

Minnesota's Forest Treasures



What Is a Tree?

A tree is any woody plant that can reach a height of 15 feet or more at maturity and that usually is single-stemmed and has a crown, or branched-out area at the top. That distinguishes trees from shrubs, which are woody but short and multi-stemmed, and from vines, which may be long and woody but lack a crown.

Minnesota's Own
Minnesota is home to 52 species of trees. This poster shows 35 of these "natives." Not shown are hemlock, American mountain ash, northern mountain ash, river birch, pin cherry, Kentucky coffeetree, rock elm, slippery elm (red elm), eastern hophornbeam (ironwood), American hornbeam (blue beech), black maple, mountain maple, red mulberry, black oak, chinkapin oak, northern pin oak, and swamp white oak.

Down to Basics
All of Minnesota's native species belong to one of two basic categories: gymnosperms or angiosperms.

Gymnosperms are trees whose seeds are not encased in a structure such as a fruit or nut. Most gymnosperms bear their seeds in cones, so they are also called conifers ("conebearers"), and have thin needlelike leaves. Virtually all conifers are evergreen, meaning they are green year-round because they shed only a portion of their needles each year. People in the wood products industry often refer to coniferous trees as softwoods.

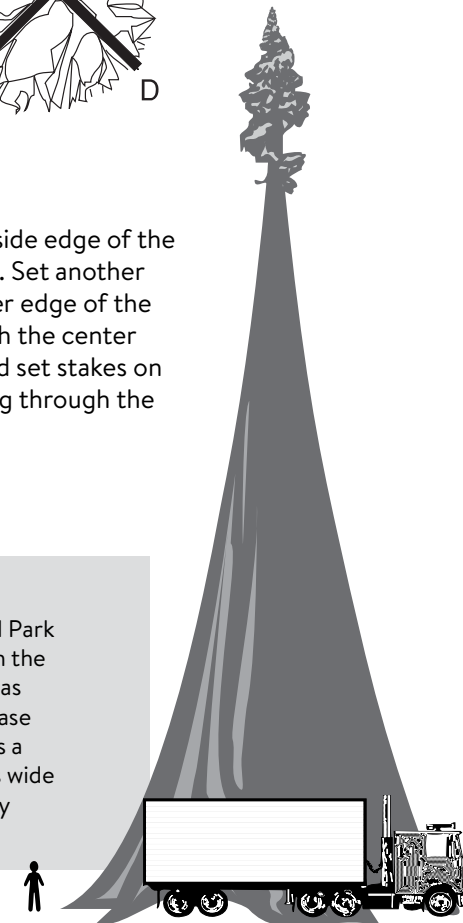
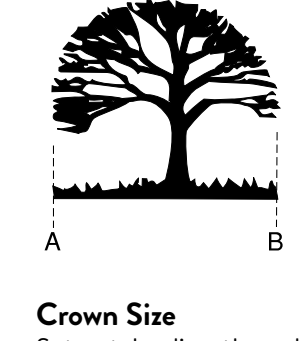
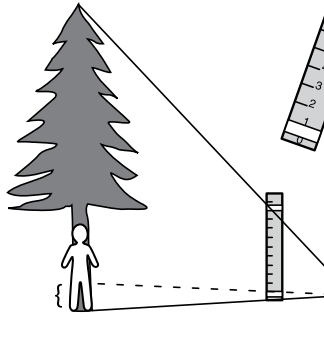

The second major kind of tree, the angiosperms, have covered seeds. Also known as deciduous or broadleaf trees, trees in this category drop their leaves each autumn. They are the ones that make the forest so colorful each fall. These trees are sometimes referred to as hardwoods (even though their wood is not necessarily harder than that of softwoods!).

Sizing Up a Minnesota Tree

Foresters aren't the only ones who can "size up" a tree. Here's how you can do it too.

Around the Middle
Get circumference by measuring the distance around the tree to the nearest inch at 4½ feet above the ground.


