

Trees and Forests Unit Review

- **Identify reasons why trees and forests are valued. Students meeting this expectation should be aware that forests serve as habitat for a variety of living things and are important to human needs for recreations, for raw materials and for a life-supporting environment.**

Trees and forests are essential to our existence on Earth and should be valued for several reasons including:

- They produce oxygen and lock up carbon dioxide
- They are able to filter out harmful pollutants from the air that we breathe
- They provide shelter from strong winds
- They provide shade and protection from direct sunlight
- They provide natural ingredients that contribute to the advancement of medicine
- They provide raw materials for our construction and paper industries, and craft industry
- They provide an area for recreation for campers

Forests serve as a **habitat** for a variety of living things. A **habitat** is an area or environment where an organism lives or occurs. A forest is an area of living (**biotic**) and non-living (**abiotic**) things that create an environment that is called an **ecosystem**. An **ecosystem** is a living community that depends on each member and its surrounding environment.

The **living things** (biotic) are categorized into three groups:

- **Producers** – living things that use energy from the sun to produce their own food. e.g. Plants
- **Consumers** – living things that need to eat producers or other consumers to live.
 - **Herbivores** – eat plants (deer, squirrels, caterpillars)
 - **Carnivores** - animals that eat other animals (lynx, coyotes, wolves)
 - **Omnivores** – eat both plants and other animals (bears, foxes)
- **Decomposers** – living things that feed off dead plants and animals. They break down remains into nutrients and minerals for the soil. (fungi and bacteria)

The **non-living things** (abiotic) in a forest are water, rocks, sunlight, air, soil, and chemicals.

- **Describe kinds of plants and animals found living on, under and among trees; and identify how trees affect and are affected by those living things.**

The forest is made up of different layers with plants and animals found living on, under and among the trees. The layers are as follows:

- **Upper canopy:** top layer of the forest
 - Captures more than 90% of the sunlight
 - Where most of the photosynthesis occurs
 - A Lot of flying animals can be found here
 - Humming bird, owl, and insects (butterfly, caterpillars).
- **Understory:** Many small trees, larger bushes and shrubs.

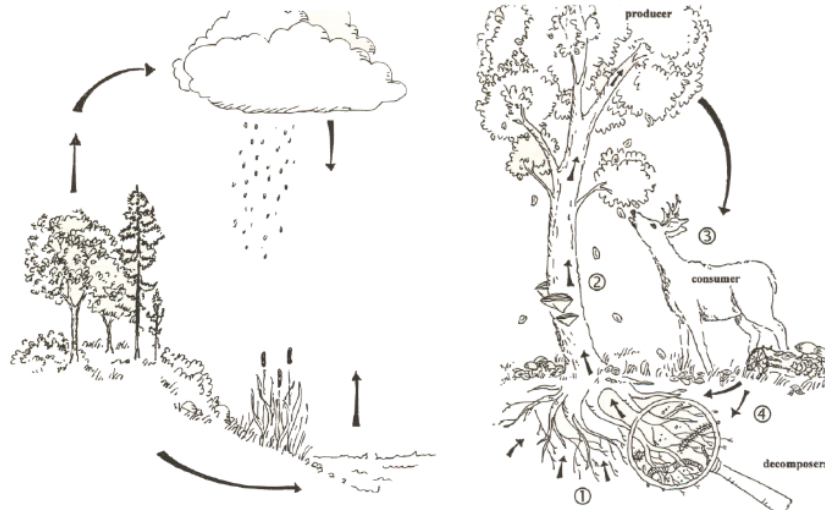
- Provides shelter for many forest animals
 - **Shrubby layer:** Home to many forest wildflowers, ferns, deer skunks and rabbits.
 - These animals find their food on this level.
 - **Forest Floor:** Dark and damp. Only plants that can live with very little light grow here.
 - Fungi decompose dead plant material here
 - Fungi are not green because they don't have chlorophyll and can not produce food through photosynthesis.
 - Fungi eat dead plant material. Mushrooms, conks and lichens are examples of fungi.
 - Decomposers such as worms, bacteria, millipedes, and centipedes are examples of decomposers.
 - Inhabitants of the forest floor are toads, mushrooms, and insects.
- Describe the role of trees in nutrient cycles and in the production of oxygen.

