TREES AND THE FOREST MIRACLE

What Is A Tree?

A tree is a wood plant at least 20 feet tall when fully grown. It usually has only one stem, or trunk, with branches at the top. Woody plants that have several stems and grow less than 20 feet are shrubs, not trees. Trees come in different sizes and shapes. Some grow short and squatty, others tall and slim.

There are two main types of trees; conifers (softwoods) and broadleafs (hardwoods).

Conifers bear seeds in cones. Spruce, pine, cedar, tamarack, and hemlock are common conifers. Conifers also have slender, pointed, needle-like leaves or overlapping scales. They are sometimes called evergreens because most keep their green leaves all year. In Michigan, the tamarack is the only conifer that sheds its leaves in the fall.

Hardwoods have broad leaves. Because most hardwoods lose their leaves in the fall, they are called deciduous. They do not bear cones.

The terms "softwood" and "hardwood" are really misleading. Some conifers have harder wood than some softwoods.

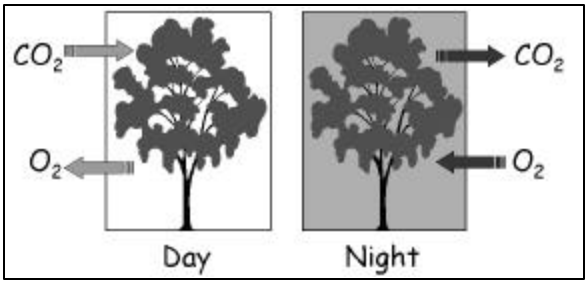
How Does A Tree Grow?

"Tall tree from little acorns grow". Every tree was once a seed, a tiny storehouse of energy, made by an older tree.

Nature programs the new seed for survival. To leave the parent tree and reach fertile soil, some seeds drift on the wind, others float on water, and still others attach themselves to the fur of animals who carry them long distances. Birds swallow some seeds, then release them in their droppings.

Once deposited in moist soil, the seed, fueled by the food stored in its hard shell, starts to grow. First, a small sprout, a tiny root, pierces the shell and begins to seek nourishment in the soil. Then another sprout, the stem, breaks out, seeking light. Sunlight, minerals, and water help the little tree manufacture its own food and grow taller.

The branches and leaves are called the crown. The leaves are tiny "factories". Using water absorbed by the roots and carbon dioxide from the air, they manufacture food. These leaf factories take their energy from the sun. The accompanying figure shows the process of photosynthesis (day) and respiration (night), putting the sun's energy to work.



After the leaves manufacture the food the tree needs for growth, primarily plant starches and sugars it moves down the trunk to the roots to be used for growth or stored away for future use.

The trunk provides strength, supports the crown, and holds the pipelines for food and fluids to move up and down the tree and through the branches. These pipelines are made up of many small sections called cells. They fit end to end and form long tubes. These cells are so tiny they can be seen only through a magnifying glass. A toothpick contains millions of cells.

Roots anchor the tree to the ground so it can stand erect in strong winds. Roots absorb water and nutrients, dissolved minerals and nitrogen, which the tree used to make food.

A tree grows in three ways:

- Up, from the buds on the tips of the trunk and branches.
- Down, from the root tips.

- Around, by putting layers of wood around limbs, roots, and trunk.

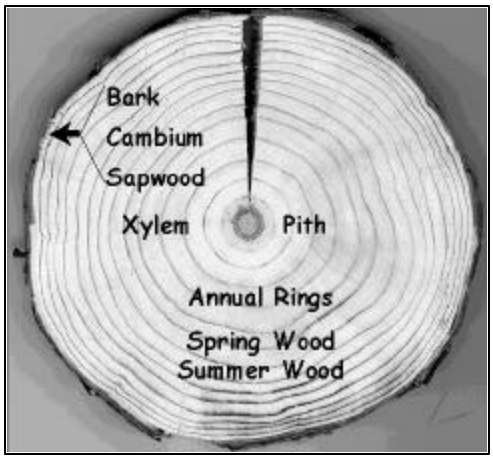
The buds on the branches cause each limb to grow, making the tree taller. The limbs also spread to receive more sunlight.

The root tips cause roots to grow longer and spread in search of more water and nutrients.

The trunk of a tree never grows upward. If you drive a nail into the trunk of a young tree it will always remain in the same place. To see how the trunk grows, examine the cross section of a stump or log.

