Tree Biology

Texas Master Gardener's
2019 Tree Care Specialist Training

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TEXAS MASTER GARDENER
TEXAS COOPERATIVE EXTENSION
The Texas A&M University System

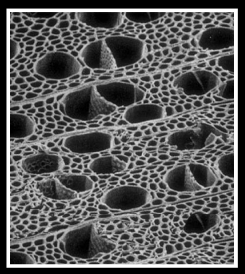
TEXAS A&M AGRILIFE EXTENSION

Tree Biology

- Tree Anatomy - study of the various parts of a tree
- Tree Physiology - study of the biological and chemical processes within these structures, providing the basis of function

Tree Anatomy
Basic Cell Structures

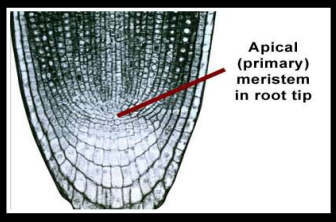
- Trees made up of cells, tissues and organs
- Cells come from meristems
  - Meristems - tissue where cell division takes place
  - Cells then undergo differentiation (development of cells in which they become specialized for various reasons)
- Similar cells are arranged into tissues together
- Tissues are organized into organs (leaves, stems, roots, flowers and fruits)

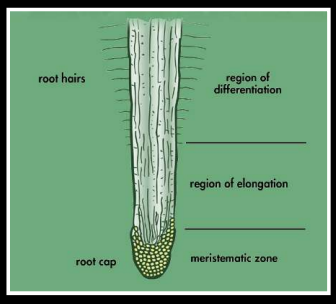


Tree Anatomy Meristems

Two Types

- Primary or apical meristems
  - produce the cells that result in elongation of shoots and roots
- Secondary or lateral meristems
  - produce cells that result in an increase in diameter

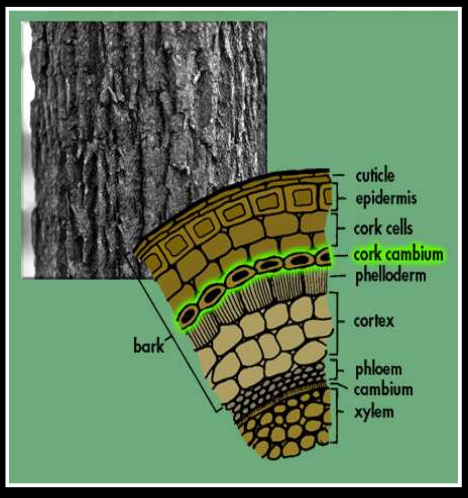




Tree Anatomy Cambium

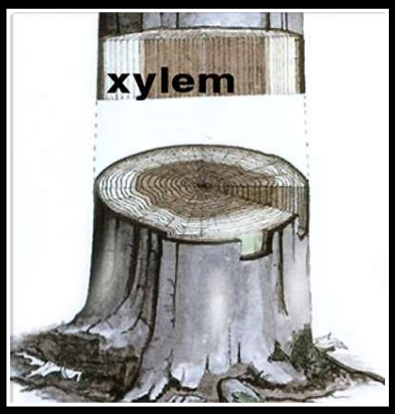
Two Types

- Cambium or dividing cells
  - Xylem to the inside
  - Phloem to the outside
- Cork Cambium
  - Bark to outside



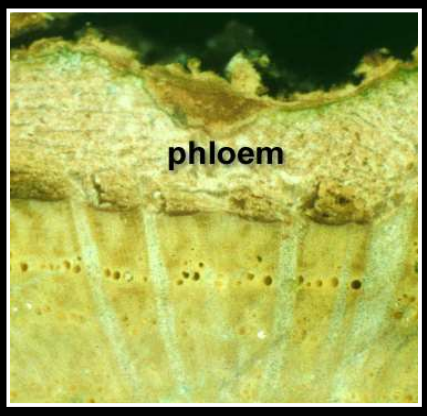
Tree Anatomy
Xylem

- Conducts water & mineral elements (upward)
- Supports the weight of the tree
- Stores carbohydrate reserves
- Defense against the spread of disease and decay