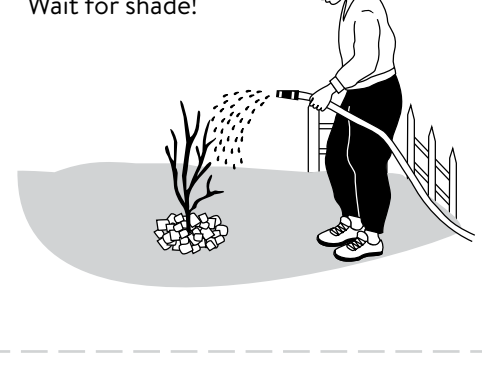
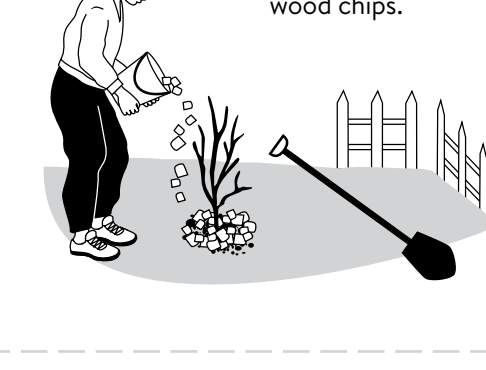

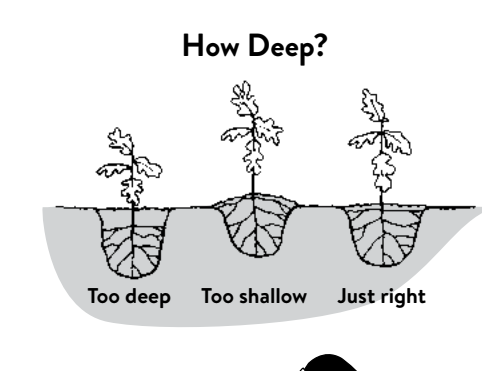
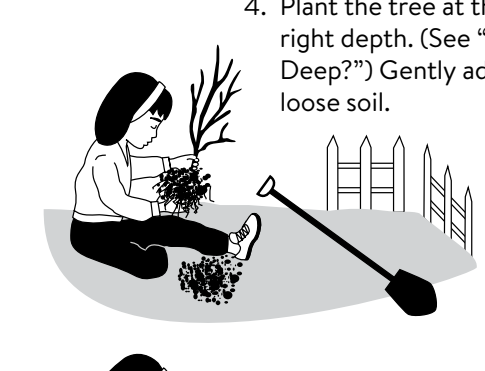
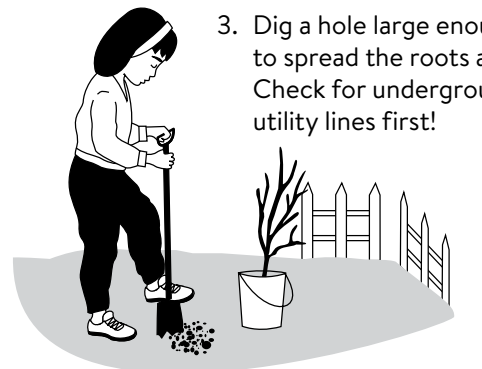
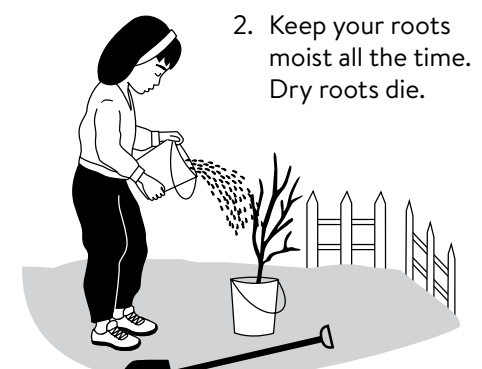

How High
Take a 12-inch ruler and mark the 1-inch and 10-inch lines on the ruler with tape. Have a partner stand at the tree's base. Hold the ruler in front of your eyes at arm length and walk back until you can see the whole tree from top to bottom between the 0-inch and the 10-inch mark on the ruler. Then move your body forward and backward until the base of the tree is exactly at 0 inches and the top of the tree is exactly at 10 inches. Sight out from the 1-inch mark to a point on the trunk above the base. Have your partner mark that spot on the trunk with tape. Measure the distance from the base of the tree to tape mark. Then estimate the height of the tree by multiplying by 10.