The Water Cycle

1. Water enters the atmosphere through **evaporation** and **transpiration** (water released from the stomata on the underside of leaves)
2. The water vapor cools and condenses in the clouds called **condensation**
3. The water is released from the clouds in the form of **precipitation** (rain, snow, hail, sleet)
4. The precipitation lands on the ground or remains on the surface and collects into streams, rivers, and lakes. This is called **collection**.
5. The cycle repeats over and over again.

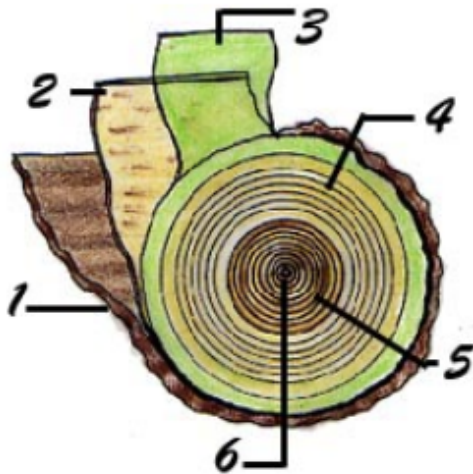
The Nutrient Cycle

1. Decomposers break down the dead matter from trees or animals
2. Nutrients are released back into the soil
3. Roots of trees absorb the nutrients
4. Nutrients travel up the trunk of the tree and are used as energy for photosynthesis
5. Consumers eat the leaves of trees or the dead leaves fall back to the ground.
6. The cycle begins all over again.



- Identify general characteristics that distinguish trees from other plants, and characteristics that distinguish deciduous from coniferous trees.

Most trees have the same basic parts. These include **roots, trunk/stem, crown, bark, phloem, cambium, sapwood, xylem, heartwood and leaves**. A tree's **roots** absorb water and nutrients from the soil, store sugar and anchor the tree upright in the ground. The **trunk or stem** supports the crown and gives the tree its shape and strength. The **crown** consists of the leaves and the branches at the top of the tree. The **trunk** is made up of a network of tubes that run between the roots and the leaves. This is how nutrients move from the soil to the leaves.



1. The **outer bark** protects the tree from extreme temperatures, bad weather, insects and fungi. Very thin in birch trees, the outer bark may be one foot thick in the Douglas fir.
2. The **phloem** is also called the **inner bark**. It conveys the food bearing sap developed in the leaves down to the various parts of the tree.
3. The **cambium** is a thin layer of cells that produce phloem on one side and sapwood on the other.
4. **Sapwood (xylem)** is the living wood in the tree through which the raw sap rises from the roots to the leaves.
5. The **heartwood** consists of old cells. This is the dead part of the tree that nevertheless provides structural strength. If air could reach these cells, the heartwood would rot quickly.
6. The **pith** is the central core of the tree.

Trees can be categorized into two types, **deciduous or coniferous**.

Deciduous trees:

- shed their leaves before the cold or dry season
- the leaves often turn orange, red or yellow
- new leaves appear in spring
- many different varieties and sizes
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Coniferous trees:

- have needle-shaped leaves
- needles are green all year long
- are cone-bearing trees
- more variety in the shape of coniferous trees ranging from bushes and shrubs to very large trees

The tamarack or larch is both coniferous and deciduous.