Tree Anatomy
Phloem

- Responsible for the movement of sugars, produced in the leaves (downward)
- Requires energy
- Composed of sieve tubes (show straws)



Tree Anatomy
Growth Rings

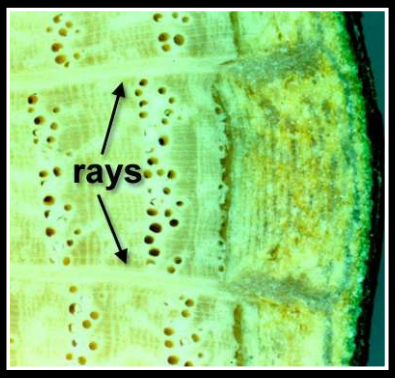
- Growth Rings
  - Earlywood
  - Latewood
- Sapwood
- Heartwood

Tree Anatomy
Growth Rings

Growth rings clearly indicate the age of a tree

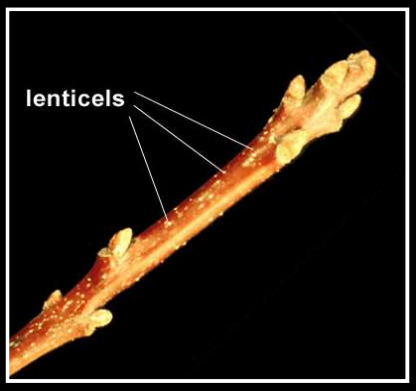
Tree Anatomy
Ray Cells

- Transport sugars and other compounds throughout the trunk
- Store starch
- Aid in restricting decay in wood tissue



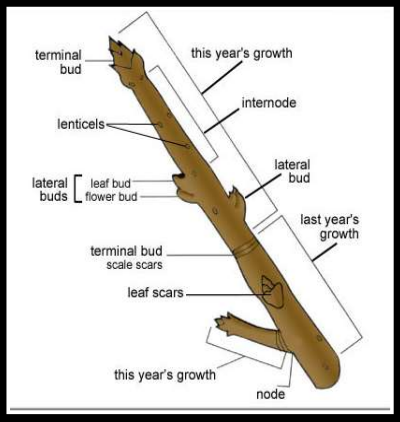
Tree Anatomy
Bark

- Protective tissue
  - Moderates temperatures
  - Offers defense
  - Reduces water loss
- Composed of non-functional phloem and corky tissues
- Contains lenticels



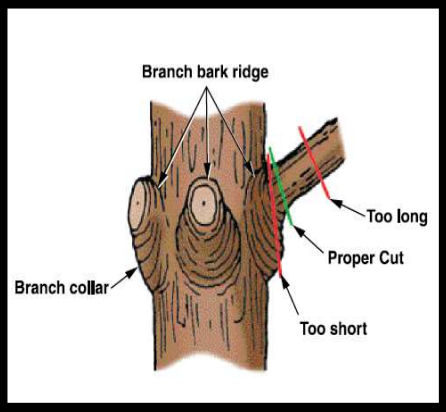
Tree Anatomy
Stems

- Stems can be twigs, branches or trunk
  - Twigs
  - Terminal bud or apical bud (dominant)
  - Lateral or auxiliary bud



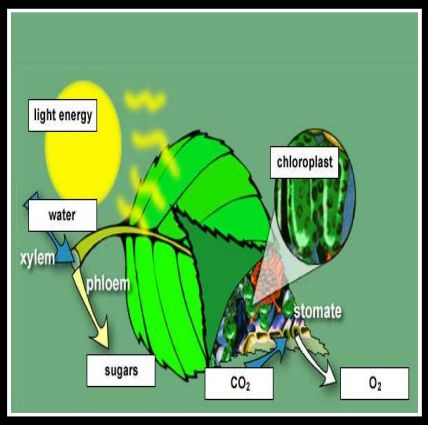
Tree Anatomy
Branches and Trunks

- Branches & Trunk
  - Similar in structure and function but autonomous
  - Each branch is self sustaining
  - Attachment terms
    - Branch collar
    - Branch bark ridge
    - Included bark



