# Tree Growth and Care

Prepared by
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CALL Tree Course

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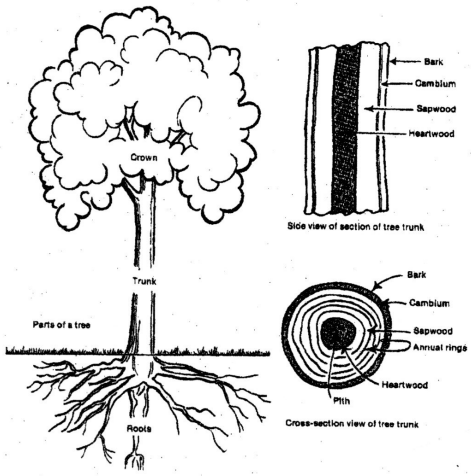
# Damage agents of trees


# How a Tree Grows




The growing parts are the buds, the root tips, and the cambium just inside the bark. The tree grows in height and spread through the buds at the tips of the branches. Likewise, the roots grow in length and spread through the root tips.

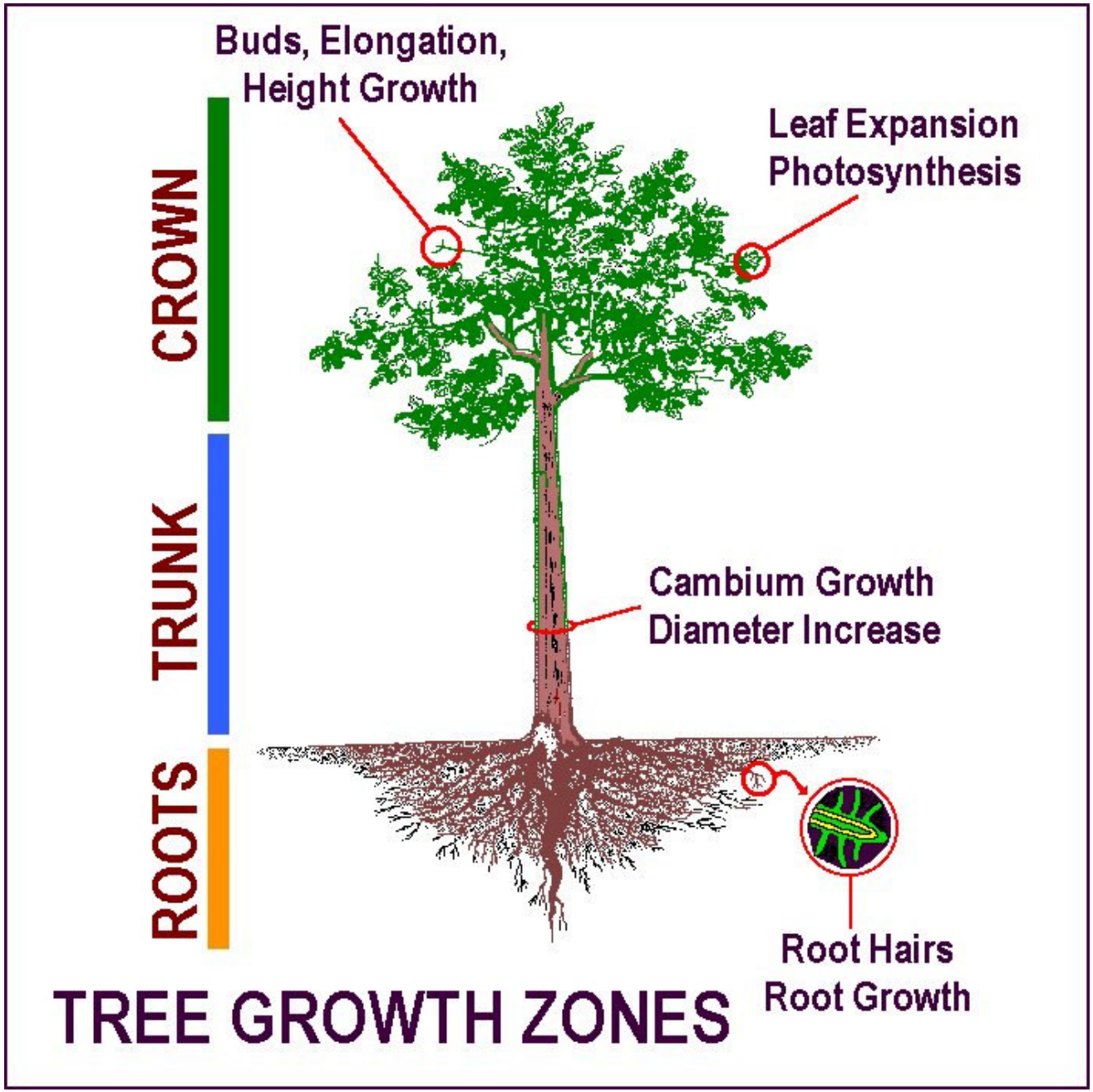
The twigs and stem of the tree increase in length by a process known as apical growth. Every year, a new shoot grows from the end of the twig. By the end of the growing season the new twig is fully grown and keeps the length it has reached for the rest of its life. In some trees, the shoot ends in a terminal bud that develops during the summer. These trees include softwoods such as pine and some hardwoods such as ashes, maples, and frequently beeches and oaks. In other hardwoods, however, such as birches, elms, and poplars, the part of the twig beyond the last lateral or side bud dies off, and the lateral bud starts the new growth the next spring.

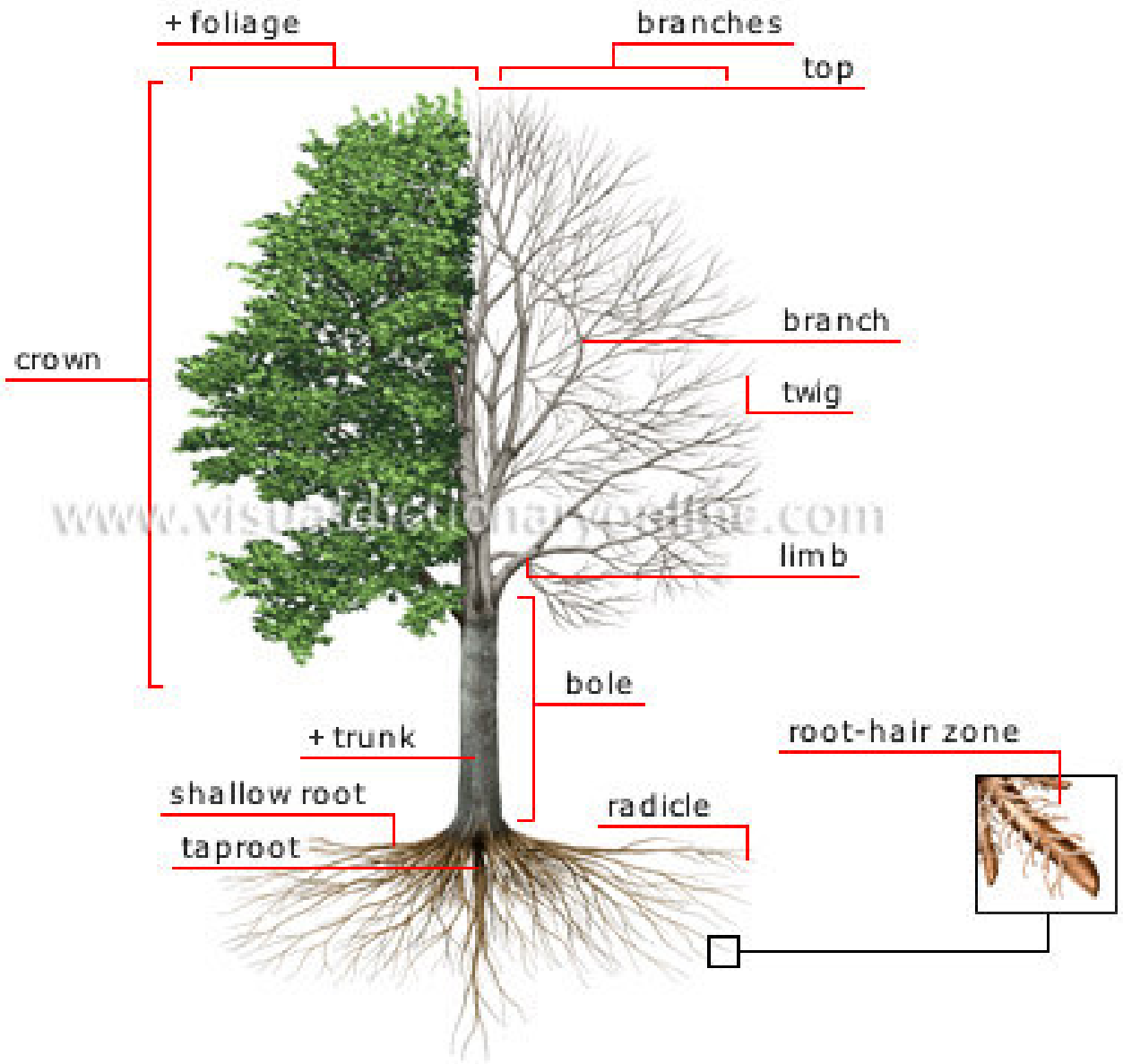
The tree grows in diameter (thickness) through the action of the cambium, a thin layer of material between the bark and the sapwood. This cambium layer grows wood on the inside and bark on the outside. The wood formed during the growing season is called an annual ring. In many trees, two distinct bands of wood make up the annual ring: the light-colored, wider band known as the early or spring wood, and the dark-colored, narrower band known as the late or summer wood. In some hardwood trees such as ash, however, the early and late wood are almost the same color. The pores of the wood are different, though; the spring wood has larger pores than the summer wood.

