College of Agriculture & Life Sciences
Cooperative Extension

Tree Care Workshop

Understanding the Growth Habits of Landscape Trees

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Tree growth

- From seed or cutting to mature plant
- Growth is genetically determined
- Influenced by environmental conditions

Florabank.org.au

Commons.wikimedia.org

Excurrent

Decurrent

Deciduous

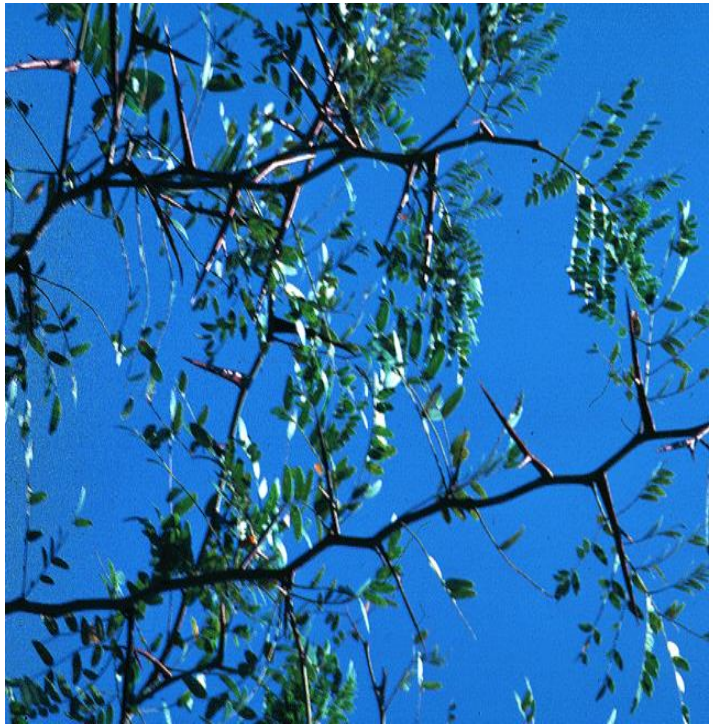
Plants that shed their leaves every year

Evergreen

Plants hold their leaves for more than a year, green year-round.

