother), where you are going and when you plan to return. The local police are a good choice.
- Despite all precautions, most regular bush travelers will, at some time in their life, become lost or stranded. If that happens, do not be afraid to admit that you are lost. It is no major tragedy. You will get out and probably without anyone else's assistance (or knowledge).
- **Do not allow yourself to panic.** It clouds the brain. In an unfamiliar and potentially dangerous situation, the seeds of panic can begin to grow in anyone. If you feel that you are on the verge of panic, **SIT DOWN**, then approach the problem in an orderly fashion. Review in your mind the details of the route that got you to where you are now. Now, try to remember landmarks, etc. Consult your map or try to recall the position of roads and rivers.
- Do not proceed unless you are sure that you have sufficient daylight to complete the journey out. Allow yourself plenty of time to construct a shelter. To determine the hours of daylight remaining, extend your arms out in front of you with your fingertips pointing in towards each other. Line your baby fingers up with horizon and count the number of fingers between the horizon and the Sun. Each finger represents about 15 minutes of remaining daylight.
- **Do not let the concern of others influence your decisions.** No one has ever died from worrying. Concern yourself only with your own immediate situation and let the others look after themselves.
- If you are not sure of where you are and you encounter a road, **do not cross it, follow it.** Even if the road is old and abandoned. It will lead somewhere.
- USE COMMON SENSE.

Water

Water is more important to your survival than food. You can survive approximately 30 days without food but only about three days without water. Dehydration will increase your susceptibility to fatigue and hypothermia. Your most reliable sources of water are lakes and streams. Most plants also contain drinking water. In Ontario, fresh water, in one form or another, is available everywhere and at any time of the year. A person's need for water is vital and at least 2 litres per day should be consumed per person. When attempting to obtain suitable drinking water remember:

- Streams or lakes with no sewage or industrial effluents upstream can be considered safe to drink as is.
- All water, no matter how badly polluted, can be made drinkable by boiling it for 10 minutes.
- By digging down in low lying areas, groundwater can often be found.
- Morning dew can be soaked up into a T-shirt (or other absorbent material) and wrung into one's mouth.
- **Do not eat snow.** It dehydrates rather than replenishes body fluids. Melt snow before consuming. A simple birch bark cup can be fabricated with a little imagination in which snow can be melted over a fire.



keep-calm.net

Fire Making

All methods of fire making (including matches) work basically on the same principle:

1. creation of a spark - the critical component in fire making is creation of a spark. The two methods that will be discussed herein are flint and steel, and the fire bow.
2. tinder - tinder is essential for catching the spark. The combination which works well is loose cattail fluff and finely shredded birch bark.
3. kindling & fuel wood - kindling consists of the small dead, dry branches at the base of all mature conifer trees. These will always be dry enough to use as kindling despite weather conditions. Fuel wood is the large logs that give off heat.

When choosing kindling and fuel wood to burn, "go to the live to find the dead". Basically, find any live, older, standing deciduous or coniferous tree and break off the lower, dead branches. You will know they are dead because they will "snap". If you cannot break them off, they are no good to you. Birch bark is amazing to use because it will burn if it is wet or dry.

Matches

Matches, when available, are an excellent tool for fire making, but they are not the only tool and they should not be relied on solely. Matches get wet, or, you simply run out. Other methods of fire making are not difficult. They can be mastered by anyone. But the time to master them is now, not when you find yourself stuck in the wilderness with a pocket full of wet matches.

Flint and Steel

By far, the easiest method of producing a spark is by running the blade of a knife along the edge of a flint stick. This method of fire making requires little practice before a reasonable level of proficiency is attained. Flint sticks can be obtained at army surplus stores and some sporting goods stores.

Flint sticks are compact, light, and can be easily attached to key chains or worn around the neck. A flint stick is a valuable tool for any bush traveler. Do not leave home without it.

Using a Firebow

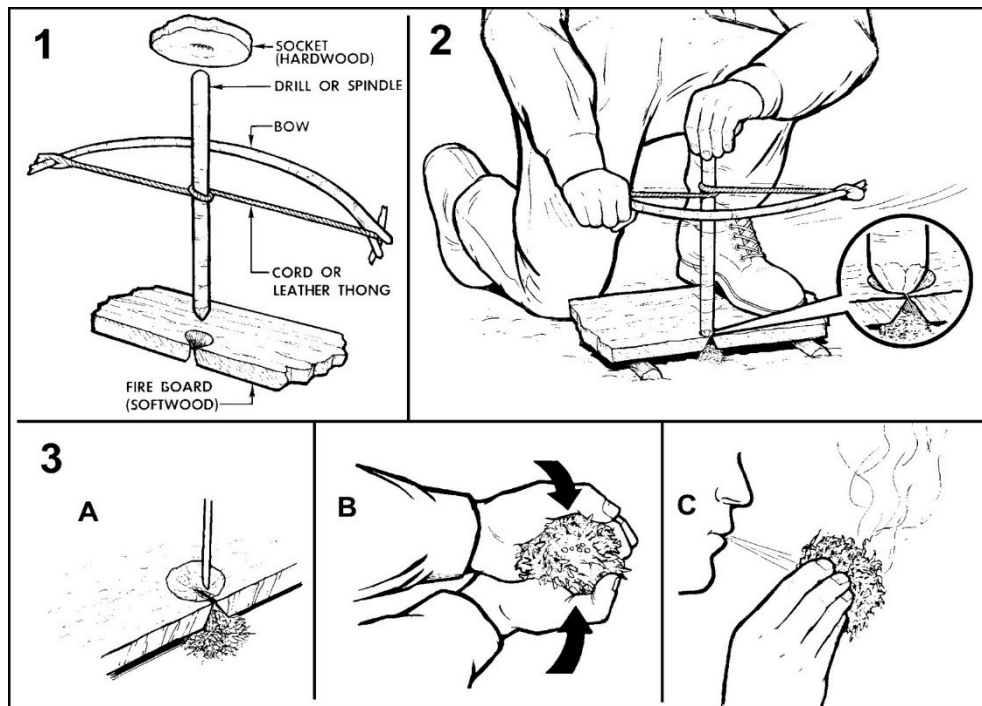
Using a firebow (Fig. 24) requires a fair bit of practice before a reasonable level of proficiency can be achieved. Once the technique is mastered, the bush traveler attains a new freedom, in that he can create a fire solely with materials found in nature. Even the bowstring can be fabricated, however, a shoelace or item of clothing is usually available.

The components of the firebow, consist of the top socket, bow and bow string, the spindle, and the fire board.

- top socket - this can be a rock or a piece of wood which has a small indentation whittled into it to accommodate the top of the spindle.
- bow and string - the bow can be made from any green branch (preferably willow) roughly 2 cm in diameter and 58 to 90 cm long. The smoothest and most durable bowstring is made from the round shoelace of a Kodiak boot. In a pinch, any type of string can be used. The bow should be strung so that the string is free from slack.
- spindle - basswood is the best by the "experts," (its soft) but black ash, red maple, and trembling aspen will work as well. The wood must be dry, straight, and about 2 cm in diameter and 15-25 cm long. The shaft should be whittled into a crude hexagonal shape (or any number of flat sides) and the ends slightly tapered into a blunt point.
- fire board - the most readily available suitable wood for a block is dead, dry cedar. This should be about 6 cm in diameter or more and split (with a knife or rock) to create a flat surface. A small depression is whittled on one surface to accommodate the spindle. A notch is cut into the fire board, which in part, joins with the depression.

*******After you make a fire, make some bannock to eat by checking out the Basic Bannock activity on page 185.**

Fig. 24. Using a Firebow



1. Twist the bowstring around the spindle (requires bending of the bow).
2. Place your left foot on the fire board, a few inches left of the depression and kneel on your right knee.
3. Hold the bow in your right hand and with the top socket in your left hand. Secure the spindle so it stands vertically on the bottom fire board (in the depression). The socket should be lubricated with fat, grease, or if nothing else is available, ear wax.
4. Start with gentle pressure on the spindle and easy back and forth strokes with the bow. This will cause the spindle to rotate rapidly in the depression. After about 30 seconds, the depression should begin to smoke; if not, stop and roughen the bottom tip of the spindle.
5. Once smoking starts, gradually increase speed and pressure until smoke begins to literally pour out and you can distinctly smell the wood burning.
6. At this point, rapidly remove the bow and block and place the glowing ember which you have produced, onto your tinder and gently blow into flame.

Hypothermia

Every winter in Canada, people die due to severe and continued loss of heat from the body, a condition known as *hypothermia*. Normal human body temperature is 38° C. In medical terms, a body is hypothermic if its internal temperature falls to 36° C. When body temperature falls to 33° C, the victim is semi-conscious. By the time the body temperature falls to 30° C, the victim is unconscious and will die, usually of heart failure, if not given immediate aid.

Often, the hypothermia process is so gradual that it is not perceived by the victim. There are a few signs to look for if a person is becoming hypothermic: shivering, incoherent speech, jumbled thought patterns, tiredness, stumbling, or loss of balance. The skin becomes pale, cool, and dry. The body becomes stiff and rigid as consciousness levels change. Further cooling leads to cessation of shivering, swelling of the extremities, decreased blood pressure, heart rate, and breathing rate.

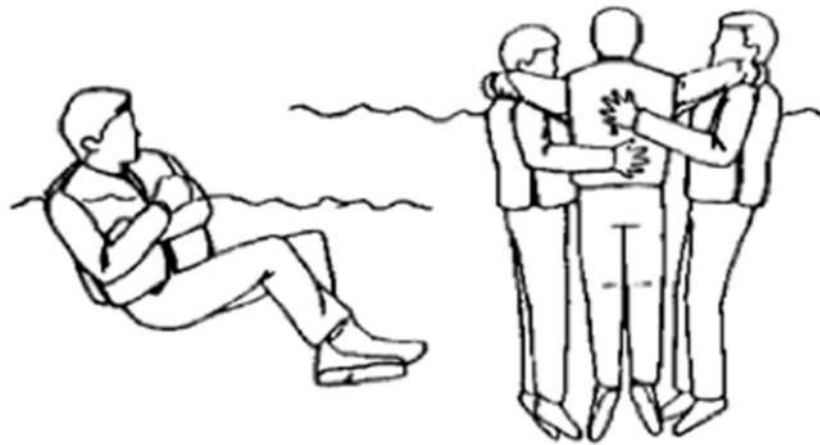
Cases of hypothermia happen most often during the winter, especially in blizzards and snowstorms. However, hypothermia also occurs when a person accidentally falls into very cold water, often while boating on warm spring days. The body loses heat 20 times faster when immersed in water than in air at the same temperature. The colder the water, the more rapid the heat loss. The body responds to protect itself against the rapid cooling; the heart pumps more rapidly and the body begins to shiver violently. Breathing becomes more rapid, inducing the dizziness related to hyperventilation.

Research has shown that survival time for adults in water at 10° C is no more than 3 hours. Because of their small size, children may be affected by hypothermia up to three times more rapidly.

To increase your chances of survival if you should fall into cold water, it is recommended that you follow these four guidelines:

- avoid movement; rely on the support of a life jacket;
- hold your arms close to your sides and pull your legs up close to your chest into the Heat Escape Lessening Posture (Fig. 25).

Fig. 25. Heat Escape Lessening Posture (H.E.L.P.)



H.E.L.P.
(Heat Escape
Lessening Posture)

HUDDLE
to maintain
body heat

- unless you are very close to shore, never attempt to swim because this speeds up heat loss;
- get as much of your body out of the water as possible by climbing onto the overturned boat or any other floating object.



Black Bears

The best way to avoid confrontation with a black bear is by taking these basic precautions:

- never store food in your tent;
- do not cook or eat in your tent;
- do not sleep in clothes worn while cooking as clothing absorbs food odours;
- store and carry food (and garbage) in airtight containers; do not bury garbage, as bears (and other animals) can easily dig it up;
- hang food packs (and your toothpaste) from a tree out of reach of bears and other animals, and away from your immediate camping area;
- never feed a bear;
- stay away from a mother bear and her cubs;
- make noise when you walk in the bush (wear bells on your shoes) to advertise your presence;
- avoid scented cosmetics - bears may be attracted to perfumes, hair sprays, and soaps.

If you do meet a black bear - freeze and do not look at the bear. Talk in a quiet, clam, monotone voice. If the bear does not leave, then continue to walk quietly and slowly back away avoiding abrupt movements and eye contact. If a black bear attacks, fight it off with any weapon you can lay your hands on, even if all you can do is kick or punch the bear. Do not play dead! This does not work with black bears. Do not climb a tree! Black bears can climb better than you. Do not run! You cannot outrun a black bear.

If a grizzly bear attacks, play dead. The recommended position is to lie face down on the ground and protect your head and neck by clenching your arms and hands over them. If you are wearing a pack, keep it on your back, it will help protect you. Do not move. With luck, the bear will quickly lose interest. If you can, climb a tree. Grizzly bears cannot climb trees.

Note: There are no grizzly bears in Ontario.



Orienteering

Map Reading

Teaching our Scouting Youth how to read a map is a survival skill that can be used both in a forest and in the city. The main concern, no matter where you are, is knowing that a person can navigate their way back to safety. More than ever, humans have become heavily reliant on technology. Phones and GPS systems are great (when they work!) but you cannot be fully dependant on technology when you are out adventuring. You need to know how to read a map when technology is not necessary, or even possible. Technology sometimes fails if you are in a remote area, or, it just dies.

Part of the natural knowledge is knowing where you are and where you are going. But this a spatial awareness that few children have because they are driven to school or around their community without ever having to find their own bearings. Understanding maps, and teaching children not to rely on sight alone for bearings, but rather to pay attention to what they feel, smell, or fear - *can prevent children from getting lost or help them find their way out.*

Besides helping to find a way, reading a map combines reading and math skills and helps build spatial sense and visual literacy. Maps provide guidance and navigation by showing what to expect and guides you in assessing specific routes.

Steps to Teach Map Reading

To begin the lesson, each Scouting Youth **MUST** have a map in their hands.

Start by asking the Scouting Youth what are the two common tools used when orienteering. The obvious answer is the map and compass. Emphasize that if you had to choose between the two as to which is more important; the correct answer is?? The map. A compass **ONLY** tells you where north is and gives you a bearing. A map has detailed information that gives you a picture of the land that you are navigating. In other words, it gives you the detailed features (landmarks) for what is ahead, for example, a stream, lake, hill, forest, road. That way, you see the whole picture.

Start the lesson by identifying the four basic parts that are **ALWAYS** on a map.

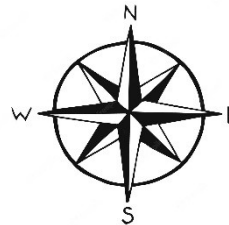
The Four Basic Parts of a Map

The four basic parts of a map include:

1. **title** - the title informs you of the area that you are navigating. You need to know where you are and where you are going. The title informs you that you have the BEST tool.
2. **legend** - a legend defines the features of a map by displaying a symbol followed by a word description of what the symbol represents. Understand the legend, understand the map. (The legend is also known as a key).
3. **north arrow** - for most modern maps, the north arrow is at the top. Sometimes, a compass rose is also displayed which shows the cardinal directions North, South, East, and West. The map orientation symbol allows you to understand how the map was drawn in relation to direction.



North Arrow



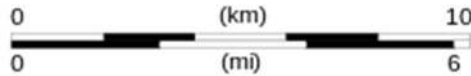
Compass Rose

An easy way for Scouting Youth to remember the order of the cardinal directions is by using the mnemonic "**N**ever **E**at **S**hredded **W**heat." Clockwise, this will give them: North, East, South, and West. So, if North is where the child's head points, east will be their right hand, South will be their feet, and West will be their left hand - NESW.

4. **Scale** - this is an abstract concept that Scouting Youth, at first, have difficulty understanding. Scale gives you the ratio of a distance on a map to the corresponding distance on the ground. Simply put, it gives context to the distance between two objects on the ground.

There are three different methods to show scale on a map:

- a. **graphic scale** - also known as bar scale, this type of map scale is a graphic format.



Graphic scale showing the ratio of map units to ground units. The top scale shows the comparable ground measurement in kilometers (km) and the bottom bar scale shows the comparable length in miles.

Not a recommended method to use/teach kids. Very confusing!

- b. **verbal scale** - this scale uses words to describe the relationship between a map and the landscape it depicts. The left side of the verbal is the unit of measurement on the map and the right side of the ratio is the unit of measurement on the ground.

For example, the verbal scale 1" = 1 mile means that one inch on the map represents 100 miles on the ground. This type of scale is sometimes confused with the representative fraction scale.

Not a recommended method to use/teach kids. The map reader needs a ruler!

- c. **representative fraction (RF) scale** - sometimes called a unitless scale, this scale is represented as a ratio of one unit to another (the units ARE ALWAYS the same). One unit on the map represents the second number of the same unit on the ground. So, if the ratio is 1:50 000, then:

1 cm on the map represents 50 000 cm on the ground

1 foot on the map represents 50 000 feet on the ground

1 pencil on the map represents 50 000 pencils on the ground

1 popsicle stick on the map represents 50 000 popsicle sticks on the ground

This is the recommended method to use/teach kids!

The four basic parts of a map are shown in Figure 26.

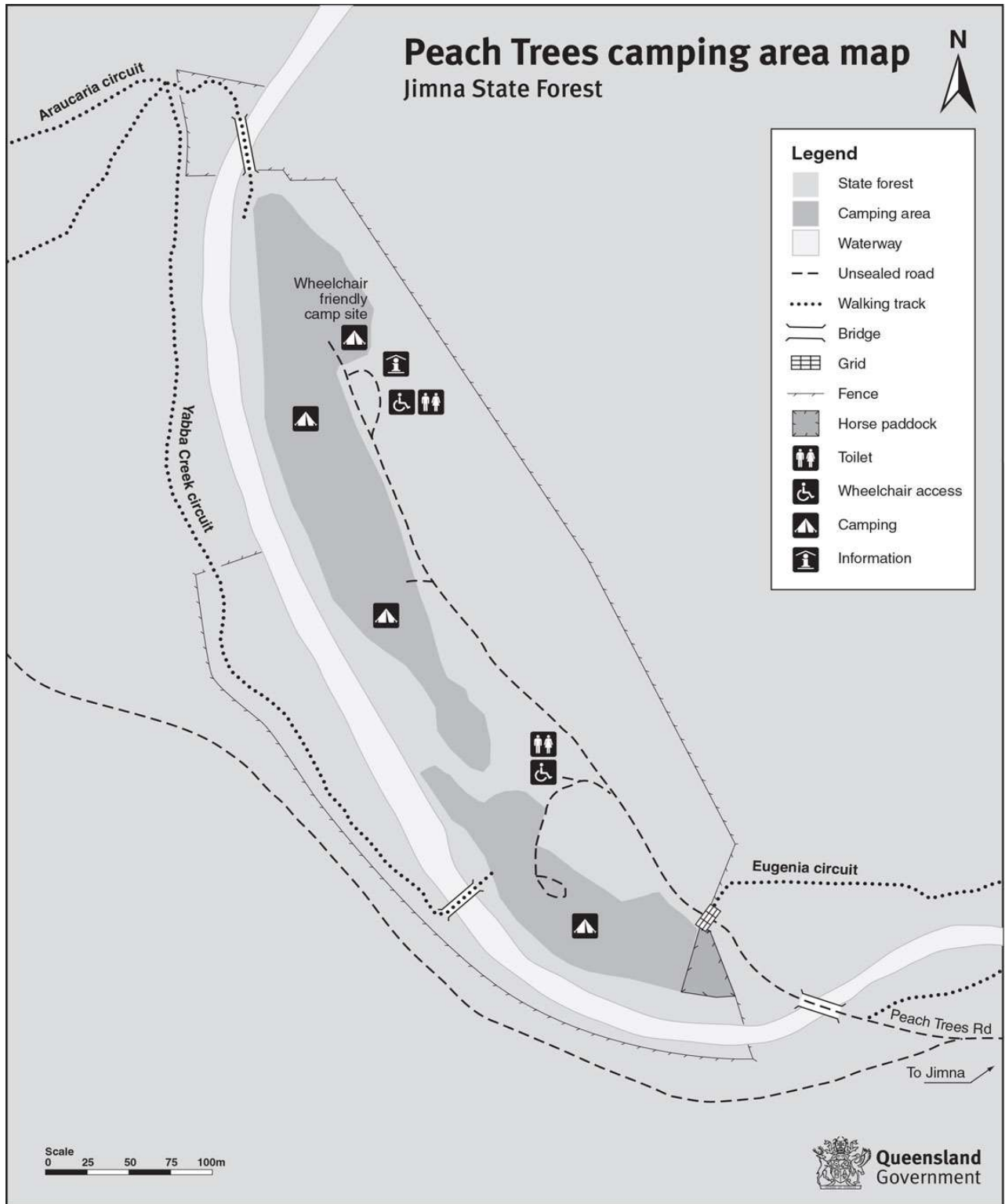


Fig. 26. The Four Basic Parts of a Map

Orienting the Map Outside

After explaining the four basic parts of a map, Scouting Youth now need to know how to align and hold the map while in the field. Orienting the map simply means **aligning the north arrow of the map with the physical north outside**. Once it is aligned, it should **always** point north. This is where it becomes a challenge for the Scouting Youth. It is a challenge because the Scouting Youth will be constantly changing directions during the activity. As soon as a Scouting Youth turns left or right, the map will change direction with them. So now, the map could be pointing east or west. **The map must always stay pointed towards north.** To ensure the map always points north, the Scouting Youth holds the map flat and pointed north, and then **moves their body around the map in the direction they want to walk.** This way, everything that is physically present in front of them appears the same way on the map.

*******Be sure to check out the Map Orienteering activity on page 186.**

Large-Scale Maps vs Small-Scale Maps

Maps are described as either large-scale or small-scale. Choosing the right scale is very important.

Small-scale maps show a larger geographic area with few details on them. **The smaller the scale of the map, the less detail will be shown.** A small-scale map expressed as a ratio will have a **larger** number to the right of the ratio. For example, a small-scale map could have a RF scale of 1: 1 000 000. Small-scale maps are typically used to show the extent of an entire country, region (such as topographic maps), or a continent.

Large-scale maps show a smaller amount of area with a greater amount of detail. **The larger the scale of the map, the better the features can be detailed.** A large-scale map expressed as a ratio will have a **smaller** number to the right of the ratio. For example, a large-scale map could have a RF scale of 1: 1000. Large-scale maps are typically used to show neighbourhoods, small towns, campgrounds.

To help visualize these two examples, a small-scale map that shows a river in a watershed may show the river features where the lines are smoothed out and the tributaries removed, whereas, the same map with a large-scale would show details of the twists and turns of the same river with the tributaries added.

An example to demonstrate why a large-scale map is better to use, let us assume the scale of a map is 1: 5000. A Scouting Youth looks at the map and sees that a flagpole is 1 cm away from their cabin on the map. This means that the flagpole is 5000 cm away from their cabin on the ground. If you do the math, there are 100 centimetres in a metre. That means that the flagpole is 50 metres away from the cabin. It does not seem that far away now. That is why it better to use large-scale maps.

Simple Tricks to Finding North When You Do Not Have a Compass

It is a no-brainer that if you are on a camping/canoe trip in the wilderness, a map and a compass are absolute musts for you to have. You should **never** venture "into the wild" without the aid of these two navigational tools. A compass could never replace a map, so if you *must* lose one, lose the compass. A compass only tells you north. A map tells you the distinctive features of the land.

There is a real sense of confidence and security that comes from knowing exactly where you are in the woods, and being tuned in with your surroundings. But getting lost happens. One of the main reasons why people get lost in the woods is simply because they are not paying attention. Most people move through the forest with their eyes focused squarely on the ground, usually only five or six feet ahead of where they are walking. People rarely stop to look around and notice the trees or distinctive features that are around them. And they almost never look behind them to see where they have been. So, if you have become lost and are trying to find your way around in the wilderness and you do not have a compass, do not worry.

There are five simple ways to figure out direction that only require your observation skills. These ways are 100% practical and rarely change in nature. They could save you from remaining lost. Do not try these at night-time. You should **NOT** be moving around in the woods when it is dark trying to locate where you are. You could fall and seriously hurt yourself and make your situation worse.

The following five recommendations can help find your way if you are lost:

- **Finding the North Star in the Northern Hemisphere**

Okay, this one you have to do at night. The North Star (Polaris) points true north. It is the last star in the handle of the Little Dipper. If you cannot find that, find the Big Dipper. The outer stars of the cup in the Big Dipper point right to Polaris. Finding the North Star will give you true north. Be careful in the dark.

- **Pay close attention to the Sun**

In the Northern Hemisphere, the Sun rises in the east and sets in the west so this will tell you which way is north and which way is south.

In the Northern Hemisphere, the Sun's highest point every day is directly south. The Sun will get higher in the summer sky than in the winter sky, but each day the highest point of its curve is always going to be exactly south.

- **Pay close attention to trees**

In the Northern Hemisphere, deciduous trees tend to grow on the south side of slopes; coniferous trees tend to grow on the north side of slopes. Use cautiously - not guaranteed.