Inside the tree itself, the wood is divided into two layers: the outer layer of light-colored wood called sapwood, and the inner layer of dark wood called the heartwood. The sapwood carries sap from the roots up through the trunk to the leaves.. The heartwood is a dead core that carries no sap, but simply gives strength to the tree. In some trees the sapwood is only $\frac{1}{4}$ to $\frac{1}{2}$ inch thick; in others it is 6 to 10 inches thick.

The pith is the soft tissue at the very center of the stem or trunk. In the newly formed twig, the first woody growth took place around the pith. You can see it easily in young stems or twigs, but in large stems or trunks it is crushed and therefore hard to see.

The roots absorb water that contains minerals in solution. In the tree, the sapwood (xylem) carries this water, called sap, up to the leaves, and there the sap combines with carbon dioxide from the air to make food. The inner bark (phloem) carries this food to all growing parts of the tree, even down to the root tips. What the tree doesn't use as food is stored to help the tree in the growth during the next season.


Buds, Elongation,
Height Growth
Leaf Expansion
Photosynthesis
CROWN
TRUNK
ROOTS
Cambium Growth
Diameter Increase
Root Hairs
Root Growth
TREE GROWTH ZONES


+ foliage
branches
top
crown
branch
twig
limb
bole
+ trunk
root-hair zone
shallow root
radicle
taproot

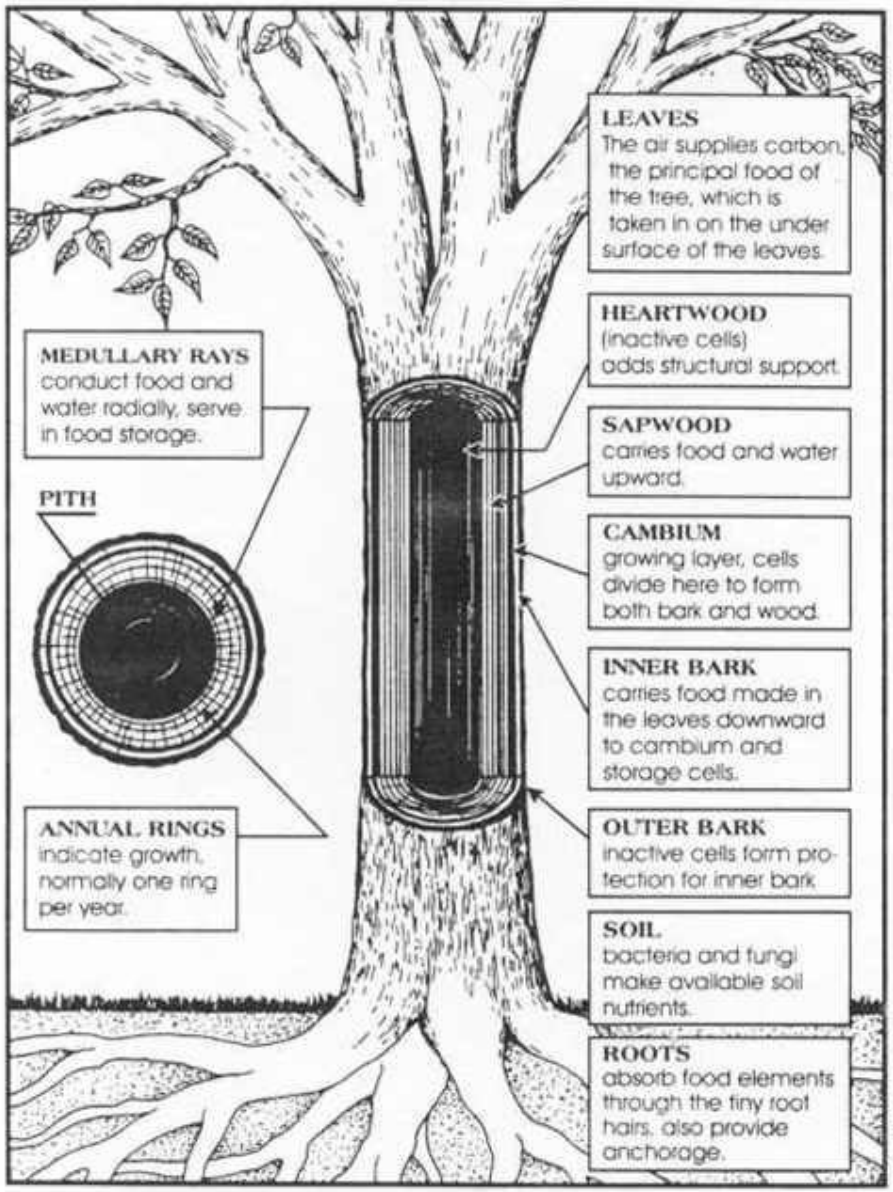
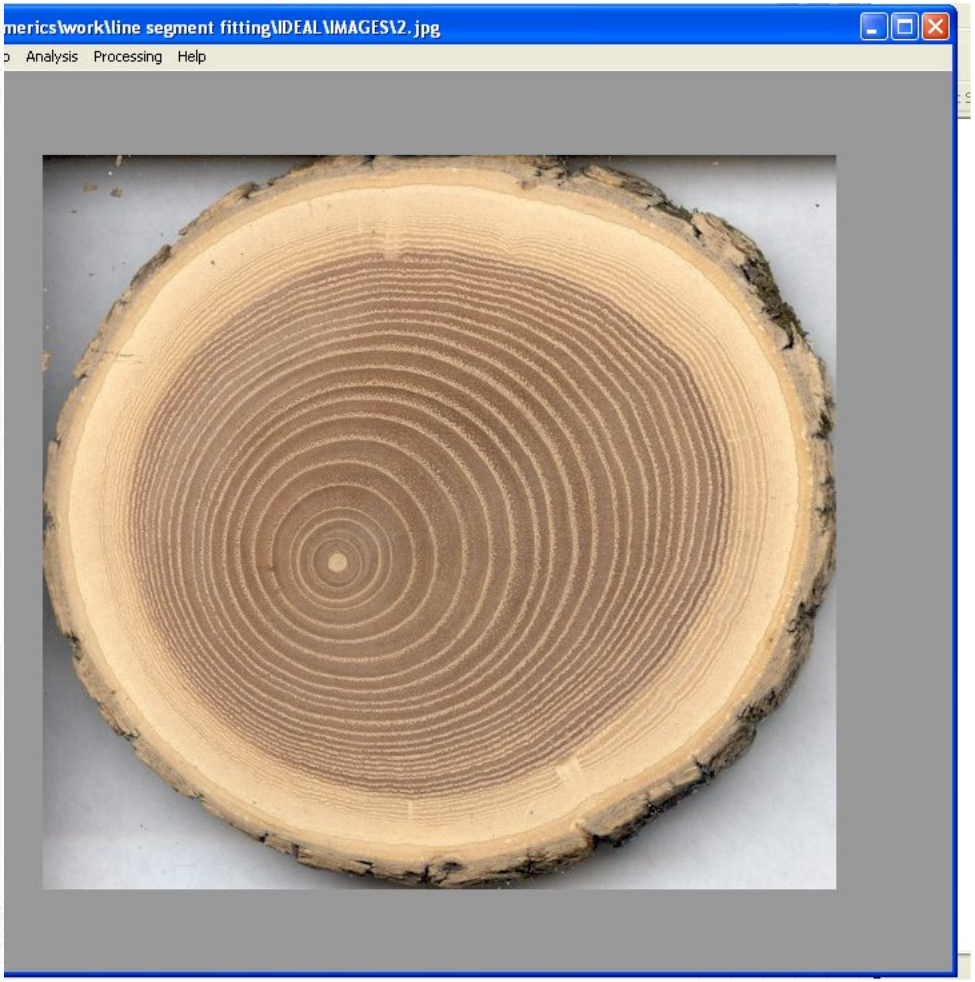