Crown Size
Set a stake directly under the outside edge of the crown farthest from the trunk (A). Set another stake directly opposite at the outer edge of the crown (B) on a line passing through the center of the tree. Rotate 90 degrees and set stakes on outside edges of the crown passing through the center of the tree (C and D).

Fun Fact
A giant sequoia in Sequoia National Park in California is largest living thing in the nation. It towers 275 feet tall and has a trunk about 36 feet wide at the base of the tree. That means it's as tall as a 20-story building and its trunk is as wide as a semitrailer is long. It's probably almost 3,000 years old.

Planting a Tree



1. Choose a good spot for your tree. Don't forget its ADULT size.

2. Keep your roots moist all the time. Dry roots die.

3. Dig a hole large enough to spread the roots apart. Check for underground utility lines first!

4. Plant the tree at the right depth. (See "How Deep?") Gently add loose soil.


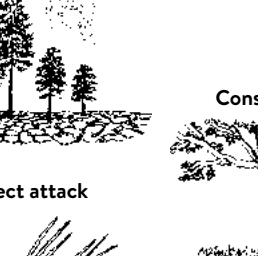
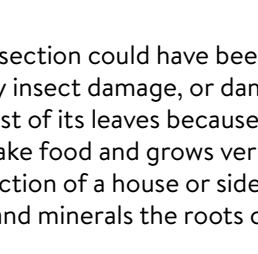
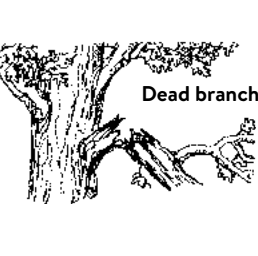
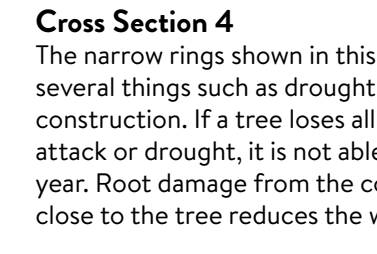

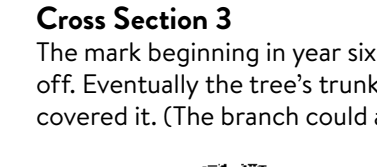


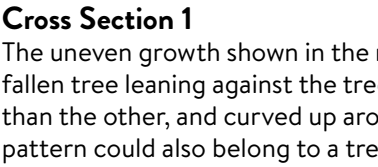
5. Add more soil and firm with foot.

6. Mulch with wood chips.

7. Water regularly. Wait for shade!

Fun Fact
More trees are planted in Minnesota than are harvested each year.

Factors That Affect Tree Growth



Cross Section 1
The uneven growth shown in the rings could have been caused by a fallen tree leaning against the tree. The tree grew more on one side than the other, and curved up around the fallen tree. This uneven ring pattern could also belong to a tree growing on a steep slope.

Cross Section 2
The scarring on this cross section was caused by a wildfire during the tree's sixth growing season.

Cross Section 3
The mark beginning in year six is all that's left of a branch that died and fell off. Eventually the tree's trunk grew around the remains of the branch and covered it. (The branch could also have been broken or cut off.)

Cross Section 4
The narrow rings shown in this cross section could have been caused by several things such as drought, heavy insect damage, or damage from construction. If a tree loses all or most of its leaves because of an insect attack or drought, it is not able to make food and grows very little that year. Root damage from the construction of a house or sidewalk too close to the tree reduces the water and minerals the roots can absorb.