- **Pay close attention to moss on trees**

In the Northern Hemisphere, particularly in deciduous forests, moss will tend to grow more on the north side of a tree trunk. Moss thrives in damp conditions. A north-facing trunk gets the least amount of Sun and consequentially will be the dampest area. Use cautiously - not guaranteed.

- **Pay close attention to flowing water**

In Ontario, all streams and creeks flow south. If you find a stream or creek, start walking south (in the direction the water is flowing). By following this route, you will eventually come to a town, and in the best-case scenario - Lake Ontario.

How to Use a Compass

A compass is a tool that shows the four cardinal directions (north, east, south, west) used for navigation and geographic orientation. It commonly consists of a magnetized needle which always aligns itself with magnetic north. The magnetic needle swings around the compass as you move, but the red end of the magnetic needle will ALWAYS point in the direction of north and the white end of the magnetic needle will always point in the direction of south.

When reading a compass, never use the directions "go right" or "go left". These are relative directions and differ depending on your location and direction. The four cardinal directions, north, east, south, and west, are constant directions and do not change.

The direction halfway between north and east is an intercardinal point and is called northeast. The other three intercardinal points are southeast, southwest, and northwest.

Parts of a Compass

It is important to understand the basic layout of a compass. The basic field compass features the following parts (Fig. 27). Most compasses include more.

Baseplate	clear, hard, flat surface on which the compass is mounted
direction-of-travel arrow	tells you which direction to point the compass when you are taking or following a bearing; point arrow to target, orient the compass, then read bearing in degrees
magnetic needle	a floating, magnetized needle; the red end always points to the magnetic pole
housing	it is a round, plastic container that rotates; filled with liquid and has the magnetic needle inside
north sign	when aligned in the orienting arrow reads 0° or 360°
orienting arrow	the non-magnetic arrow marked on the floor of the housing; it has an outline shaped to exactly fit the magnetized end of the needle and rotates with the housing when the dial is turned
degrees or bearing	on a dial around the housing that is rotated; the outer circle has 360 degree markings and the four cardinal points

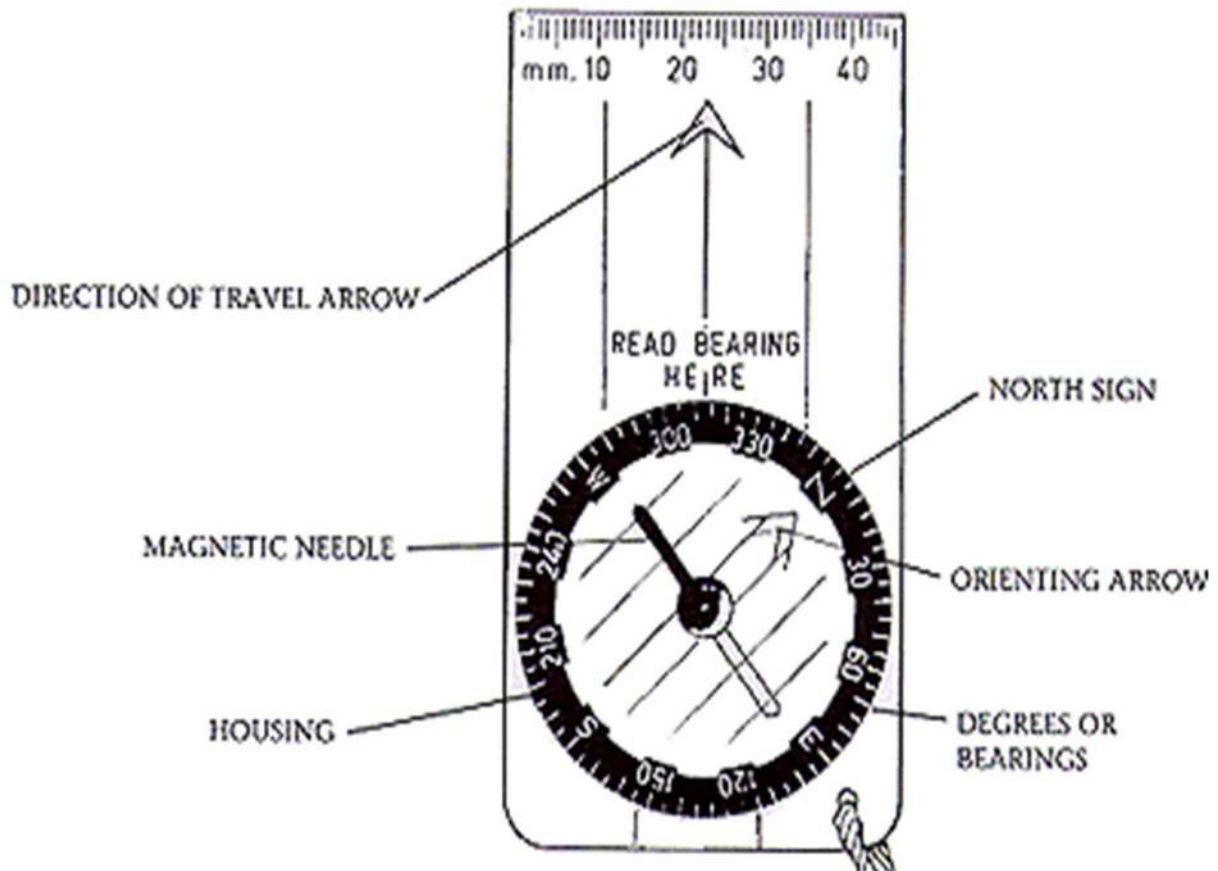


Fig. 27. The Basic Layout of a Compass

How to Read a Compass

To read your compass:

- Hold the compass steady and flat in your hand so the baseplate is level and the direction-of-travel arrow is pointing straight away from you; if the compass is tilted, the needle will touch the housing and not move correctly.
- Hold the compass about halfway between your face and waist in a comfortable arm position with your elbow bent towards your stomach.
- Look down at the compass and see where the needle points.
- Read the correct end of the needle.
- Keep the compass away from metal objects; a knife, your watch, a ring; all can cause a false reading if too close to the compass.

Taking a Bearing in the Field

A bearing is the angle of direction to your destination, measured in degrees. It is the most precise way to describe a direction. For example, when you need to find your way from one place to another, you need to use numbers to find out the bearing to that place. So, instead of heading in a direction of northwest to get to your campsite, you might follow a bearing of 315° . The direction you are going is called your heading. Heading and bearing are basically the same thing.

While holding the compass in your hand, turn your body while keeping the compass in front of you. Notice that as the compass rotates, the magnetic needle stays pointing in the same direction (north). Look on the dial of the housing of your compass. You will see numbers and tiny lines. These numbers represent the 360 degrees in a circle that surround you no matter where you are. So:

1. Start by finding a landmark that you can also identify on your map.
2. Hold the compass flat with the direction-of-travel arrow pointing away from you and directly at the landmark.
3. Now, rotate the housing until the magnetized needle is inside the orienting arrow. ("RED is in the SHED")
4. Look at the direction of travel arrow to read the bearing you have just made.

IMPORTANT: A very common mistake that beginners make occurs when they see the red end of the arrow pointing in a specific direction, they assume that is the direction they follow. That is not the case. Remember, to find your direction, you must turn the compass housing until the north (red) end of the needle is lined up in the orienting arrow on the floor of the housing. Now look at the direction of travel arrow to read the bearing you have just made. Remember: "RED is in the SHED".

As a point of reference:

- due east is 90°
- due south is 180°
- due west is 270°
- due north is 360° (also 0°)

*******Be sure to check out the Photo Orienteering activity on page 187.**

Being Prepared for Summer Sunshine

As summer approaches, we become drawn to the outdoors, enjoying the beautiful, sunny weather. While participating in various events and activities, we must also prepare ourselves against the health risks that can affect us while out in the sunshine. The primary concern today is the effects of ozone depletion and increase ultraviolet (U.V.) radiation striking the Earth.

Over the past few years, Canadians have been warned about the effects of long-term exposure to the Sun. This warning was the result of new information regarding the thinning of the ozone layer. This thinning is caused by the release of C.F.C. molecules into the atmosphere which break down the ozone layer. The main function of the ozone layer is to shield the Earth from harmful U.V. rays emitted from the Sun. The amount of U.V. radiation that affects us depends on such factors as:

- time of day - the most intense sunshine is between 11 a.m. and 2 p.m.;
- the season - the Sun is more intense in summer months;
- weather conditions - even on a cloudy day, 80% of U.V. rays still pass through the clouds;
- reflection from other surfaces - 17% on sand and 80% on snow;
- latitude - rays are closer to the equator
- altitude- the atmosphere filters less U.V. rays at higher altitudes;
- individual skin types - range from extremely Sun-sensitive to deeply pigmented;
- clothing - protects exposed areas;
- time spent in the Sun.

Ultraviolet rays are classified in three categories: UVa, UVb, and UVc. UVa rays penetrate deeply into your skin and your body has no biological defenses to combat them. They cause premature aging or wrinkling of the skin. They are also thought to be the cause of photo-sensitive reactions when taking some medications.

UVb rays attack the surface of your skin. They are thought to be the most damaging to your skin, producing painful burns and contributing to skin cancer. These are the rays that cause your skin to tan.

They stimulate melanocytes (cells in the outer layer of your skin), to produce melanin, a brown pigmentation. This browning is your skin's natural protection against further damage caused by burning.

UVc rays are completely filtered by the Earth's ozone layer and have no harmful effects. It is very important to note that the effects of UVA and UVB rays occur 12 months of the year and not just in the summer.

Probably the most confusing issue in dealing with how to protect yourself from U.V. radiation is interpreting and understanding the terminology. We hear about "S.P.F." and "U.V Index". S.P.F stands for Sun Protection Factor which is a numbering system designed to help you when purchasing the most effective protection for your skin type. S.P.F numbers range as low as 2, to as high as 60. The number represents a multiple of how much time you can spend in the Sun before you begin to burn. The higher the S.P.F. number, the greater the protection from burning. For example, using a sunscreen with a S.P.F. of 4 allows you to stay in the Sun four times longer than you could before you would start to burn without protection. An S.P.F. of 20, allows you to stay out in the Sun 20 times longer. Dermatologists recommend a sunscreen with a minimum S.P.F. of 15 for all skin types.

Environment Canada measures UVB rays (the ones that burn) on an index of 0 to 10. The higher the UVB number, the more UVB rays a person will receive and the faster they will burn. As sunnier weather progresses, you will begin to hear UVB Index readings on the radio or television with the weather report. The values represent the estimated time it takes for skin to burn on people who have light and untanned skin types (in other words, very fair people). If you have a darker skin type, then the time it takes for you to burn is somewhat longer.

U.V. Index	Category	Sunburn Time
over 9	extensive	less than 15 minutes
7-9	high	about 20 minutes
4-7	moderate	about 30 minutes
0-4	low	more than 1 hour

So, if the UVb Index reading was 8, and you have fair skin, then it takes only 20 minutes before you would begin to burn without protected skin. Using a sunscreen with a S.P.F. of 15 will allow you to stay in the Sun for 5 hours before you would begin to burn. If you have fair skin, so, you need to apply a S.P.F. sunscreen of at least 60. Anything above that is a waste of money.

When selecting a sunscreen, you have two choices, either physical blockers or chemical absorbers. Physical blockers reflect or scatter U.V. rays. These are the thick, white, or sometimes coloured creams and are very effective. Chemical absorbers are the most common sunscreens that smell nice. They absorb rays as they interact with the molecules of the sunscreen. Chemical absorbers are more effective if they are applied 45 minutes before exposure to the Sun. S.P.F. only measures the sunscreen's ability to filter UVb rays. The Food and Drug Administration has not yet established a rating system that recognizes UVA protection. Some sunscreens do provide UVA protection. Consumers should read the label carefully to ensure they are receiving 100% UVA and UVb protection. A Harvard study has shown that one severe sunburn received during childhood or adolescence increases your chances in later life of developing malignant melanoma, a deadly form of skin cancer.

Sunscreens however, are not sufficient protection. Doctors recommend that in addition to using sunscreen, you can further protect yourself by wearing clothing that is non-transparent to the Sun. It is important to note that some clothing lose their filtering capacity when wet. Hats, especially broad, wide-brimmed ones, offer protection to the head, ears, and neck area. The use of dark brown tinted or amber coloured sunglasses with 100% U.V. protection will protect your eyes. Sunglasses without a correct U.V. protective coating may do more harm than good because they allow the eye to dilate in sunlight but do not block the U.V. rays.

Although there is much effort and cost in preparing for summer weather, it is well worth the effort to protect yourself and your family (especially the campers!) from the harmful effects of U.V. radiation. It will certainly lead to a more enjoyable and healthy summer.

Being Prepared for Summer Bugs

Whether you are out camping, fishing, hiking or just stepping out into your own backyard, you need protection from insects such as mosquitoes, and biting flies. The warm weather, and fresh air is something that we all look forward to. Biting insects are not. The misery of biting insects can make our outdoor experience miserable and deter us from wanting to continue to enjoy the outdoors.

If you want to step outside in any situation and keep insect-biting pests at bay, then understanding how to be protected by finding a good insect repellent is crucial. Also known as "bug spray", a good insect repellent prevents any insect from landing or crawling on you.

Insect Repellents

In Ontario, the biting insects that annoy us the most include: mosquitoes, black flies, deer flies, horse flies, and ticks. Some of these insects can also inflict serious illness such as Lyme Disease, West Nile Disease, and Zika.

Insect repellents do not kill insects, but work to keep insects away from you. They only repel the insects that bite, not the insects that sting such as bees, hornets, and wasps. When there is a risk of getting a serious illness, such as Lyme Disease, it is important to choose a repellent that is effective. But it is only effective when it is applied correctly and safely.

Deet

Deet is an insect repellent that is used in products to prevent bites from insects such as mosquitoes, biting flies, fleas, and small flying insects. Deet is a colourless liquid with a faint odour that does not dissolve easily in water. It is considered a safe and effective means in preventing insect bites. Although it is unsure exactly how Deet works, scientists believe that some insects can detect people by their body chemicals and exhaled air. It is believed that Deet has an unfavourable odour which confuses insects and prevents them from locating humans. The concentration of Deet in a repellent indicates how long that repellent will be effective - the higher the concentration the longer it is effective.

For example, 10% Deet is effective for about 2 hours. A repellent with 30% Deet provides about 5 hours of protection. Deciding on which concentration to purchase is dependant on the amount of time you will be spending outdoors. For example, if you only plan to be outside for 1 hour, then 10% Deet would be sufficient.

When used on children, insect repellents should not contain more than 30% DEET. Insect repellents are not recommended for use on children less than 2 months old (use mosquito netting). Deet-containing insect repellents should not be harmful to children if parents follow the directions on the label to use the product safely. Some experts recommend against applying Deet and sunscreen simultaneously. This could increase Deet penetration into the skin. Deet should be applied at least 30 minutes later. It is recommended also that insect repellent sprays be used instead of lotions, as lotions can be rubbed deeper into the skin.

Regardless of which insect repellent you choose, it is recommended that you ALWAYS read the label and follow the instructions for application carefully.

Maximizing Effectiveness of an Insect Repellent

Again, it is ALWAYS recommended to read the label and follow the instructions for application carefully. Apply and re-apply an insect repellent according to the label instructions. DO Not overuse the product. Be sure to apply the amount of repellent indicated by the label. Using too much does not mean it is more effective. The effectiveness of the insect repellent can vary due to the following conditions:

- physical activity (leads to sweating);
- water exposure (washes off);
- air temperature (evaporation rate increases higher temperatures);
- your own attraction to insects (everyone is different).

Repellents and Children

Because children are always putting their hands in their mouths, the following precautions should be taken to use repellents safely:

- read and follow label directions to ensure proper use; be sure you know how much to apply;
- do not allow a child to apply insect repellent;
- do not apply to children's hands;
- after returning indoors, wash the child's treated skin and clothes with soapy water (or give them a bath);
- do not apply near eyes and mouth and sparingly around ears (it is recommended to apply the repellent to your own hand and then apply to the child's face);
- never use repellents over cuts and wounds, or irritated skin;
- be careful when applying to clothes; Deet, for example, may dissolve rayon, spandex, and other synthetic products (do not apply under clothing);
- do not spray in enclosed areas;
- avoid breathing any repellent in;
- do not spray around food.

Other Safety Tips

- choose repellents in the form of sticks, lotions, or unpressurized sprays;
- check label for warnings regarding flammability;
- do not use on pets or animals;
- most insect repellents do not work on lice or fleas.

Natural Insect Repellents

"Natural" insect repellent ingredients include citronella, geranium, peppermint, and soybean oil. All are approved for safe use but have been known to have limited effectiveness against biting insects. They only keep insects away for a short time. Synthetic repellents have been tested and proven to be more effective and longer lasting. Natural repellents require reapplication over several hours in order to be effective.

Natural repellents may be good if there is no serious risk against contracting a serious insect-borne illness. If there is a health concern, such as Lyme disease in an area known to have ticks, then Deet, picaridin, or other approved, effective products should be used.

Other products that are proven NOT to be effective as insect repellents include wristbands soaked in chemical repellents and ultrasonic devices that give off sound waves to keep insects away.

Other Ways to Protect a Child from Insect Bites

While it is virtually impossible to avoid all insects from biting you, the following recommendations can also reduce the risk:

- in the outdoors, dress your child in long pants, a light-weight, long-sleeved shirt, socks, and closed shoes;
- broad-rimmed hats can keep insects away from the face, especially if you spray the hat;
- avoid clothes with bright colours or flowery prints; they seem to attract insects;
- while in the outdoors, avoid using scented soaps, perfumes, or hair sprays; these attract insects;
- after being outside, check your child for ticks, especially behind the head in the nape; remove ticks safely.

Identifying Three Pesky Insects

Horseflies, deer flies, and black flies are blood-sucking insects that have proven to be a complete nuisance when enjoying the outdoors. A bite from these insects can be very painful and even contribute to transmitting infections. Horseflies, deer flies, and black flies are all active during the day. It is recommended to avoid wooded or forested areas on hot, humid days. All three can also become a nuisance when you are swimming. The shiny appearance of the surface water and swimming movement seems to attract them. The following table compares the differences between a horsefly, deer fly, and blackfly.

Table 5. Differences Between a Horsefly, Deer Fly, and Black Fly

Feature	Horsefly	Deer Fly	Blackfly
size (mm)	12-32	6-8	2-6
antennae	short, spiky, orange-red colour	antennae usually longer than head	short
colour	black, gray, pale yellow, white triangles on back	gray or light brown with yellow/black striping	black, very distinct arched body; gnat-like appearance
eyes	very large, brilliant, iridescent green-coloured compound eyes	large, often brightly coloured	large, compound
wings	usually lacking dark areas	large, clear with dark bands	clear, broad, large, fan-shaped

Ticks

A tick is a small organism that will bite to attach itself to the skin of a host to feed on the host's blood. Ticks belong to the largest group of organisms called arthropods, which includes insects. Like spiders, mites, and scorpions, ticks are classified as arachnids, having eight legs (Fig. 28).



Fig. 28. A Tick

Ticks find a host (primarily mammals) by detecting the animal's breath and body odour, or, by sensing the body heat, and moisture of the animal. A tick will find a place and wait for a host, usually along a well-used path. Here, it will rest on the tips of grasses, leaves, or branches by holding on with its legs. When a host brushes the spot where it is resting, the tick will climb aboard the host. Ticks crawl. They cannot jump or fly or drop from trees. Some ticks will attach themselves right away to the host while others will search out areas where the skin is thinner, like the ears.

Life Cycle of a Tick

Most ticks undergo four life stages: egg, six-legged larva, eight-legged nymph, and adult. After a tick hatches, it must eat blood at every stage in its life cycle to survive. At each stage, a new host must be found. In some cases, it can take up to three years to complete a tick's life cycle. Most die because they are unable to find a new host. A tick will vary in size throughout its life cycle (Fig. 29). An adult tick is about the size of an apple seed. Nymphs are about the size of a poppy seed, while larva are about the size of a grain of sand. Ticks are most active during the spring, summer, and fall months, preferring temperatures above 4° C. As an adult, the longer a tick feeds, the more engorged with blood it becomes. When a tick is engorged with blood, it can easily reach the size of a grape. Usually, ticks this size have stayed attached to your body for up to a week.

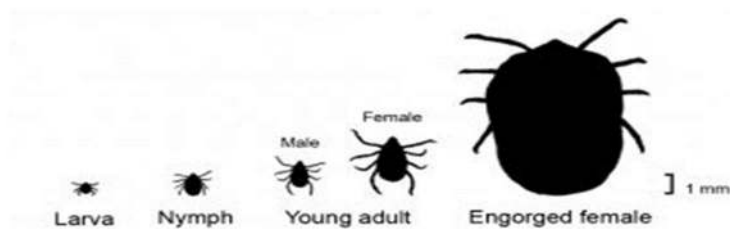


Figure 29. Relative Size of a Tick Throughout Its Life Cycle

How to Remove a Tick

It is very unlikely that you would even know there is a tick attached to you. If you have been out in wooded areas or patches of over-grown vegetation it is important to conduct a full-body check. It can be difficult to view your whole body, so either use a mirror or ask someone to assist you. Pay close attention to areas on your body that are warm and inviting to ticks, such as underarms, behind the knees, behind ears, inner thighs, in the belly button, or in and around any hair.

If you find a tick attached to your skin, simply remove the tick as soon as possible.

- use clean, fine-tipped tweezers to grasp the tick as close to the skin's surface as possible;
- pull upward with steady, even pressure; do not twist or jerk the tick as the mouth parts could break off and remain in the skin;

- after removing the tick, thoroughly clean the bite area and your hands with rubbing alcohol or soap and water;
- never crush a tick with your fingers; dispose of the live tick by putting it in alcohol, placing it in a sealed bag or container, wrapping it tightly in tape, or flushing it down the toilet.

If you develop a rash or fever within several weeks of removing a tick, seek medical attention:

- tell the doctor about your tick bite;
- when the bite occurred;
- where you most likely acquired the tick bite.

Ticks and Lyme Disease

Lyme disease is an infection caused by the bacterium *Borrelia burgdorferi*. This bacterium is spread by a tick bite. While there are many species of ticks, an infected black-legged tick (*Ixodes scapularis*) is primarily responsible for the spread of the bacterium that causes Lyme Disease. Not everyone, however, who is bitten by an infected tick will develop signs and symptoms of Lyme disease. In most cases, a tick must be attached for 36 to 48 hours or more before the Lyme Disease bacterium can be transmitted. If you remove a tick quickly (within 24 hours) you can greatly reduce the chances of getting Lyme Disease. The first sign of Lyme Disease is often an expanding round or oval red "bullseye" rash. If left untreated, people may experience neurological symptoms, heart problems, and have about a 60% chance of developing Lyme arthritis.

Protection From Ticks

In addition to tick repellents (Deet), there are other simple precautions that you can take to protect yourself from ticks:

- tuck your pants into your socks and tuck your shirt into your pants to minimize skin contact with a tick;
- avoid over-grown, weedy areas and tall grass in favour of wide, clear paths;
- if you enter a tick-infested area, check your clothes and body at least twice a day.

Stars in the Night-time Sky

In general, a typical star is an enormous ball of hot gases, produced by a nuclear reaction in its core, that releases enormous amounts of light and heat energy. Just as humans are born, grow up, and eventually die, scientific evidence shows that a star also has its own life cycle, which spans billions of years. Gravity is the force that does not only help create and build a star, but that ultimately causes it to die.

Individual stars are different. They differ in their mass, size, temperature, and luminosity (the amount of light they emit). A star's brightness to us on Earth may not be their actual brightness. Some stars that look dim are bright stars that are very far away. Distances between stars are so great, that scientists have developed measurement called a light-year to measure their distance from the Earth. A light-year is the distance that light can travel in a vacuum in one year. One light-year is equal to about 9.5×10^{12} km (about 6 trillion miles).

To help Scouting Youth understand the immense measure of distance in a light-year, if a Scouting Youth was standing on a star that was 10 light years away and waved to a Scouting Youth on Earth, it would take 10 years before the Scouting Youth on Earth would see the Scouting Youth on the star waving to them. Hence, when the Scouting Youth on Earth waved back to the Scouting Youth on the star, it would take another 10 years before the Scouting Youth on the star would see the returned wave.

Polaris (The North Star)

Polaris is probably the most well-known star in the night-time sky. Polaris is the brightest and last star in the handle of the Little Dipper (Fig. 30). Also known as The North Star, it is best known for staying nearly motionless in the sky while the entire northern sky moves around it. Polaris sits directly above the Earth's north pole along our planet's rotational axis. This is the imaginary line that extends through the planet and out of the north and south poles. Earth rotates around this line, like a spinning top. Because it always stays in roughly the same place in the sky, it is a reliable way to find the direction of north. Once you are facing toward Polaris, you know you are facing north, which can help orient yourself any evening you are out stargazing. As you face Polaris and stretch your arms sideways, your right-hand points due east, and your left-hand points due west. About-face from Polaris steers you due south.