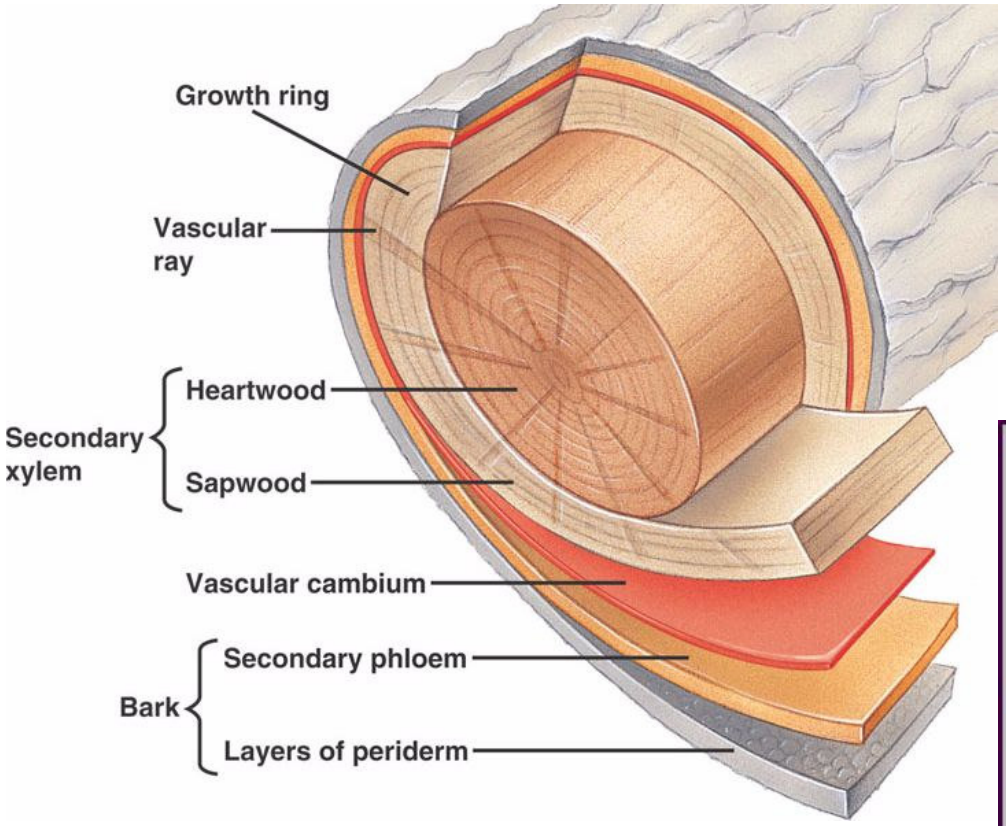

DIAGRAM SHOWING FUNCTIONS OF DIFFERENT PARTS OF A TREE

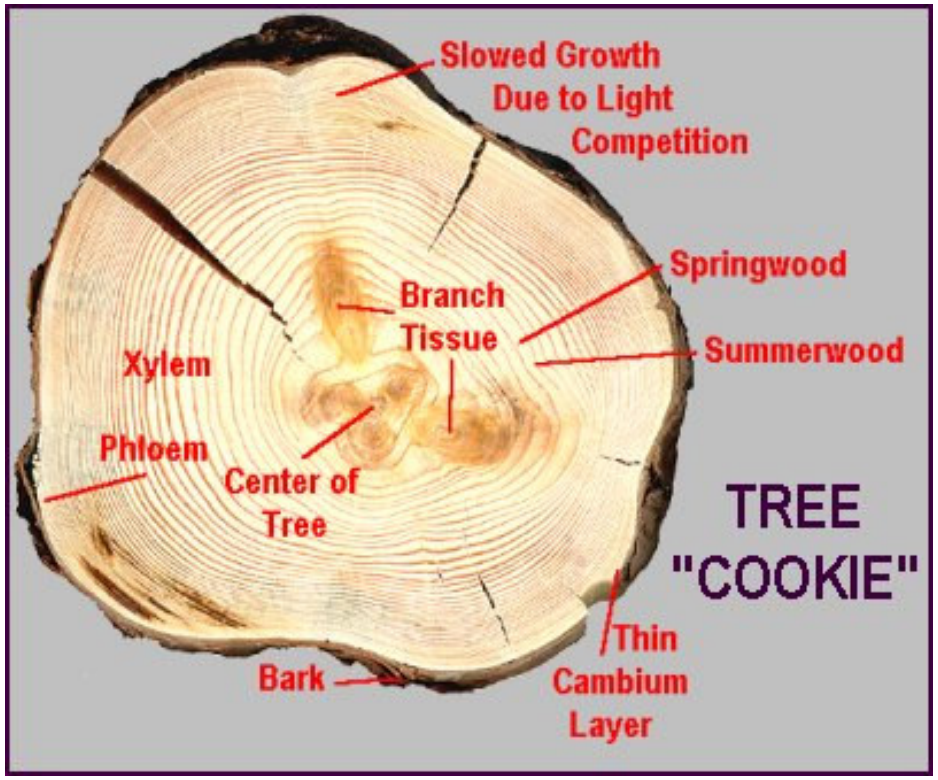
Courtesy of the *New Tree Experts Manual* by Richard R. Fenska

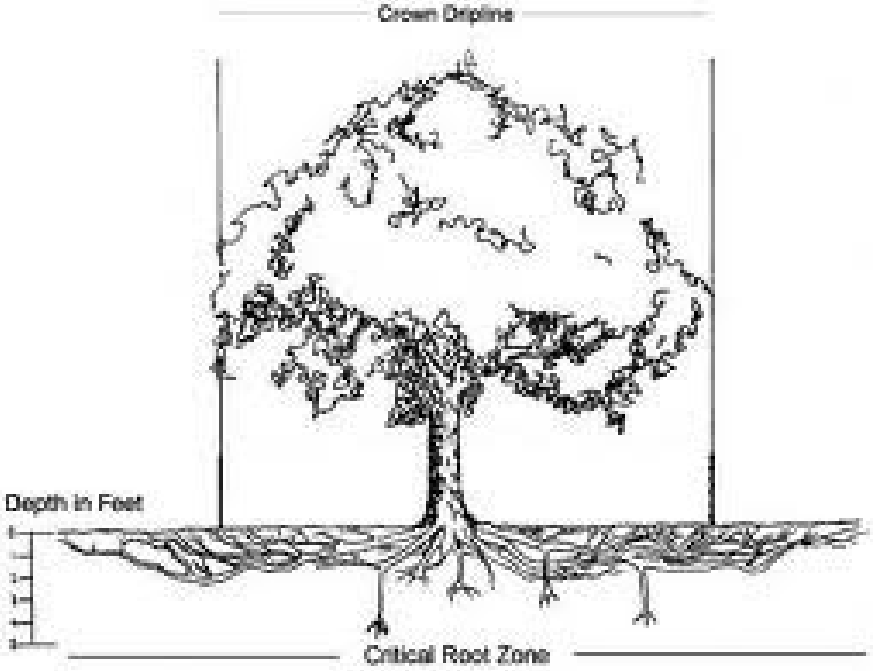


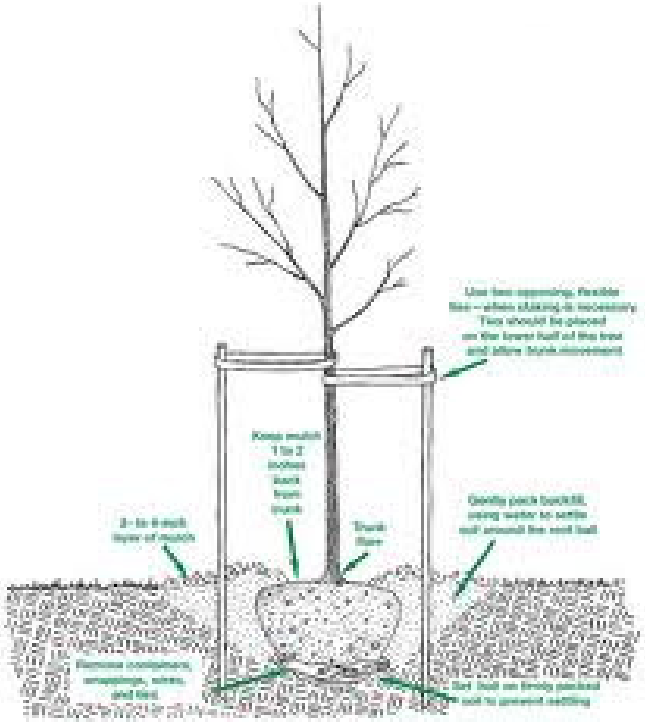
# Age

# Age


Growth ring
Vascular ray
Secondary xylem
Heartwood
Sapwood
Vascular cambium
Bark
Secondary phloem
Layers of periderm