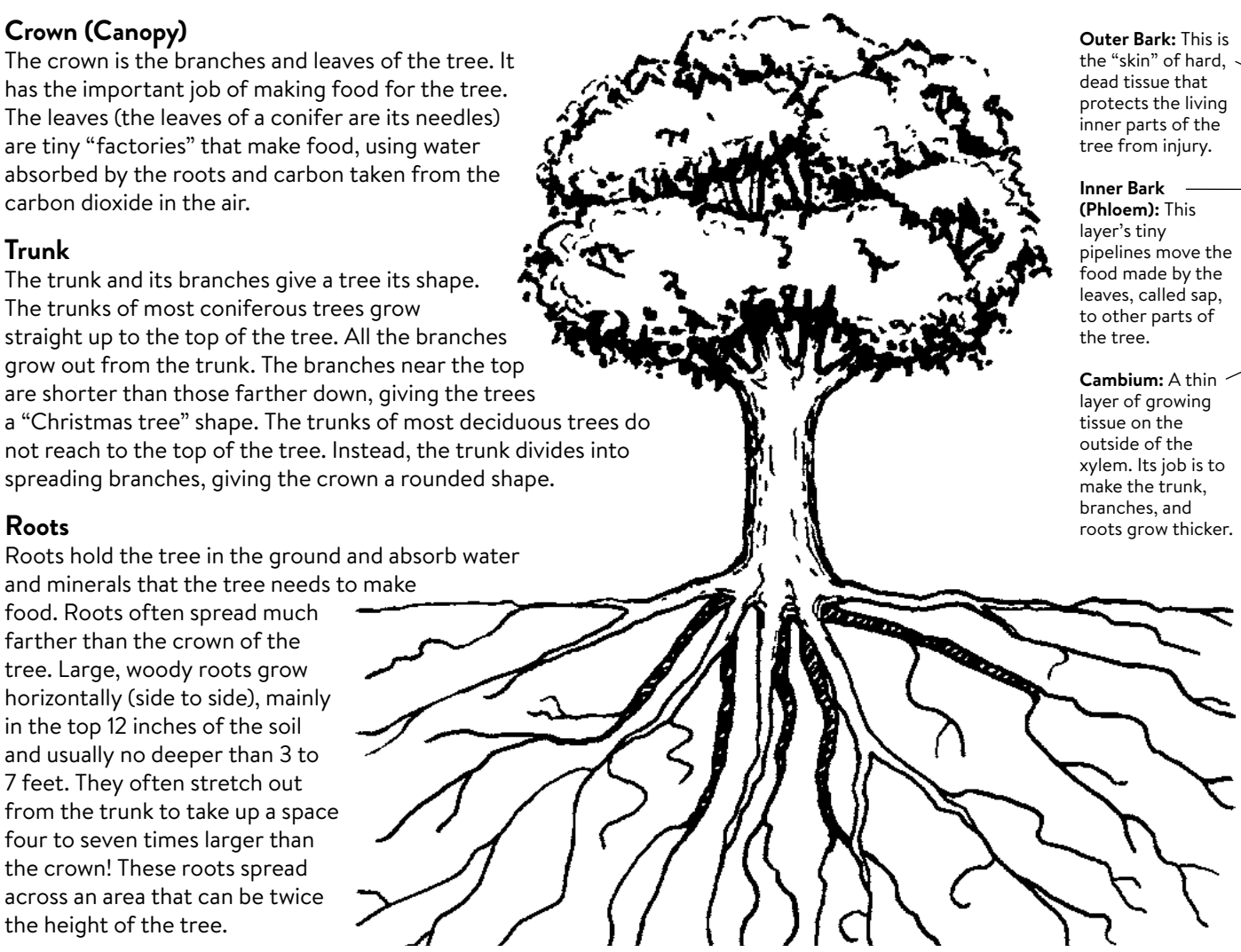
Parts of a Tree

Trees have three main parts—crowns (canopies), trunks, and roots. Each part has a special job to keep the tree healthy and growing.