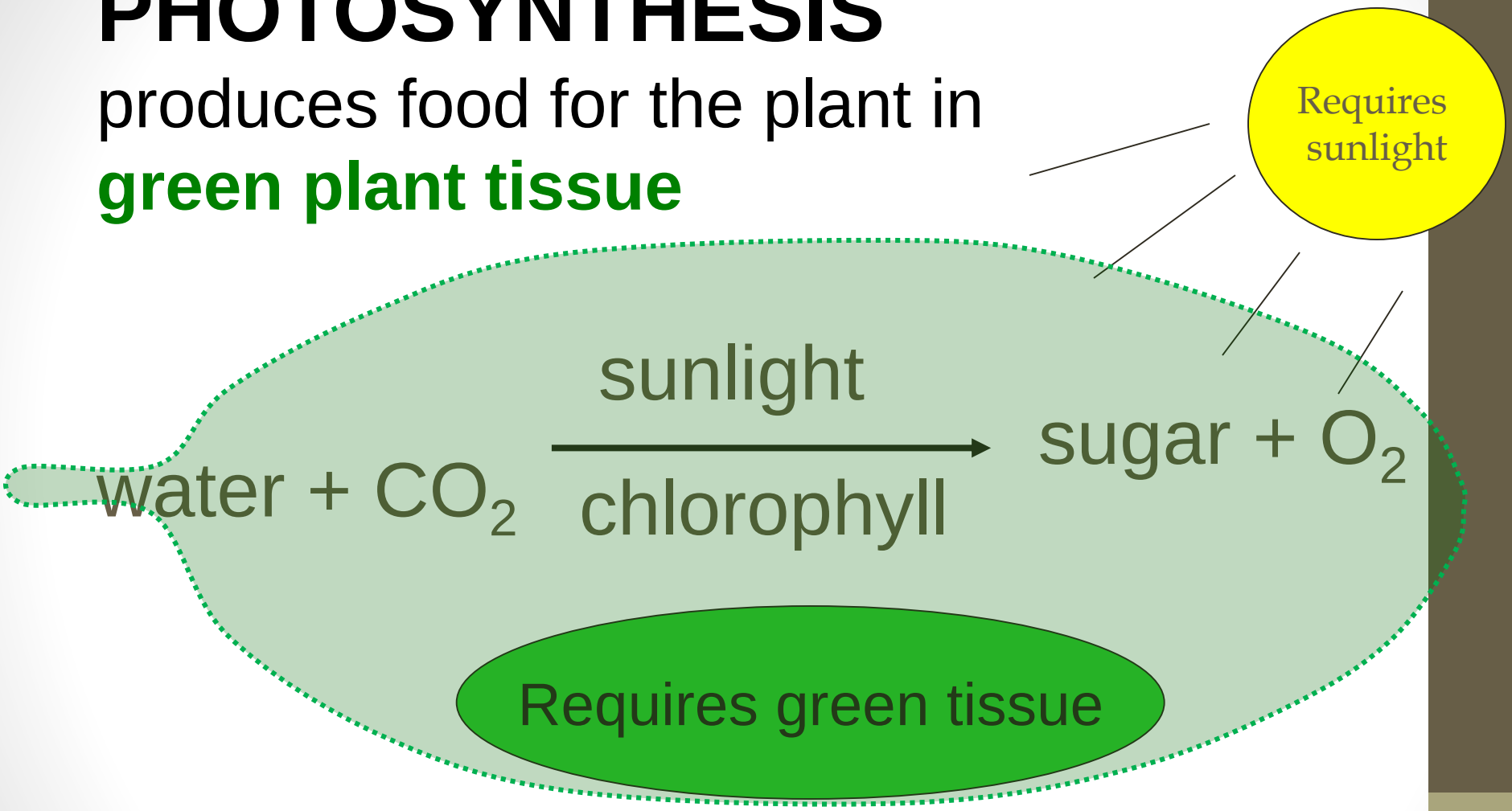
Leaves

1. Capture and conserve light energy through the process of **photosynthesis**.
2. Take up carbon dioxide for photosynthesis and release oxygen for use in **cellular respiration**.
3. Store conserved energy in “food” molecules --**sucrose and starch**.
4. Control water use and leaf temperature through **transpiration**.