- **Identify characteristics of at least four trees found in the local environment. Students should be familiar with at least two deciduous trees and two coniferous trees. Examples should include native species, such as spruce, birch, poplar, and pine and cultivated species, such as elm and crab apple.**

White Birch (deciduous):

- a small to medium tree with many stems
- bark is thin, smooth, and marked with brown horizontal lines
- bark is light, strong and flexible and peels off in paper strips
- have narrow, oval shaped crown above a slender trunk
- simple, round shape leaves with fine-toothed margin
- not cone bearing
- in the past, Indians used Birch bark to build canoes

Spruce (coniferous):

- large tree with narrow crown
- cone bearing – cones are light brown and scaly
- needles are four sided, stiff, and sharp
- needles are arranged spirally on a twig
- bark is scaly and grayish-brown
- most common building wood in Canada

Poplar (deciduous):

- very common tree in Canada
- used for making paper and makes excellent firewood
- oval shaped leaves with a fine-toothed margin
- bark is smooth and yellowish
- in the past, poplar trees played an important role in natural medicine

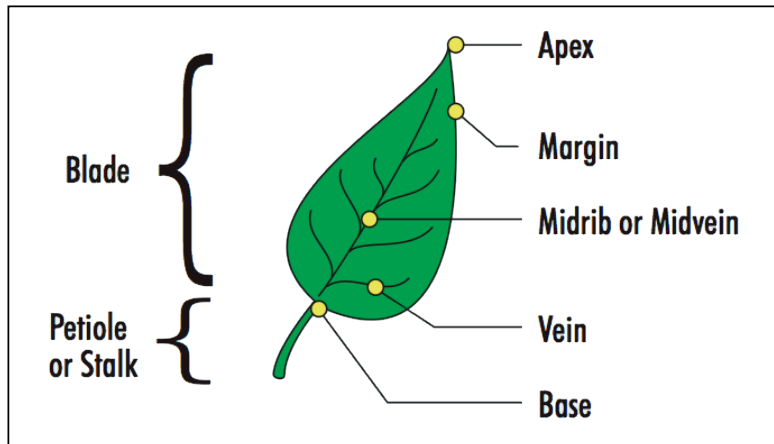
Pine (coniferous):

- most widespread tree in Canada
- cone bearing with needles that appear in pairs
- bark is thin and scaly
- most commonly used for plywood, paneling, furniture, and railway ties
- most common trees Indians used to build teepees
- pine trees are the first to grow back after a forest fire

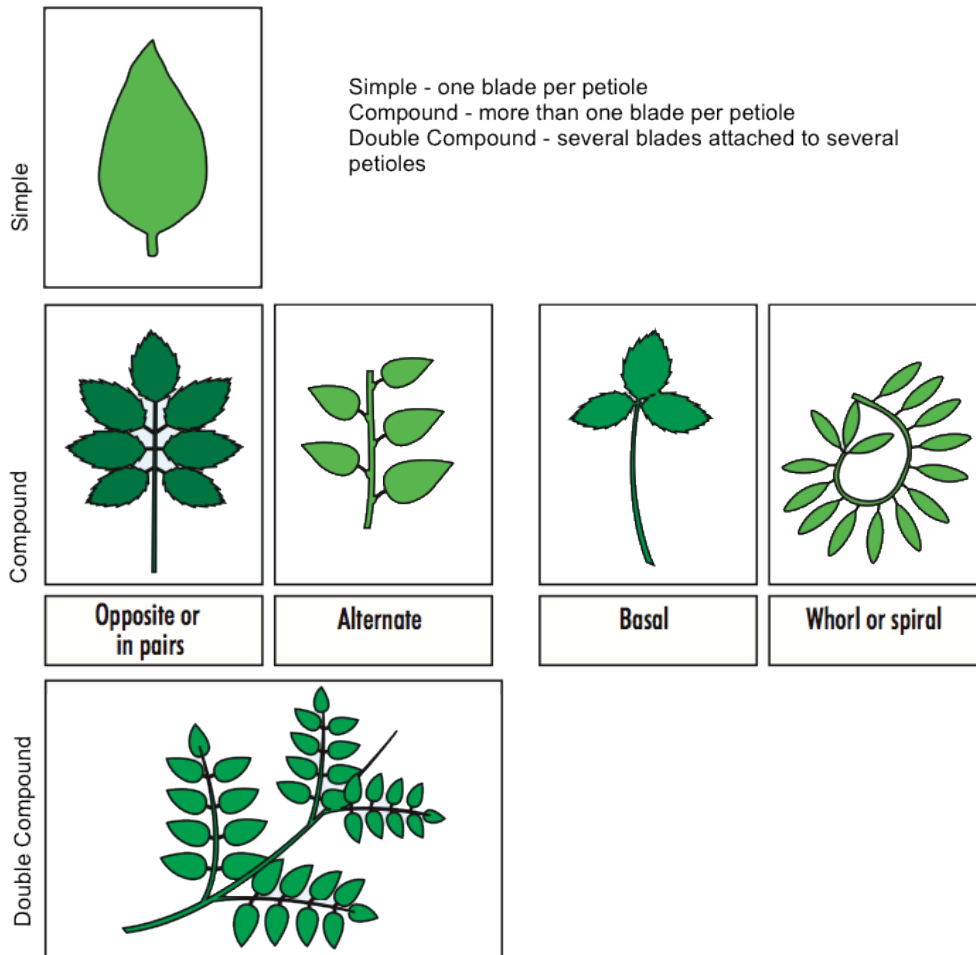
- **Describe and classify leaf shapes, leaf arrangements, branching patterns and the overall form of a tree.**