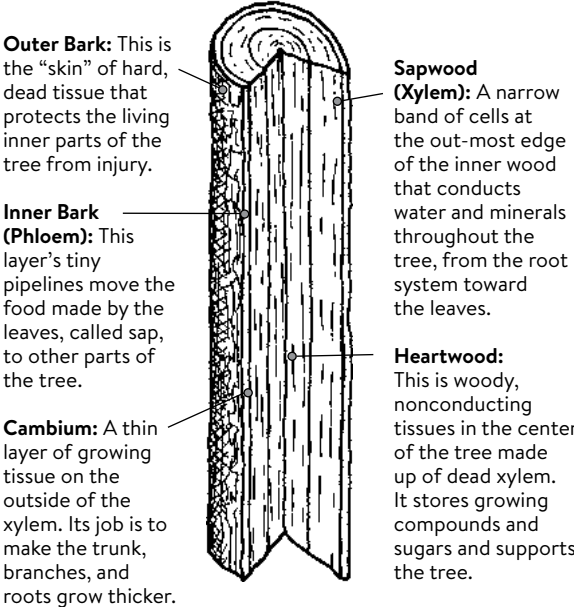
Crown (Canopy)
The crown is the branches and leaves of the tree. It has the important job of making food for the tree. The leaves (the leaves of a conifer are its needles) are tiny "factories" that make food, using water absorbed by the roots and carbon taken from the carbon dioxide in the air.

Trunk
The trunk and its branches give a tree its shape. The trunks of most coniferous trees grow straight up to the top of the tree. All the branches grow out from the trunk. The branches near the top are shorter than those farther down, giving the trees a "Christmas tree" shape. The trunks of most deciduous trees do not reach to the top of the tree. Instead, the trunk divides into spreading branches, giving the crown a rounded shape.

Roots
Roots hold the tree in the ground and absorb water and minerals that the tree needs to make food. Roots often spread much farther than the crown of the tree. Large, woody roots grow horizontally (side to side), mainly in the top 12 inches of the soil and usually no deeper than 3 to 7 feet. They often stretch out from the trunk to take up a space four to seven times larger than the crown! These roots spread across an area that can be twice the height of the tree.



Tree trunks are made of five layers.



Outer Bark: This is the "skin" of hard, dead tissue that protects the living inner parts of the tree from injury.

Inner Bark (Phloem): This layer's tiny pipelines move the food made by the leaves, called sap, to other parts of the tree.

Cambium: A thin layer of growing tissue on the outside of the xylem. Its job is to make the trunk, branches, and roots grow thicker.

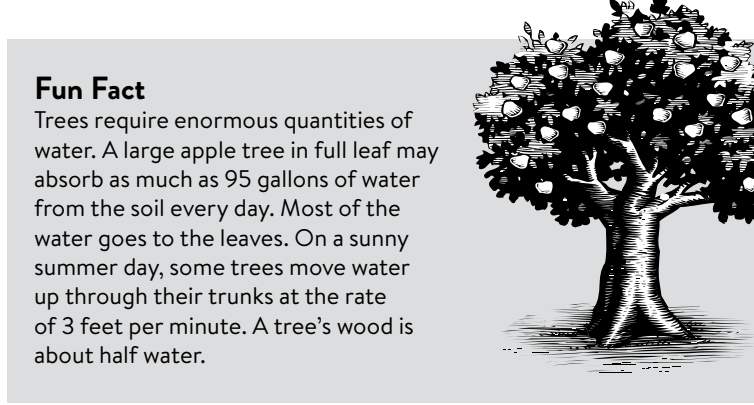
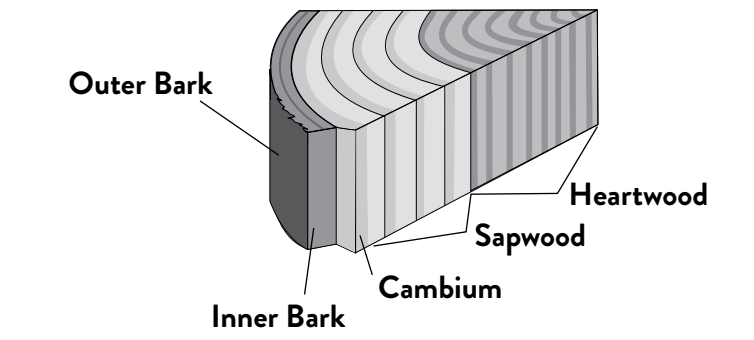
Sapwood (Xylem): A narrow band of cells at the out-most edge of the inner wood that conducts water and minerals throughout the tree, from the root system toward the leaves.

Heartwood: This is woody, nonconducting tissues in the center of the tree made up of dead xylem. It stores growing compounds and sugars and supports the tree.