PHOTOSYNTHESIS

produces food for the plant in **green plant tissue**



RESPIRATION

makes energy available for the plant

No light required

$$\text{sugar} + O_2 \longrightarrow CO_2 + \text{water} + \text{energy}$$

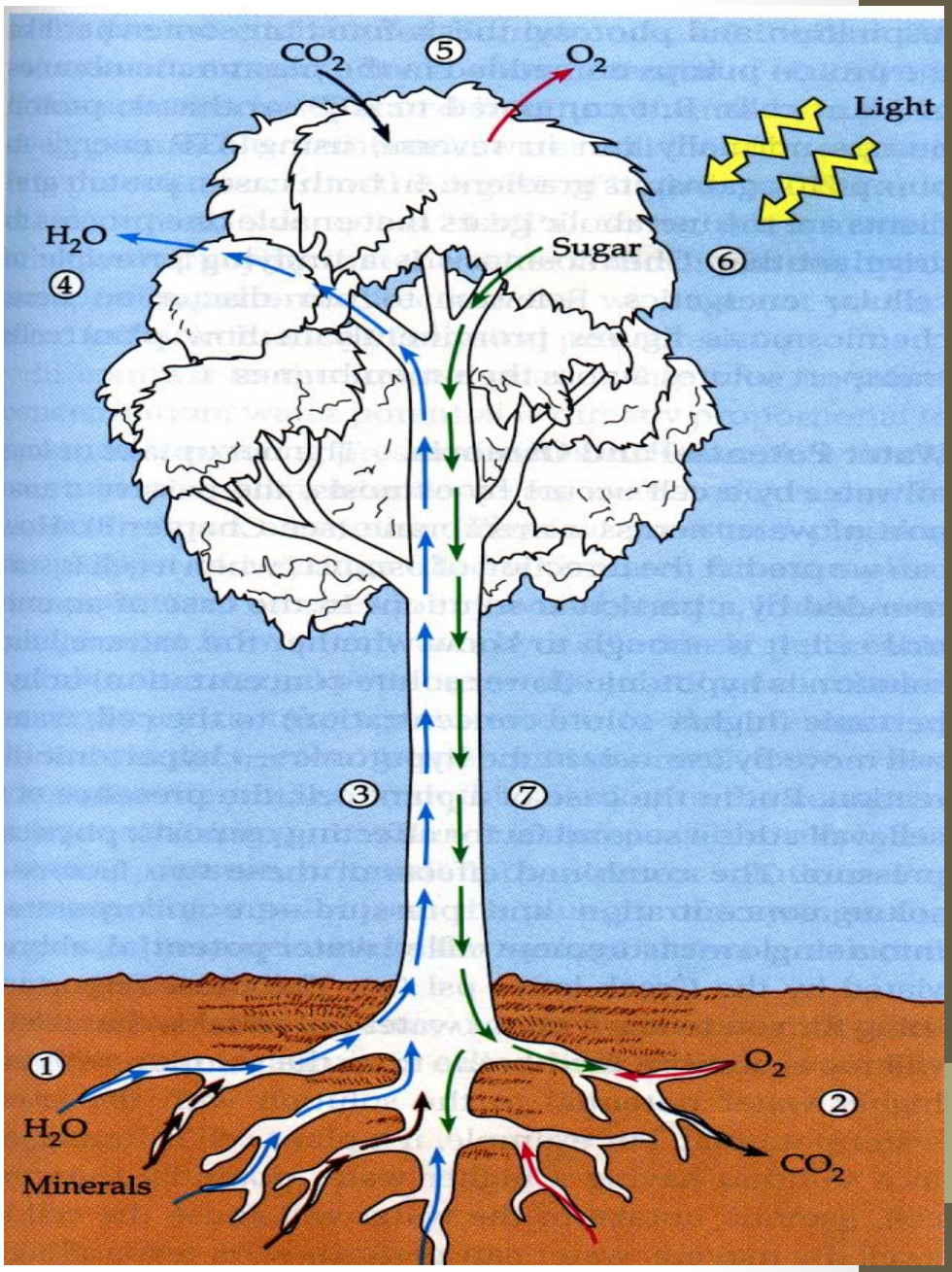
Requires oxygen

Occurs in the entire plant

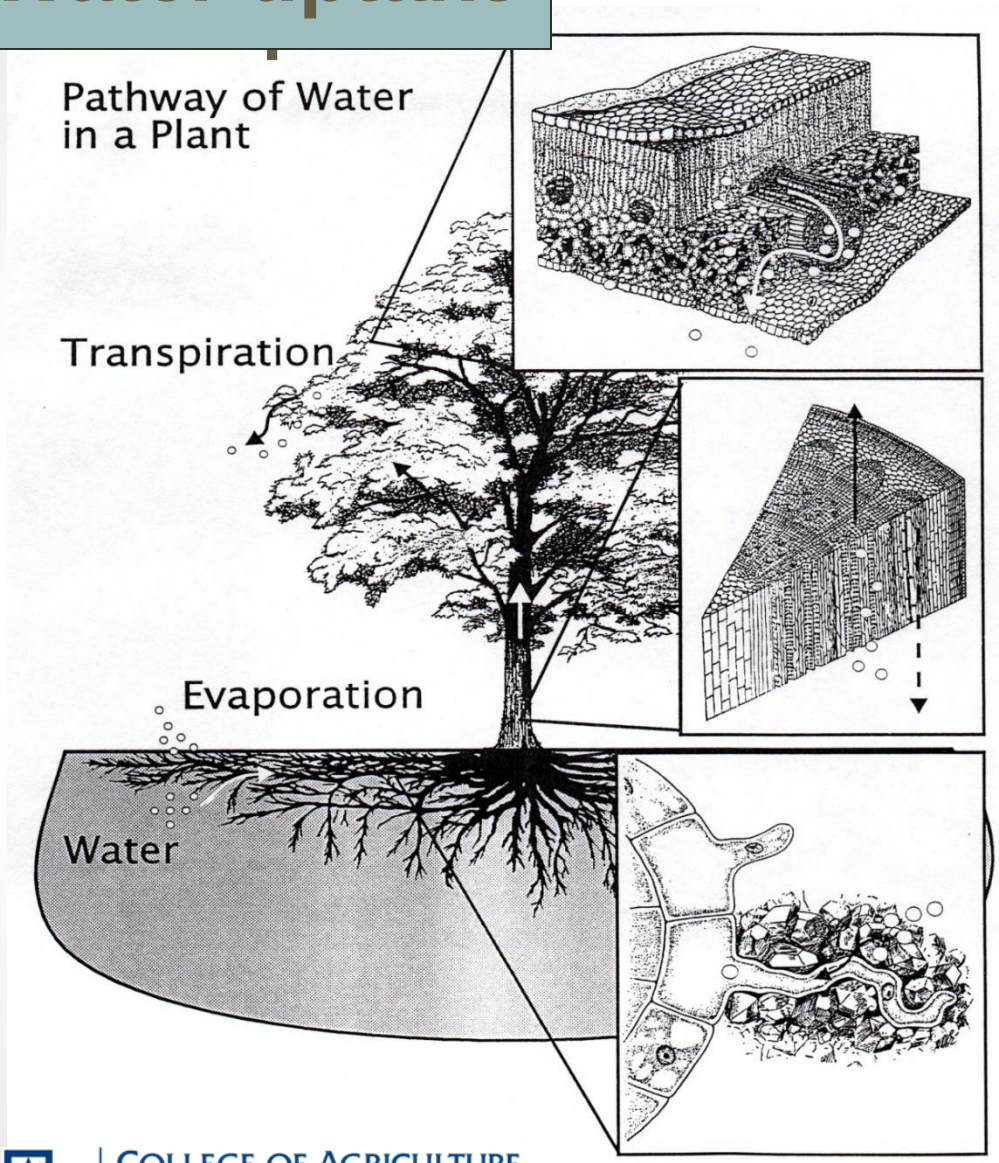
Transport systems in plants

Water and minerals move upward in xylem

Sugars move downward in phloem



Water uptake



Water vapor moves through stomates into the atmosphere

Upward movement through xylem vessels

Uptake through root hairs

Translocation

Transport of soluble organic materials (sugars) from one part of the plant to another.