The covering on the outside of the trunk is called the outer bark. It consists of dead cells and serves only to protect the vital interior. Just inside the outer bark is a thin, light-colored layer called the inner bark. The cells in the inner bark carry food, made in the leaves, to the branches, stem, and roots.

Next comes a living, growing layer, the cambium, which is a thin, single layer of cells just inside the inner bark and invisible to the naked eye. During warm months, the cells in the cambium divide to form new cells. Cells produced toward the outside of the tree form bark; those produced toward the inside form wood. Cambium is also present in the limbs and roots and allows them to grow.



Now comes a wide band of light-colored wood called sapwood, a part of the pipeline system that carries water and food from the roots to the crown. The dark, inactive wood in the center of the trunk is heartwood. It provides support and strength to the tree. The trunk core is called the pith.

Each year, the cambium makes a new layer of wood for the trunk. Each layer is made up of tow bands; light wood called spring wood and dark wood called summer wood. Usually, the spring wood band is wider than the summer wood band. These rings, formed by the layers of wood, are called annual rings or growth rings.

When A Tree Dies

Trees, like humans, are born, grow to maturity, and die. After they die, they decay, contribute minerals to the soil and create room for new plants to grow. This is part of the dynamic process called ecology.

A rotten log or decaying stump offers one of the best ways to study the ecology of a forest. What happens at the log, the competition and cooperation among plants, animals, and the influence of other factors in the environment like moisture, air, temperature, and light, reflects in a small way larger forces at work in the entire forest.

Shade-tolerant plants such as sugar maple, balsam fir, hazel, and dogwood, for example, sprout and grow on rotten logs and humus. These plants provide a special service as they grow; They help the log decay back into the soil.

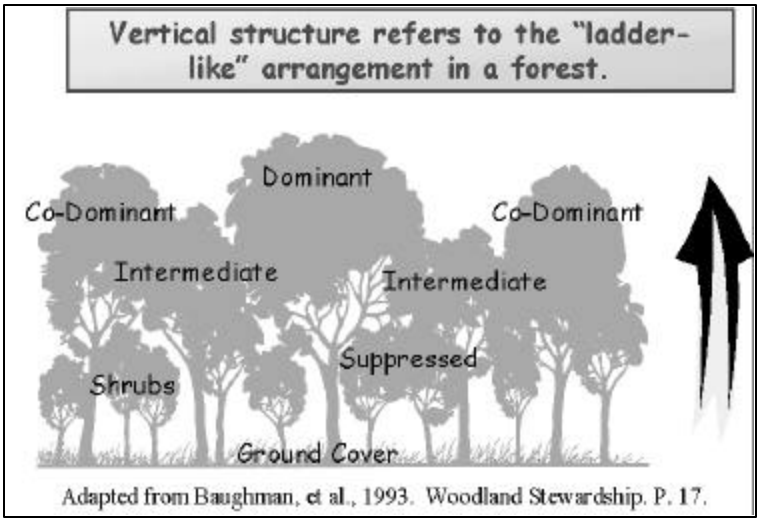
By observing these same processes in the larger forest, we can understand how to manage and use a forest.

What Is A Forest

A forest is a living association of plants and animals in which trees are the dominant species. From a distance, we see the upper layer of green crowns, called the canopy. The forest appears to consist only of big trees.

As we draw nearer, however, we see other plants, medium-sized trees and shrubs. The small trees growing beneath the forest canopy are called the understory. The ground cover in

the forest consists of small plants, such as shrubs, vines, herbs, wildflowers, and mosses. They grow in openings where sunlight reaches the ground. We call this storied effect the forest structure.



The base of the structure is the forest floor, the ground beneath the trees. If we could sweep the floor to remove dead leaves, we would expose the humus. A humus layer takes a long time to develop. It comes from the decay of forest litter; leaves, seeds, twigs, branches, dead plants and animals. This combination of decomposed plant and animal matter makes the soil granular and porous, easy for roots to penetrate.

Organic matter, the humus layer also helps seeds and young plants develop and grow. Experts estimate that, each year, two tons of such litter are converted to soil on each acres of forest floor. Bacteria and fungi help to break down the debris. Forest dwellers that find food and shelter on or underneath the forest floor, such as worms, insects, mice, moles, and shrews, also help to produce fertile soil.