Fun Fact
Tree roots come in many different sizes. Some are so tiny you can only see them with a microscope. Others may be up to 12 inches or more across.

Read the Rings

How do trees keep growing new wood every year? It's a fascinating story. Most trees in North America add new wood to their girth each year in a regular, predictable way. The new tissue is added right inside the bark by a thin layer of cells called the cambium. With the warmth of spring, cambium cells begin to divide. The cambium cells on the outside become part of the tree's phloem, a band of inner bark through which the tree's food supply moves. The cambium cells on the inside become the xylem, a system of tiny tubelike cells that carry the tree's water supply. These xylem layers give us the annual rings.

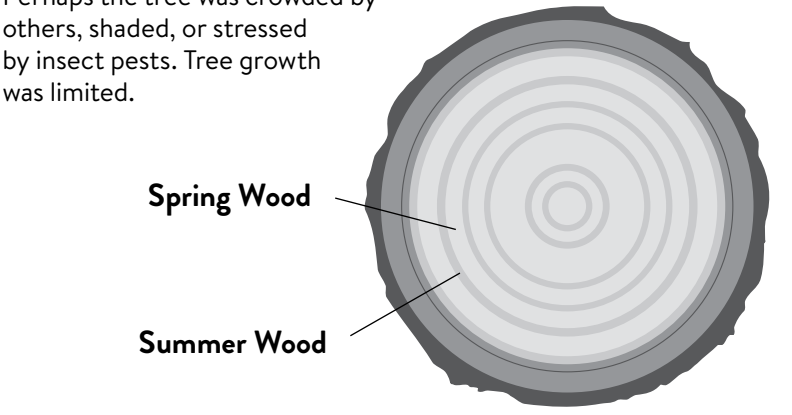