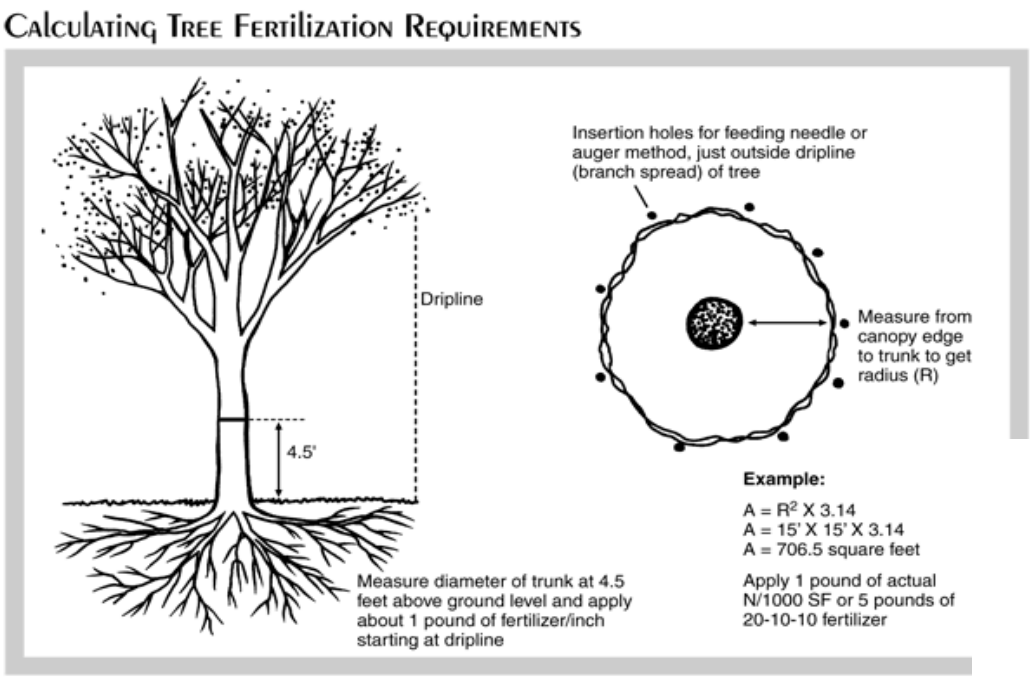

Slowed Growth Due to Light Competition
Springwood
Branch Tissue
Summerwood
Xylem
Phloem
Center of Tree
TREE "COOKIE"
Thin Cambium Layer
Bark

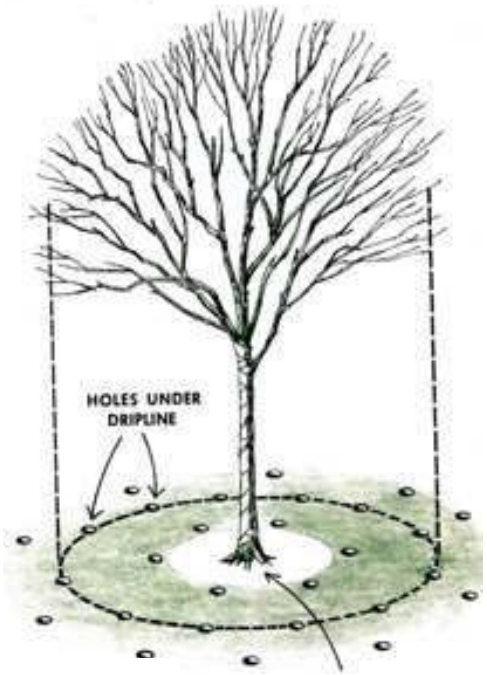

Crown Dripline
Depth in Feet
Critical Root Zone

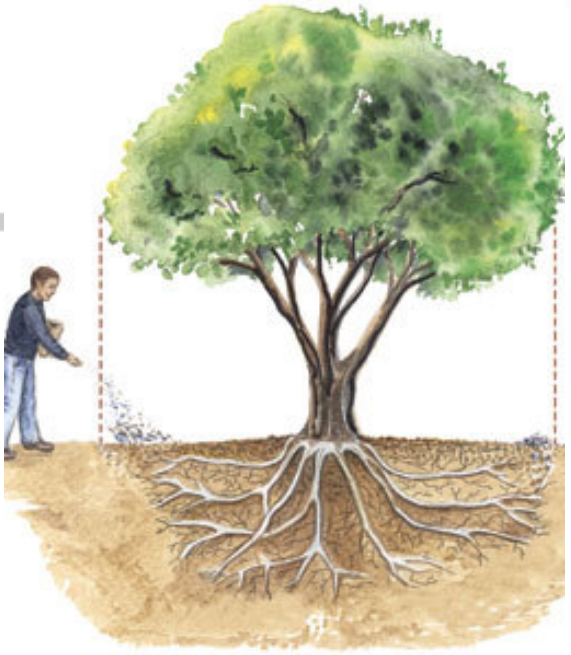


# Tree Fertilization

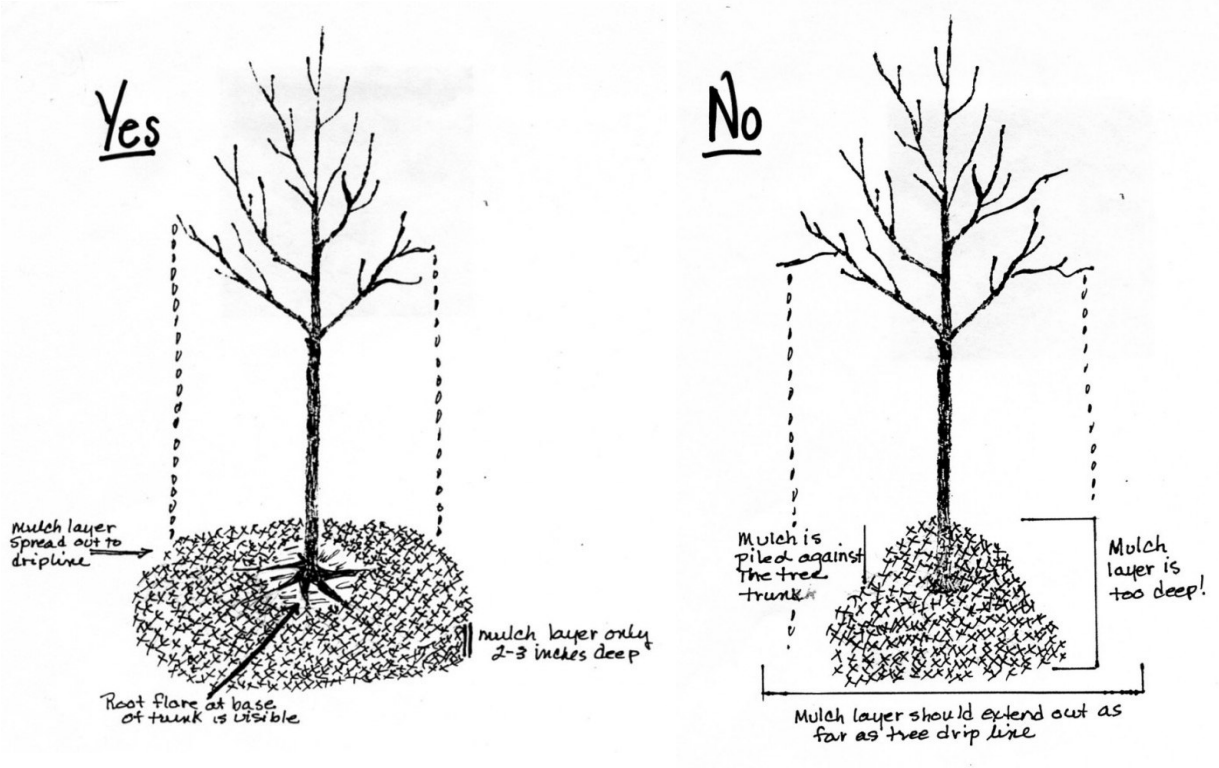
## Holes—Broadcast---Tree Spikes



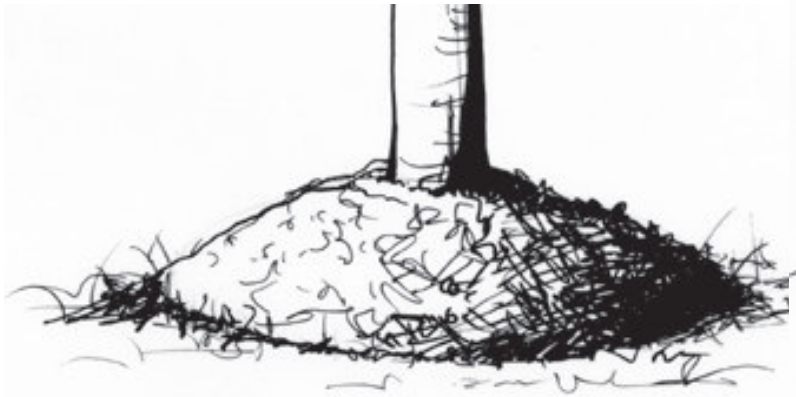



# Mulching

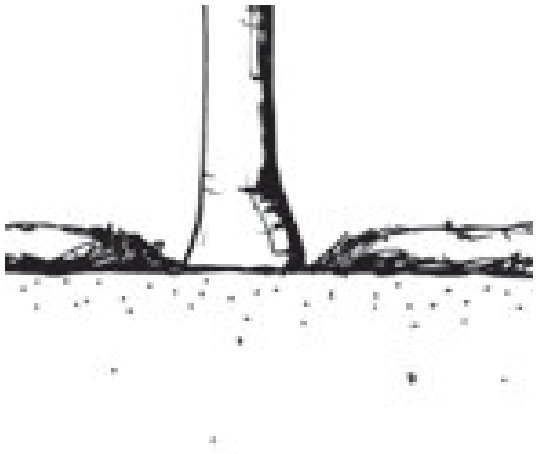

Yes
Mulch layer spread out to dripline
Mulch layer only 2-3 inches deep
Root flare at base of trunk is visible
No
Mulch is piled against the tree trunk
Mulch layer is too deep!
Mulch layer should extend out as far as tree drip line