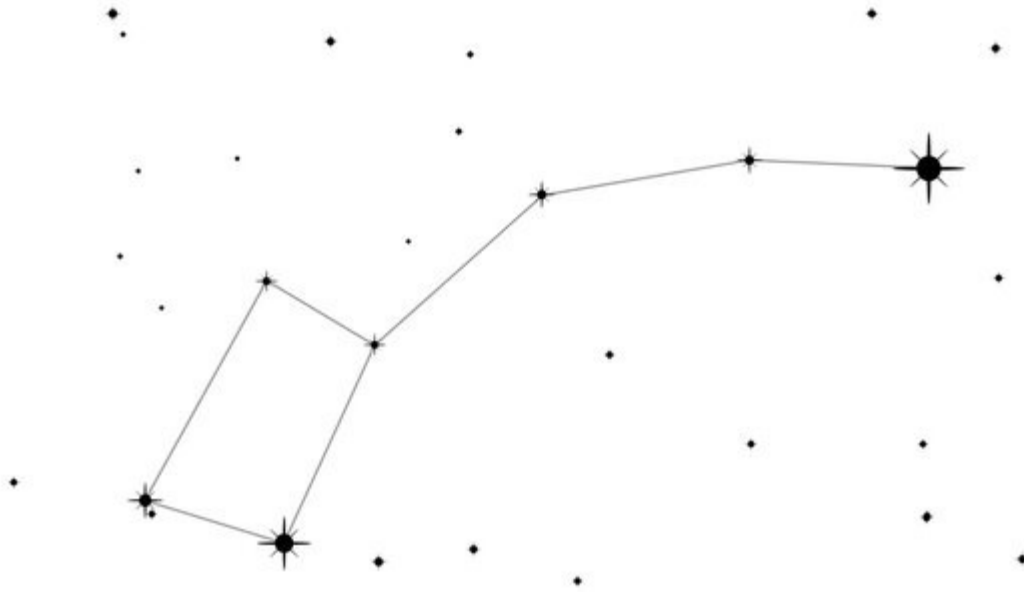


Fig. 30. Polaris in the handle of the Little Dipper.

Polaris is not the brightest star in the night-time sky, as most people think. It is only about the 50th brightest star. It is about 447.6 light-years from Earth. Fig. 31 shows the placement of the Big Dipper and the Little Dipper in the night-time sky. The following steps will help locate Polaris in the night-time sky:

- The first step is to find the Big Dipper. It is perhaps the most easily recognizable constellation in the night sky and looks like a "large spoon."
- It is composed of seven bright stars - three in the handle and four in the head of the spoon.
- Next, imagine the line connecting the two front stars of the Big Dipper. If you continue this line off to the upper right, the first bright star you come to is Polaris, the North Star.
- The Little Dipper sits above the Big Dipper and is angled as if it were pouring water in the larger "spoon" of the Big Dipper. Polaris is the last star in the handle of the Little Dipper.

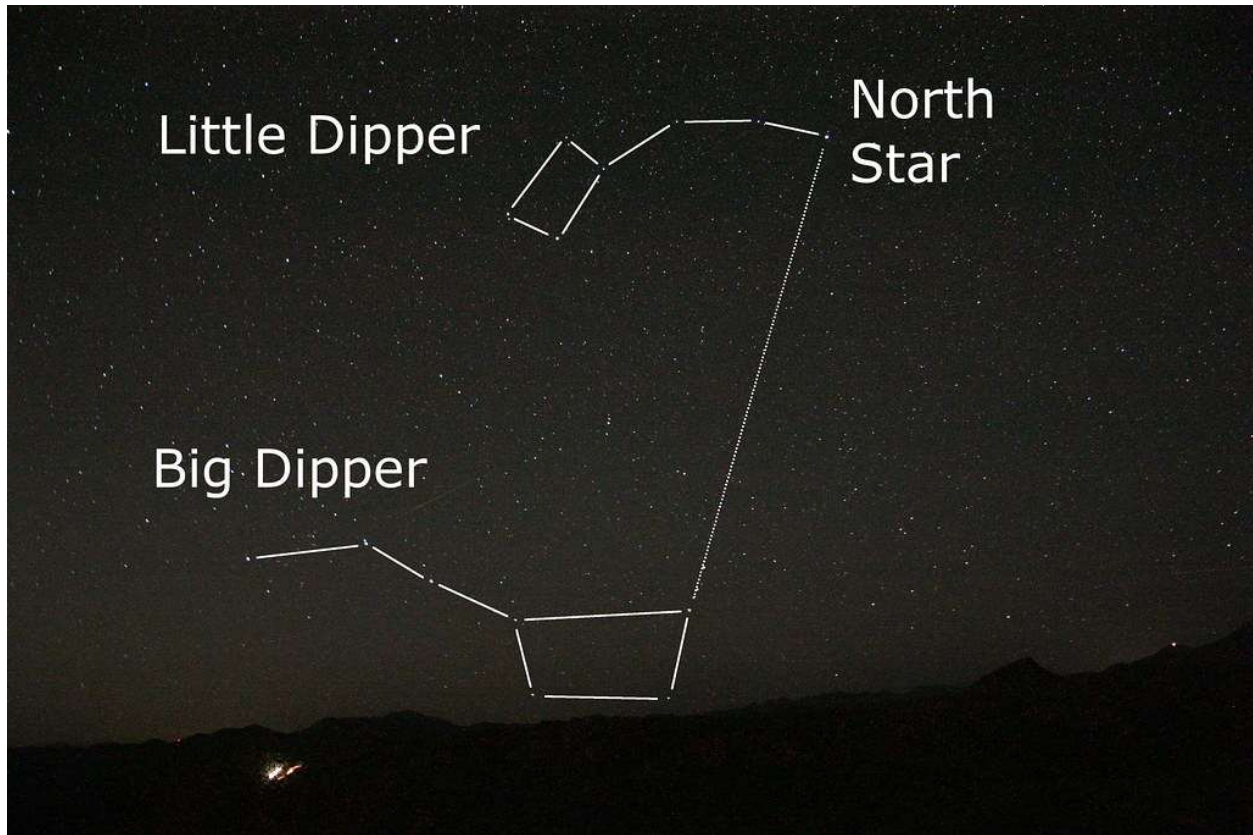


Fig. 31. Placement of the Big Dipper and the Little Dipper in the Night-time Sky

Constellations

Constellations are groups of stars that form recognizable patterns in the night-time sky. Since ancient times, people have imagined that groups of stars form pictures of animals, people, things, gods, and goddesses. The pattern of stars making up a constellation remains the same, night after night. Each civilization has named the constellations after important people or objects. Our modern naming system originates from Greek and Roman mythology. For example, Ursa Major means "Great Bear".

Although the individual stars look like they are close together, they are not. They are actually very far from each other and at different distances from Earth. Some constellations include Orion the Hunter (Fig. 32), Cassiopeia (Fig. 33), Leo the Lion, Libra the Balance, the Big Dipper (Ursa Major, the "Great Bear"), and the Little Dipper (Ursa Minor, the "Little Bear")

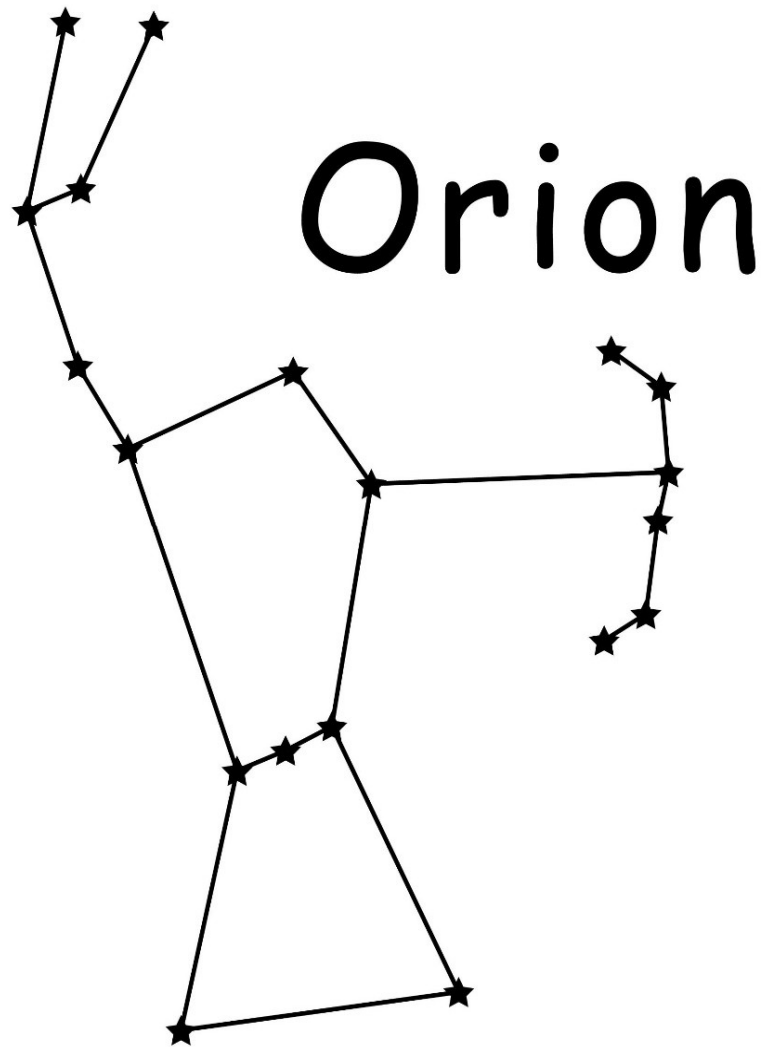


Fig. 32. Orion

Orion the Hunter is best visible in the night sky during the winter months of the Northern Hemisphere and summer months in the Southern Hemisphere. This ranges from October to March. In the northern hemisphere, Orion is found in the south-western skies. In the southern hemisphere, Orion is found in the north-western skies.

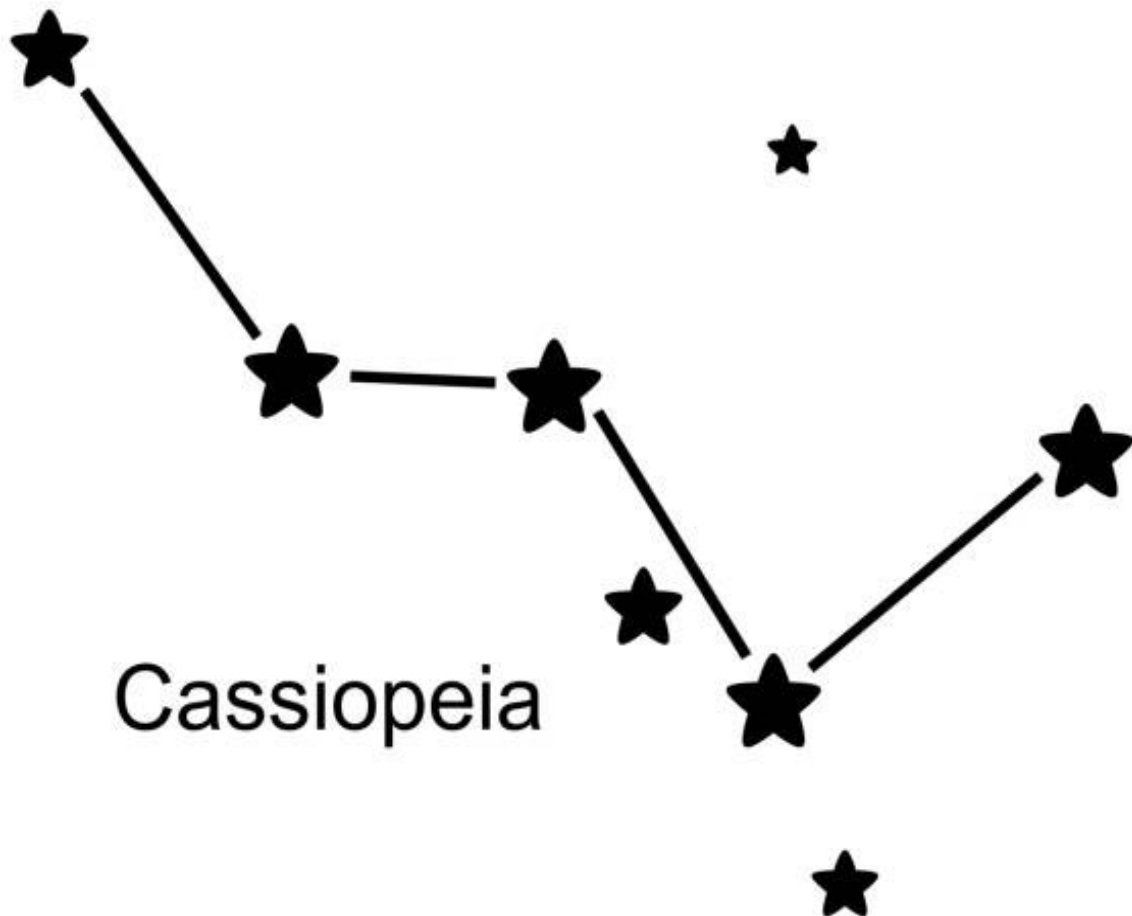


Fig. 33. Cassiopeia

The mythological queen Cassiopeia floats overhead in the night-time sky in fall and winter. The best time to see this constellation is in late fall, when she stands high in the northeastern sky during the evening hours. Cassiopeia looks like a flattened "W" against the frothy background of our home galaxy, the Milky Way.

The Moon

A natural or artificial body that orbits a planet is called a satellite. Our Moon, also called Luna, is Earth's only natural satellite. It is a light for the night. (The Moon itself does not emit light. The light we see from it is reflected light from the Sun).

The Moon is 3 476 km in diameter (1/4 that of the Earth) and has an average distance of about 380 000 km from the Earth. The Moon's mass is very small, and as a result, it has low gravity (about 1/6 that of the Earth). With a weak gravity, the Moon cannot hold an atmosphere; therefore, the Moon lacks weather, clouds, rain, wind, and surface water. Astronauts carry air with them on the Moon and communicate through radio because the Moon has no air to carry sound.



*******Be sure to check out the Lost on the Moon activity on page 188.**

Stream Study

Streams are bodies of flowing water moving in one direction due to gravity. Streams can be found everywhere—they get their start at a headwater, which may be a spring, snowmelt, a lake, and then travel all the way to its mouth, usually another water channel, a larger lake, or an ocean. The characteristics of a stream change during the journey from its source to the mouth. The temperature is cooler at the source than it is at the mouth. The water is also clearer, has higher oxygen levels, and freshwater fish such as trout can be found there. Towards the middle part of the stream, the width increases, as does species diversity—numerous aquatic green plants and algae can be found. Toward the mouth of the stream, the water becomes murky from all the sediments that it gathered upstream, decreasing the amount of light that can penetrate through the water. Since there is less light, there is less diversity of flora and lower oxygen levels.

Stream Invertebrates (Insects)

In shallow streams, the most common biological organisms studied are macroinvertebrates (insects) and fish. Macroinvertebrates are organisms that are large (macro) enough to be seen with the naked eye and lack a backbone (invertebrate). They inhabit all types of running waters, from fast-flowing to slow-moving streams. Stoneflies, mayflies, and caddisflies are three of the many types of macroinvertebrates found in a stream. They serve as an abundant food source for fish and other stream-dependent creatures.

A common adaptation for life in moving water is for invertebrates to attach themselves to the stream bottom. Larvae of blackflies and riffle beetles have sucker-like parts on the surface of their abdomens. Caddisfly larvae live in tube-like cases that can be secured to the bottom. Nymphs of stoneflies and mayflies are flattened and streamlined in shape and can attach themselves to the undersides of rocks without being swept away by the current. If there is sand or silt on the streambed, animals such as nymphs of mayflies and dragonflies may bury themselves in tunnels for protection. Few animals live on the surface of the water because the water is always moving.

Insects are the most abundant animals in a stream ecosystem. They rely on water to reproduce. Several species spend most of their life under and around rocks and vegetation until emerging as terrestrial or flying adults - sometimes for just one day - to mate and die. Eggs that are laid in water eventually develop into a nymph or larvae, and then through a process called metamorphosis, transform into an adult. Metamorphosis can occur in two forms. Complete metamorphosis involves the development from egg to adult in four stages, none of which look like another. Incomplete metamorphosis is the development from egg to adult occurring in three stages: egg, nymph, and adult. The time it takes for each species to undergo metamorphosis varies. The stonefly, for example spends 1 to 3 years in the nymph stage.

Aquatic invertebrates are good indicators of stream quality because:

- they are affected by the physical, chemical, and biological conditions of the stream;
- they may show the impacts from habitat loss not detected by traditional water quality assessments;
- they are a critical part of the stream's food web;
- some are very intolerant of pollution and therefore water quality indicators.

Samples of 24 stream invertebrates, along with pictures and identification features, can be found in the Appendix on pages 226-229.

Stream Vertebrates (Fish)

Larger animals like trout and smaller fish are predators that snatch up floating or drifting insects, or those less firmly attached to the streambed. These animals seek out sheltered "holes" or other areas protected from the direct current in order to use less energy to stay in the same place. If they ever stop swimming, they will be carried away with the flow.

Fish are adapted in colour, form, physiology, and behaviour in order to survive in a stream. Fish that swim in fast water have a stream-lined shape and are round in cross-section. This shape helps the fish to swim by making it easier to push water aside around the fish's body. These fish have well developed muscles, which are needed to swim against the flow of the river.

There are also fish that are found in fast moving water that seldom swim. These include darters and sculpins, who both possess large, sturdy pectoral fins which they use to prop themselves between stones to avoid being carried by the current. These bottom dwellers are usually laterally depressed with underlying mouths, and eyes positioned on top of their heads. Bottom dwellers also have reduced swim bladders (or none at all). These buoyancy-regulating organs are of no use to a fish that does not rise to the surface of the water.

Bottom dwelling fish are very well camouflaged with their environment. Their light colours and markings blend in perfectly with their surroundings. The mottled sculpin can change its mottled pattern from dark to light when the background changes.

Identifying Fish

When identifying fish, specific vocabulary is used to describe the external body parts. These body parts are common to most fish. Fish are grouped according to their outside body parts, specifically the number and location of fins, and body shape. The difference in the body parts is what distinguishes one fish from another. Their similarities are used to classify them into specific family groups. Common external anatomical features of a fish can be seen in Fig. 34.

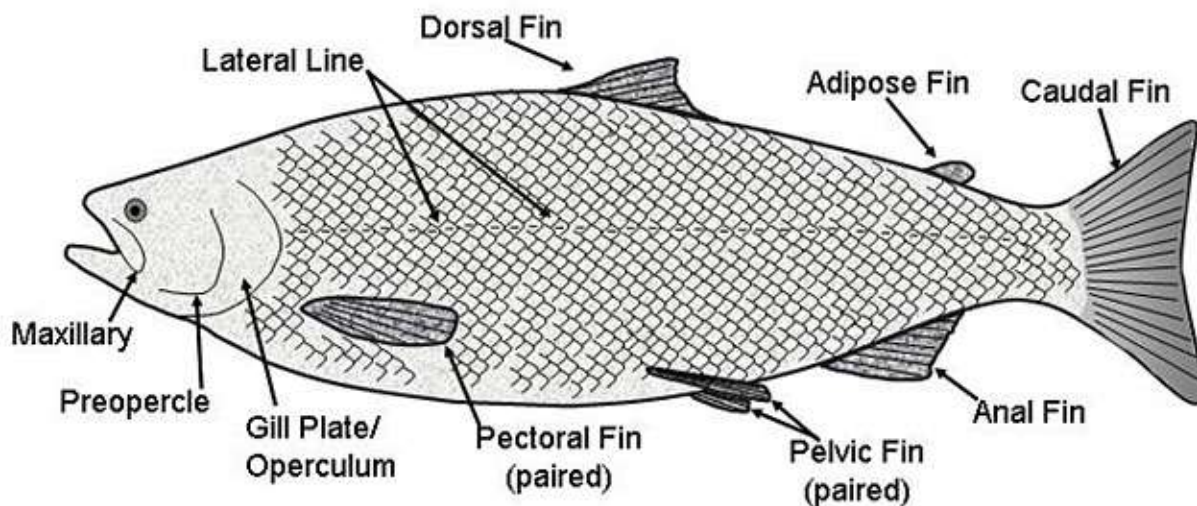


Fig. 34. External Anatomy of a Fish

A specific family of fish will have physical traits, called distinguishing characteristics, that set it apart from other fish in other different families.

These characteristics are adaptations that help fish survive within a specific environment. For example, fish in the pike family have a long, slender body with very sharp teeth. Fish in the bass family are characterized by having bands of teeth on the roof of the mouth and tongue, as well as on the jaws. Bass also have two separate or only slightly connected dorsal fins.

Most fish caught in a stream are members of the minnow family. Many people incorrectly refer to any small fish as a minnow. The term "minnow" refers to a family of fishes, not the size of a fish. Members of the minnow family are characterized by:

- elongated bodies;
- a single dorsal fin;
- no adipose fin;
- toothless jaws (but they do have teeth in their throat).

Members of the minnow family range in size from 12 mm to 3.0 m (9.8 feet). The largest member of the minnow family found in Ontario is the carp.

Another family of fish found in a stream that is important to anglers are fish in the salmon/trout family. Members of this family are typically referred to as salmonids. Salmonids have slender bodies, with small, rounded scales and their mouths contain a single row of sharp teeth. Salmonids typically have fins that lack the stiff spines found on fins of some other fishes. The dorsal fin is located about midway on the back with the pelvic fins being placed far back.

Common to all salmonids is an adipose fin. This is a small, fleshy, flap of skin located on top of the fish between the dorsal and tail fins. While the adipose fin was traditionally regarded as vestigial (no actual function) it is now believed that this fin can help the trout sense movement and sound in the water around them. The adipose fin is only found on salmon, trout, catfish, and whitefish.

Stream Conditions for Trout

Water conditions are of the utmost importance if you expect to find trout in a stream. The following conditions are critical to a trout's survival in a stream:

- water temperature (10° C minimum);
- oxygen content (5 mg/L minimum);
- rate of flow (velocity).

Not only are water conditions critical to a trout's survival, but good habitat is equally important. Trout require:

- variety of depths; pools, riffles (species specific);
- proper substrate (bottom type);
- available cover; forested areas along streams (known as riparian areas).

*******Be sure to check out the *Factors Affecting Rainbow Reproduction* activity on page 191.**

Parr Marks

When viewing a young salmonid from the side, a series of dark, oval, vertical markings are visible (Fig. 35). These are called parr marks. The presence of these marks suggests that the trout is in its first year. Sometimes, fish at this stage in their life cycle are also referred to as fingerlings. For the sole purpose of being biologically accurate, these fish should not be referred to as "minnows".

Parr marks are a form of camouflage. The marks serve to break up the outline of the fish so that it blends in easily with the gravel and shadows in a stream. At this stage in their life cycle, the young fish are actively feeding and the parr marks help to deter predators that are in the water. The speckles on the young fish's back also serve a similar function to deter predators from above. Parr marks fade as the fish grows.

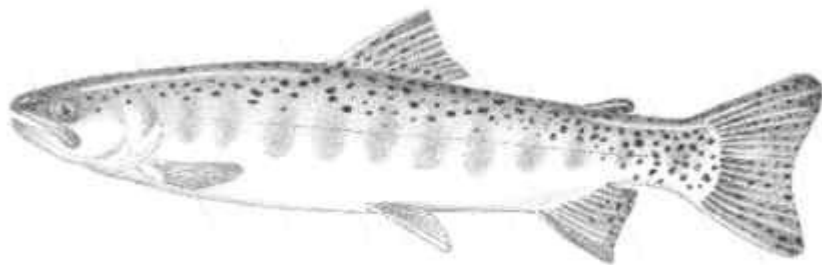


Fig. 35. Parr Marks on a Salmonid

Samples of 14 stream fish (including trout), along with pictures and identification features, can be found in the Appendix on page 243.

*******Be sure to check out the *Stream Study - A Biological Assessment* activity on page 195.**

Weather Dynamics

The Earth's Physical Systems

A system is any collection of interacting objects. The Earth can be thought of as a single physical system, however, it is necessary to subdivide the world into smaller systems. The Earth is divided into four major systems that include the atmosphere, hydrosphere, lithosphere, and biosphere. The hydrosphere and atmosphere have the greatest effect on weather systems.

The Hydrosphere

The hydrosphere comprises all the water in the atmosphere and on the surface of the Earth. This includes all bodies of water, glaciers and icebergs, water vapor, and clouds.

The Atmosphere

The atmosphere is an envelope of gases surrounding the solid surface of the Earth. It is divided into five layers:

troposphere - extends from the Earth's surface up to about 10 km. All the interactions that involve heating the air and creating wind effect occur here.

stratosphere - the region of rising temperature, that extends to about 50 km.

mesosphere - the region of decreasing temperature, that extends to about 90 to 100 km, where temperature levels off at a frigid $-90^{\circ} C$ to $-100^{\circ} C$.

thermosphere - at an altitude of 100 km, the temperature begins to rise and becomes much higher than at any other level. At an altitude of 150 km, the temperature reaches $180^{\circ} C$, and at 500 km, a temperature of $600^{\circ} C$.

exosphere - the thin outermost layer of the atmosphere. Typically, the beginning of space as so few particles are there (mainly hydrogen).

Forms of Energy

The most important source of energy for the Earth is the Sun. The Sun's radiation provides the power to set in motion most of the physical processes important to life.

