Trees 101

Structure, Function, Identification, Jargon

Pam Zipse
Outreach Coordinator, Rutgers Urban Forestry Program of NJAES
urbanforestry.rutgers.edu
NJ Licensed Tree Expert # 426
NJ Certified Teacher of Biological Science # 863775
Defining a Tree
What is a Tree?

- A woody perennial plant, typically having a single stem or trunk growing to a considerable height and bearing lateral branches at some distance from the ground.
What is a Tree?

• A large water pump facilitating moisture exchange for energy conversion and food production.
Photosynthesis
Photosynthesis

- For a tree to be healthy, it must be able to carry out photosynthesis.

- Carbon Dioxide + Water \textit{in the presence of light}, yields Sugar + Oxygen

\[
\text{CO}_2 + \text{H}_2\text{O} \quad \text{\rightarrow} \quad \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2
\]
Photosynthesis

• So what does a tree need to be able to successfully carry out photosynthesis?

• Carbon Dioxide (Air)
• Water
• Light
Photosynthesis

• Anything that inhibits a tree’s ability to carry out photosynthesis...

• *Anything that prevents a tree from pumping water and cycling air...*

• is going to harm the tree!
Forestry is Common Sense Elevated to a Science
Structure and Function...

Beginner's Guide to Tree Anatomy and Physiology
Anatomy & Physiology (Structure & Function)

• Tree Anatomy deals with the **structure** of trees.
  – What are the parts of a tree?

• Tree Physiology deals with the **functions** and activities of these parts.
  – How does a tree grow?
How does a tree grow?
How does a tree grow?

- Trees grow from the outside out and from the top up.
How does a tree grow?

- The **cambium** is the *living* layer of actively dividing cells located just inside the bark that produces a new growth ring each year.
- **Phloem** is formed to the outside and eventually becomes bark.
- **Xylem** is formed to the inside and eventually becomes wood.
How does a tree grow?

- **Phloem** cells carry the sugar produced by photosynthesis from the leaves down to the rest of the tree for use (growth) and storage.
- **Xylem** cells carry water from the soil to the leaves for use in photosynthesis.
How does a tree grow?

- In the spring, growth is fast and the cambium produces large cells that appear light in color.
- In the summer, growth slows down, and the cambium produces smaller cells that appear darker.

Counting the rings will tell you the age of the tree!
Tree Terminology (Anatomy)

- Crown
- Branches
- Trunk
- Roots
Tree Terminology

• Many crowns together make a canopy.
• Large branches give way to small twigs.
• The trunk, sometimes called the bole, should end in a flare (trunk flare/root flare), not go straight into the ground.
• The root system can potentially extend to 2-4 times the height of the tree.
Tree Terminology

- The majority of tree roots are found in the upper 18 inches of soil.
- The root system consists of large woody roots, long ropelike lateral roots, fine absorptive roots, and a zone of root hairs.
- Roots will grow where they can find water.
Soil

- Available pore space between soil particles is critical in root establishment and growth.

- Ideal soil is about 50% pore space, which may be filled with air or water. Compaction reduces soil pore space; below 12%, root growth is inhibited.
Tree Terminology

- Root Collar
- Branch Collar
- Branch Bark Ridge
- Cambium
A tree's **root collar** is the area where the roots join the main stem or trunk. There should be a visible flare leading from the trunk to the major roots.
Tree Terminology

- the **branch collar** is the swollen area at the base of a branch where it meets the trunk.

- The **branch bark ridge** is the raised strip of bark at the top of a branch union, where the growth and expansion of both the trunk and the adjoining branch push the bark into a ridge.
Tree Terminology

The branch collar and branch bark ridge help determine the proper placement of pruning cuts.
Good Pruning
Good Pruning

Trees don’t heal, they seal
Tree Identification

...and related jargon
Tree Terminology

Simple Leaf

- Blade
- Petiole
- Bud
- Stem

Compound Leaf

- Leaflet
- Rachis
- Petiole
- Bud
Tree Terminology

Leaves

- Simple
- Palmate compound
- Pinnate compound
- Double pinnate compound

Veins

- Parallel
- Pinnate
- Palminate
- Net veined
Tree Terminology

opposite  alternate  whorled
Tree Terminology

- The edge of the leaf blade is called the **margin**.
• Describe the margin:
serrate
• Describe the margin:
  doubly serrate
• Describe the margin:
  entire
• Describe the leaf:
  simple, lobed, palmate
• Describe the leaf:
  simple, lobed, pinnate
• Describe the leaf:
  compound, pinnate
Tree Terminology

- opposite
- alternate
- whorled
opposite

alternate

whorled
Other Important Stuff
Understanding Trees & Forestry…

- For example, Tree Identification / Dendrology
- When and why is it important to use the botanical (Latin) names for trees?

- There can be many common names for any tree.
- Many pests are genus specific.

- Genus: maple (*Acer*)
- Species: red maple (*Acer rubrum*)
- Cultivar: October Glory red maple (*Acer rubrum ‘October Glory’) 

- red maple is the common name (or swamp maple...)
- *Acer rubrum* is the botanical name (always!)
Understanding Trees & Forestry...

Wrong tree, Wrong place

Right tree, Right place

National Arbor Day Foundation
Understanding Trees & Forestry...

- Ecosystem Services of Trees! (www.itreetools.org)
Inventory & Analysis...

- Species Composition
  - 10/20/30 rule (5/10/15)
Inventory & Analysis...

- Relative Age Distribution
  - To enable consistent management...

![Bar chart showing frequency of diameters at breast height (cm)]
Young Trees (Planting & Establishment)...

• ABC’s Method for Young and Small Tree Pruning
  (Dr. Chris Luley and Andrew Pleninger)
  – A - Assess the Tree
  – A - Apical Dominance
  – B - Bad Branches
  – C - Competing Branches
  – C - Clearance
  – D – Dose
  – E – Every pruning cut for a reason!
Mature Trees (Maintenance & Risk Management)
Tree Program Management...
Continuing Education Categories...

- Understanding Trees & Forestry

- Inventory & Analysis

- Young Trees (Planting & Establishment)

- Mature Trees (Maintenance & Risk Management)

- Tree Program Management
What have we learned, and how can we use it...
Thank you!

- Any questions?