Fun Fact
Trees require enormous quantities of water. A large apple tree in full leaf may absorb as much as 95 gallons of water from the soil every day. Most of the water goes to the leaves. On a sunny summer day, some trees move water up through their trunks at the rate of 3 feet per minute. A tree's wood is about half water.

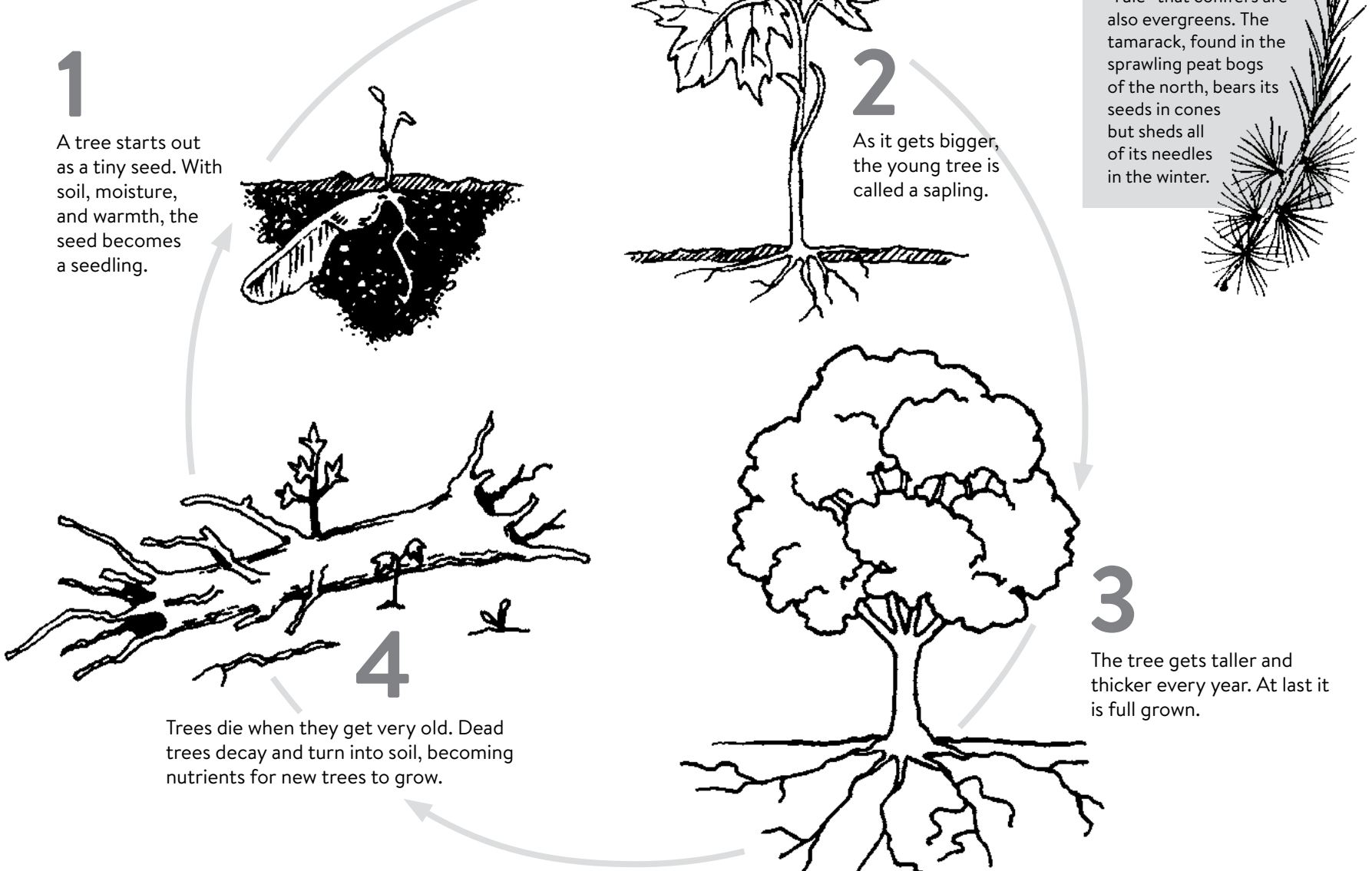
As spring begins, new cells are added quickly, and the tree increases in diameter. In a cross section of a stump, this growth appears as a wide, light-colored band called earlywood or spring wood. But as the season moves on into summer and fall and the soil is less moist, the cells are added more slowly. The rings—latewood or summer wood—are narrower and darker. Finally, the cold dry days of fall halt growth altogether.