The total amount of energy in the universe remains constant. Energy cannot be created, nor destroyed, however, it can be converted from one form to another. The two forms of energy most important to someone in the outdoors are:

radiant energy - energy in the form of heat from the Sun that heats the atmosphere.

heat energy - energy resulting from the random motion of the atoms and molecules of substances.

Energy is commonly measured in units called calories. A calorie is the amount of energy required to raise the temperature of 1 mL of water from 14.5° C to 15.5° C.

Heat Transfer

Heat sources are places that are warmer than the things around them, so that heat moves out from them. Places cooler than the things around them to which heat moves, are called heat sinks. Heat always moves from warmer places toward cooler places. For example, heat moves from a hot stove (heat source) into a cooler teakettle (heat sink). Heat can be transferred the following ways:

conduction - when two objects at different temperatures are in contact, heat flows from the warmer to the cooler object.

convection - the vertical rise of heat energy through a gas or a liquid by the motion of the particles in the fluid.

radiation - energy that enters the Earth's atmosphere as heat in the form of waves from the Sun.

Solar Energy and Weather

Solar energy interacts with water, solid ground, and air to cause different weather processes. The differences between the mechanisms for the warming of water, land, and air result in a variety of different temperatures for substances on or above the Earth's surface.

Heating Water

The type of interaction between solar radiation and water depends on the state of the water:

- fresh snow reflects up to 90% of incoming radiation;
- ice reflects about 50%;
- water reflects only 7%.

Although 93% of heat radiation is absorbed by water, the temperature remains relatively constant. This is because water has a large specific heat capacity, that is, the amount of heat required to raise the temperature of 1 g of a substance 1° C.

Heating Dry Land

Dry land has a smaller specific heat capacity than water, and therefore dry land will heat more readily. For example, if sand and water are exposed to the same amount of radiant energy, the temperature of the sand will increase five times as much as the temperature of the water.

Heating Air

After the land and water absorb radiant energy, the air is heated by conduction and convection. Energetic molecules in land or water collide with molecules in the air that are close to the surface. These collisions give the molecules in the air some of the energy. Then, as the lowest layer of air warms, it expands, becoming less dense. So, as the warm air rise, cooler air descends and takes its place close to the ground.

The Formation of Wind

Uneven heating of air creates wind. When air is heated, the molecules in the air move faster and collide with greater forces. Consequently, they push each other further apart, making the air less dense. If cool air is located beside the warm air, the cool dense air exerts pressure on the warm, less dense air, and pushes it upward, out of the way. This movement of air is called wind.



Relative Humidity

The air is said to be humid when it contains a lot of water vapor. At any given temperature, the air can hold only a certain amount of water vapor. Warm air can hold more water than cold air. When the air holds all the water vapor it can, it is said to be saturated. The amount of water vapor that the air would contain (if it were saturated) divided by the amount of water vapor in the air (absolute humidity) is called relative humidity (expressed as a percentage).

At a relative humidity of 100 percent, water vapor usually condenses to liquid water. The temperature at which water vapor condenses is called the dewpoint. As air rises during convection, it cools. When it has cooled to the dewpoint, the water vapor in the air condenses to form a cloud. To form clouds and rainfall, a steady supply of moisture must be evaporated into the atmosphere for several hours.

The Precipitation Process

Precipitation is the collective name for moisture in the liquid, supercooled, and solid forms that fall from the atmosphere. Precipitation can occur in three different forms:

The following lists the common types of precipitation and gives their meteorological definitions:

drizzle - precipitation in the form of very small droplets of water which appear to float

hail - lumps of ice generally showing concentric layers of clear and opaque ice

snow - white or translucent ice crystals usually of branched hexagonal or star-like form frequently interlocked to form large flakes

rain - precipitation in the form of water droplets larger than drizzle

ice pellets (sleet) - transparent or translucent pellets of ice that are spherical or irregular, that bounce when hitting hard ground making a sound on impact

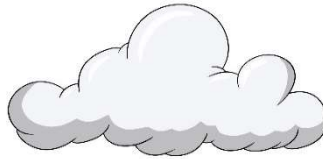
frost - feathery crystals of ice that form when water vapor in the air condenses at a temperature below freezing



Clouds

Clouds are condensation forms that develop above the ground, usually by the lifting and chilling of moist air. Although clouds seem to appear in many varieties, they can be categorized in three general types and are recognized as falling into three altitude classes:

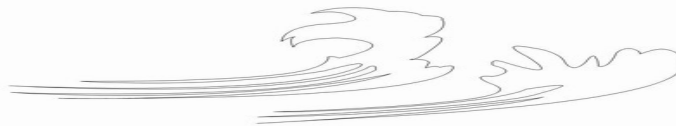
1. cumulus (piled or heaped up) - has vertical development, appearing puffed up and billowy, with flat, even bases. They usually appear in groups, developing in a dry, clear, summer sky. May cause precipitation. Found below 2000 metres.



2. stratus (spread out or stretched in layers) - they form in seemingly endless layers that have no shape or form because they are flat. May cause precipitation. Found below 2000 metres.



3. cirrus (curly) - composed of ice crystals that form thin filaments, wispy puffs, or translucent veils. Found below 8000 metres.



*******Be sure to check out the *Classifying Clouds* activity on page 199.**

In addition, the term "nimbo" or "nimbus" is used as a prefix or suffix to indicate clouds producing precipitation, resulting in such names as nimbostratus or cumulonimbus.

Air Masses

It is to be expected that the air from widely separated and different parts of the Earth might show very different kinds of weather. It is perhaps less obvious, that where these different kinds of air meet, additional areas of poor weather often occur.

Although air is usually in motion (due to convection), large portions of air often remain in the same place long enough to take on the temperature and moisture characteristics of the land or ocean below. An air mass is a large section of air that is nearly uniform in temperature and humidity. Figure 36 shows the six different air masses that influence Canadian weather.

To properly describe an air mass, at least two terms are used:

- a term to describe its relative moisture content (dry or moist)
- a term to describe its relative temperature (cold, temperate, or warm)

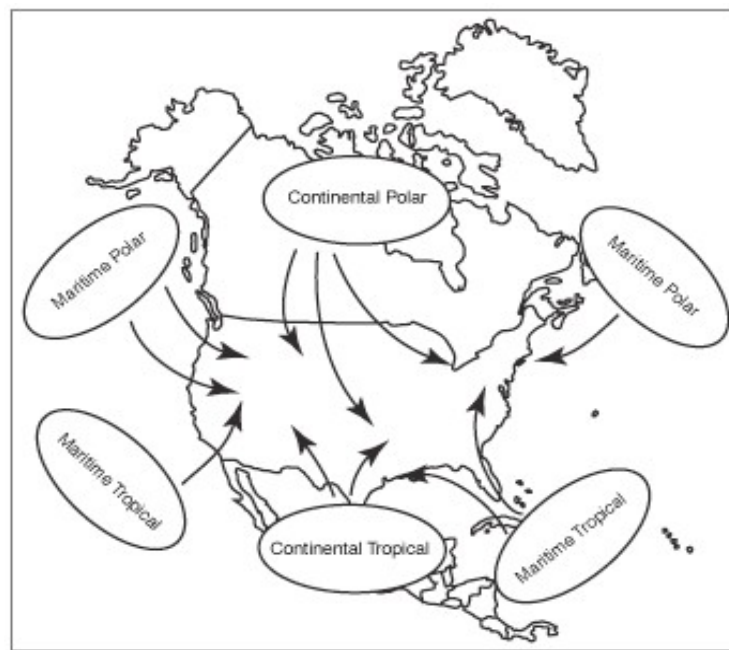


Fig. 36. Six Different Air Masses That Influence Canadian Weather

Frontal Systems

The atmospheric circulation often brings large masses of warm and cold air side by side. Largely because of density differences, the warm and cold air masses do not mix, but remain separated by a boundary zone known as a front. Fronts are zones of rapid transitions in the temperature and humidity characteristics of adjacent air masses, resulting in light to intense precipitation. Where the air masses are converging, the warmer, less dense air either rides up and over the cooler air, or is wedged upward by invading colder air. There are four types of fronts:

1. cold front - a boundary along which cold air moves under and into warm air (Fig. 37). Because the cold air is dense and relatively heavy, it moves rapidly under and into warm air pushing the warm air up sharply, resulting in intense and localized precipitation. A cold front will bring a temperature change before the rain comes. After a cold front passes, the skies are clear.

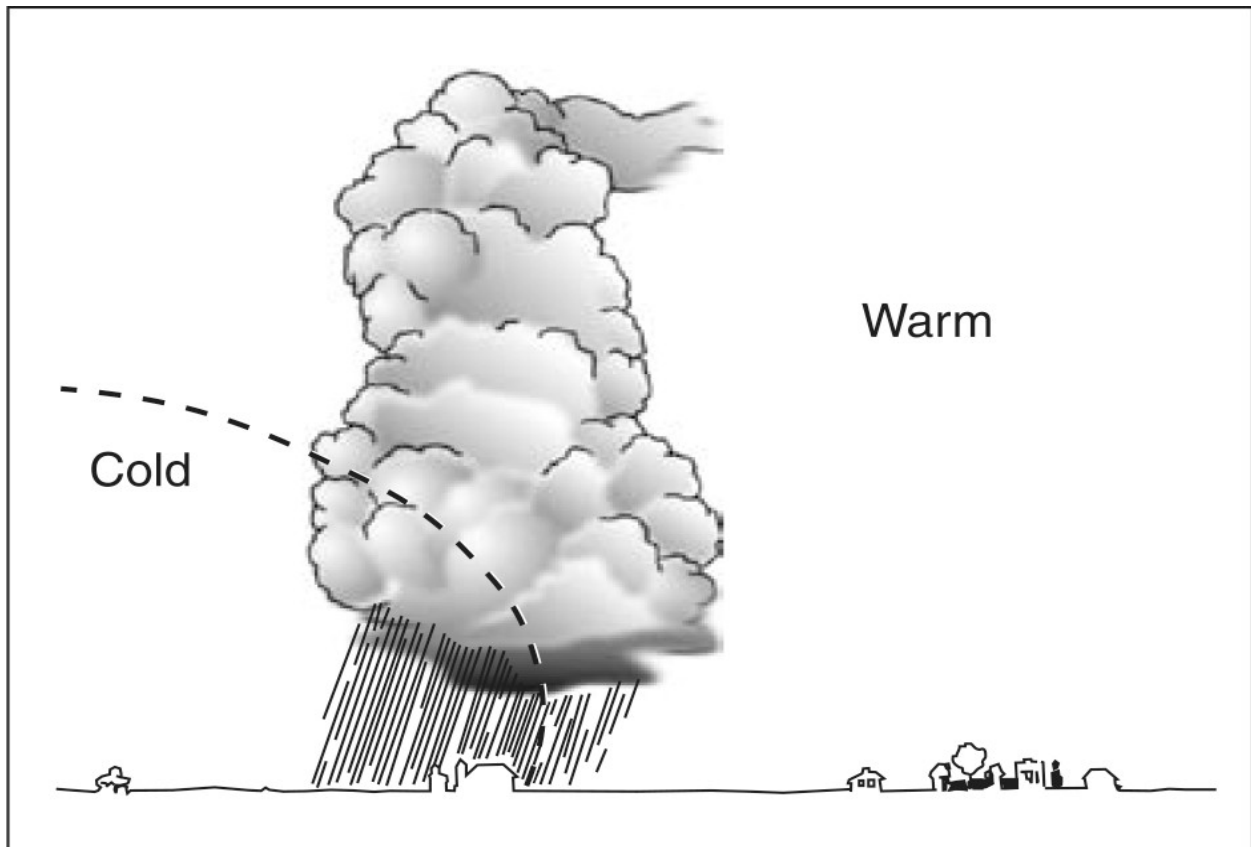


Fig. 37. Cross-section of a Typical Cold Front

2. warm front - a boundary between warm air and colder air, where the warm air mass is moving faster than the cold air mass (Fig. 38). The lighter, warm air cannot displace the heavier, cold air so it is forced to rise over the cold air, resulting in light to moderate precipitation. A warm front brings rain before and during its passing. After a warm front passes, the skies are cloudy.

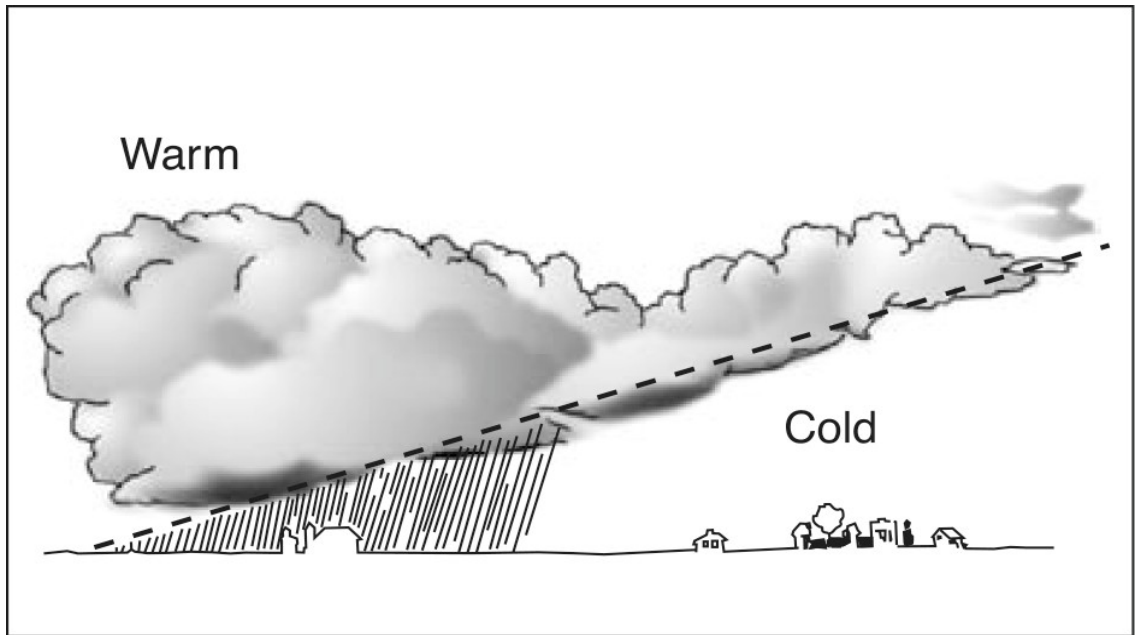


Fig. 38. Cross-section of a Typical Warm Front

3. stationary front - the boundary between air masses that maintain their warm/cold identity and yet do not exert any displacement force and remain at or about the same location for a day or more (Fig. 39). A cold air mass and a warm air mass are in contact, but neither is moving, thus, becomes stationary. The result is a dreary sky that covers a large geographic area.

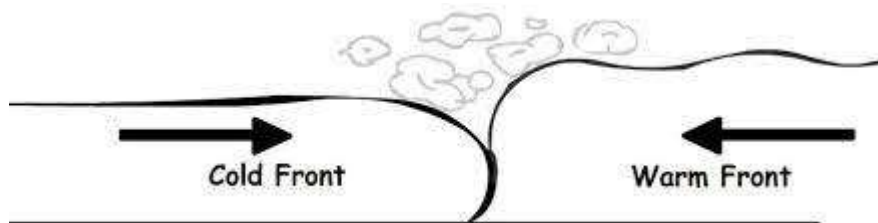


Fig. 39. Cross-section of a Typical Stationary Front

4. occluded front - the boundary where a cold air mass moves under a warm air mass, lifts it up, and then meets another cold air mass (Fig. 40). The approaching cold front pushes all the warm air up, away from the ground, and makes contact with the leading cold air mass. Occluded fronts often cause a period of showers and/or steady precipitation with poor visibility.

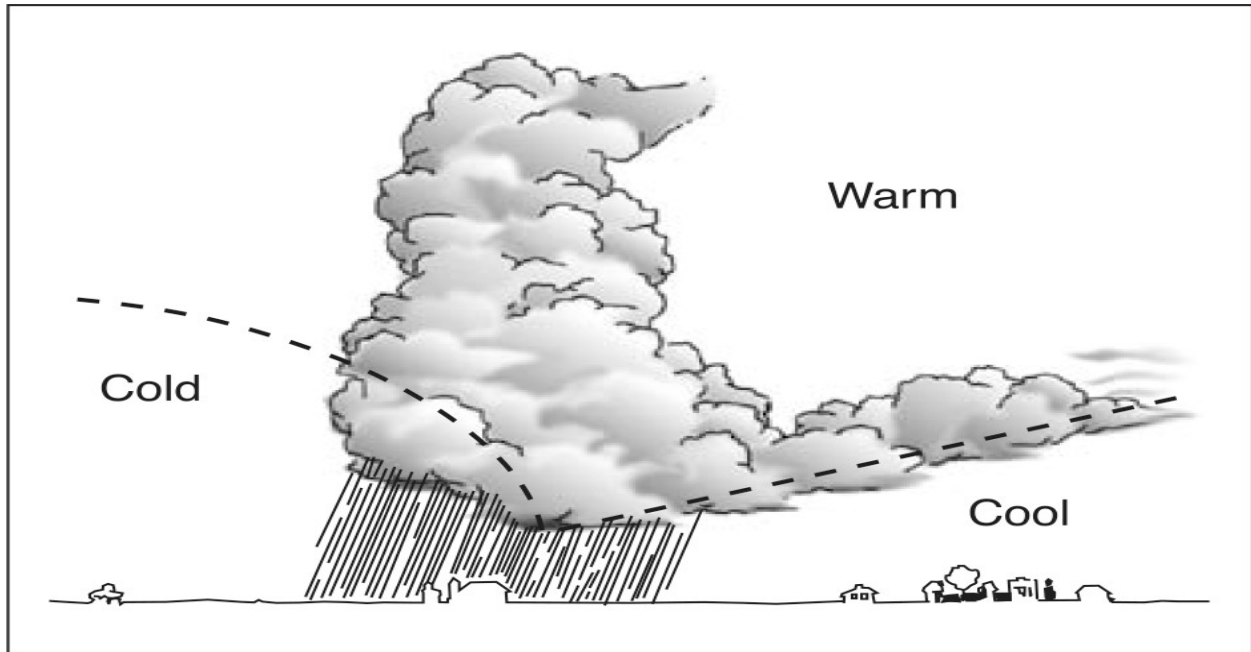


Fig. 40. Cross-section of a Typical Occluded Front

When you look at a weather map which shows frontal positions, cold fronts will be marked in blue, warm fronts in red, stationary fronts in alternate red and blue, and occluded fronts in purple.

Severe Weather

Where warm and cold air meet along a front, storms are often produced. These storms may be mild, with only light winds and rain, or they may be violent. Initially, most severe storms begin as thunderstorms. Thunderstorms are local weather disturbances in which strong convection currents rise rapidly to great heights. Because of this, water vapor in the cloud is carried upward, condenses, and freezes very quickly. Lightning commonly occurs, which heats the air causing the air to expand and explode in bursts of thunder. Columns of rain or hail pour down on Earth.

Tornadoes

A tornado is a violently spinning column of air hanging below a thundercloud. The funnel-shaped columns of tornadoes contain winds that may be whirling up to 500 km/h. The average funnel cloud varies from 30 to 60 m in diameter, and travels at speeds of 30 to 50 km/h. Most tornadoes occur in North America, especially in Oklahoma, Kansas, and Missouri. In these regions, cold, arctic air reaches south, meeting dry desert air from the west, and moist tropical air from the Gulf of Mexico. The interaction of these three different air masses is ideal for creating a tornado.

Hurricanes

Also related to thunderstorms are hurricanes, which are large, more destructive, and last longer than tornadoes. It is a gigantic, 500 km/h wide, whirling, roving thunderstorm. Most hurricanes that affect North America start as waves of disturbances in the trade winds over the Atlantic Ocean, west of the African coast, most often in August, September, and October. A hurricane gets its energy from the thermal energy of warm, tropical, ocean water. People call them hurricanes when they form over the Atlantic, typhoons when they form over the Pacific, and tropical cyclones when they form in the Indian Ocean.

Monsoons

A monsoon is a system of winds that causes torrential rain and extensive flooding in the summer. Southern Asia is the only region of the world that experiences monsoons. Although the flooding causes serious damage in the summer, the absence of a monsoon for even one season would result in crop losses and famine due to lack of water. A monsoon begins when hot air rises, drawing strong winds from over the Indian Ocean. The warm, moist air passes over the land, generating torrential downpours of rain. Flooding is unavoidable.

*******Be sure to check out the Weather Dynamics discussion activity on page 201.**

Activities

Tree Identification

The purpose of this activity is to use a map to locate ten different coniferous/deciduous trees on the Camp Samac property. Scouting Youth can participate individually (if confident) or with a partner.

Materials: tree map
symbol tally sheet
pencil

It is important that the Map Orienteering Lesson (pg. 114) has already been taught prior to this lesson. It would also help to review the leaf pictures on pages 201-222.

What You Do:

1. Distribute maps to the Scouting Youth. All maps are different.
2. Review the Tree Identification Lesson.
3. Explain procedure for completing the Tree Identification activity. Look for ten small circles with a symbol on specific trees on your map. When you locate one of the indicated trees on the course, draw the symbol on the answer sheet.
4. Hand out a symbol tally sheet to each camper. The Scouting Youth are sent out in different directions and at different intervals so as not to follow one another or clump together.
5. Once outside, the Scouting Youth will orientate the map more precisely. They can look at the land for features such as buildings, a bridge, or a parking lot. Find the symbols for the same features on the map and then turn the map until the symbols on the map line up with the landscape features they represent. Hold the map flat. If you need to change direction, do not turn the map. Turn your body around the map.
6. Blow a whistle three times and have the Scouting Youth return to the starting point. Scouting youth are reminded of safety precautions and to return to the starting point when they have finished the course. Check their answers for accuracy.

Tree Identification Lesson Summary

List the all the parts of a tree: trunk, branches, twig, leaves, crown, fruits, flowers, and roots.

Explain the difference between coniferous and deciduous trees. Ask the Scouting Youth to list examples of coniferous/deciduous tree species:

Coniferous Trees	Deciduous Trees
• have cones	• do not have cones
• needle-like or scale-like leaves	• broad, flat leaves
• considered softwoods	• considered hardwoods
• no fruits or flowers	• do not have fruits or flowers
Examples	
• cedar	• maple
• hemlock	• beech
• pine	• oak
• fir	• elm
• spruce	• ash

Introduce how to use leaves, bark, twigs, buds, cones, form, and site to identify trees throughout the year. (Leaves fall off in the winter so you must use the twig).

When identifying deciduous trees, you must look at the twig and leaf arrangement on the branch.

- Opposite Arrangement - when two twigs or leaves are arranged directly across from each other on the twig it is called an **OPPOSITE ARRANGEMENT**. Maples, ashes, and dogwoods have opposite arrangement.
- Alternate Arrangement - when two twigs or leaves stagger up the branch and are not located directly across from each other, that is called an **ALTERNATE ARRANGEMENT**. All other deciduous trees have alternate arrangement.

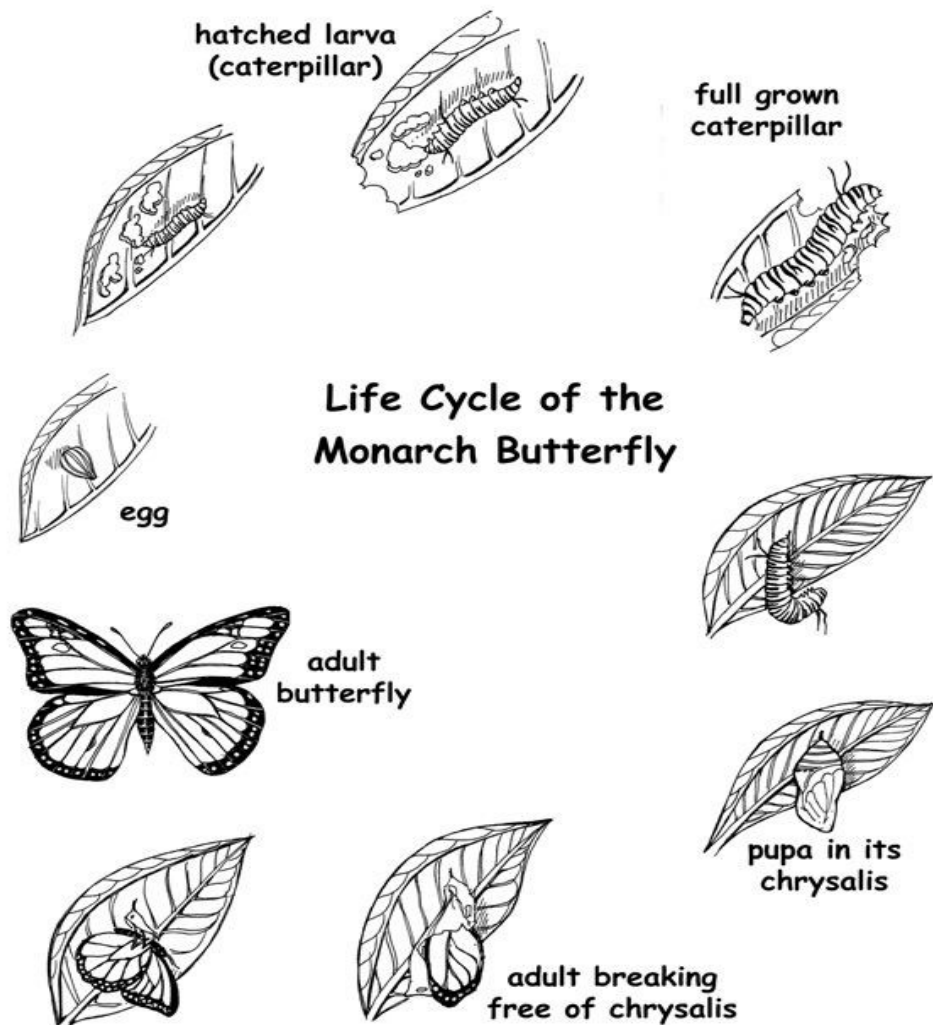
When identifying deciduous trees, you must look at the leaf. If there is just one blade on the leaf stalk, it is a **SIMPLE LEAF**. If there are many blades on the leaf stalk, it is a **COMPOUND LEAF**. The multiple blades of the compound leaf are called leaflets.