You can identify trees by their **shape or silhouette**. The features of their leaves, bark, twigs, buds, flowers, and fruits are distinctive. They can be classified as **broad leaf (deciduous) or needle leaf (coniferous)**.

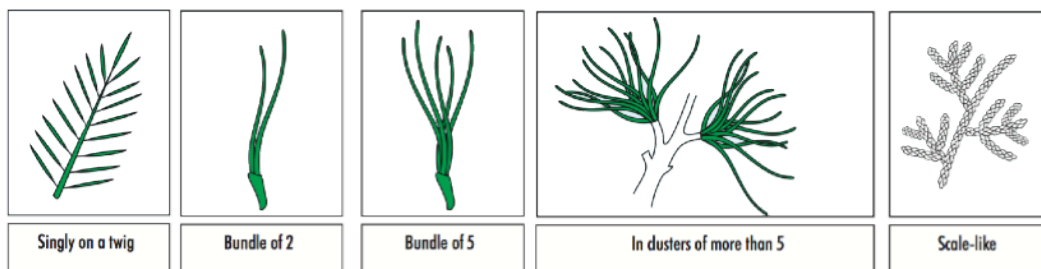
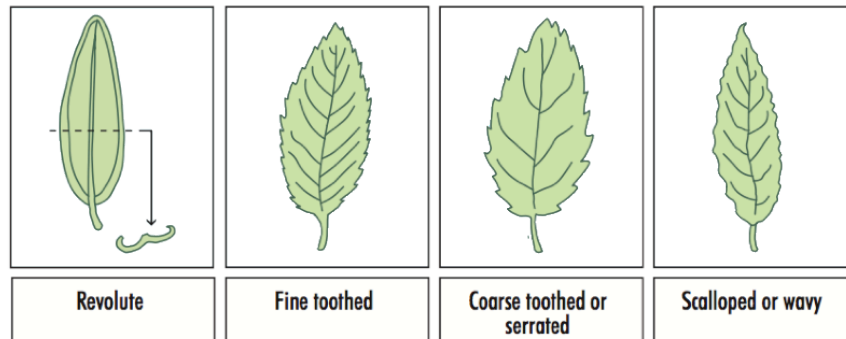
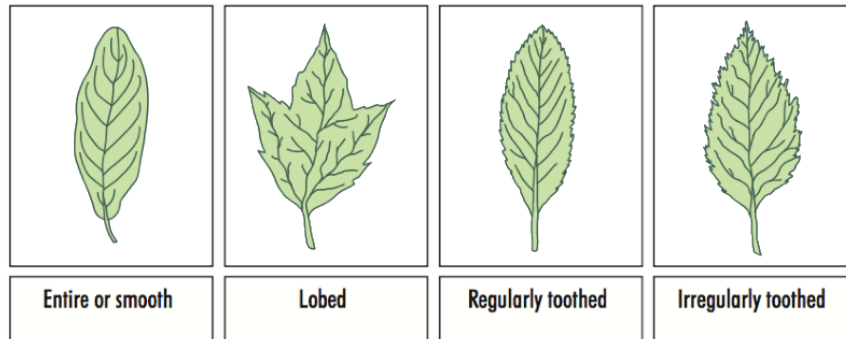
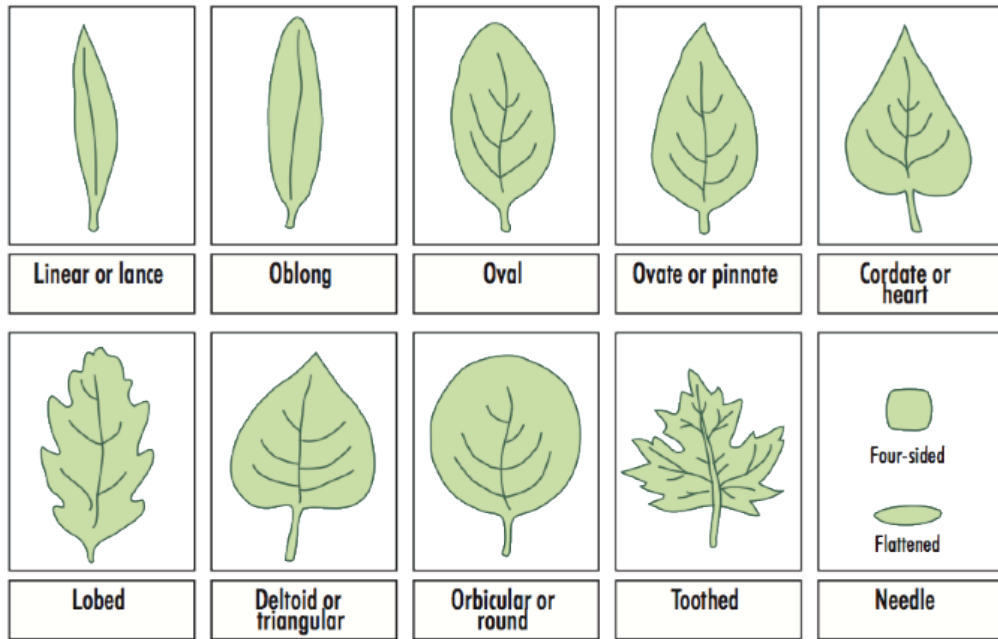
Leaves are the most common feature considered when identifying a tree.