# Mulching

## Volcano

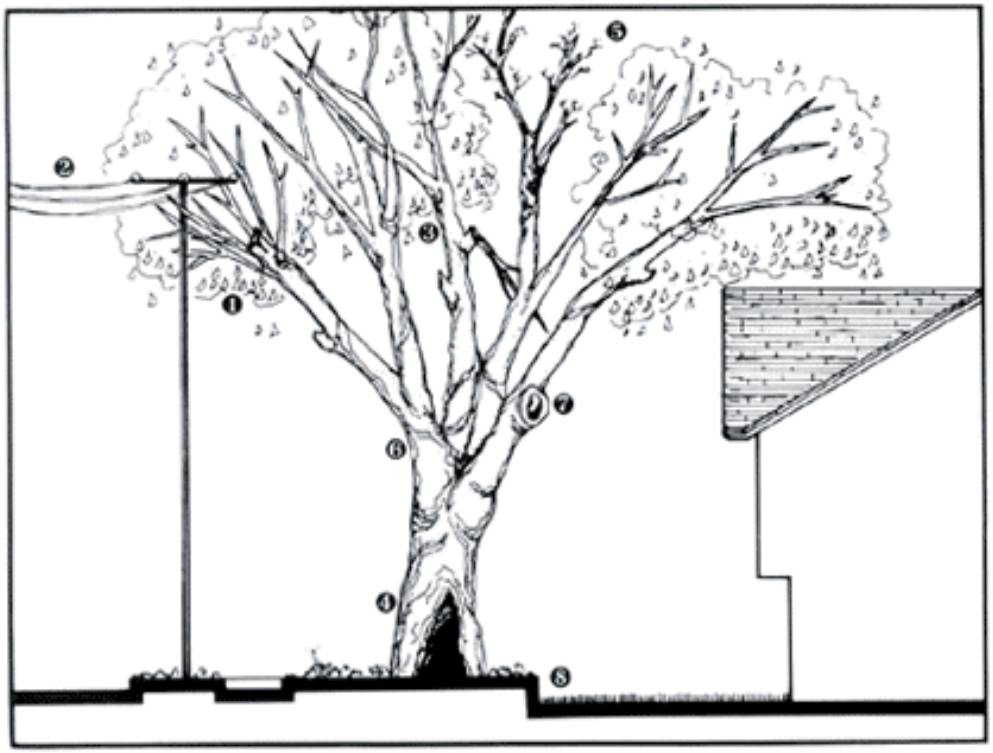


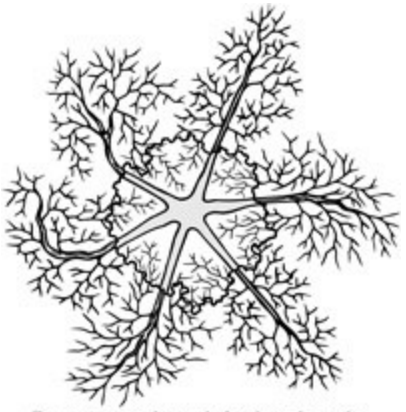
## Donut



## Examples of defects present in urban trees

1) Regrowth from topping, line clearance or other pruning
2) Electrical line adjacent to tree
3) Broken or partially attached branch
4) Open cavity in trunk or branch
5) Dead or dying branches
6) Branches arise at one point on the trunk
7) decay and tot present in old wounds
8) Recent change in grade, soil level or other construction

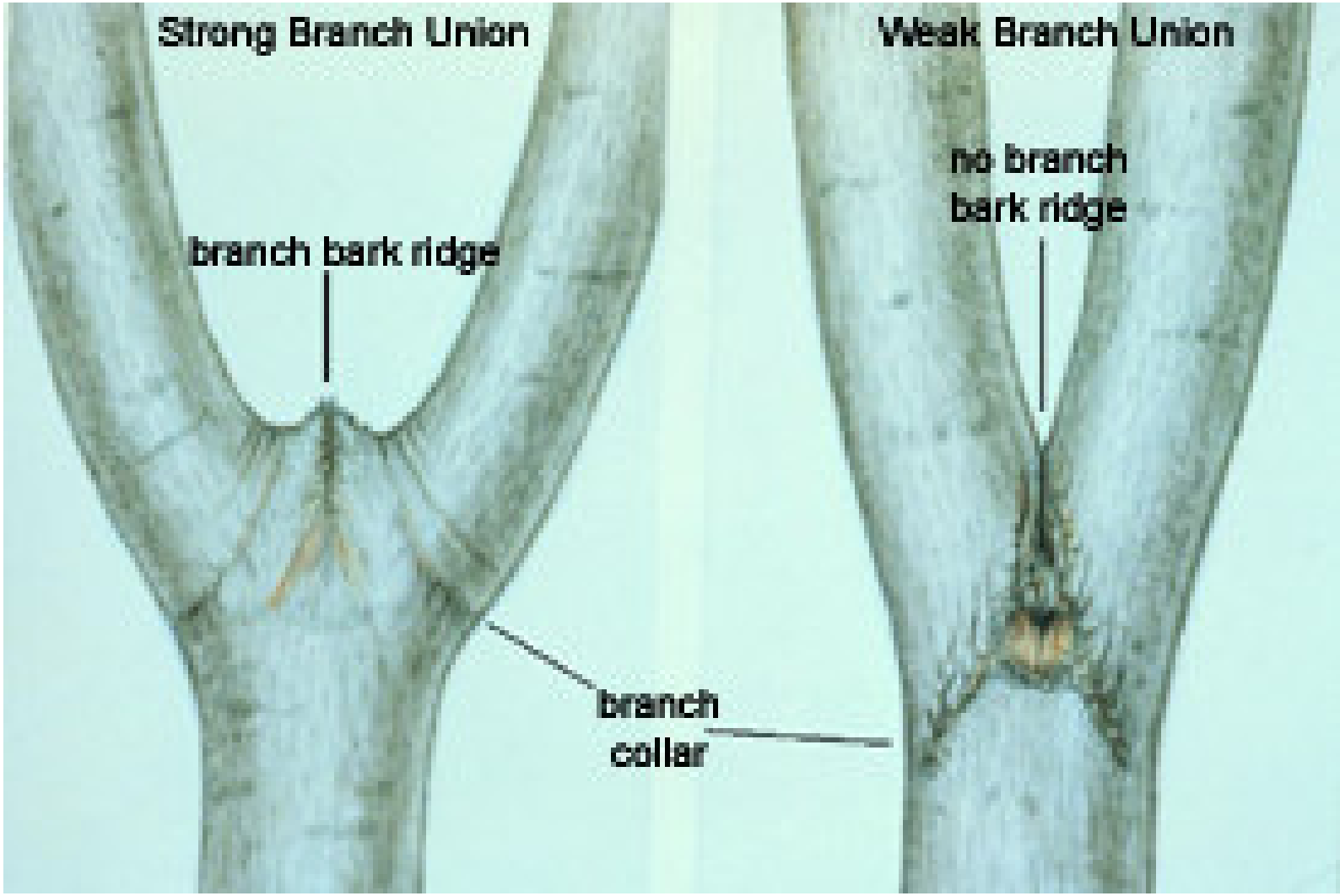


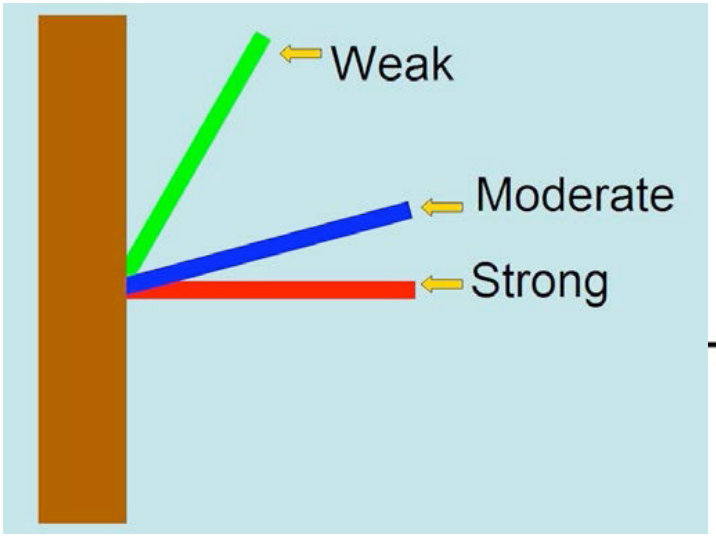
Roots extend much farther than the drip line and are found mostly in the upper 6 to 12 inches of soil.