Monarch Butterfly Life Cycle

What You Do:

1. Ask the Scouting Youth if they know the link between caterpillars and butterflies? Hold up a picture of a caterpillar, and then a butterfly. Ask, "Do you know how these two animals are alike?" Tell the Scouting Youth that they are the same animal, even though they look very different. This animal changes (metamorphoses) over its life cycle. Ask, "What does that mean?"
2. Review each stage of a butterfly's life: egg, caterpillar, chrysalis, adult. What is the animal's main activity in each stage?
 - egg: growing and developing
 - caterpillar: eating
 - chrysalis: changing form
 - adult: eating and reproducing
3. Show pictures of each stage or have the Scouting Youth follow along using the "Life Cycle of the Monarch Butterfly" sheet.
4. Write each of the words: egg, caterpillar, chrysalis, butterfly on four separate cards. You will probably need about 8 sets of cards (32 cards total). You can do this activity with any group size; just change the numbers, making sure you have an even number of each life cycle stage. Shuffle the cards randomly and place them in a circle in a large open area, either on the ground or on chairs. Have the Scouting Youth pick a place to sit/stand and then begin to play music as the Scouting Youth move around the circle. When the music stops, all Scouting Youth should stop where they are and pick up the nearest piece of paper. Which life cycle stage are they?

5. Ask all Scouting Youth to strike a pose as if they were a butterfly in that stage (e.g., eggs get into a ball on the ground, etc.). Then, tell them to move about and act their life stage for a few moments. What does a chrysalis do? What does a caterpillar do? Now turn on the music and repeat a couple times, allowing campers to try the different stages.
6. Take the Scouting Youth on a hike to the open field area to find some milkweed plants or monarch butterflies.



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What's in the Box?

What You Need:

Gather all the skulls, furs, bones, feathers, anything from an animal (or animal sign) and place everything in a box.

What You Do:

- divide the Scouting Youth into two teams (sometimes boys against girls works);
- a Scouter then pulls one of the items out of the box and each team must guess what it is;
- you can keep score, or give bonus points if a team member can give extra information about the item;
- this game can be played when its raining, or better, at the end of the night.

Poaching of Black Bears in Canada

In Canada, it is legal to hunt black bears. A permit to hunt black bears costs about \$15 and a licensed hunter is allowed to harvest up to two black bears each year. Initially, it was also legal to trade bear parts if it was conducted by a licensed fur trader and exported with a permit. However, the attempt to regulate the trade market proved to be futile as the number of illegal trades far surpassed that of legal ones.

There are many incentives to obtain and trade bear parts illegally. Black bear parts are especially in high demand around the world. Given their small size, gall bladders and bear paws can easily be smuggled across borders without much hindrance. In addition, there is a greater profit to be made by avoiding taxes as well as import and export duties.

Black bear parts smuggled out of North America usually end up in Asia where they are sold in pharmacies and restaurants. For thousands of years, bear parts have been used as cures in traditional Chinese medicine. In Korea, bear paws have been considered an exotic delicacy. Today, a bowl of bear paw soup can cost as much as \$1 000.

Nearly every part of the bear has medicinal use. South Korea is considered the world's largest market for imported bear parts. Not far behind, however, are Hong Kong, China, and Japan. The gall bladder is the bear's most valuable part. In traditional Chinese medicine, bile and gall bladders are used as remedies for an array of illnesses such as fever, swelling, cancers, burns, internal bleeding, ulcers, pain, heart, and liver disease. A compound found in bile known as ursodeoxycholic acid (UDCA), has been used in western medicine to treat liver disorders. A gall bladder can command up to \$10 000 in east Asia. Its price is about 20 times the street price of cocaine per ounce.

Because of economic growth experienced in Asia, it is expected that the demand for bear parts will only increase in the future. Whatever they may be, steps are necessary to prevent the poaching of black bears to prevent them from becoming an endangered specie teetering on the brink of extinction.

What To Do:

1. Discuss background information. Answer the following questions:

- If you are legally entitled to hunt black bears in Ontario, then why do people poach black bears?

An estimated 40 000-50 000 black bears are legally hunted every year in the United States and Canada. Because it is against the law to sell body parts from legally taken bears, most hunters do not bother salvaging any of those parts. There is an incredible demand for bear parts within the Asian culture. If the parts from these bears could be used to supply the Asian demand, then poaching could potentially cease. Yet, to meet the demand in Asia, additional bears are killed illegally by poachers. The demand for bear parts will probably never diminish because, bear gallbladders for example, and other body parts have been key ingredients in Asian medicines and aphrodisiacs for centuries. Their use in these potions is so deeply ingrained in the culture that they are considered necessities.

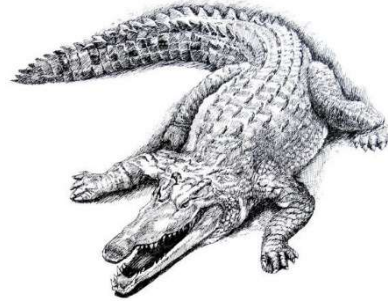
2. Can you think of some solutions to help prevent black bear poaching?

- *Current laws prohibiting the sale of body parts from legally hunted bears are helping to promote bear poaching in North America.*
- *If the true value of a poached bear was publicized and the parts from bears taken legally were legally used to supply the demand in Asian countries, the incentive for poaching could be greatly reduced.*
- *Do not buy anything that came from a black bear.*
- *"If you see it, report it!"*
- *Support various organizations that are fighting the illegal selling of bear parts.*

3. What other animals do you know of that are in danger or facing extinction? What are people doing to protect these animals? Are these solutions working?

- *Elephants, rhinos, tigers, lemurs, sea turtles, gorillas.*

Despite the efforts being made, illegal wildlife trafficking is a business worth \$5-\$23 billion a year.



Ectothermic Word Search

Locate the following ectothermic reptiles:

crocodile

lizard

alligator

snake

turtle

tortoise

tuatara

skink

python

monitor

pit viper

iguana

B	E	R	G	J	F	I	Z	Y	P	A	E	J	D	R	A
L	R	D	H	U	L	L	P	D	C	Z	B	M	O	E	N
Z	A	R	A	T	A	U	T	L	N	O	H	T	R	P	E
P	S	W	G	B	W	E	S	N	V	M	W	R	O	A	Y
L	O	D	B	M	Q	P	Z	O	W	B	T	Y	T	X	H
I	P	A	E	O	O	M	W	P	G	D	F	C	A	N	O
Z	W	G	J	N	S	C	E	H	K	R	S	H	G	E	L
A	E	S	K	I	N	K	R	B	O	E	E	M	I	T	O
R	D	H	K	T	B	N	A	T	K	J	L	G	L	W	V
D	F	E	R	O	T	V	A	A	M	Z	A	Y	L	K	O
G	V	W	O	R	B	G	N	W	R	A	Z	C	A	T	U
O	E	G	K	A	I	S	V	R	E	P	I	V	T	I	P
I	M	E	C	L	N	E	C	A	H	M	E	T	K	A	C
G	E	Y	L	F	E	B	M	L	A	O	E	V	H	Y	C
I	W	L	N	B	W	M	R	T	A	Y	L	E	A	B	T
L	P	O	T	Y	B	S	N	X	L	Z	E	B	W	R	E
R	W	B	E	R	A	H	W	R	E	L	L	I	K	S	S
N	A	L	Y	R	U	A	B	I	G	U	A	N	A	E	I
N	O	N	A	D	H	T	N	R	P	Z	O	O	A	R	O
M	P	W	R	T	C	K	S	N	A	Q	M	H	H	E	T
L	A	T	P	M	E	V	Y	N	R	S	C	T	B	E	R
E	L	I	D	O	C	O	R	C	D	Z	A	Y	M	E	O
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Camouflage

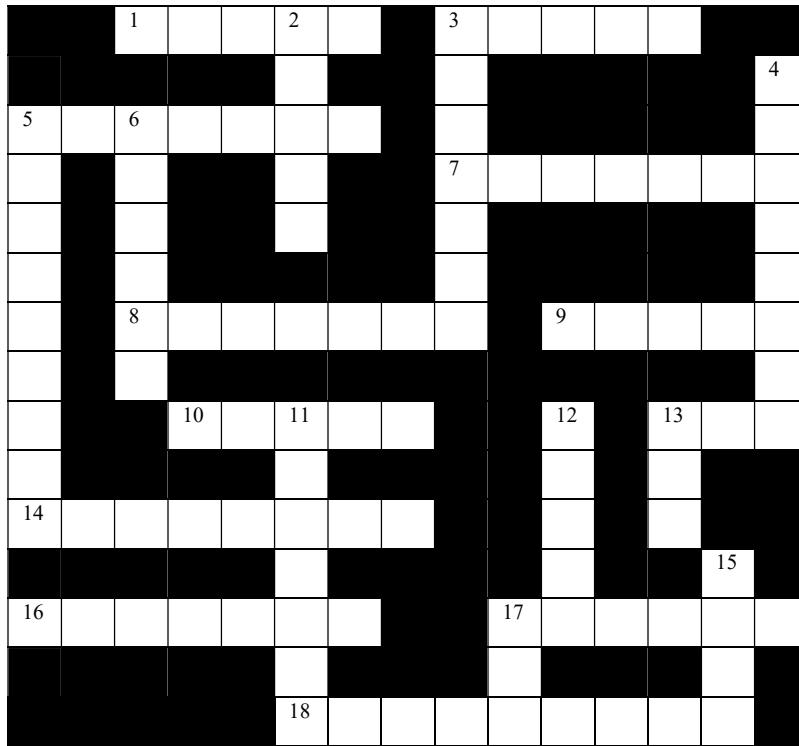
Background Information

Camouflage is an adaptation that helps animals avoid detection. It is a process that allows an animal to have an appearance that helps it blend into the background. Camouflage does not merely suggest only color, but also shape and pattern. The background where an animal is found can either be its environment (e.g. insects that resemble plants) or other animals (e.g. zebra blending in with others in a herd to confuse a predator). The more convincing camouflage is, the more likely it is that the animal will go unseen.

What You Do:

1. Discuss with the Scouting Youth some examples of North American animals that are camouflaged. Good examples are: snowshoe hare, Screech Owl, American Bittern, leopard frog, baby deer (fawn).
2. Go to an area with trees or just tall grass. The object of the game is for the Scouting Youth (the rabbits) to hide close to the Scouter (the wolf). The Scouter will close his/her eyes and count to 20 and all the rabbits run and hide. The "wolf" must stay in the same spot but can turn around on that spot looking for the rabbits. If the wolf spots a rabbit ("I see Tina in a red shirt behind the spruce tree") the rabbit must come out. When the Scouter cannot see any more rabbits the wolf calls: "Come on out but stay beside your hiding place".
3. Whoever is the closest to the wolf wins.

Vertebrate Animals Crossword



Across

1. A striped animal that looks like a horse.
3. An endangered "bear" in China.
5. A marine mammal closely related to a whale and porpoise.
7. This animal has a long neck.
8. This animal has a mask.
9. The only "bear" found in Australia.
10. A Bengal or Siberian _____.
13. Some say this animal has 9 lives.
14. The only species on Earth in which the male gives birth to the unborn young.
16. Also called a bison.
17. The male of this animal is called a jack; the female is called a jenny.
18. This reptile can swim underwater, walk on land, and has a BIG bite.

Down

2. A big animal with one horn.
3. This bird cannot fly.
4. This animal has a long trunk.
5. These animals became extinct millions of years ago.
6. A type of reptile.
11. King Kong was one of these.
12. This animal looks like a big pig, but it's name means "river horse".
13. What you would call a female moose or whale.
15. He fights forest fires: "Smokey the _____".
17. Man's best friend.

Belonging to a Community

Background Information

The place where an organism lives in is called its habitat. Good habitat is defined as having enough food, water, shelter, and space available. Many kinds of organisms can live in the same habitat. Different kinds of organisms in each habitat have different ways of living. Each way of living is called a niche. The organism's niche is its role, job, or responsibility within the habitat. A niche is determined by what the organism eats, how it gets food, and where it lives.

The different kinds of plants and animals that interact with one another in one area form a community. All organisms interact with other organisms in some way. No organism lives completely by itself. Each organism is part of a community. Within a community, there can be several populations of plants or animals. A population is a group of organisms of one species in a particular place at a particular time. A community, can then be defined as simply a set of interacting populations.

A community can be characterized by the prominent species that lives in the community or by the physical environment of the community (desert community, pond community, deciduous forest community). Just as organisms have characteristics (or properties) such as size, weight, age and so forth, communities too have characteristics. Community-level characteristics include:

- diversity - the number of species in the community.
- relative abundance - the relative abundance of a species in a community with respect to the abundance of all species in the community.
- stability - a measure of how much a community changes over time.

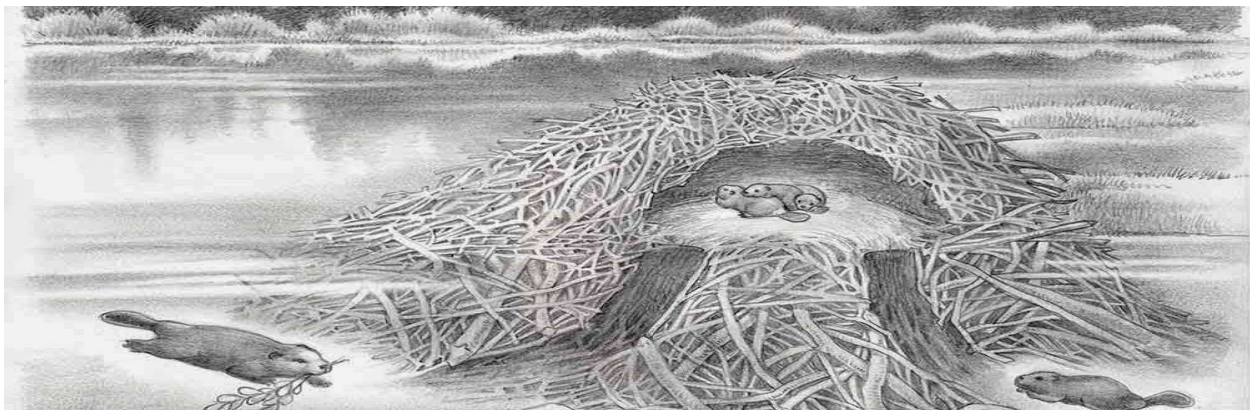
The organisms in any community can be divided into three groups based on how they get their food. Because plants can make their own food, they are called producers. Producers use energy from the Sun to make their food. Those organisms that cannot make their own food and eat other organisms are called consumers. Consumers are known by what they eat. Animals that feed on plants are called herbivores. Animals that eat other animals are called carnivores. An animal that eats both plants and animals is called an omnivore. Within a community, organisms survive by eating other organisms. An animal that feeds on other animals is called a predator. The animal that is eaten is called the prey.

What You Do:

1. Examine how each Scouting Youth belongs to the community. Talk about what lessons they may go to (i.e. swimming, skating, skiing). Ask if they are in another club or involved in a sport.
2. Relate this discussion of community to the animal community. What about a wolf pack or beaver colony? How does each wolf/beaver know its pack/colony? Do they allow other wolves/beavers into their pack/colony?
3. Take a walk around the Camp Samac property with the Scouter Youth to visit various habitat types. List some of the animals that have been identified within each habitat at Camp Samac. Identify the role that each animal would have in its community (i.e., predator, prey).

Beavers form very strong social, family bonds. Up to eight related beavers belong to each colony. Each colony has a breeding pair, the year's kits, and the offspring from the previous year. The older kits are responsible for caring for the new-borns, collecting food, and building the dam. The populations within a community are limited by habitat availability. In the best-case scenario, two colonies will be at least 0.8 km apart. Beavers are very territorial and will defend against other beaver families. Beavers communicate to each other by vocalizations, body language, scent markings, and by slapping their tails on the surface of the water.

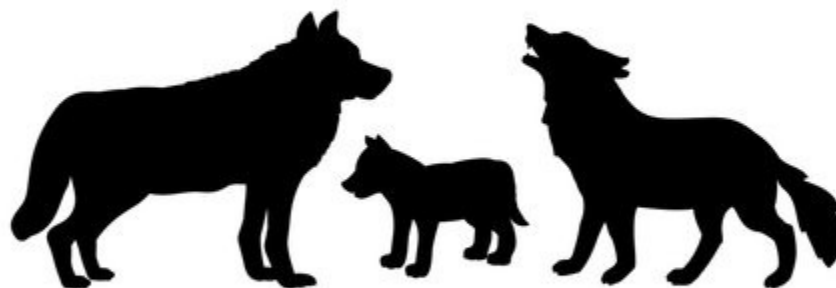
In the winter, the colony lives together in their lodge, sharing food that has been collected and stored for the winter. One of their favourite foods is trembling aspen. The adult pair "rules the lodge" and use the various forms of communication to indicate their dominance. Beavers are herbivores. They do not eat meat.

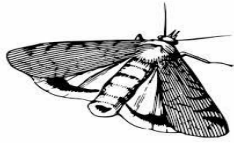


A wolf pack is an exceedingly complex social unit. A large family is made up of parents, offspring, siblings, aunts, uncles, and on occasion, wolves displaced from other packs. A typical wolf pack has a dominant male and female (alpha) pair. The alpha pair are the only two that breed. The second-in-command wolves are the beta pair. The beta pair are the first in line to replace the alpha pair. Next in line are the individuals in the middle ranks, followed by the lowest (omega) rank. Sometimes, if there is dissension in the ranks, a wolf may be driven out of the pack, or, leave on his own free will where he will now begin a life with a constant fight for survival.

The alpha pair maintains order by directing the whole pack, while the beta pair commands the mid-level wolves. The wolf pups have no rank. The alpha male is the first to eat, followed by the beta wolves, and then finally, the omega wolf. At this point, there may be little left to feed on. Wolves are carnivores.

The success of the pack is based on the size, commitment, and loyalty from everyone. Life in a pack involves raising and feeding the pups, strategic hunting, and fiercely defending their territory. This instinctual behaviour allows wolf packs to sustain themselves for many generations.





Bat and Moth

This is "Marco Polo" with a batty twist.

What You Need:

- 2 blindfolds
- group of 10 or more Scouting Youth
- large, open area

What You Do:

1. Pick one Scouting Youth to be the "bat" and another Scouting Youth to be the "moth." The bat should not know who the moth is. The rest of the Scouting Youth are "trees."
2. The "trees" form a circle and must stand still.
3. Both the bat and moth are blindfolded. They can move around during the game, but cannot go out of the circle.
4. The object of the game is for the bat to use sound to catch its prey, the moth. When the bat calls out "echo," the moth answers "prey." All other players answer "tree."
5. Once the bat tags the moth, the moth becomes the bat and a new moth is picked.



Suet Log Feeder

This feeder will attract chickadees, nuthatches, woodpeckers, and blue jays from late September to March. The suet (animal fat) chunks can be easily cut and packed into the holes of your feeder. Birds become dependent on the high energy content of this food so be sure to add suet to your feeder often.

Materials: tree log approximately 10 cm across and 30 cm long (birch or maple)
 $\frac{3}{8}$ -inch diameter dowels, 10 cm long (4 to 6)
 $\frac{3}{8}$ -inch diameter drill bit
 $\frac{3}{4}$ -inch or 1 inch diameter drill bit
drill
eye-screw
15 cm piece of wire
hammer
suet

Obtain Suet

- Purchase beef fat trimmings from a local butcher. It is inexpensive, or the butcher might even give it to you at no charge.
- Save bacon and pork meat drippings to create your own suet. This will be softer than rendered beef fat but is still suitable for the birds.
- Buy lard at the grocery store. Lard is typically found shelved near the butter or margarine products.
- Buy vegetable shortening in place of animal fat. This is a preferred choice for many vegan or vegetarian birders who prefer not to use animal products, and it is still suitable for the birds. Vegetable shortening is typically found with baking supplies.

Preparation of Suet

Suet recipes do not need to be complicated in order to attract a range of hungry birds. Before offering the suet to the birds, however, it should be rendered to help it maintain its shape more easily.

To Render Suet

1. Chop the fat into small pieces or run it through a meat grinder. If you are getting the fat from a butcher, they may be willing to do this for you. Be sure all traces of meat are removed.
2. Heat the chopped fat on low until it is liquefied. Do not use higher temperatures to melt the suet more quickly, as this could lead to fires or scorching.
3. Strain the liquid fat through cheesecloth or a fine mesh to remove any particles or contaminants. The suet should be strained several times so it is as pure as possible.
4. Pour the fat into molds or containers and allow it to cool. The cakes can be chopped or cut to be fed to the birds, or you may choose to use containers that are the appropriate size to fit your suet feeders.

Once the suet is rendered, it can be fed to the birds as-is or you can choose to add simple ingredients to make it more appetizing to a wider range of birds.

Easy Suet Recipe

- 1 cup of rendered suet;
- 1 cup of chunky peanut butter;
- 3 cups of stone-ground cornmeal;
- $\frac{1}{2}$ cup of white or wheat flour.

Melt the suet and peanut butter together until they are smooth and liquid. Add the cornmeal and flour, mixing well. Allow the mixture to cool slightly to thicken and then pour it into molds or containers to use. Refrigerate or freeze suet until it is firm and you are ready to use it.

What Else You Can Add to Suet

While a simple bird suet recipe is useful, adding different ingredients to the mixture before it cools can make it more attractive to birds. Popular ingredients to customize a suet recipe include:

- chopped, unsalted nuts;
- dried fruit bits;
- birdseed;
- honey;
- kitchen scraps.

These are the easiest items to add to simple suet to make it even more tempting for your birds. Take the time to experiment with adding other ingredients to discover what your birds find most appetizing, and you will soon have plenty of suet-eaters at your backyard buffet.

Making the Log Feeder

1. Obtain a log that is approximately 10 cm across and 30 cm long. The log does not have to be perfectly straight.
2. Starting at the top of the log using the 1-inch diameter drill bit, randomly drill 5-6 holes around the log that are evenly spaced apart. Drill the holes at least 2 cm deep.
3. With the $\frac{3}{8}$ -inch diameter drill bit, drill a perch hole $\frac{1}{4}$ -inch below the 1-inch holes that hold the suet. Drill the holes at least 2 cm deep. Insert the perches and tap with a hammer until snug. Perches should be at least 8 cm in length.
4. Attach eye-screw and wire to the top of the log.
5. Fill all 1-inch diameter holes with suet.
6. Hang it up near a tree or somewhere that birds have easy access to.

Build a Hibernaculum

Habitat loss and degradation/fragmentation by roads have had a detrimental effect on snake populations in Ontario (not to mention human persecution). Because snakes are ectothermic, they need to hibernate in the winter. The snakes of Ontario take refuge underground for the winter, often in large groups where they share the little warmth between each other. Usually, many individuals congregate together in a hibernaculum. A hibernaculum is simply an underground chamber place where the same species of snake, or, even different species of snakes find protection from the cold. Old wells, burrows, rock crevices, caves, and retaining walls are a few examples of natural hibernacula (singular hibernaculum).

Hibernacula are important for snakes because snakes require a site below the frost line and close to the water table to survive Ontario's cold winters. Building a hibernaculum will provide more overwintering opportunities for snakes in fragmented and isolated landscapes. They can also be constructed as an expression of acceptance to provide valuable opportunities for education and community stewardship.



Materials: 2 or 3 shovels (you will need help)
old bricks
logs
old cinder blocks (broken or whole)
old tires
old down spouts
old eavestrough
rocks/rubble
2-3 drainpipe cut-offs (2-inch diameter, 3-4 feet long)
whatever you got

What You Do:

1. Select a well-drained site protected from cold winds with good sun exposure (south-facing). Ensure that the surface and ground water flow away from the site, such as an upland area.
2. Begin digging. The hibernaculum can be dug to fit the available space, but it **must** be below the frost line (2 m/6 $\frac{1}{2}$ ft). Snakes prefer an overwintering site that is close to the water table but not flooded. Moist air ensures the snakes do not dehydrate over the winter.
3. Place the bricks, cinder blocks, rubble in the bottom of the hole to create gaps, passageways, and chambers for the snakes. Chambers created at different depths allow the snakes to move vertically and horizontally to find a preferred temperature/humidity level. The down spouts and eavestroughs can provide easy movement throughout.
4. Insert the drainpipe cutoffs at ground level. These will be used as entrance/exit tubes.
5. Cover the pile with the removed soil, about 50 cm (1 $\frac{1}{2}$ feet) high).