SOURCE

Leaves

SINKS

young growing shoot tips,
developing flower buds,
elongating roots,
tubers, bulbs, fruit

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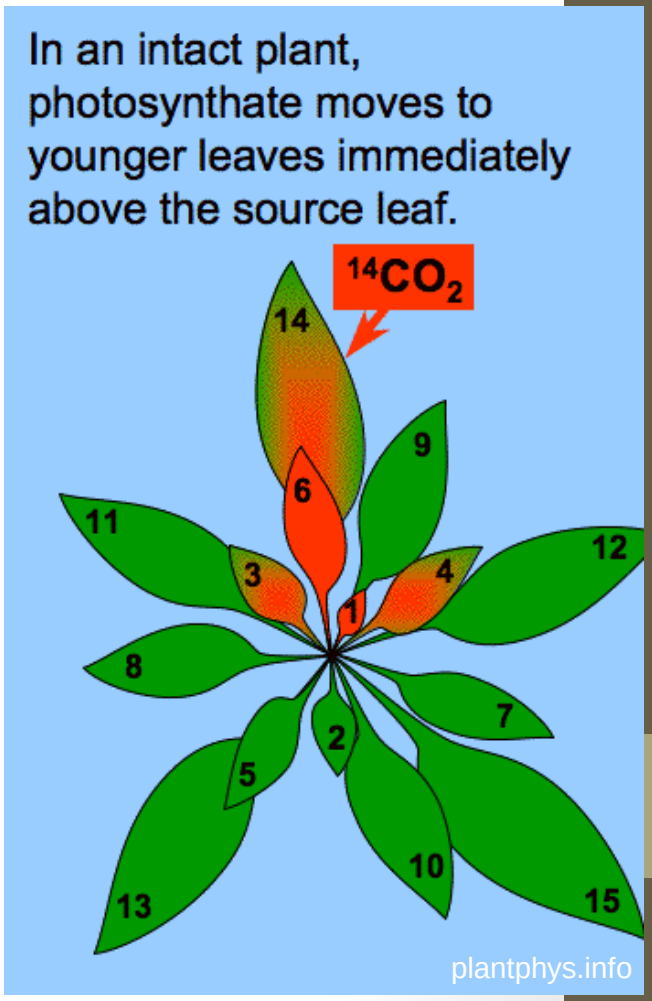
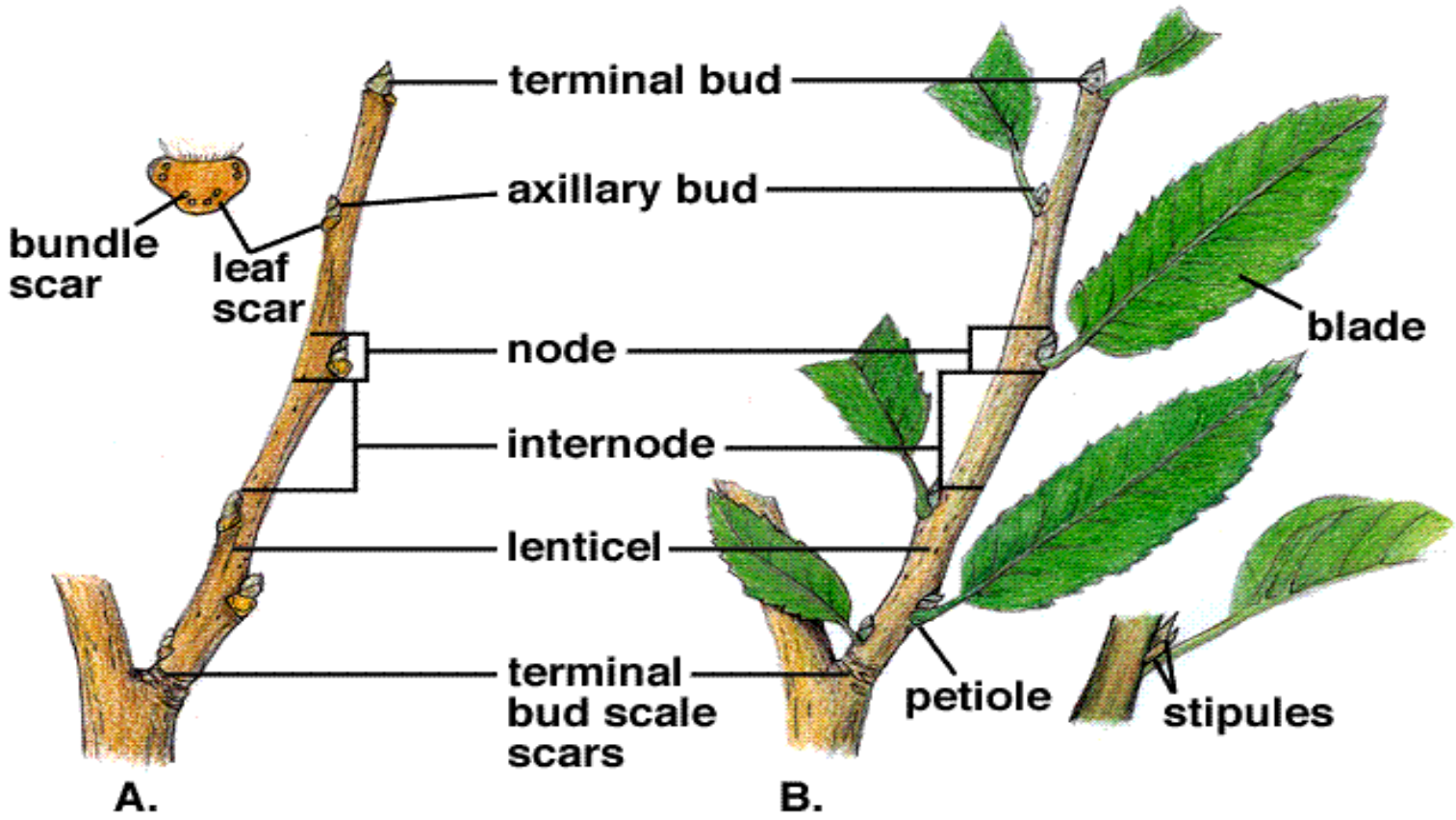