Tree Anatomy
Leaves

- Function
  - Photosynthesis (food building)
  - Respiration- the process by which the chemical energy generated by photosynthesis, and stored as starch or sugar, is used by the tree
  - Transpiration
- Buds form in the fall
- Classification and arrangements help to identify species



Tree Anatomy
Roots

- Primary functions
  - Anchorage
  - Absorption
  - Storage
  - Conduction
- Structural Roots
- Absorbing roots
- Lateral roots
- Sinker roots
- Mycorrhizae

Earthworms = Soil Health

A healthy soil includes a large amount of earth worms

Tree Physiology

- Osmosis- movement of water from higher concentration to lower concentration
- Translocation- longitudinal and axial transport

Tree Growth

- Processes controlled by Hormones
  - Auxins, gibberellins, cytokinins, ethylene and abscisic acid control such things as cell division, cell elongation, fruit ripening, leaf drop and root development
    - Auxins – produced in shoot tips is also important in root development
    - Cytokinins – produced in roots, instrumental in shoot initiation and growth

Tree Growth

- Tropisms – the orientation of growth in response to an environmental stimuli
  - Geotropism
  - Phototropism

Tree Growth

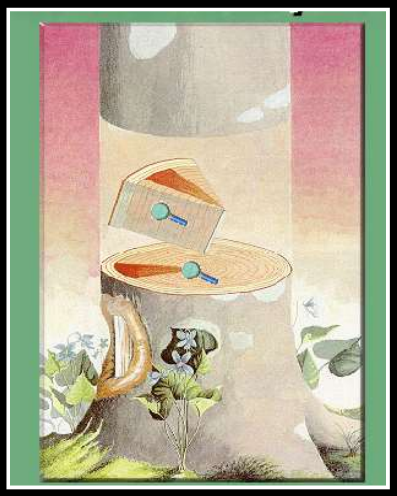
- Temperatures affect growth
- Water enters roots by osmosis
- Plants love rainwater
- Apical Dominance
  - Process where growth regulators present in the terminal bud inhibit the growth of lateral buds on the same shoot

Tree Defenses

- Physical features
  - Thick bark, leaf hairs, thick cuticles, thorns, etc.
  - Chemical production to resist insect feeding, pathogen infection or decay

Tree Defenses

- Compartmentalization
  - Process by which a tree limits the spread of discoloration and decay
  - CODIT
    - Compartmentalization of Decay In Trees



Any Questions?

Biology Credits

- Pictures and diagrams
  - Introduction to Arboriculture – Tree Biology CD-ROM; International Society of Arboriculture, 2003
- Sheldon Hammond, Northwest District ANR Program Development Coordinator in Cooperation with the University of Georgia Cooperative Extension Service Urban Forestry Issue Team

Texas Tree Trails

We cannot protect, preserve, and celebrate significant trees that we fail to recognize.

Texas Tree Trails is a cooperative effort between the Texas Historic Tree Coalition, Texas Forest Service, the Trinity Blacklands Urban Forestry Council and the Cross Timbers Urban Forestry Council. The group works to showcase significant trees in the area to provide recognition of these local treasures and a public education regarding their background as well as a virtual on-line tour of these trees (www.texastreetrails.org).

The Big Tree Registry

http://texastreetrails.org/

Dallas/Fort Worth Regional Co-Champion: Southern Magnolia at the Fort Worth Botanic Garden

Big Tree, Dallas/Fort Worth Regional Big Tree: Lilac Chaste-tree located at a Private Residence

Champion, Dallas/Fort Worth Regional Co-Champion: Mexican Buckeye at the Dallas Arboretum

Historic Trees

Dallas California Crossing Comanche Marker Tree

Post Oak Grove at Pioneer Park

The Half-Way Oak in Stephens County

Time for Q & A

Trees love a good hug!!!

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