How to Attract Snakes to Your Backyard

Do I really need a snake in my backyard? Why not? What kinds of snakes could I attract to my backyard? Look out the window into your backyard and think about available food, water, shelter, and space. Think about how you can all help snakes by making sure they have access to the habitat they need.

Native habitats in southern Ontario are under pressure from human activities. Regardless, southern Ontario is home to a variety of snake species. Fortunately, these snakes can coexist with humans in urban areas, if suitable habitat features remain. Measures taken to attract and protect any animal species and their habitat contributes to a broader goal of conserving our native ecosystems and biodiversity.

Snakes play a very significant role in nature. They eat pests such as rodents, harmful insects, slugs, and other destructive plant pests. Aside from their role in the balance of nature, they are an "indicator species" of environmental quality. Reptiles are very sensitive to pollutants in the landscape. Their presence in your backyard is a good indicator of a healthy environment.

What snakes can I expect to attract to my garden? Thankfully, Ontario's local snakes are harmless and pose no threat to humans. The following four species of snakes could potentially come and inhabit your backyard: the northern brown snake, the eastern garter snake, eastern milk snake, or the northern redbelly snake.

What can you do in your landscape to attract and support a population of snakes?

Getting Started:

Provide hiding places: Snakes require shelter from their many predators such as hawks, crows, and even cats. Suitable hiding places may consist of rocks or decaying logs, brush piles, or patches of dense shrub or herbaceous vegetation. You can also build special structures for snakes. These can range from simple rock and brush piles to elaborate rock walls. Dry-stack rock walls (built without mortar) are particularly suitable, because the crevices and cracks between rocks provide abundant and varied hiding places for snakes. If you decide to start with a rock or brush pile, make sure that the pile is stable and relatively large (about one metre wide at the base). Careful placement of these structures is also important: locate them adjacent to borders, hedges, or a compost heap.

Provide warm sites: Snakes get their body heat from the environment and therefore require suitable warm "basking" areas. Raising their body temperature helps these reptiles utilize energy and digest their food. Adding rocks of varying sizes to the base of an exposed hillside is one way to improve habitat for snakes, and placing new rock walls and rock piles on south-facing slopes or where they receive the Sun is another. In the garden, snakes may take advantage of warm conditions under black plastic sheets that are used to control weeds on vegetable or flowerbeds. You can provide warm sites just for snakes by placing sheets of tin or black asphalt roofing in sunny locations — about 60 x 60 cm sheets work well. These covers are more durable than plastic sheets and last for many years.

Provide a pesticide-free environment: Chemical pesticides and herbicides can harm wildlife either directly or by contaminating their food supply. Limit the use of traditional insecticides, use them only when absolutely needed and only on the target plants. Avoid mowing your lawn in the late evening or at night. Almost all species of reptiles are actively moving through the lawn at night.

Encourage and protect native vegetation and habitats: When creating wildlife habitat, imitate patterns found in nature. Leave a place in your yard a little "wild". The entire landscape does not need to be so manicured; an area that has a patch of wild growth, piles of leaves or branches provide places to hide and to hibernate over the winter. Instead of imported ornamentals, plant native plants that are more insect and disease hardy than many imported plants.

Enhance access to habitats: Natural landscapes are a mosaic of interconnected habitats, providing a variety of conditions for wildlife. Reduce the distance between habitat patches for easy access to animals. Snakes are more likely to use the structures you have provided, such as rock walls or brush piles, if they are not isolated in the middle of large open areas. Efforts to maintain and restore wildlife habitat on your property reduce fragmentation of the landscape and create habitat networks in your area. What you do on your property, however small, can make a difference.

Finally, take a little time to learn more about snakes. They are the least understood or appreciated reptile. Too many have fallen victim to the shovel. Fortunately, today, less people kill them than years ago partly due to the many educational programs on TV and what children are now taught about reptiles in school and at Scouts!

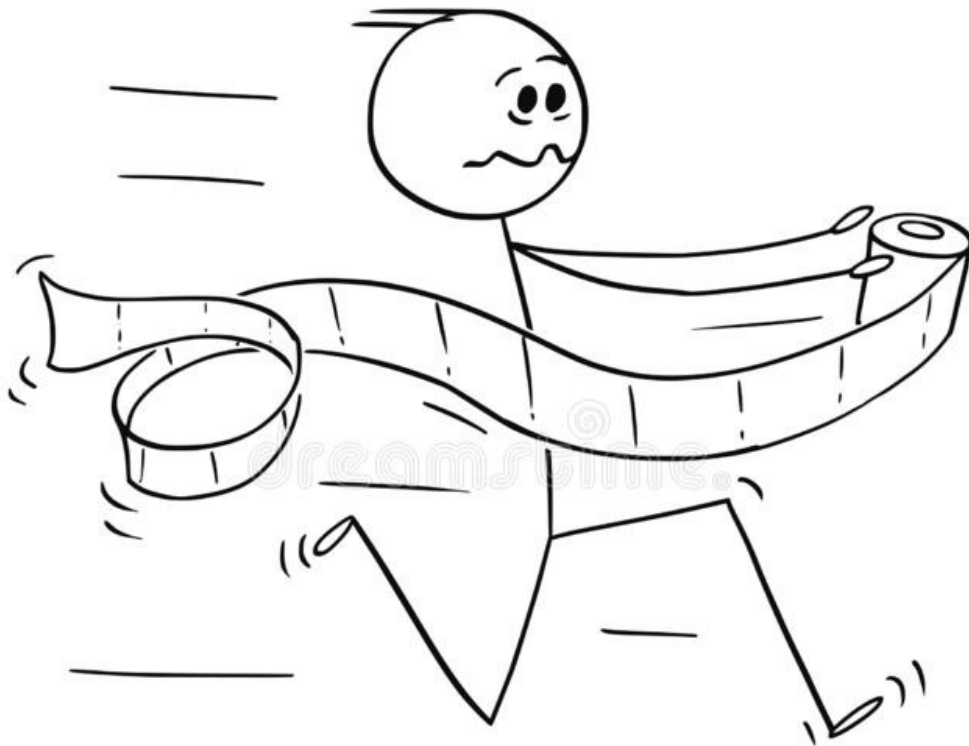
Toilet Paper Snake

What You Need:

- 1 roll of toilet paper per team (5-6 Scouting Youth per team)

What You Do:

1. Each team completely unrolls a roll of toilet paper.
2. The unrolled toilet paper is then carried by the team's members so that the paper snake does not tear. It is carried through a predetermined route throughout the Camp Samac property.
3. The team with the longest snake when they arrive at the finish line wins.



Make a Turtle Nest Protector

Making a turtle nest protector increases the odds of the survival rate of newly hatched turtles. A properly constructed nest protector requires little cost and effort. It is easy to make and can provide a valuable learning experience for Ben to help animals at risk.

Materials: one 8-foot untreated 2X4
eight 3-inch screws or nails (2 per corner)
 $\frac{1}{2}$ -inch galvanized mesh (2 square feet)
4 washers
four 10-inch nails (spikes)
metal staples (as needed)
jigsaw
tape measure
small flag (optional)

What You Do:

1. Cut the 8-foot 2X4 into 4 equal lengths (2-feet each).
2. Screw (or nail) the 2-foot lengths together to make a 2-foot square frame.
3. Make an escape route for the newly hatched turtles by cutting a 2-inch by 1-inch notch in the middle on the bottom edge of each side of the frame,
4. Staple the galvanized mesh on the top of the four sides of the frame.
5. When you spot a nesting turtle, give the female turtle enough time to lay her eggs. Once done, place the nest protector over the nest. Use the washers and stake the four corners of the frame into the ground to prevent predators from getting at the nest.
6. Check that the exit holes and the top of the nest protector are free of any vegetation (or obstructions) to ensure the hatchlings can escape and proper sunlight and water can get through.

7. Attach a small flag to mark the nest protector. This is a visual reminder for people to avoid this area as much as possible.

NOTE: Sometimes, people may get impatient and begin to worry if they have not seen the eggs hatch or young turtles come out, so people will dig up the nest. That is a big mistake. On occasion, the eggs will hatch, but the young turtles will not emerge until the next spring. Let things be. Turtles have been doing this for a very long time. They know what they are doing!



Turtle hatching

Making a Shelter

What You Do:

- Take $\frac{1}{2}$ hour discussing what constitutes a survival situation and how you would deal with it; (getting lost, an injury, car accident)
- Discuss how people get lost, and that they are never prepared when they get lost; (do not pay attention, cannot read a map, its dark and cannot see)
- Discuss the background information on Wilderness Survival;
- With the group, proceed to the shelter building area; discuss survival tips along the way;
- At the shelter building area, divide the Scouting Youth into two/three groups (depending on group size);
- Have the Scouting Youth construct a lean-to in the designated area; make sure there are sufficient branches to build the shelters - do not allow the Scouting Youth to break branches off trees;
- Give the Scouting Youth approximately 45 minutes to construct shelters;
- Once completed, discuss with each group the pros/cons of their shelters; the point is to focus on the good points;

Its not a competition between groups as to who has the best shelter or who can finish first. The purpose is to build a shelter that fits everyone in the group.

Points to consider regarding a good shelter:

- is it big enough for the number of people in the group to lay down comfortably (no one sleeps standing up);
- it is not on a down-slope where water will run into it;
it is not too high (heat rises);
- it needs on open side for the fire;
- it is sturdy enough to withstand wind/snow/movement.

Basic Bannock

Ingredients:

2-4 cups of flour
 $\frac{1}{4}$ cup of powdered milk
1 tablespoon baking powder
1 teaspoon of salt
 $\frac{1}{4}$ cup of brown sugar
2 tablespoons of shortening

What You Do:

1. Mix dry ingredients in a bowl; except 1 cup of flour.
2. Add water until all flour is absorbed and the mixture can be formed into a solid ball.
3. Work with your hands and add flour until the dough can take no more flour but the ball still stays together.
4. Form into a flat cake about 1 cm thick.
5. Add shortening to frying pan. Place dough in frying pan, tip frying pan into the fire. (Cook with heat, not direct flame).
6. Rotate pan to brown the outside. When brown and firm, flip over and repeat.

Note:

- Can take between 10 and 40 minutes for the whole bannock to cook.
- Add $\frac{1}{2}$ cup of raisins and a pinch of cinnamon to improve flavour.
- Any type of flour may be used, even corn meal.
- Can substitute butter, margarine, or bacon grease for shortening.
- Try adding such ingredients as chocolate, dried fruits, wheat germ, nuts.

Map Orienteering

The purpose of this activity is to use a map to locate six specific landmarks in the Camp Samac property. Scouting Youth can participate individually (if confident) or with a partner.

Materials: large-scale laminated map of Camp Samac
symbol tally sheet & pencil

What You Do:

1. Distribute maps to the Scouting Youth. All maps are different.
2. Review the Map Reading Lesson (pg. 116).
3. Explain procedure for completing the orienteering activity. Look for six small circles with a symbol near specific landmarks on your map. When you locate one of the indicated landmarks on the course, you will find a crayon on a string at that spot. Without removing the crayon from the string, draw the symbol on the answer sheet. Complete all six symbols in this manner.
4. Hand out a symbol tally sheet to each Scouting Youth. The Scouting Youth are sent out in different directions and at different intervals so as not to follow one another or clump together.
5. Once outside, the Scouting Youth will orientate the map more precisely. They can look at the land for features such as buildings, a bridge, or a parking lot. Find the symbols for the same features on the map and then turn the map until the symbols on the map line up with the landscape features they represent. Hold the map flat. If you need to change direction, do not turn the map. Turn your body around the map.
6. Blow a whistle three times and have the Scouting Youth return to the starting point. The Scouting Youth are reminded of safety precautions and to return to the starting point when they have finished the course. Check their answers for accuracy.

Photo Orienteering

The purpose of this activity is to use a compass to record bearings of specific landmarks in the Camp Samac property. The Scouting Youth can participate individually (if confident) or with a partner.

Materials: compass
several different photographs
bearing tally sheet & pencil

What You Do:

1. Start by giving the "How to Use a Compass" lesson (pg. 123).
2. As a reference point, ask the Scouting Youth to point to the four cardinal directions. Remind participants the value in degrees of each cardinal point. This will help them remember that when they are outside facing east, their bearing should be somewhere around 90°.
3. Practice taking bearings in the classroom by finding a few easy landmarks.
4. Show one of the photographs to the Scouting Youth and tell them that they are looking for specific landmarks within the Camp Samac property. All landmarks are easily recognized buildings or things. When they find the landmark, stand directly in front of it, approximately the same distance away from what they think the picture was taken. To take a bearing:
 - Start by finding the landmark that is seen in the centre of the photograph.
 - Where you are standing in front of the landmark must physically appear the same way as the surroundings in the photograph.
 - Hold the compass flat with the direction-of-travel arrow pointing away from you and directly at the centre of the landmark.
 - Now, rotate the housing until the magnetized needle is inside the orienting arrow. ("RED is in the SHED")
 - Look at the direction of travel arrow to read the bearing you have just made and write down the bearing on your answer sheet.
5. Blow a whistle three times and have everyone return to the starting point. Everyone is reminded of safety precautions and to return to the starting point when they have finished the course. Check their answers for accuracy.

Lost on the Moon

The Problem

You are in a space crew originally scheduled to rendezvous with a mother ship on the light surface of the moon. Mechanical difficulties, however, have forced your ship to crash-land at a spot 200 km from the rendezvous point. The rough landing damaged much of the equipment aboard. Since survival depends on reaching the mother ship, the most critical items available must be chosen for the 200-kilometre trip. Below are listed 15 items left intact after landing.

You May Assume That:

1. The number of survivors is the same number on your team;
2. You are the actual people in the situation;
3. The team has agreed to stick together;
4. All items are in good condition.

What You Do:

Step 1: Individually, **without discussing the situation or the items with anyone else**, your task is to rank the items in terms of their importance to your crew in its attempt to reach the rendezvous point. Place number 1 by the most important item; number 2 by the second most important, and so on through number 15, the least important. Include a reason for each of your rankings.

Step 2: After everyone has finished the individual ranking, rank the 15 items as a team.

Step 3: After everyone has finished the team ranking, a leader will rank the 15 items according to NASA Scientists.

Team Members: _____

List of Items	Reason	You	Team	Expert
box of matches				
food concentrate				
20 m of nylon rope				
parachute silk				
portable heating unit				
two pistols				
1 case powdered milk				
2 tanks of oxygen				
map of the stars				
life raft				
magnetic compass				
10 L of water				
signal flares				
first aid kit				
FM receiver-transmitter				

Answers - Lost on The Moon - Ranking (Source: NASA Scientists)

1. **Two oxygen tanks:** required for survival since the moon lacks oxygen
2. **10 L of water:** also required for survival
3. **Map of the stars:** needed for locating position and figuring out how to get to rendezvous point
4. **Food concentrate:** not as necessary as air and water, but helpful in providing strength
5. **FM receiver-transmitter:** on Earth, powerful receivers could pick up messages which would then be relayed to the mother ship
6. **20 m of nylon rope:** this is needed for lunar mountain climbing
7. **First aid Kit:** needed for any possible injuries that may happen while in transit
8. **Parachute silk:** offers excellent protection from sunlight and heat buildup
9. **Life raft:** this is a carry-all for supplies (the moon's gravity permits heavy loads to be carried), as a shelter, or a possible stretcher for the injured
10. **Signal flares:** these cannot burn in a vacuum, but they can be shot, therefore providing excellent propulsion for flying over obstructions
11. **Two pistols:** like the signal flares, these too will provide excellent propulsion
12. **1 case of dehydrated milk:** milk is heavy and relatively useless in this situation, therefore less valuable
13. **Portable heating unit:** on the moon, overheating is a problem, not the cold
14. **Magnetic compass:** the moon has no magnetic field so the compass is useless
15. **Box of Matches:** these are the most useless due to their inability to burn without oxygen

Factors Affecting Rainbow Reproduction

Let's look at the reproduction rate of one of Ontario's favourite sport fish - the rainbow trout. On average, the female rainbow trout lays 900 eggs. Rainbow trout spawn (lay their eggs) in the spring in a fine gravel bed on the bottom of a stream. They will only spawn in fast moving, cold water. The temperature of the water determines if the eggs will develop and hatch.

READ THE PURPLE CARD

A. In this example, are mortality factors that affect the life of the rainbow trout. How many trout die from:

- acid rain _____
- predation _____
- siltation _____
- disease _____
- loss of spawning ground _____
- high water temperature _____

Total Number (A): _____

B. In this example, are survival factors that increase the chances of a rainbow trout living. How many eggs survive due to:

- a fishing club conducting stream improvement _____
- erosion control, preventing siltation _____
- planting trees and shrubs along the stream _____
- fishing regulations enforced _____
- industries introducing pollution controls _____
- a fish ladder providing access to spawning grounds _____

Total Number (B): _____

Now, subtract total A from the original 1800 eggs.

$$1800 - \text{total A} = \text{_____ total (C)}$$

Now, add total B to total (C)

$$\text{total B} + \text{total (C)} = \text{_____ total (D)}$$

The new total (D) represents the total number of eggs left after spawning. If your answer is more than 1800 eggs, it is still correct because although we are considering only two trout, within a trout population there are many trout which lay many eggs. This only ensures the survival of the population because as we now know, many eggs will die.

Instructions for Playing "Factors Affecting Rainbow Reproduction"

In the spring, two female rainbow trout move into a section of stream with running water. The two trout lay a total of 1800 eggs.

Each Scouting Youth will roll the dice two (2) times. Each roll is done in successive turns with each group member. The first roll represents fish mortality. The second roll represents improving egg survival.

On the first roll, if you roll a:

- 1 - 300 trout eggs die because of acid rain
- 2 - 500 trout eggs are preyed upon by other fish
- 3 - 100 trout eggs are smothered from siltation
- 4 - 400 trout eggs die due to degradation of spawning bed
- 5 - 200 trout eggs die from disease
- 6 - 600 trout eggs die because of high water temperature

On the second roll, if you roll a:

- 1 - 400 more eggs survive because a fishing club conducts stream improvement
- 2 - 300 more eggs survive because erosion control prevents siltation
- 3 - 500 more eggs survive because trees and shrubs are planted by the stream
- 4 - 600 more eggs survive because fishing regulations are enforced
- 5 - 300 more eggs survive because industries introduce pollution controls
- 6 - 600 more eggs survive because a fish ladder providing access to spawning grounds

1. Factors that cause death are called "mortality factors". Which mortality factors can humans help to lessen?

- *acid rain*
- *siltation*
- *loss of spawning ground*
- *high water temperature*

2. An introduced, alien, exotic, non-indigenous, or non-native species is a species living outside its native home. It arrived in a new place by human activity, either deliberate or accidental. Introduced species that have a negative effect on a local ecosystem are also known as invasive species. Typically, invasive species dominate their new ecosystem and reduce the populations of many native species.

In 1886, the brown trout was brought from Europe and purposely introduced into Canadian waters, the same waters occupied by the rainbow trout. Over the years, the brown trout has been recognized as a popular gamefish amongst anglers. Its introduction has had no negative effects. In fact, it has proven to be beneficial.

Why did the introduction of the brown trout have no negative effects on the native populations of the rainbow trout?

The brown trout can live and grow in colder waters than the rainbow trout. You are most likely to find brown trout at the headwaters of a stream, while finding rainbow trout closer to the mouth of the stream. As a result, there is no competition between the two trout. The brown trout is able to occupy a niche successfully that was otherwise unoccupied before.

Stream Study - A Biological Assessment

Invertebrates

Invertebrate life in moving water is abundant. Invertebrates can be found swimming, floating, attached to vegetation, buried in the bottom of the stream, or under rocks. Because of the wide range of habitats within the stream, invertebrates also have a wide range of adaptations that enable them to survive within these habitats.

The Task: To investigate the invertebrate life in the stream ecosystem.

How? Using a kitchen sieve, observation basin, invertebrate identification sheets.

Why? To understand how invertebrates are adapted to life in a stream and the role they play in a stream ecosystem.

- What You Do:**
1. Invertebrate collection will occur within the 5 m section of the stream.
 2. Fill an observation basin $\frac{1}{4}$ full with water.
 3. Obtain the kitchen sieve and thoroughly search out the area for invertebrates. When the bottom material is disturbed, organisms will leave it. The current will carry them into your sieve.
 4. If you do not have a sieve, simply lift rocks off the bottom of the stream to find invertebrates. If the animal is attached to a small rock, then put the whole rock in the observation basin with the invertebrate attached to it.
 5. Place all captured insects in the observation basin. Using the "Insect Identification Sheet", attempt to identify the insects that you caught. Look for adaptations each insect possesses for life in the stream. Carefully return all insects to the stream when your work is finished.

Insect Identification Sheets, including descriptions, can be found on pages 226-229.

Discussion:

1. Select two (2) different invertebrates that you caught and identified. Describe their shape and how each is specially adapted for living in a stream.

The variety of invertebrates in a stream is influenced by the nature of the bottom and therefore determines the necessary adaptations for the insect.

- *Sandy bottomed ecosystems are the least favourable because they offer little in the way of shelter or protection for insects.*
- *Bedrock, although a solid substrate, is so exposed to fast currents that it offers little for organisms to cling and hold on to.*
- *Gravel and rubble bottoms support the most abundant life because they have the greatest surface area, thereby providing many sheltered and protective places for invertebrates to live.*

Because of the wide range of habitats within the stream, invertebrates also have a wide range of adaptations that enable them to survive within these habitats. The following lists some aquatic insect adaptations:

- *flattened, stream-lined bodies (stonefly and mayfly)*
- *muscular legs with "hooks" on their feet to attach themselves to undersides of rocks so they do not get swept away (stonefly and mayfly)*
- *colouration of their body covering blends in with the rocks and stones of the stream bottom (stonefly)*
- *sucker-like parts on the surface of their abdomens (blackflies and riffle beetles)*
- *some make tube-like cases that attach to rocks (caddisfly)*
- *some carry bubbles of air with them under their wings (water beetle)*
- *some use surface tension and specialized structures on the tips of their legs to stay afloat (water striders)*
- *some have specialized mouthparts for grabbing and chewing (dragonfly and damselfly)*

Vertebrates (Fish)

Fish are very common and abundant in streams. They are important because they are a key link in the food chain, and they provide recreation for us. Many fish are sensitive to water quality throughout the stream; therefore, they occupy different habitats. Many fish are also associated with each other and can be found together occupying one habitat. These habitats include under stones, in vegetation, under logs, in undercut banks, in deep pools, and in fast moving water.

The Task: To sample for the various types of fish present.

How? Using a minnow net, observation basin, kitchen sieve, and fish identification sheet.

Why? To learn to identify various fish species and the negative impacts humans have on a stream.

- What You Do:**
1. Within the 10 m marked section of the stream, fill the observation basin $\frac{1}{4}$ full with water.
 2. Using the minnow net and kitchen sieves, thoroughly search out different habitat types for fish.
 3. Using the "Fish Identification Sheets", attempt to identify the fish you caught. Write down the names of the fish you caught on the fish data sheet.
 4. Carefully return all fish to the stream when your work is finished.

Fish Identification Sheets, including descriptions, can be found on pages 230-234.

Discussion:

1. Take a close look around the stream. List three (3) human activities and/or surrounding land uses that you feel would have a negative impact on the stream.

One of the most serious threats to a stream is the changing of the landscape around the stream such as:

- *the clearing of forests,*
- *the conversion of natural landscapes to farmland*
- *the growth of cities*
- *the building of roads*

Each type of change to a landscape will have its own specific impact, usually directly on natural ecosystems and directly or indirectly on water resources. Sediment deposits can greatly alter stream habitat. Sediments can occur in water bodies naturally, but they are also produced in large amounts as a result of the above-mentioned land-use changes. These activities can put too much soil and particulate matter in streams. This sediment can harm plants and animals by carrying toxic chemicals into the water, smothering fish eggs and small organisms used by fish as food, raising water temperature, and reducing the amount of sunlight penetrating the water.

The impact of pollution can also have a negative impact on a stream. The causes of pollution are varied and include industrial wastes, sewage, runoff from farmland, cities, and factory effluents. Wastes that people dispose of can pollute the air, the land, and water resources. They affect the quality of rainwater and of water resources both above and below ground, and damage natural systems.

Classifying Clouds

Name: _____

Purpose: To learn to identify clouds according to altitude, shape, and potential for precipitation.

What You Need: pencil
data sheet

What You Do:

1. For three days, classify and record the clouds that you see in the morning and in the afternoon at camp. Use the descriptions provided below on the three main classifications of clouds. Do your own classifications. *Do not discuss them with other Scouting Youth.*
2. As a group, discuss the results.