A Woody Twig



Two meristems

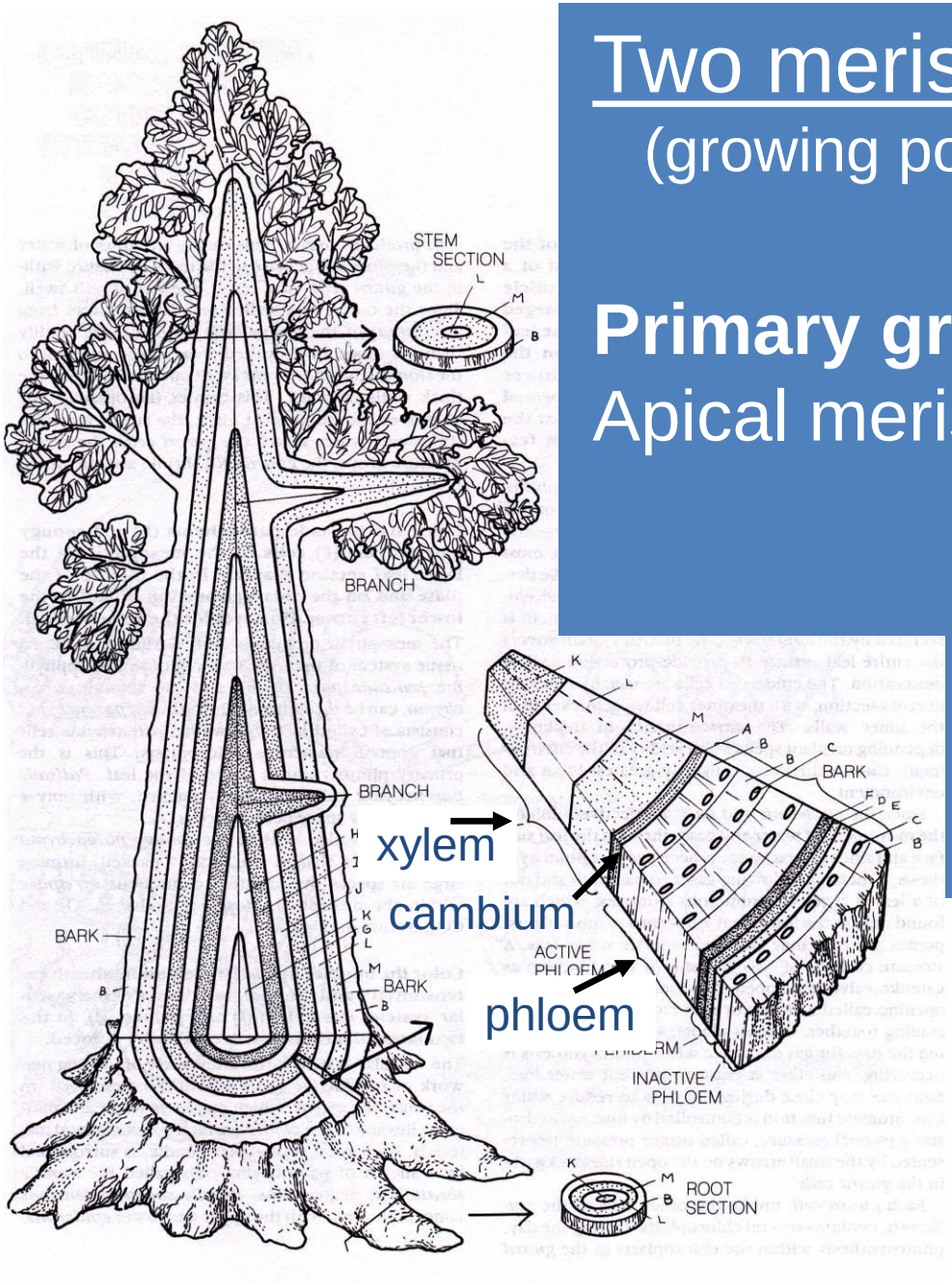
(growing points)