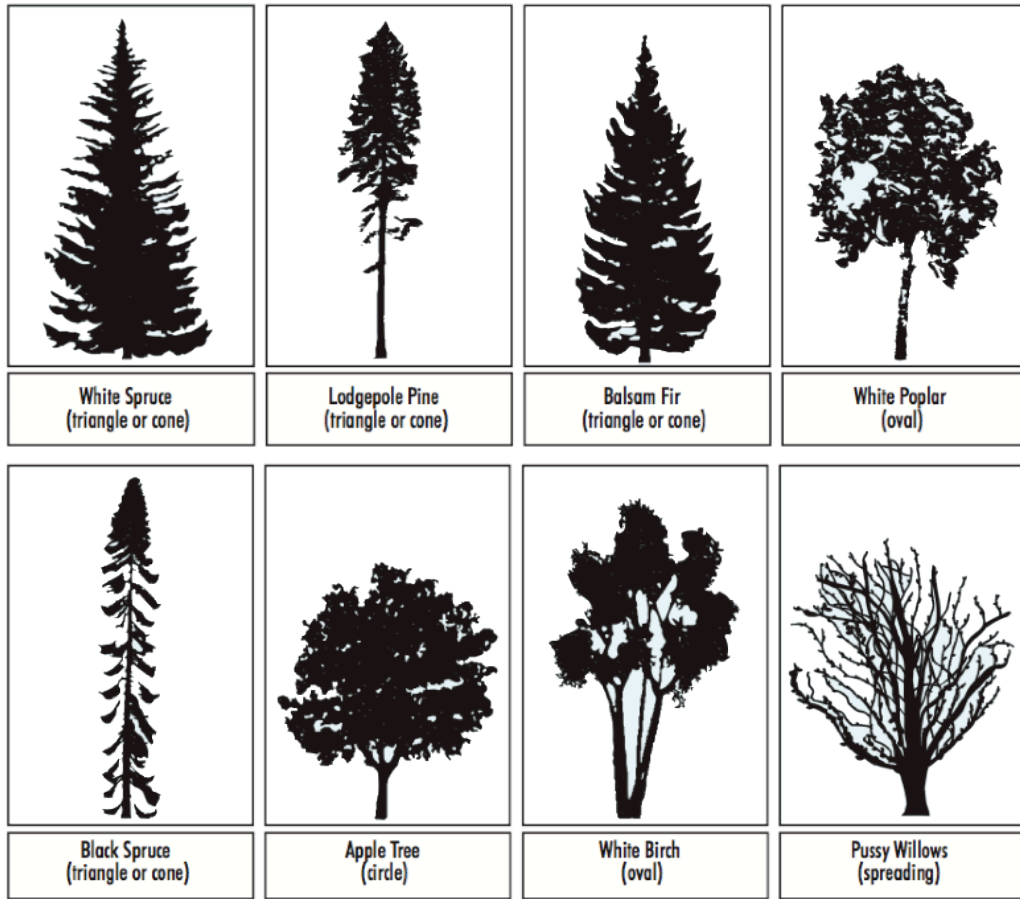
They can be classified by their arrangement on a twig or branch.



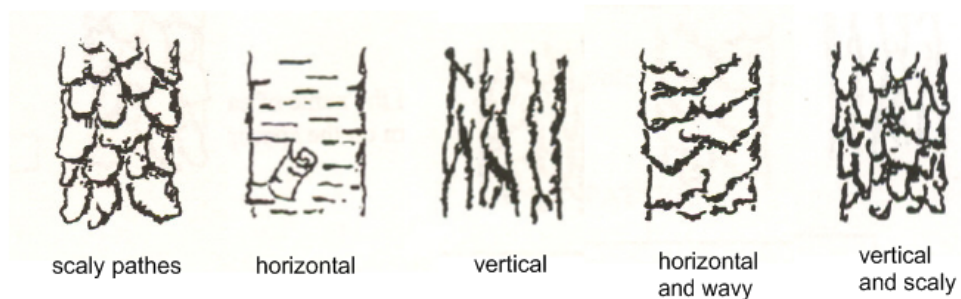
They can be classified by the **general shape of the leaf** and by the **shape of their margins or edges**. There are ten different leaf shapes. Leaf edges can be smooth, finely notched, coarsely notched, or wavy. Lastly, leaves can also be classified by their **arrangement on a twig**.



General shape or silhouettes of a tree may also be used to differentiate between tree species. Trees can have a triangle or cone shape, an oval shape, circle shape, a spreading shape or a rectangular shape.



Another way that trees can be identified is by their bark. Tree bark can be differentiated according to color, texture, and bark patterns. The bark of most trees changes color and thickens as the tree ages. Bark can be reddish brown, grey or white. The texture of bark can be smooth or rough. Bark patterns include scaly patches, horizontal, vertical, horizontal and wavy, and vertical and scaly.