The Three Main Types of Clouds

Type	Description	Altitude (m)
cumulus	low, rounded clouds	below 2000
cirrus	thin, wispy clouds made of ice crystals	below 8000
stratus	low, uniform sheet clouds, often with drizzle	below 2000

What You Saw:

	Time	Type of Cloud
Day 1	Morning	
	Afternoon	
Day 2	Morning	
	Afternoon	
Day 3	Morning	
	Afternoon	

What was the largest number of different classifications for any one observation time?

On a sunny day, would you expect to see any nimbostratus or cumulonimbus clouds?

Weather Dynamics Discussion

1. A Scouting Youth boils a hot dog in a plain tin can over a fire. Another Scouting Youth boils a hot dog over the fire in a tin can that was painted black. In which can will the hot dog cook the fastest. Why?

The black can. It will absorb more heat than the plain tin can.

2. What color clothing should tennis players wear to reduce heat transfer by radiation? Why?

Light coloured clothing. The light colour absorbs less heat.

3. Which snow would probably melt faster in sunlight, clean white snow, or dirty snow? Why?

Dirty snow. The dirt in the snow would absorb heat, thereby melting the snow it is in.

4. Explain what a weather reporter means by "the relative humidity is 62%."

The air is holding 62% of the humidity that it theoretically could hold at that temperature.

5. During which season are dehumidifiers most used? What advantages do they offer?

Dehumidifiers are most used in the summer when temperatures and relative humidity are high. They reduce the humidity in a building making the air feel more comfortable. With a high relative humidity, the cooling effect of sweating is reduced.

6. List four (4) decisions you have made in the past year that have depended on the weather.

- *which events (indoor or outdoor) to attend*
- *what type of clothing to wear*
- *where to travel*
- *weather-related items to buy*

7. Imagine you are affected directly by each of the following events listed below. In each case, describe the two most important steps you would take to protect yourself.

- *a blizzard - get off roads or sidewalks; protect yourself from the cold.*
- *a hurricane - stay as far away as possible from flying debris; as the storm approaches, move inland to a higher elevation where the storm surge will not reach.*
- *a tornado - get inside a building; try to get to an interior or basement room where there are no windows.*

APPENDIX

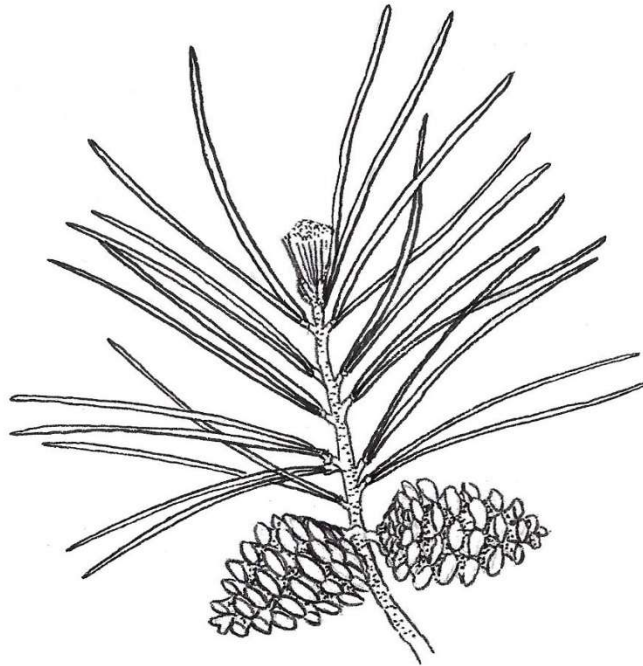
Eastern White Pine
(Pinus strobus)



- Leaves:** 3-5 inches long, **clusters of 5**, soft, flexible.
- Bark:** young trees are smooth, green, becoming dark gray with a thick rectangular, blocky appearance as the tree ages.
- Cone:** 6 inches long.
- Form:** windswept appearance, there is more foliage on the leeward side than the windward side.
- Site:** prefers moist sands, loams, and well-drained clays.
- Use:** doors, trim moulding, cabinetry.

*eastern white pine is Ontario's provincial tree.

Red Pine
(Pinus resinosa)



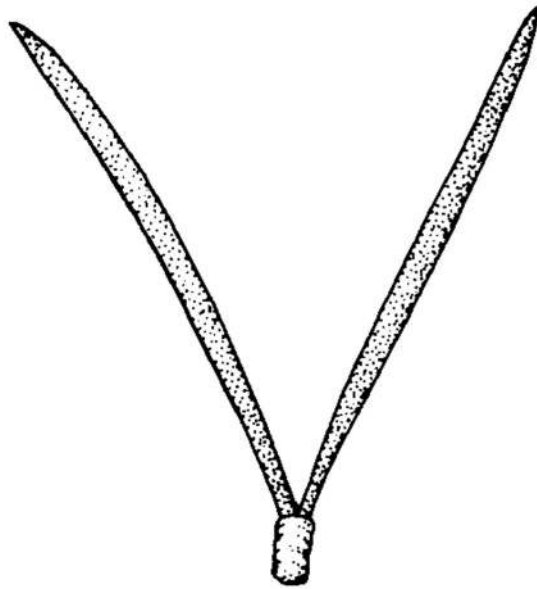
- Leaves: **4-6 inches long**, clusters of two, stiff, **will break when bent.**
Bark: large pink scales, becoming thick and layered.
Cone: 2 inches long.
Form: straight, limbless trunk with little taper; short, oval crown.
Site: prefers well-drained sands or sandy loams.
Use: structural timber, telephone poles, railway ties.

Scots Pine
(Pinus sylvestris)



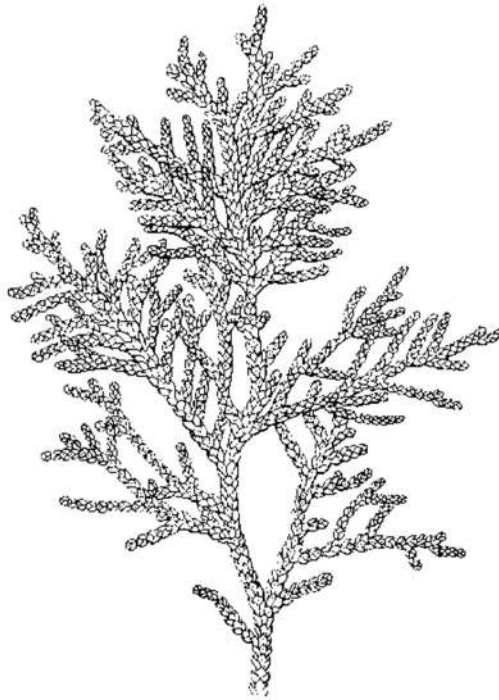
- Leaves: $1\frac{1}{2}$ - 3 inches long, clusters of two, **usually twisted together or individually.**
- Bark: **bright orange** in crown portion of tree.
- Cone: 2 inches long, points backward on the branch.
- Form: irregular.
- Site: variety of soils, planted in large numbers because of its hardiness and rapid growth.
- Use: Christmas trees.

Jack Pine
(Pinus banksiana)



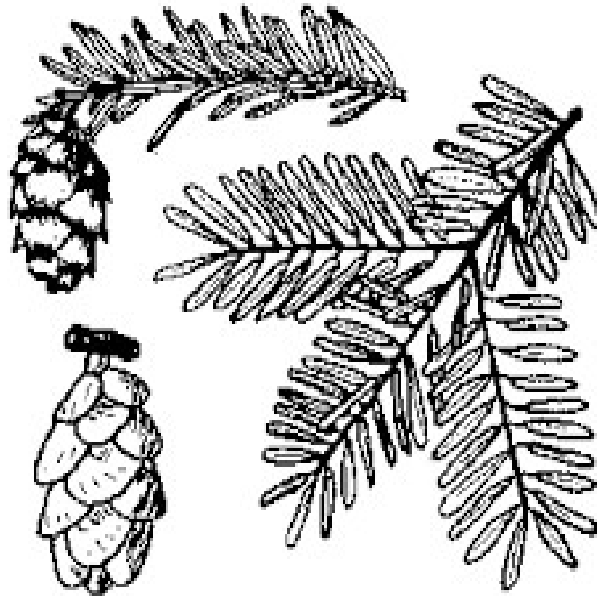
- Leaves: $\frac{3}{4}$ - 2 inches long, clusters of two, stiff, sharp-pointed, not twisted but spread apart **usually forming a distinct V-shape**.
- Bark: thin, reddish brown to gray on young, becoming dark gray and flaky on older trunk.
- Cone: 1-3 inches long, variable in shape, usually pointing inward, **impossible to open** (will only open with heat from a forest fire).
- Form: irregular.
- Site: sandy soils of northern Ontario.
- Use: railway ties, poles, and mining timbers.

Eastern White Cedar
(*Thuja occidentalis*)



- Leaves: **flat and scale-like**; has strong aroma when squished in your hand.
Bark: thin, stringy, and fibrous
Cone: oval, $\frac{1}{3}$ - $\frac{1}{2}$ inches long.
Form: narrow, conical, almost columnar crown that extends to the ground.
Site: very shallow, dry soils.
Use: canoe frames, posts, shingles, fences, decks; very resistant to decay.

Eastern Hemlock
(*Tsuga canadensis*)



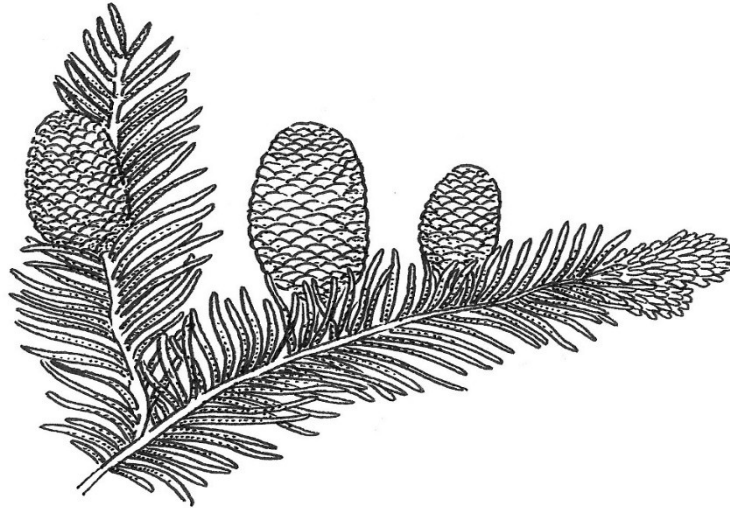
- Leaves:** flat and attached to twig by small stalk; leaves do not circle around the twig they are attached to.
- Bark:** rough, thick, purple-red underneath; often found with numerous sapsucker holes radiating around the trunk.
- Cone:** $\frac{3}{4}$ -inches long, pointed.
- Form:** slender, flexible branches that spread horizontally from the trunk.
- Site:** requires moist, cool conditions.
- Use:** coarse lumber, **not suitable for camp fires because it throws off sparks**; a preferred food of white-tailed deer.

White Spruce
(Picea glauca)



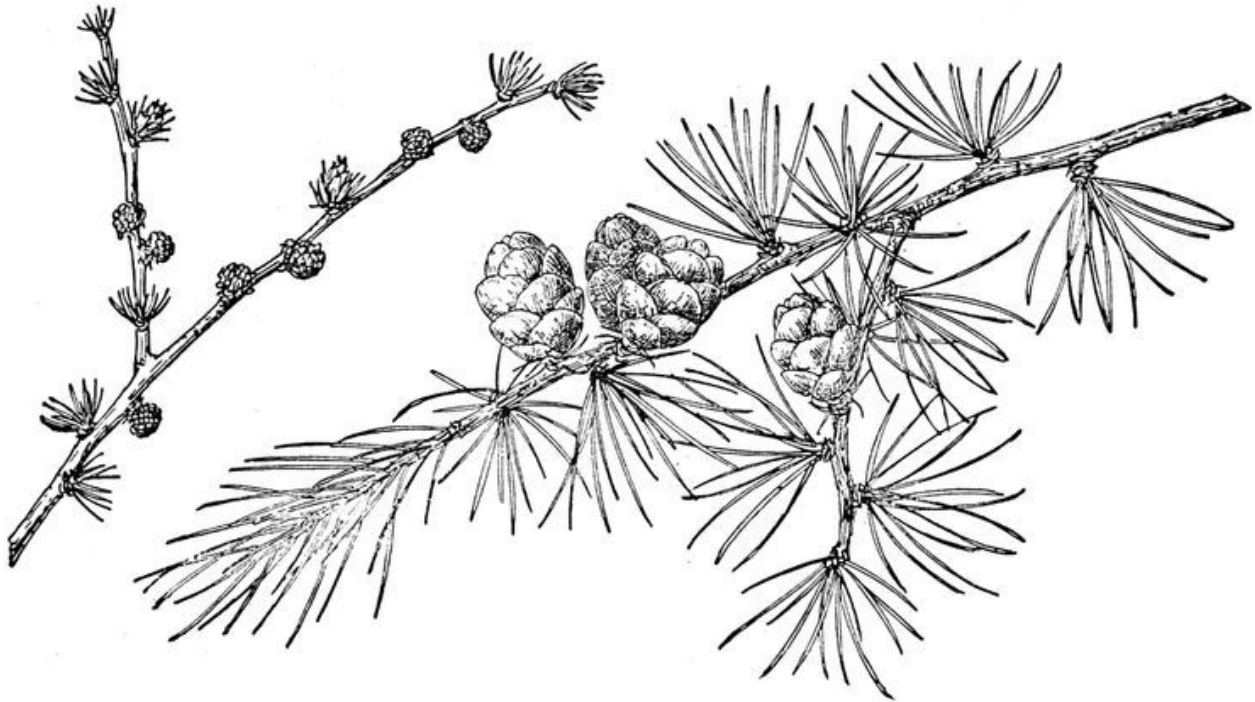
- Leaves:** singly born, **square in cross-section**, $\frac{3}{4}$ -inches long, stiff, **growing completely around the twig.**
- Bark:** thin, flaky, or scaly, freshly exposed under scales is pink, black peppery appearance underneath.
- Cone:** 2 $\frac{1}{2}$ inches long.
- Form:** very pyramidal with a dome-shaped top
- Site:** sites a wide range of soils from moist sands to sandy and clay loams, or well-drained clays.
- Use:** construction, Christmas trees, pulpwood.

Balsam Fir
(Abies balsamifera)



- Leaves: **flattened in cross-section**, usually arranged on two sides of the twig, $\frac{3}{4}$ -inch long, **sessile** (no stalk).
- Bark: **numerous large resin blisters**, otherwise, smooth at all ages.
- Cone: 2-4 inches long.
- Form: usually a narrow, spire-like crown, concave-sided at top.
- Site: adaptable to a wide variety of soils.
- Use: pulpwood, Christmas trees.

Tamarack (Eastern Larch)
(Larix laricina)



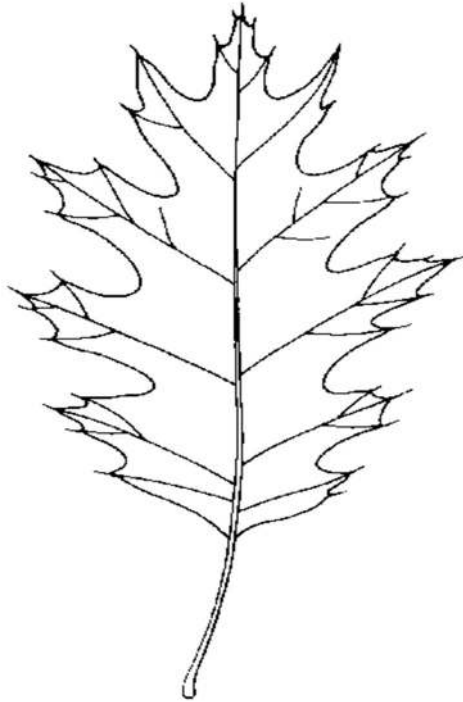
- Leaves:** singly born on new growth, clusters of 10-30 leaves on new branches; **leaves turn yellow in the fall; it is the ONLY coniferous tree that loses its leaves.**
- Bark:** small, thin, gray scales, inner bark red-brown.
- Cone:** $\frac{1}{2}$ -inch long.
- Form:** straight trunk with little taper; a small, narrow, open conical crown with slightly ascending branches.
- Site:** prefers moist sites, from swamps to heavy clays and coarse sands.
- Use:** pulpwood, posts, railway ties.

Hard Maple (Sugar Maple)
(*Acer saccharum*)



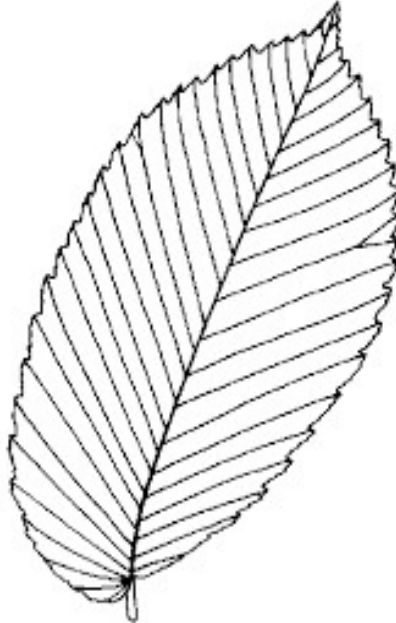
- Leaves:** simple, opposite, 3-5 lobes with long, U-shaped notches between the lobes.
- Bark:** young trees are light gray, as tree ages it becomes dark gray and deeply furrowed into **narrow vertical strips that curl outward**.
- Twig:** slender, smooth, shiny, red-brown.
- Bud:** sharp-pointed
- Form:** straight trunk free of branches for 2/3s or more of its height, narrow, rounded crown.
- Site:** deep, fertile, moist, well-drained soils (indicative of a climax forest).
- Use:** a leading furniture wood, flooring, veneer, and maple syrup.

Red Oak
(Quercus rubra)



- Leaves:** simple, shallowly lobed (always have 10-12 pointed lobes), **lobes being sharp and tipped with a bristle.**
- Bark:** usually smooth and hard, sometime rusty-red in colour, **impossible to break off.**
- Twig:** moderately stout, reddish-brown, hairless.
- Bud:** sharp pointed **with clustered terminal buds.**
- Form:** short, sturdy trunk and wide-spreading uneven-shaped crown with rounded outline.
- Site:** prefers rocky or gravelly uplands in pure stands, or with other hardwoods.
- Use:** flooring, furniture.

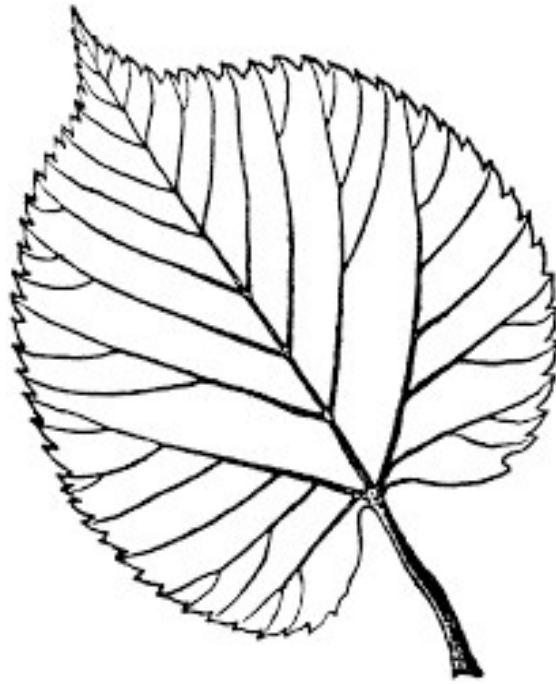
White Elm
(Ulmus americana)



- Leaves:** simple, the leaf base is always lop-sided, leaf surface feels like sandpaper.
- Bark:** light gray, with alternate light and dark layers with flat ridges (ridges form a diamond pattern, but they are flat).
- Twig:** slender, brownish, almost always has a zigzag pattern.
- Bud:** the terminal bud is always crooked.
- Form:** straight trunk, forks several feet above the ground with graceful, umbrella-like crown.
- Site:** rich, moist, sandy, gravelly loams where the water table is close to the surface.
- Use:** barrels, boxes, crates.

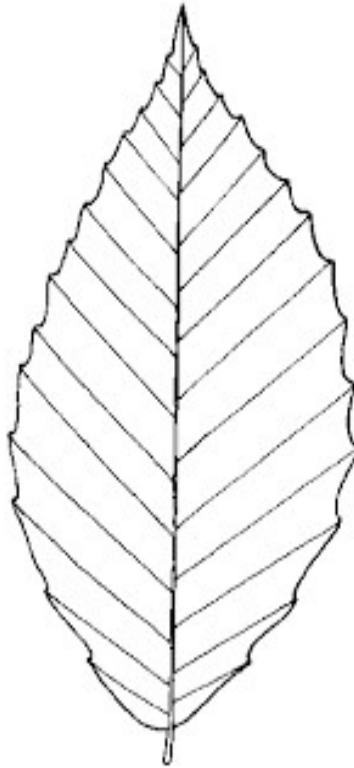
*This tree was almost wiped out in the early 1930s by Dutch elm disease.

Basswood
(*Tilia americana*)



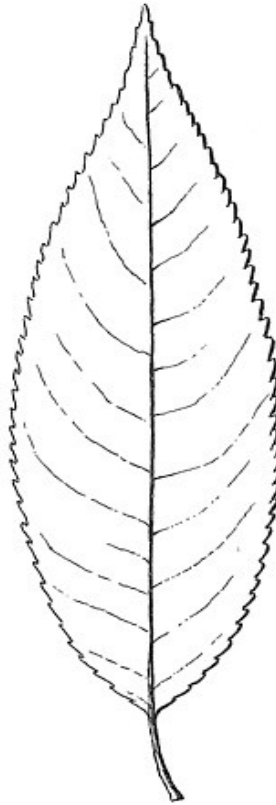
- Leaves:** simple, **large, heart-shaped** with one side of leaf base lower than the other.
- Bark:** young trees are smooth, light gray, while **older bark breaks off in flat-topped ridges with chocolate-brown inner bark.**
- Twig:** stout, reddish, often covered with a grayish skin.
- Bud:** reddish-brown, plump, and **edible (tastes like raw, green peas).**
- Form:** straight trunk, branch-free in the lower part, **uniformly rounded crown.**
- Site:** deep, fertile soils, **does not form pure stands.**
- Use:** the wood is one of the softest and lightest in weight of the Canadian hardwoods and is valued for hand-carving.

American Beech
(*Fagus grandifolia*)



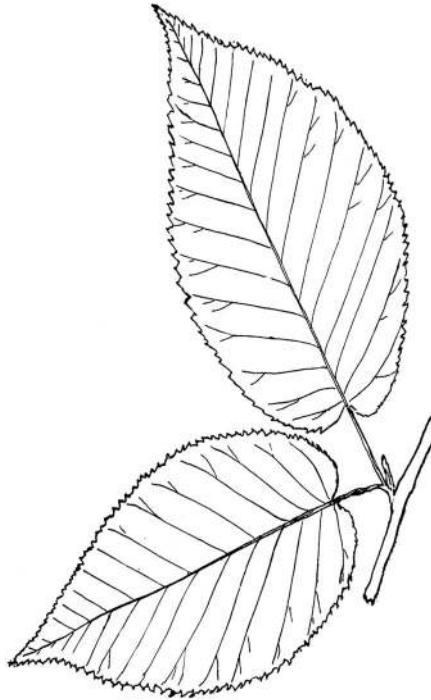
- Leaves:** simple, elongated, oval, straight veined, **each vein ends on a point on the leaf margin.**
- Bark:** thin, smooth, light bluish-gray, **looks like elephant's skin.**
- Twig:** slender, **slightly zigzag.**
- Bud:** brown, long, slender, **pointed, with many scales in 4 rows, each with a gray tip.**
- Form:** short trunk and wide-spreading crown.
- Site:** moist, well-drained slopes and rich bottomlands.
- Use:** flooring, furniture, when treated with preservatives it is used for railway ties.

**Black Cherry
(Prunus serotina)**



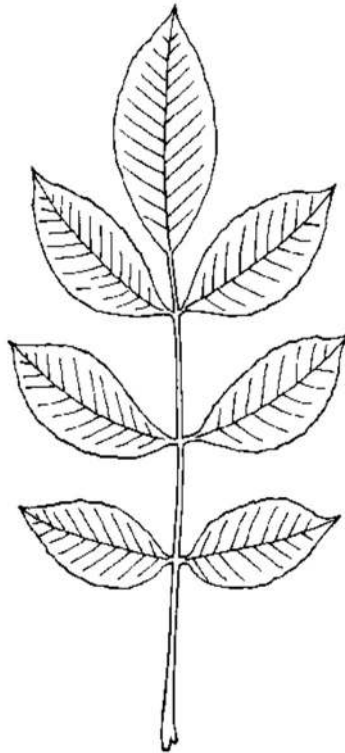
- Leaves:** simple, tapered at both ends, **leaf margin looks like an insect chewed it, has 1-2 dark red glands at the base of the leaf on the leaf stalk; on the back of the leaf at the base along the midrib is some orange fuzzy stuff.**
- Bark:** young trees are smooth, **shiny black with numerous lenticels.**
- Twig:** **smells and tastes awful** (scrape your thumbnail to remove some bark).
- Bud:** very small, rounded.
- Form:** straight, branch-free trunk with little taper.
- Site:** a variety of soils, but prefers rich, moist soils along with other hardwoods.
- Use:** valuable wood for furniture (very expensive due to scarcity of tree and cost to mill it).