Species composition describes how a forest is "put together". A stand is an individual body of timber of similar age, species, and general appearance. A pure forest is one composed of a single species, such as a red pine plantation. A forest characterized by cone-bearing trees is a coniferous forest. One characterized by trees which lose their leaves is a deciduous forest. When a forest is composed of both conifers, and deciduous trees, it is called a mixed forest. An aspen-fir-spruce forest is a good example.

Other life in a forest community includes birds, frogs, grouse, and other animals. Some life can be easily seen, but not easily heard, like snakes, caterpillars, and spiders. Other life forms can not be easily seen or heard. The joint activity of all living things in the forest, growing , reproducing, dying, improves the soil. And, for the livelihood of our forest community, fertile soil is essential.

Why Leaves Change Color

It requires no vivid imagination to picture Mother Nature going about on autumn days with a liberal supply of paint coloring the leaves of forest trees and other plants with brilliant shades of red, purple, orange, and yellow.

Many people suppose that Jack Frost is responsible for the color change, but he is not. Some of the leaves begin to turn before there is any frost. We know that color change is the result of chemical processes which take place in the trees as the season changes from summer to fall.

During the spring and summer months, leaves have served as factories where most of the foods necessary for tree growth are made. This food-making process takes lace in the leaf

in numerous cells containing the pigment chlorophyll which gives the leaf its green color. Besides the green pigment, leaves also contain yellow and orange pigments, which for example, give the carrot its color. Most of the year these yellowish colors are hidden by the greater amount of green coloring. But in the fall, partly because of changes in the length of daylight and temperature, the leaves stop their food-making process. The chlorophyll breaks down, green color disappears, and yellowish colors become visible, giving leave part of their fall splendor.

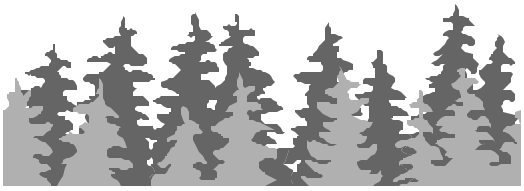
At the same time other chemical changes may occur, causing formation of additional pigments that vary from yellow to red to blue. Some of them give rise to the reddish and purplish fall colors of dogwoods and sumacs. Others give the sugar maple its brilliant orange or fiery red and yellow. The autumn foliage of some trees, such as quaking aspen, birch and hickory, shows only yellow colors. Many oaks and other species turn brown or red, while beech turns a golden bronze. These colors are due to the mixing of varying amounts of the chlorophyll and other pigments in the leaf during the fall season.

Color intensity may vary from tree to tree. For example, leaves directly exposed to the sun may turn red, while those on the shady side may be yellow. The foliage of some tree species just turns dull brown from death and decay and never shows bright colors.

Tree colors may vary from year to year, depending on weather conditions. When there is much warm, cloudy rainy weather in the fall, the leaves may have less red coloration. The smaller amount of sugar made in the reduced sunlight moves out of the leaves during the warm nights. Thus, no excess sugar remains in the leaves to form the pigments.

Only a few regions of the world are fortunate in having these showy displays, The eastern United States and southeastern Canada possess large areas of deciduous forests (broad-leaved trees) because weather conditions are favorable for bright fall colors. Some western areas of the United States, especially mountain regions, and eastern Asia and south eastern Europe also have bright coloration.

As fall colors appear, other changes take place. Where the base of the leafstalk is attached to the twig, a special layer of cells develops and gradually severs the tissues supporting the leaf. At the same time nature heals the break, so that after the leaf is finally blown off by the wind or has fallen from its own weight, a leaf scar marks the place where it grew on the twig.



Most conifers, pines, spruces, firs, hemlocks, cedar, are evergreen but lose the oldest years growth each year. Trees normally turn brown on the inside and drop the leaves. The younger needlelike or scalelike leaves remain green the year round, though often becoming brownish green where winters are cold. Individual leaves may stay on the tree two or more years.

Through fallen leaves, nature has provided a fertile forest floor. Fallen leaves contain large amounts of valuable nutrients, particularly calcium and potassium, which were originally a part of the soil. Leaf decomposition enriches the top soil layers by returning part of the elements borrowed by the tree and at the same time provides for more water-absorbing humus.

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Revised by MSU Upper Peninsula Forestry Extension Office, 9/98.