One light band and one dark band together make up a single year's growth and show as one annual ring. A new annual ring is added under the bark each year.

School children everywhere are intrigued by figuring the age of a tree through counting its rings. (Start at the outer, newest ring just inside the bark and count in toward the center to know the age of the tree.) But scientists find many other fascinating bits of information tucked into the annual rings. Best known is the relationship between weather, growing conditions, and the width of the rings. Wide, light rings mean spring weather was good: warm days, lots of rain, good growing conditions. Narrower rings mean spring was probably cold or dry, and/or growing conditions were stressed. Perhaps the tree was crowded by others, shaded, or stressed by insect pests. Tree growth was limited.



Cycle of Life

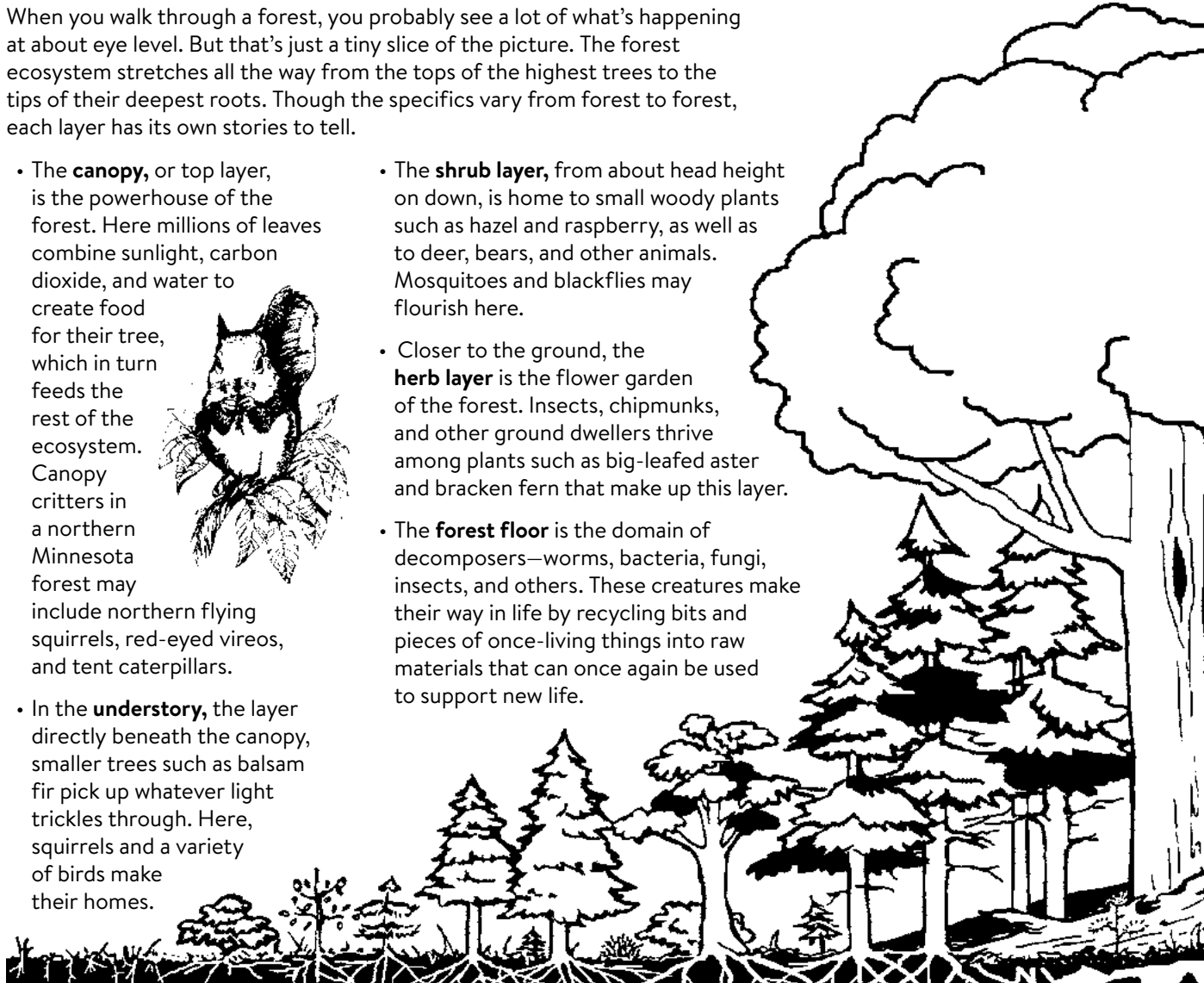


Fun Fact
Minnesota is the proud home of one of the rare exceptions to the "rule" that conifers are also evergreens. The tamarack, found in the sprawling peat bogs of the north, bears its seeds in cones but sheds all of its needles in the winter.

Forest Layers

When you walk through a forest, you probably see a lot of what's happening at about eye level. But that's just a tiny slice of the picture. The forest ecosystem stretches all the way from the tops of the highest trees to the tips of their deepest roots. Though the specifics vary from forest to forest, each layer has its own stories to tell.

- The **canopy**, or top layer, is the powerhouse of the forest. Here millions of leaves combine sunlight, carbon dioxide, and water to create food for their tree, which in turn feeds the rest of the ecosystem. Canopy critters in a northern Minnesota forest may include northern flying squirrels, red-eyed vireos, and tent caterpillars.
- In the **understory**, the layer directly beneath the canopy, smaller trees such as balsam fir pick up whatever light trickles through. Here, squirrels and a variety of birds make their homes.
- The **shrub layer**, from about head height on down, is home to small woody plants such as hazel and raspberry, as well as to deer, bears, and other animals. Mosquitoes and blackflies may flourish here.
- Closer to the ground, the **herb layer** is the flower garden of the forest. Insects, chipmunks, and other ground dwellers thrive among plants such as big-leaved aster and bracken fern that make up this layer.
- The **forest floor** is the domain of decomposers—worms, bacteria, fungi, insects, and others. These creatures make their way in life by recycling bits and pieces of once-living things into raw materials that can once again be used to support new life.



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