White Birch
(*Betula papyrifera*)



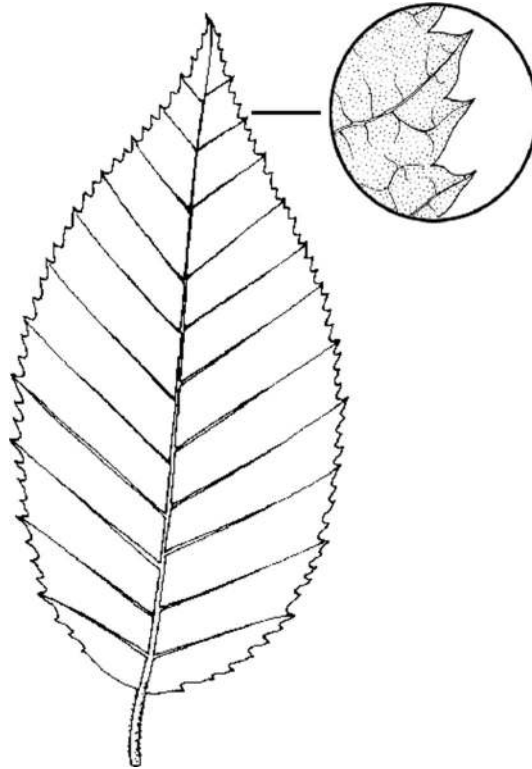
- Leaves:** simple, triangular to oval, leaf margin is double-toothed, no teeth on the margin adjacent to the stem; smaller than yellow birch, less than 10 veins.
- Bark:** young - thin, smooth, reddish-brown with numerous lenticels.
old - creamy-white, papery, peels off in large pieces.
very old - black, thick, no sign of papery bark.
- Twig:** dull brown, slender, new growth is hairy, **bitter taste**.
- Bud:** appears waxy or gummy, sticky, dull brown.
- Form:** slender trunk, narrow, oval, open crown with many fine branches.
- Site:** moist, upland soils, often in pure stands.
- Use:** popsicle sticks, toothpicks, clothespins, broom handles.

White Ash
(*Fraxinus americana*)



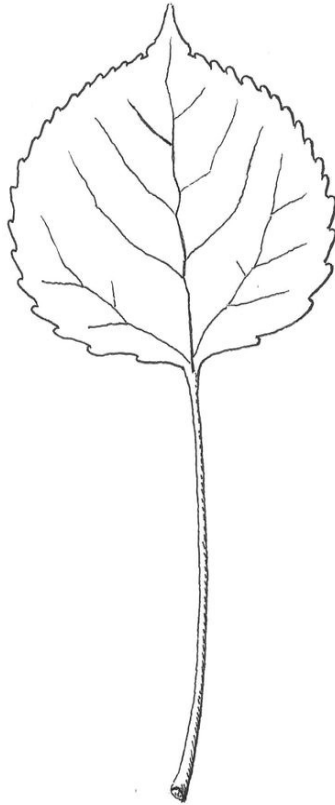
- Leaves: compound, opposite, usually with 5-9 leaflets, leaflets have long stalks.
- Bark: light to dark gray with thick, **distinct, diamond-shaped furrows with pointed ridges**; bark is very difficult to scrape off.
- Twig: very stout, dark, blue-gray.
- Bud: **lateral buds are tight to the terminal bud.**
- Form: long, straight trunk free of branches, crown is narrow and pyramidal.
- Site: deep, well-drained but moist soils.
- Use: the wood is hard, heavy, strong, straight-grained and flexible, hence, baseball bats, hockey sticks, oars, etc.

Ironwood (Hop Hornbeam)
(*Ostrya virginiana*)



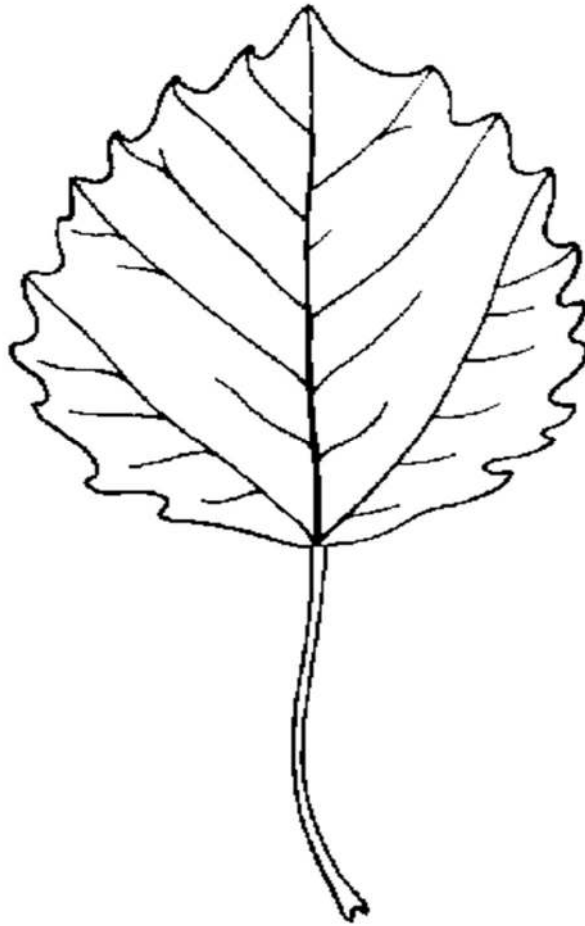
- Leaves:** simple, **numerous forked veins near the leaf margin** (the only leaf you need to check the veins for to identify); difficult to distinguish from yellow birch (veins on yellow birch seldom fork)
- Bark:** grayish-brown, **broken into longitudinal, narrow strips that curl at both ends** (looks like white cedar).
- Twig:** brown, slender, **very fine appearance**.
- Bud:** wider than twig and **sits on a 45° angle from the twig**.
- Form:** upright trunk, long, slender branches that form a wide-spreading crown.
- Site:** well-drained slopes and ridges, tolerant of shade.
- Use:** tool handles because **it is very hard**, little commercial value.

Trembling Aspen
(*Populus tremuloides*)



- Leaves:** simple, small, nearly circular, fine teeth; **the leaf is flattened at right angles to the leaf base** so it leans to either side and "trembles" in the wind.
- Bark:** smooth, creamy-white; **often mistaken for white birch at a distance.**
- Twig:** slender, red-brown, **shiny.**
- Bud:** $\frac{1}{4}$ -inch, **sharp, pointed, semi-divergent, shiny.**
- Form:** slender and graceful looking, long round trunk and short rounded crown.
- Site:** prefers sandy and gravelly slopes, **often in pure stands, always in the Sun.**
- Use:** pulpwood, matches, crates.

Largetooth Aspen
(*Populus grandidentata*)



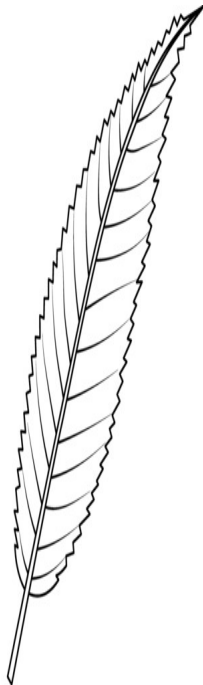
- Leaves:** simple, egg-shaped, almost circular, wavy margin with **prominent and irregular teeth**.
- Bark:** smooth, pale green to yellowish gray, **usually with an orange cast**.
- Twig:** moderately stout, brownish gray, downy when leaves are unfolding.
- Bud:** pointed, **covered with a grayish down**.
- Form:** trunk is short and tapered, crown is oval but is usually quite uneven with a few irregular coarse branches.
- Site:** moist, fertile soils.
- Use:** pulpwood, boxes, crates.

Balsam Poplar
(Populus balsamifera)



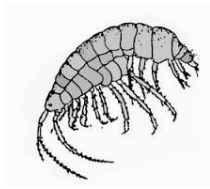
- Leaves: simple, broadly ovate, **underside is creamy-white with rusty patches; has a rounded stalk.**
- Bark: smooth, green-brown when young, gray-black, and deeply furrowed when old.
- Twig: medium diameter, red-brown.
- Bud: $\frac{1}{2}$ -inch, pointed, **really smells when you squish it with your fingers.**
- Form: long, straight, round trunk with a narrow open crown of a few stout ascending branches.
- Site: prefers moist, rich, low-lying ground.
- Use: mostly for windbreaks, has little commercial value.

Willow
(*Salix* spp.)



- Leaves:** simple, **long, and narrow**, green upper, gray lower; margin wavy to smooth.
- Bark:** dark brown or blackish, deeply furrowed into scaly, forking ridges.
- Twig:** vivid green, brown, black, slender, **very flexible**.
- Bud:** $\frac{1}{4}$ -inch, one bud scale.
- Form:** can be found as low growing bushy shrub or tall, broadly branched tree.
- Site:** wet banks of streams and lakes, especially floodplains.
- Use:** erosion, control, toys, pulpwood, **makes a great firebow**.

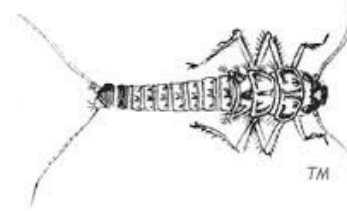
Sideswimmer (Scud)



Description: They swim on their sides, very quickly. They have 7 pairs of segmented legs, 2 pair of antennae. A hard, plate-like shell covers all but the head and upper body.

Size: 5-20 mm long.

Stonefly Nymph



Description: They have 2 long antennae with 2 hair-like tails. 6 segmented legs on middle section of body. Each leg has 2 hook-like claws. Gills on undersides and wing pads.

Size: 7-12 mm long.

Blackfly Larvae



Description: Soft, shaped like a bowling pin, grub-like maggot. Head is usually black with tiny gills near it. Small suckers on end of abdomen for attachment. Segmented body.

Size: up to 50 mm long.

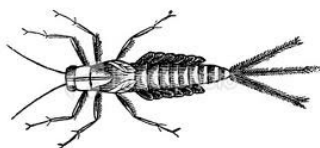
Caddisfly Larvae



Description: Worm-like with 3 pairs of well-developed legs on the first 3 body segments and hooks on the last segment. Often found inside a case built from organic material.

Size: up to 20 mm long.

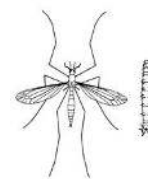
Mayfly Nymph



Description: Usually have 3 long tails extending from their flat body. Some have leaf-like gills on their abdomen. They have single claw on each leg. The antennae are short.

Size: 15 mm or less.

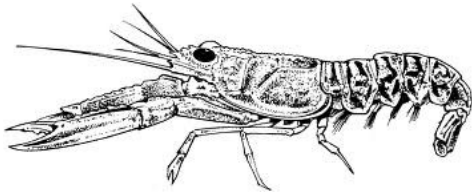
Cranefly



Description: The adult looks like a giant mosquito. The larva has a fleshy, roundish, and plump, legless, white body that is segmented. Protrusion at the anal ends are gills.

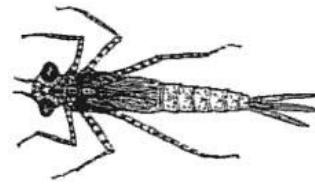
Size: larvae up to 10 cm long.

Crayfish



Description: This 10-legged crustacean has the front legs modified into large claws that are used for grasping food, defense, and digging burrows.
Size: 10- 150 mm long.

Damselfly Nymph



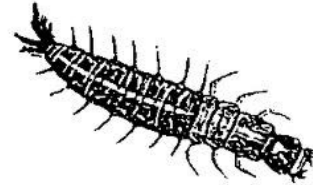
Description: Slender body with 3 long, tail-like gills at the end. The extendable jaws fold up under the head. The adult folds its wings along abdomen at rest.
Size: 10-20 mm long.

Predaceous Diving Beetle



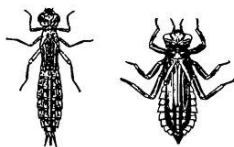
Description: The larvae have segmented, streamlined bodies. The jaws can be larger than the rest of the head. Adult is smooth and oval. Back legs are paddle-shaped.
Size: up to 40 mm long.

Dobsonfly Larvae



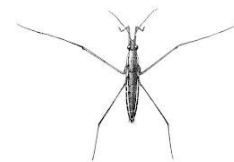
Description: Mouth has large, chewing pinchers. Body is segmented and has 6 segmented legs on the middle section, each with tiny pinchers. Back end is forked with 2 short tails.
Size: up to 65 mm in length.

Dragonfly Nymph



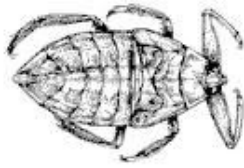
Description: These nymphs have large eyes and a large scoop-like lower lip. The abdomen is oval. The 6 segmented legs are located near the head. Has wing pads, but no wings.
Size: 18-49 mm long.

Water Strider



Description: Skates and slides along the surface of the water. They are flat and long without wings. The 2nd and 3rd pair of legs are almost twice as long as their body.
Size: 8-12 mm long.

Giant Water Bug



Description: Flat bodies and flattened hind legs which are used for swimming. The front legs are used to grab prey. It can inflict a painful bite. Leathery wings allow them to fly.

Size: 25-60 mm long.

Leech



Description: Leeches are black/brown, flat, segmented, with a sucker on both ends. One of these is the mouth. Most leeches are carnivores that feed on snails and worms.

Size: 5-450 cm.

Clams



Description: These bivalves have 2 hinged shells enclosing the soft body. Clams are rounder. Mussels are flatter and more oblong in shape. Fleishy foot can extend beyond shell.

Size: 2-4 cm.

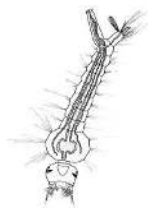
Midge Larva



Description: Possesses a long, thin cylindrical body. The digestive tract can be seen inside the body as a thin, dark line. Distinct, often dark head.

Size: 2-30 mm long.

Mosquito Larva



Description: These "wigglers" twist and squirm just below the water surface. They usually hang from the surface, suspended by the surface.

Size: up to 8 mm long.

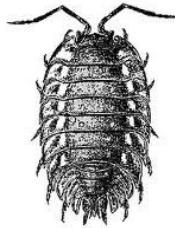
Alderfly Larvae



Description: Larvae have 7 pairs of abdominal filaments, lack anal prolegs and have a central caudal filament. More commonly found in the slow-moving parts of streams.

Size: up to 30 mm in length.

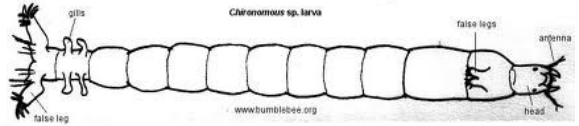
Aquatic Sowbug



Description: They are flattened dorsoventrally. The head is fused with the first two thoracic segments; the 7 remaining thoracic segments are similar to each other.

Size: up to 20 mm long.

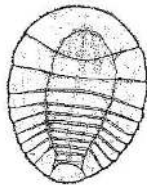
Aquatic Worm



Description: Long, thin segmented worm. Colour is usually red but may also be tan, black or brown. The short bristles that help with movement may be too small to see by eye.

Size: 5-30 mm in length.

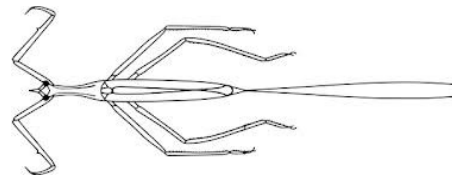
Water Penny Larva



Description: Inside the hard, spiral-shaped shell is a soft body. The shells are usually opened on the right side (hold shell with tip pointing up and opening facing you).

Size: 4-6 mm long.

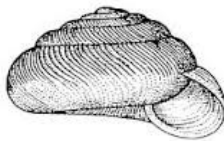
Water Scorpion



Description: Flat bodies and flattened hind legs which are used for swimming. The front legs are used to grab prey. It can inflict a painful bite. Leathery wings allow them to fly.

Size: up to 50 mm long.

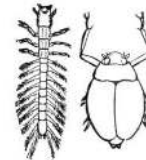
Freshwater Snails



Description: Inside the hard, spiral-shaped shell is a soft body. The shells are usually opened on the right side (hold shell with tip pointing up and opening facing you).

Size: 5-20 cm.

Whirligig Beetle



Description: These beetles swim in circles. The adult is streamlined and oval. The 2 hind legs are flattened and function as oars. The larva is long and segmented with many legs.

Size: 5-25 mm long.

Fish Identification Sheet



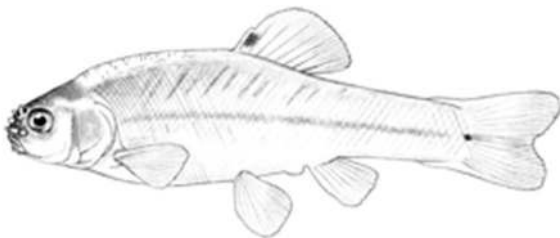
Creek Chub (*Semotilus atromaculatus*)

- has distinct black spot at the anterior base of the dorsal fin
- males may have 6-8 short spikes (tubercles) on snout during breeding season



Bluntnose Minnow (*Pimephales notatus*)

- has a rounded head and a terminal mouth, although the snout hangs a little bit over the mouth
- on the first 2 or 3 dorsal rays is a dusky blotch
- the lateral line extends from the head to tail, ending in a black spot
- the dark colouring on the edges of the scales causes a cross-hatched look along the body



Fathead Minnow (*Pimephales promelas*)

- has a deep, compressed chunky body, heaviest towards the head
- mouth is distinctly terminal
- usually a black spot on the anterior edge of the dorsal fin
- breeding males possess large, scattered tubercles on top of their heads



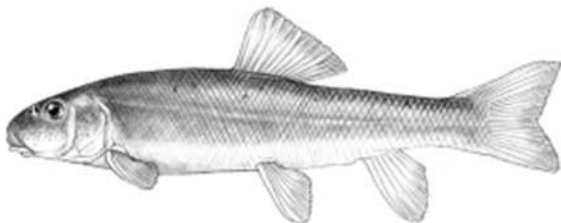
Blacknose Dace (*Rhinichthys atratulus*)

- very stream-lined shape; triangular-shaped head
- the mouth is inferior and the short snout extends slightly over the mouth
- dark brown to olive on its dorsal surface and silvery white below
- distinct, dark black lateral band from snout through the eye to the base of tail
- males develop bright orange colour along lateral line during breeding season



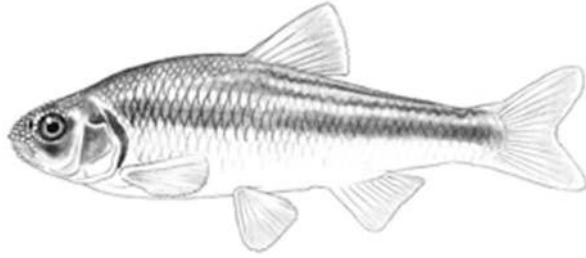
Longnose Dace (*Rhinichthys cataractae*)

- very stream-lined shape; triangular-shaped head
- the mouth is inferior and the long, fleshy snout protrudes well beyond the downward-facing mouth
- dark green to black on its dorsal surface, shading to pearly or yellowish underneath
- lateral band absent or indistinct; sides typically mottled or blotchy
- males may develop reddish-orange colour on head and fins
- often mistaken for suckers because of their subterminal "sucker-like" mouth
- almost always found on the bottom of fast flowing streams among the rocks



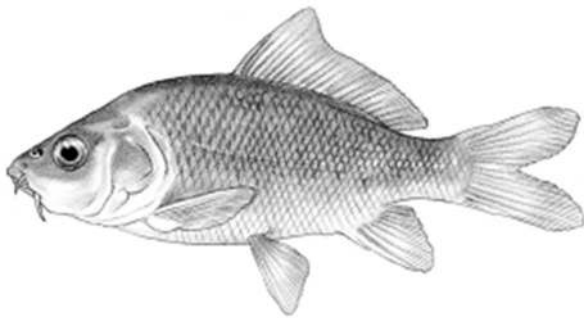
white sucker (*Catostomus commersoni*)

- inferior mouth over-hung by snout; fleshy, upper lip is thinner than lower lip
- long, round-bodied fish with a dark green, gray, copper, brown, or black back and sides and a light underbelly



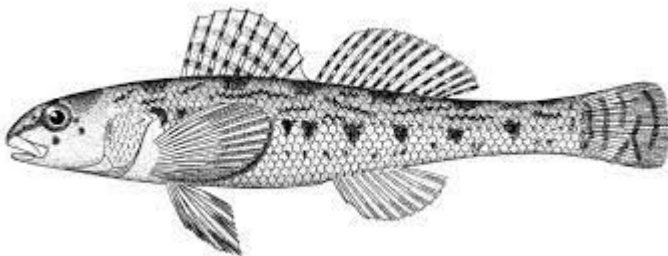
common shiner (*Luxilus cornutus*)

- olive back with a dark, dorsal stripe
- body is strongly laterally compressed
- sides are silvery coloured (sometimes bronze) with dark scattered crescents; belly silvery-white
- loose scales, with missing patches



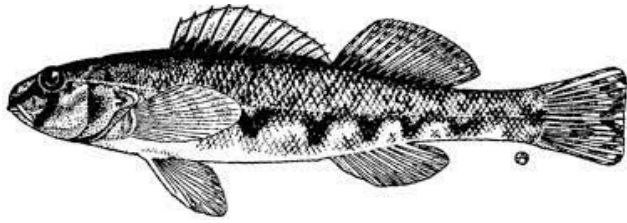
common carp (*Cyprinus carpio*)

- has large, conspicuous barbels at the corners of the mouth
- large, thick scales
- a large serrated spine at the anterior edge of the dorsal and anal fins



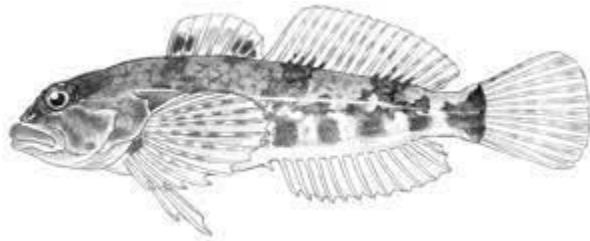
johnny darter (*Etheostoma nigrum*)

- very slender with brown to yellow scales, large pectoral fins
- distinctive w, M, or V-shaped markings on the sides
- two dorsal fins, one which is hard with spines, the second made up of soft rays



rainbow darter (*Etheostoma caeruleum*)

- stout-bodied; back is mottled brown with 6-10 saddles down the length of the body; sides are light brown with up to 14 vertical stripes down the body
- breeding males are brilliantly coloured - bands of bright blue-green with orange-red in between
- very sensitive to pollution and silt; stays in clean, pollution-free streams



mottled sculpin (*Cottus bairdii*)

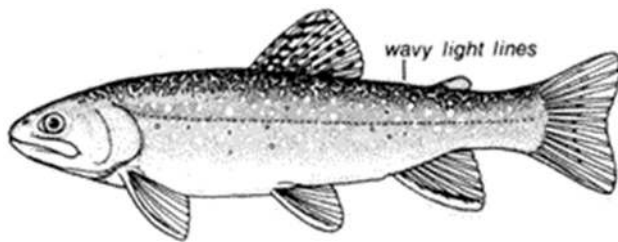
- broad, flattened head, tapering abruptly into the rather slender body. very large mouth
- small prickles are often found on the head and body
- dorsal fin is divided into two distinct parts; the first just barely joins with the second; both soft and flexible
- pectoral fins are very large, banded, and fan-shaped
- because it is a bottom-dwelling fish, colour is a combination of bars, spots and mottles randomly distributed
- are always found in fast-moving, cold, well-oxygenated streams

Identifying Trout



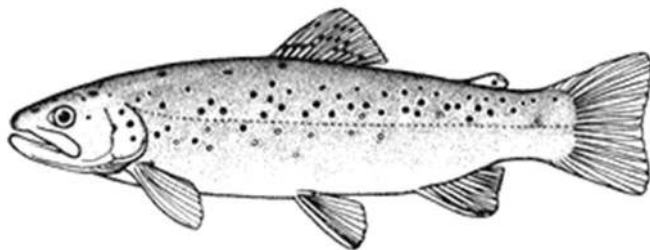
Rainbow Trout (*Salmo gairdneri*)

- has numerous black spots along the entire length of the fish, including the tail
- has a black border around the adipose fin



Brook Trout (*Salvelinus fontinalis*)

- dark, heavy, wavy lines (vermiculations) extend along the dorsal area to the caudal fin
- the leading edge of the three lower fins has a pronounced white border
- red spots with blue halos on the sides



Brown Trout (*Salmo trutta*)

- body is a golden brown to silver in colour
- has numerous black spots throughout the body, but not on the tail
- red or orange spots with silver halos on the sides

Scouts



(Sharing Community Outdoor Universal Teachable Stuff)



Written & Compiled by:

Guy Morey
March 2023