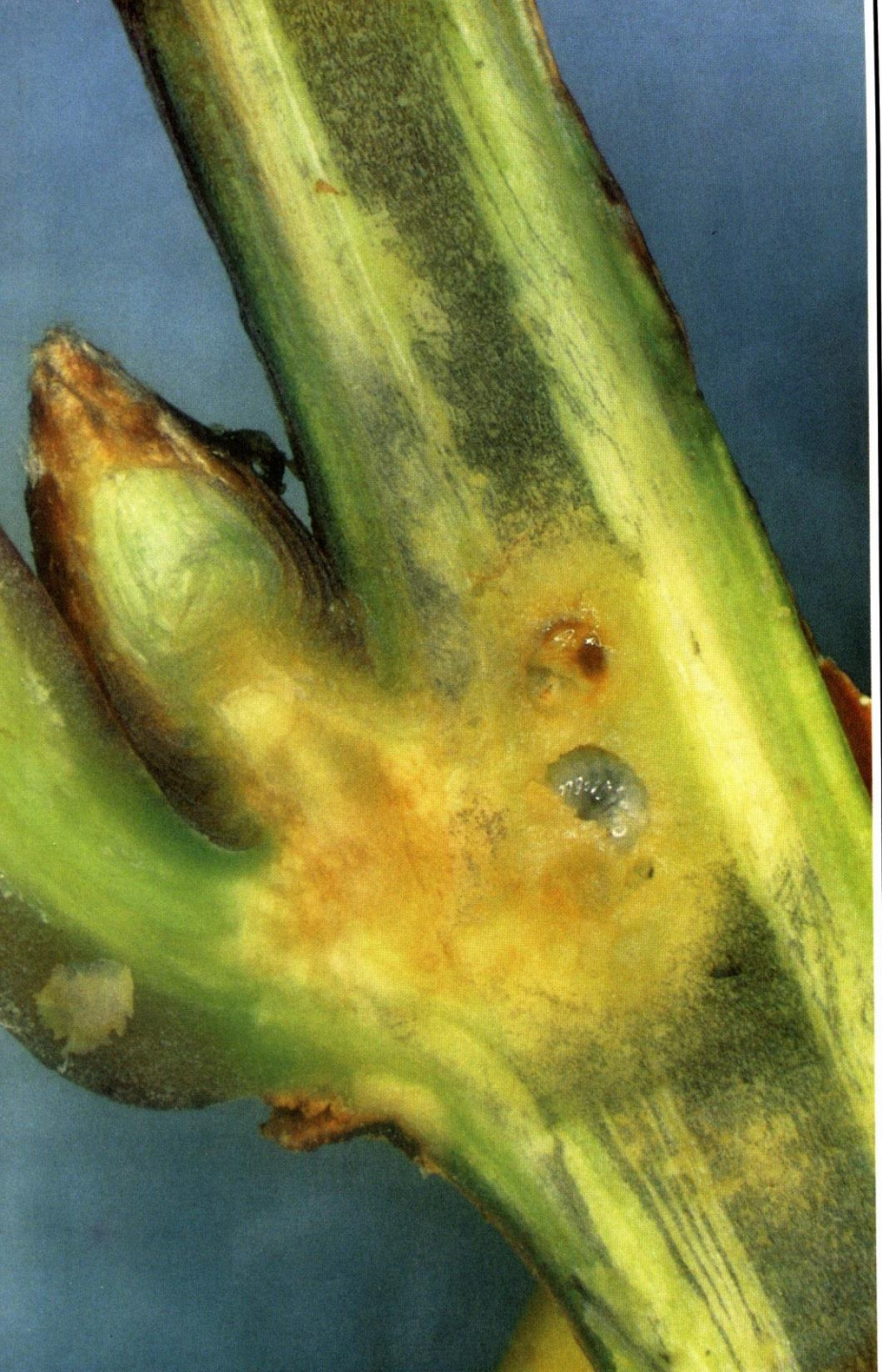
Primary growth

Apical meristems (buds)