- Interpret the growth pattern of a young tree, distinguishing this year's growth from that of the previous year and from the year before that. Students meeting this expectation should recognize differences in coloration and texture of new growth and old growth, and locate scars that separate old and new growth.

The study of tree discs is called **dendrochronology**.

- Trees can tell us a lot about themselves.
- Foresters study tree cross-sections or discs in order to learn about the past of individual trees.
- The study of trees can also tell us the history of the areas surrounding the tree. For example, a fire scar or the last drought in the area may result in very narrow growth rings.

Trees form new wood in the spring and summer only. Springwood is lighter in color than summerwood. This growth shows up in a series of **light (spring growth)** and **dark (summer growth)** rings called **annual rings**. Growth rings vary in size according to each year's growing season. Environmental conditions such as weather, amount of growing space, soil condition, insect attacks, and fire influence their size.

The study of growth rings can tell us a lot about a tree's history.

- The center of the ring indicates the birth of the ring.
- An evenly spaced ring indicates rapid growth.
- Rings wider on one side than the other indicate that something may have been leaning against the tree thus forcing the growth to one side.
- Small narrow rings could indicate either over population or lack of water.
- Several small narrow rings indicate a series of drought seasons.
- A black area with the rings growing in towards the black area indicates possible fire damage. An area of smaller rings grouped together may indicate an insect attack.



- **Identify human uses of forests, and compare modern and historical patterns of use.**
 - **Identify human actions that enhance or threaten the existence of forests.**
 - **Identify an issue regarding forest use, identify different perspectives on that issue, and identify actions that might be taken.**
- People began life on this planet as forest dwellers.
 - They were food gatherers and depended on the forest for all their needs: **food, clothing and shelter.**
 - They gradually became food growers, clearing a small patch in the forest to grow food. But they continued to depend on forests to meet a lot of their needs.
 - Even today, people depend on the forest **for paper, timber, fuel wood, and medicine.**
 - Trees are used in **timber-based industries such as plywood, saw milling, paper and pulp, and particleboard.**
 - Humans have been depending on the forest to cure them of various ailments. Even today man is dependent on the forest for **herbs and plants to fight against disease.**
 - Leaves, bark, and other parts of many other trees have **medicinal value and are used to make various medicines.**

Biotic stress is the result of the action of a living organism, such as disease causing fungi (fungal pathogen), insects, or grazing animals including deer and cattle.

Natural factors that affect the forest:

- **snow, ice, insects, and wind**- can have both positive and negative effects on the forest.
- For example snow and ice provide moisture for the soil but they also break tree branches and erode the soil.

Abiotic stresses involve physical (non-living factors that are part of the environment that affect forests.)

- **Drought, extremes of heat and cold, and pollution** are three abiotic factors that have been implicated in the decline of forests.
- **Human actions** can either enhance or threaten the existence of forests.

The government has worked to ensure that Alberta's forests are being managed properly.

- Forest managers work to ensure that our forests are protected.
- **Reforestation** is one way that industry works to ensure forests are maintained.
- **Reforestation** – to plant seeds for new trees to grow or plant small trees that has been grown in nurseries

Forest ecosystems are suffering from:

- **Pollution**
- **fire**
- **overuse by humans**

- **acid rain** - kills leaves and trees and can cause permanent damage to the soil of the forest floor, which, in turn, kills tree roots.
- **Harvesting** can also have a harmful effect on forests.
 - o **Clear cutting** - requires the use of large machinery that cuts down entire sections of forest. Soil will be eroded and vegetation will die without trees.
 - o **Selective harvesting** - more preferred method of harvesting - only the largest trees are chosen and smaller trees are planted to replace them.
- **Pests** - insects which invade and destroy leaves or trees

The top three most threatening pests to forestry are:

1. Mountain pine beetle and invasive alien insects or diseases
2. Spruce beetle
3. Spruce budworm

Alberta must deal with two major long-term issues that can affect forest health:

- Aging forests
- Potential climate warming