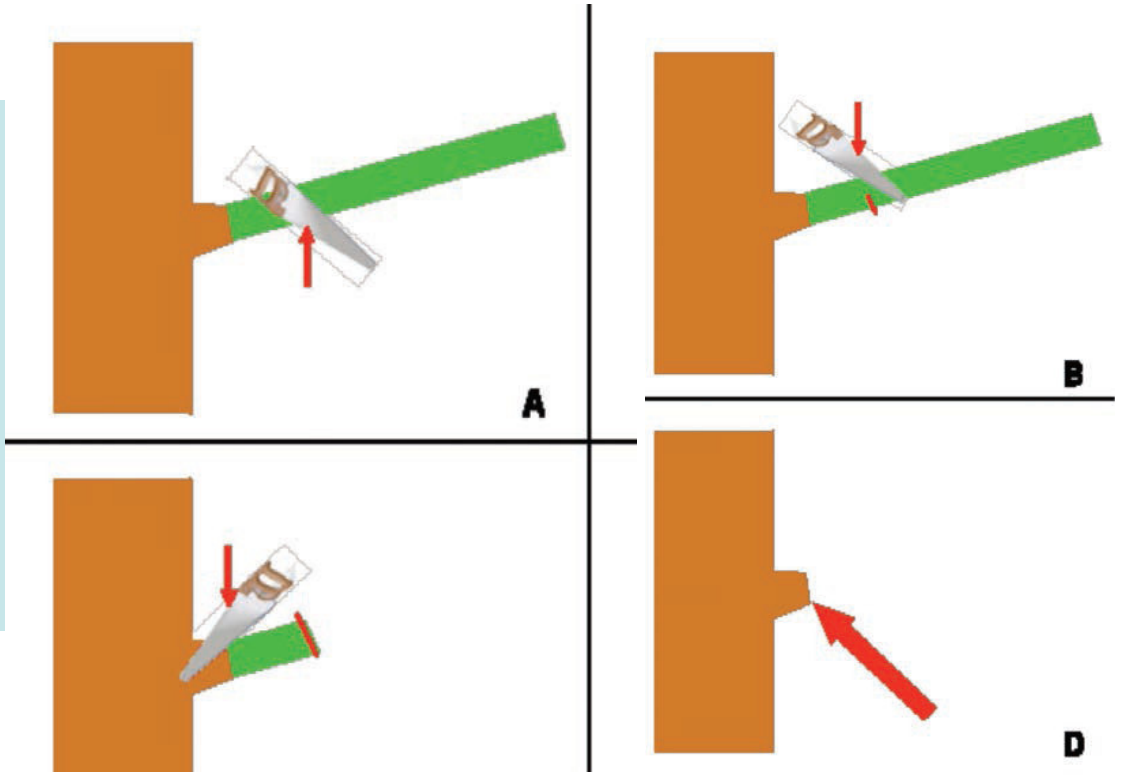
# Strong

# Weak

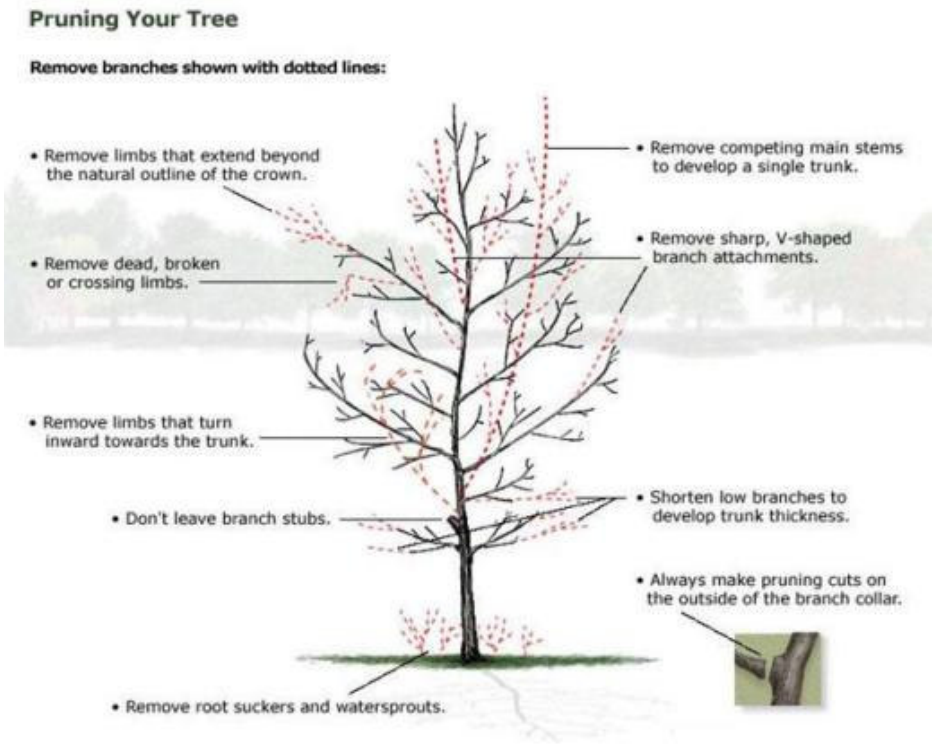

Strong Branch Union
branch bark ridge
branch collar
Weak Branch Union
no branch bark ridge