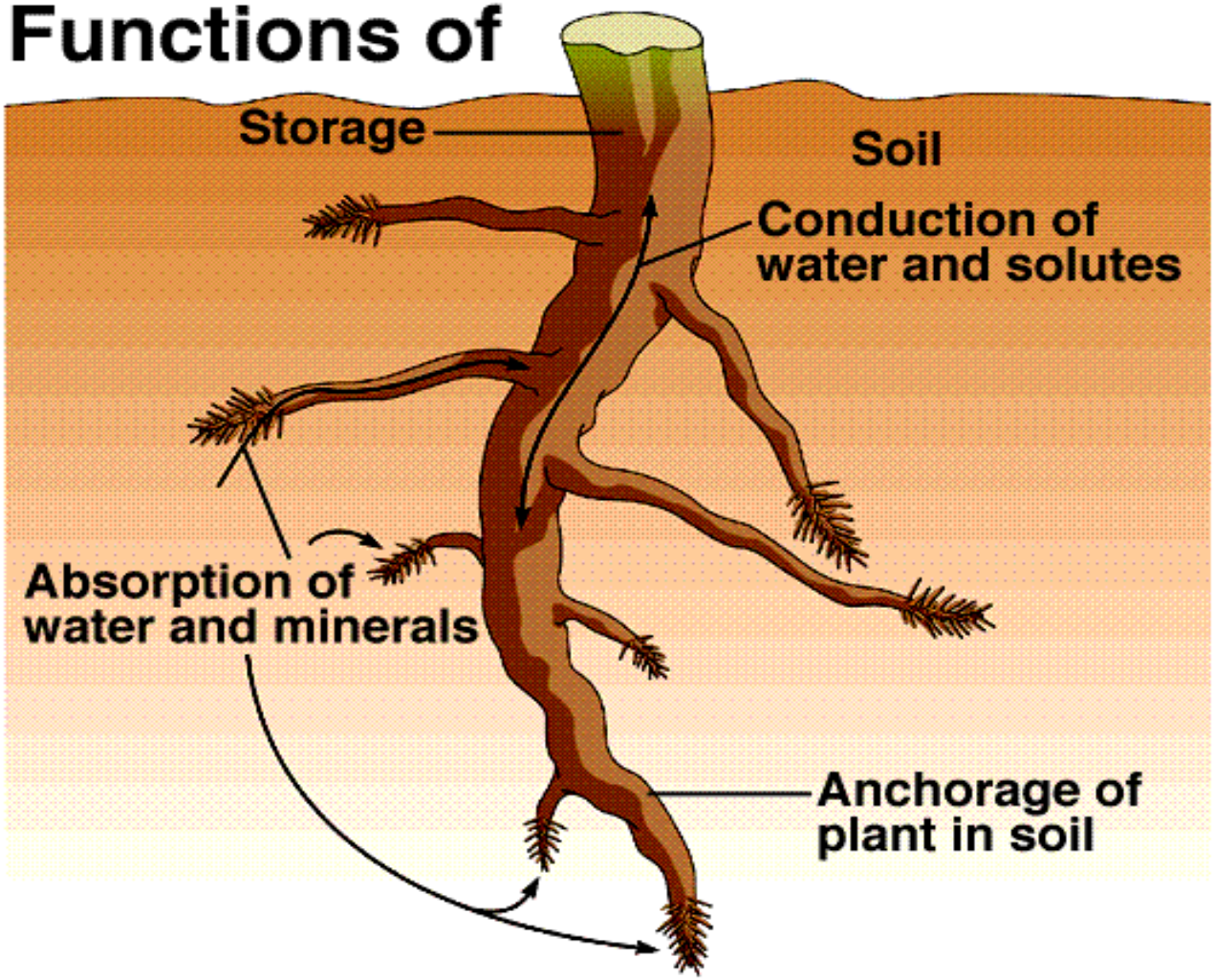
Secondary growth

Cambium differentiates into phloem and xylem





Major Functions of Roots



Bark

Phloem

Cambium zone

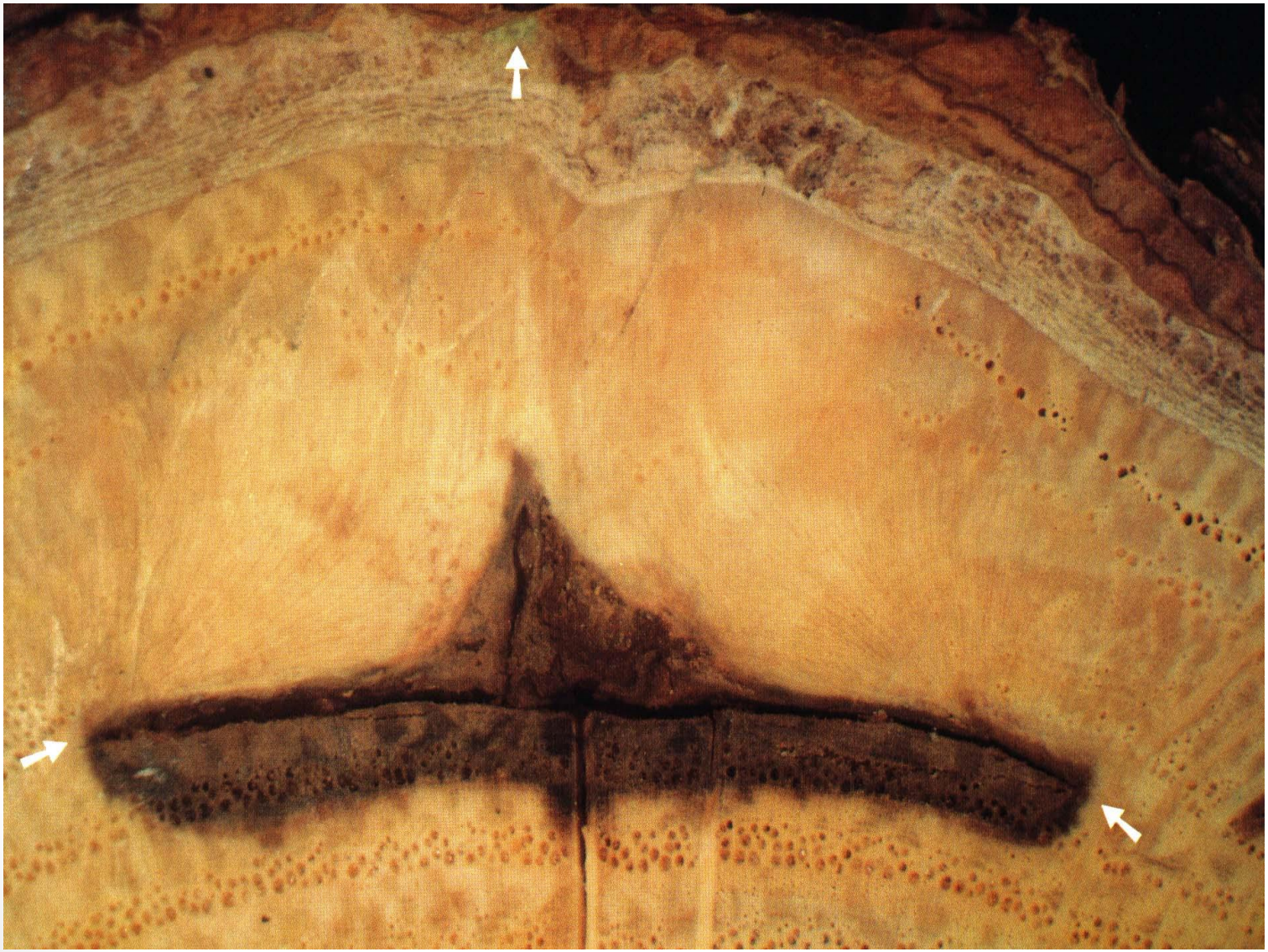
Open vessels,
Conducting sapwood

Non-conducting sapwood

Heartwood

Last 7 growth increments only earlywood vessels.
Attacked by gypsy moth for 7 yrs.

***Quercus alba* – White Oak**



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Heat Drought Stress

What happens in stressed trees?

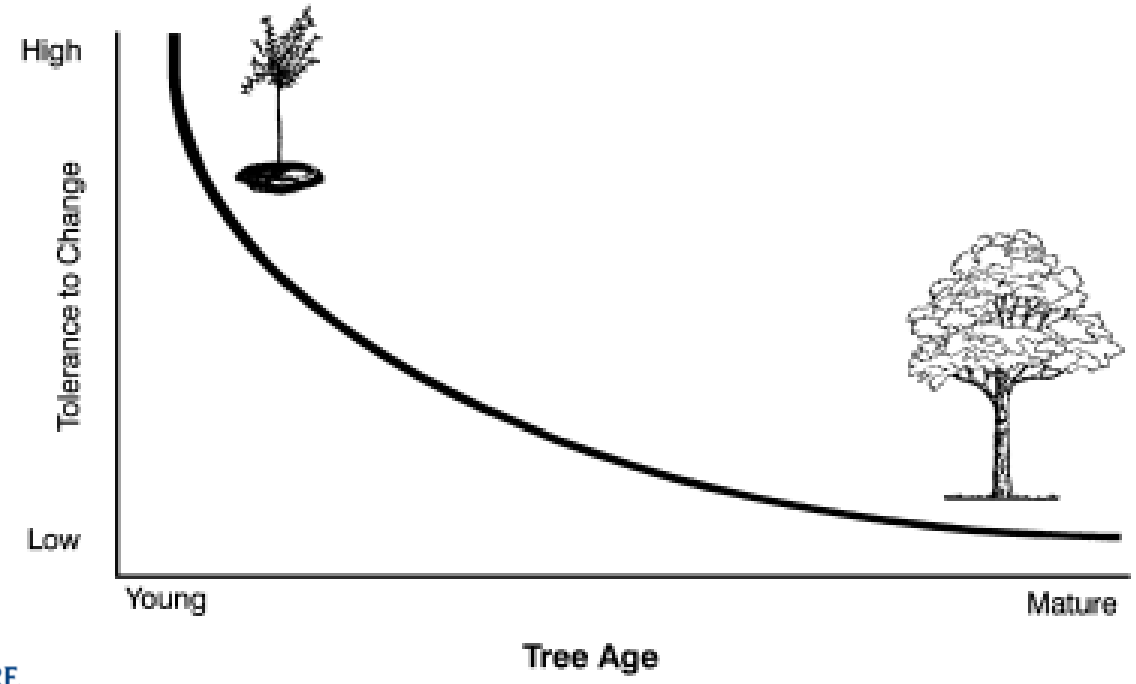
Stress = external factor that prevents optimum plant function

Water stressed plant characteristics:

- Leaf expansion is inhibited even at mild stress
- Fewer leaves are produced (reduced new leaf area)
- Leaves shed
- Roots grow more abundant and deeper
- Stomata close in response to abscisic acid
- Photosynthesis slows with increasing stress
- Leaf cuticles become thicker
- Leaves change (wilt, roll)
- **Stressed plants cannot store enough carbohydrates**

As trees mature they can handle less stress or disturbance

- Mature plants are more sensitive to drought, high temperature, soil disturbance, root loss, insects, diseases.



http://www.clemson.edu/extfor/publications/forlf18/

Summary

- Leaf photosynthesis produces the plant's food.
- Respiration throughout the plant and provides energy for growth and defense.
- Meristems are the growing points (buds, cambium)
- Sugars translocate from source to sink
- Stressed trees have less energy, grow less and decline.