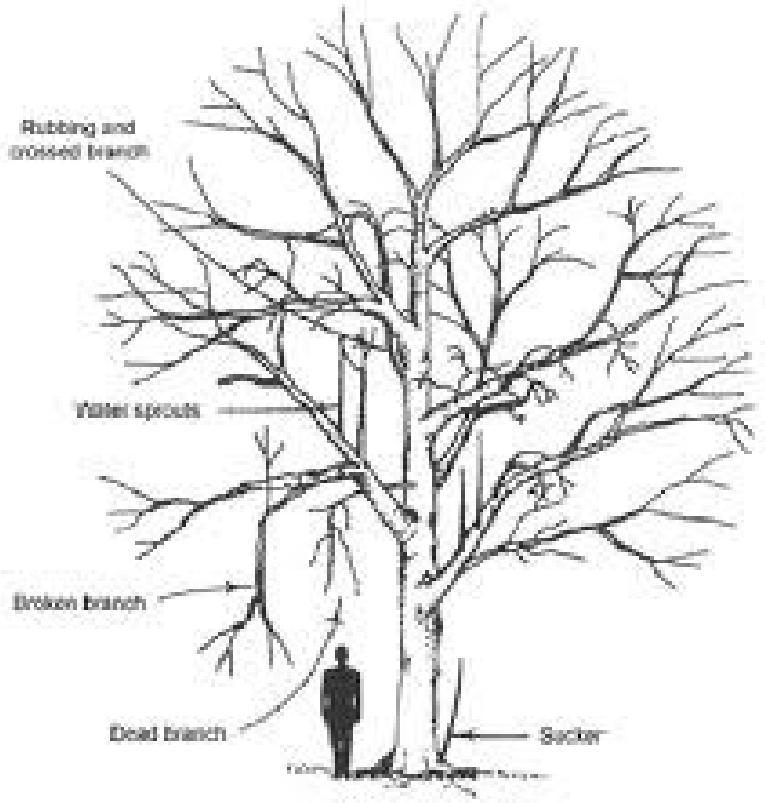
# Limb Strength



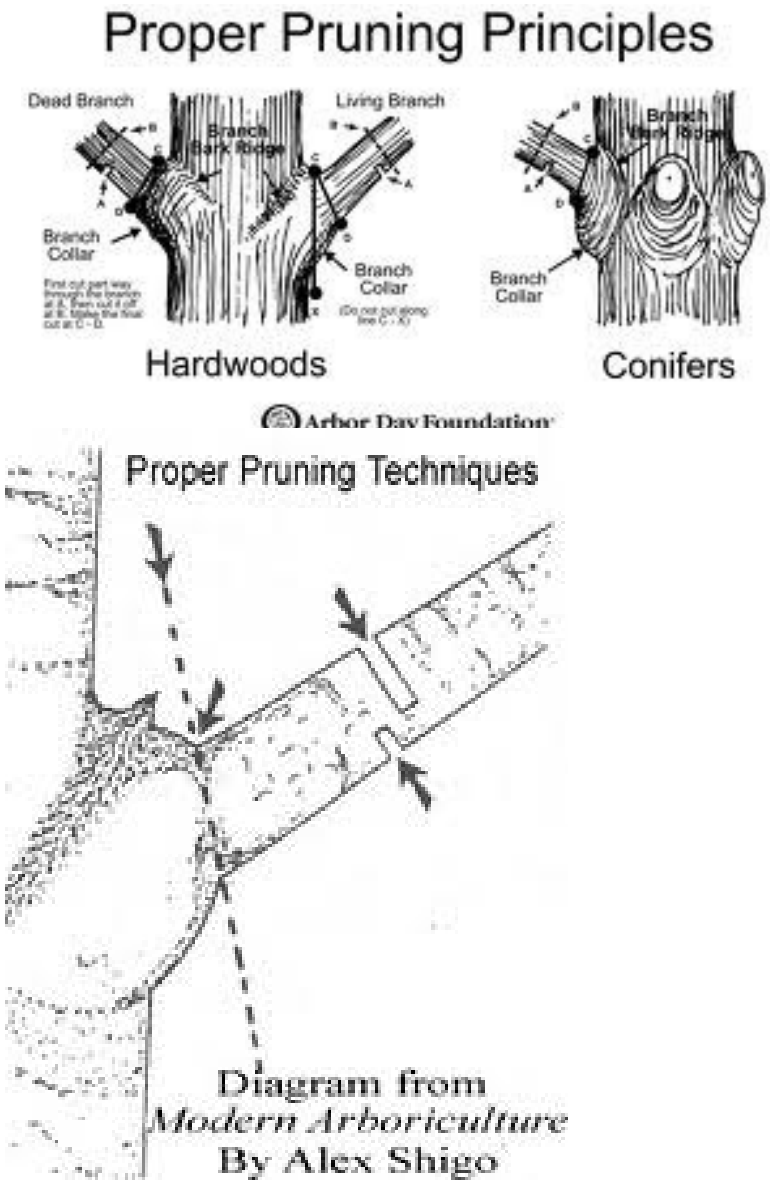



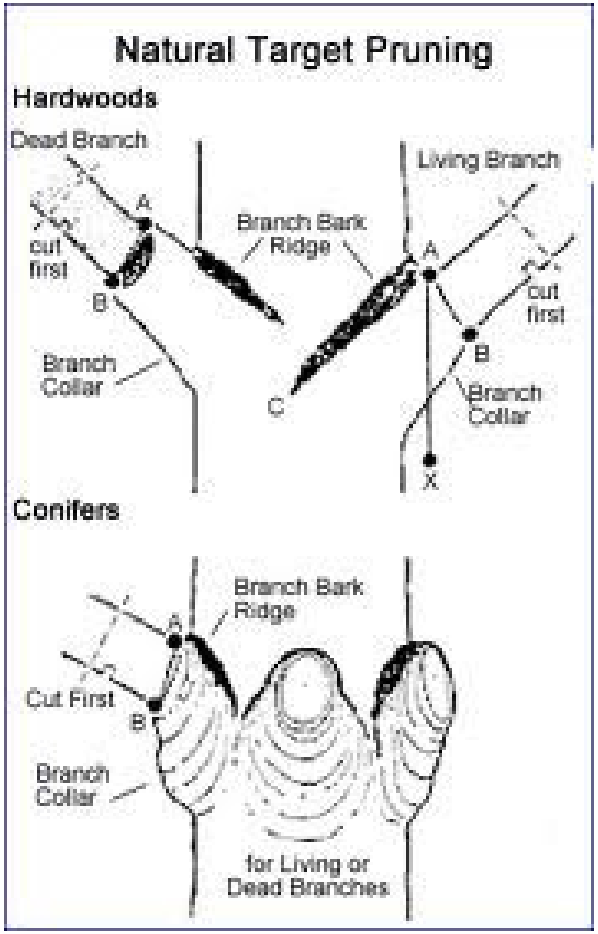
# Pruning


Pruning Your Tree
Remove branches shown with dotted lines:
• Remove limbs that extend beyond the natural outline of the crown.
• Remove competing main stems to develop a single trunk.
• Remove sharp, V-shaped branch attachments.
• Remove dead, broken or crossing limbs.
• Remove limbs that turn inward towards the trunk.
• Don't leave branch stubs.
• Shorten low branches to develop trunk thickness.
• Always make pruning cuts on the outside of the branch collar.
• Remove root suckers and watersprouts.

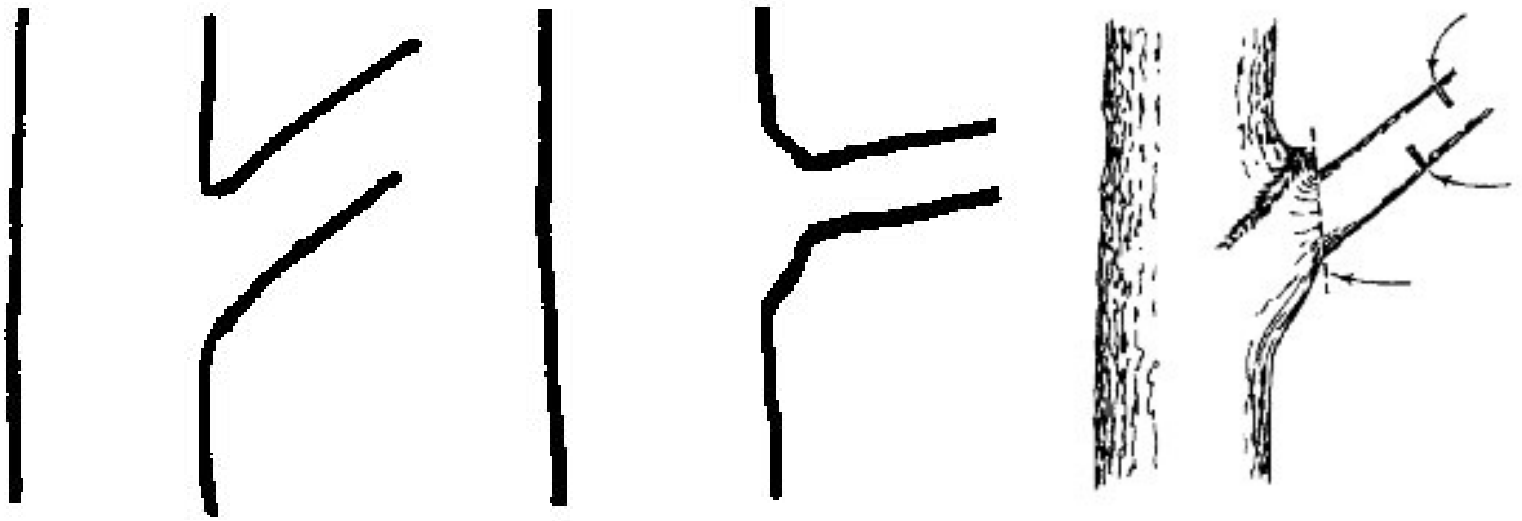

Rubbing and
Broken branch
Dead branch
Sucker

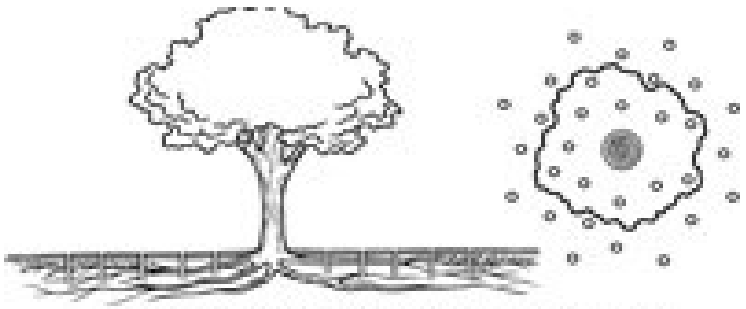
# Pruning


Proper Pruning Principles
Dead Branch
Living Branch
Branch Bark Ridge
Branch Collar
Branch Collar
Branch Collar
Hardwoods
Conifers
Arbor Day Foundation
Proper Pruning Techniques
Diagram from
Modern Arboriculture
By Alex Shigo


Natural Target Pruning
Hardwoods
Dead Branch
Living Branch
cut first
Branch Bark Ridge
Branch Collar
cut first
Branch Collar
A
B
C
X
Conifers
Branch Bark Ridge
Cut First
Branch Collar
for Living or Dead Branches

# Pruning

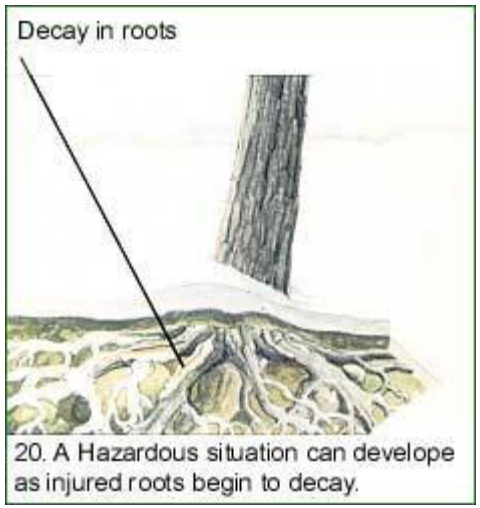




**Holes drilled through the root system to improve aeration.**

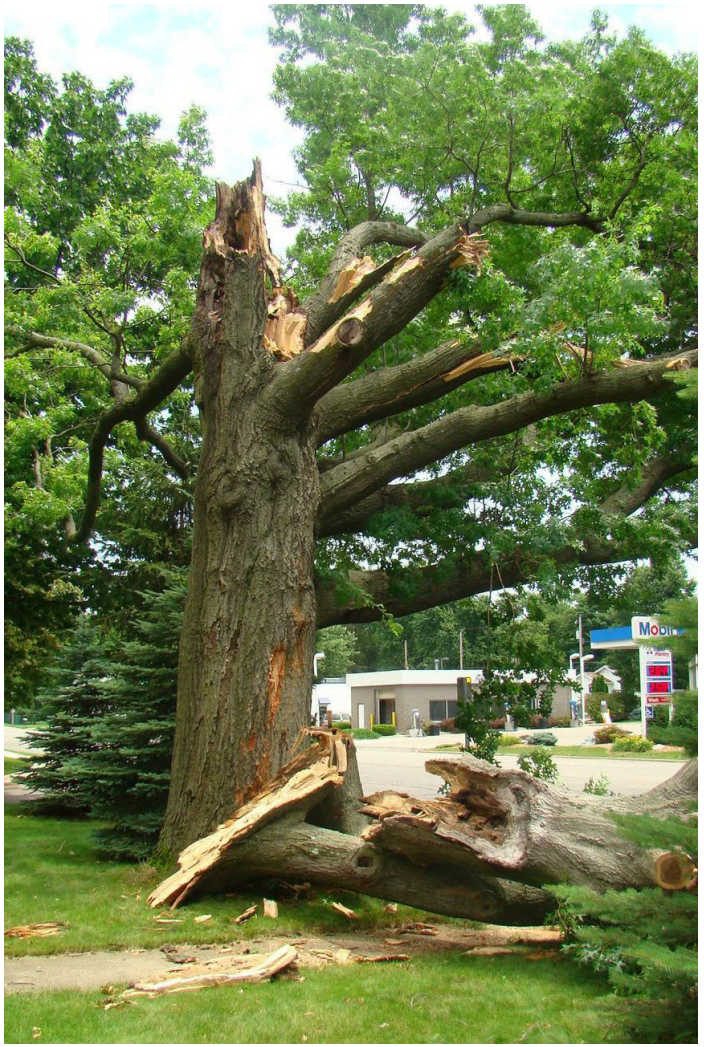

52. Loose injured bark around wound

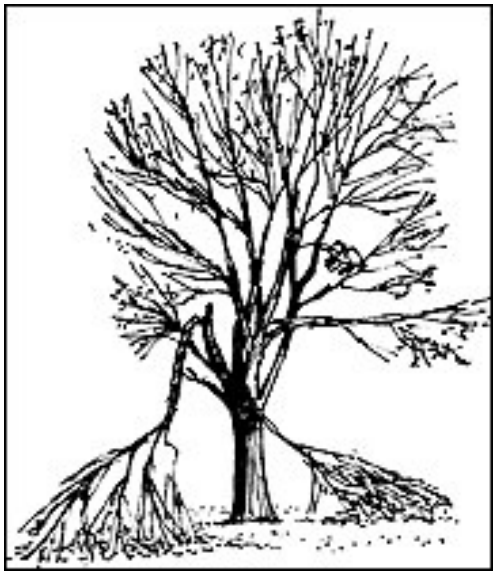
Scribe wound properly

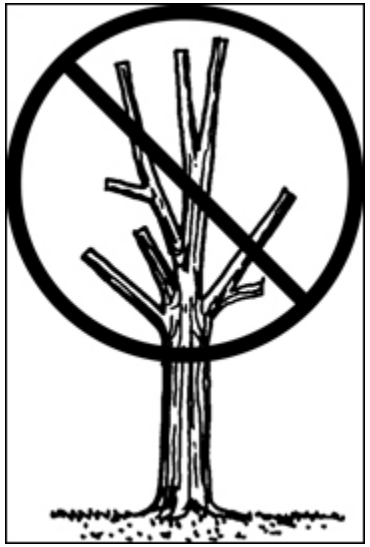



20. A Hazardous situation can develope as injured roots begin to decay.

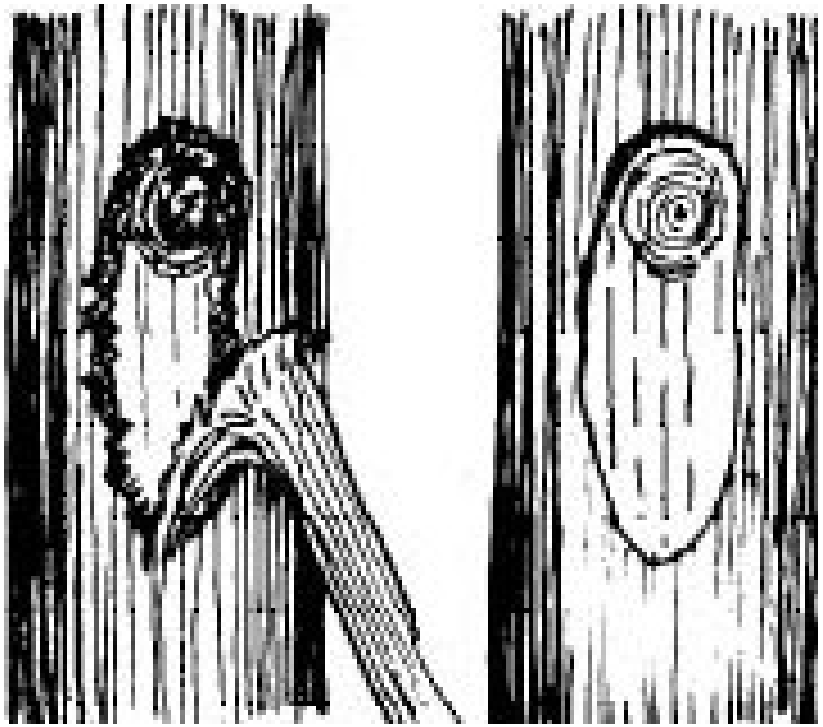
# Damaged Trees

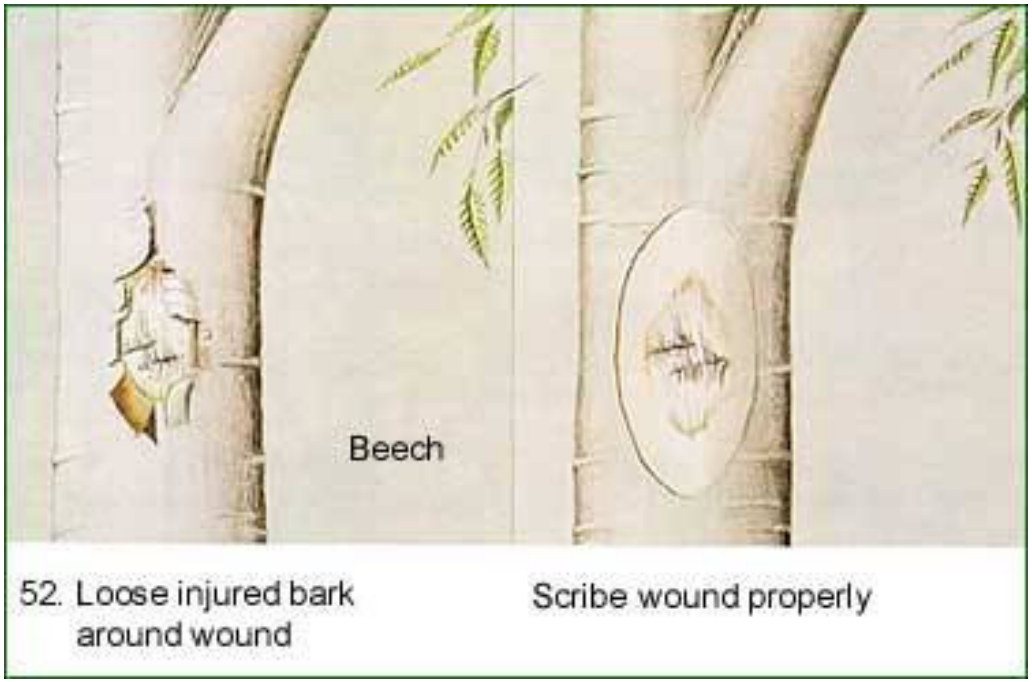






# Scribing a Wound





# Callous material

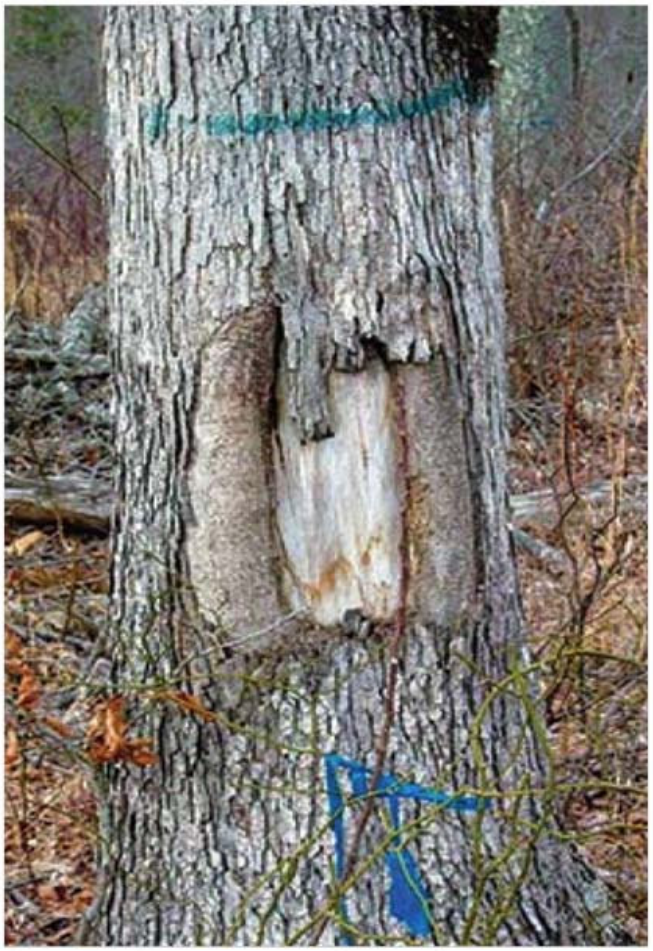


*Photo Credit: Wayne Clatterbuck*

**Callus tissue forming on the vertical axes of the tree wound on white oak, but the ragged bark on the horizontal axes has slowed the growth of callus tissue.**

# Girdling Root

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