Swanson Tree

Tree Care Rooted in Knowledge

ENERGY ALLOCATION AND Pruning

ENERGY: WHERE IT'S USED, WHERE IT'S MADE, WHERE DOES IT TRAVEL, AND WHAT IT IS.

PRUNING: TYPES OF PRUNING AND THE IMPACT IT HAS ON ENERGY USE, STORAGE, AND FUTURE DECAY

ENERGY

Where is Energy Used – Sinks

Buds
Leaf formation
Flowering
Fruit
Primary Growth
Secondary Growth

Physical Support Structure
Stem
Twig
Branch
Leader
Trunk
Roots

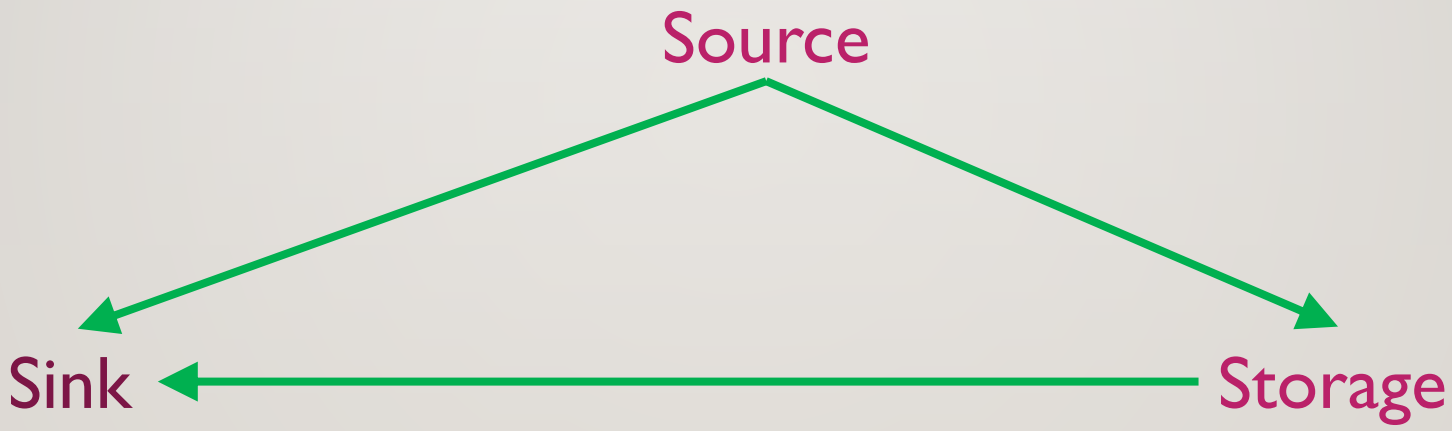
ENERGY

Where is Energy Made - Source

- Leaves
- New Twigs and buds
- Sometimes in the bark (think crape myrtles and other thin bark trees)

ENERGY

Where does Energy Flow



ENERGY

What is the Energy Source for a Tree

Glucose (monosaccharide) Simple

Fructose (monosaccharide) Simple

Sucrose (disaccharide) Complex

Stored as a Starch, Glucose becomes Insoluble and can be broken down into glucose again or converted to cellulose

PRUNING

Merriam-Webster defines pruning as such: *to reduce especially by eliminating superfluous matter.*

Trees and woody ornamentals prune themselves all the time

- When a branch has become too shaded
- When a branch becomes too heavy
- When genetic structural defects surface (Bradford pear)
- When temperatures become too cold or hot for a plant (Freeze Damage)

PRUNING

Human Pruning Styles

Deadwood Removal (Removal of branches that the tree decided to prune. Typically, we do this to reduce risks associated with falling branches.

Thinning Cuts. This is the removal of live tissue back to a parent or larger stem. This is often done to increase sunlight penetration into the canopy and could reduce fungal leaf spots and could increase branch taper and support apical dominance.

PRUNING

Reduction cuts. This is the removal of live tissue back to a stem smaller than what is being removed. This reduces the overall size of the tree and is common for fruit trees to strengthen the scaffold branches to hold more fruit. This also works on branches that are getting very long and heavy – think about lacebark elm

Subordination Pruning – This is the removal of live tissue in the form of a reduction cut, to suppress apical dominance of one leader over another.

PHOTOSYNTHETIC CAPACITY

Leaves!

Leaves produce about .1 gram of glucose per daylight hour. On a mature 30” DBH Oak that could be about 11,304 grams of glucose per hour or about 45,216 Calories per hour. (A mature oak may have 100,000 to 200,000 leaves in a growing season.

A tree’s BMR (Basal Metabolic Rate) changes dramatically from season to season, or phenology.

Many compounds other than glucose are manufactured such as more complex sugars, amino acids, lipids, proteins, and other organic molecules used in plant growth and self-protection

PHOTOSYNTHETIC CAPACITY

During the growing season trees may store up to 66% of their photosynthate. In theory this means that 33% of the capacity is required just to meet the BMR without any storage of excess sucrose.

Springtime produces the highest BMR of the season and may consume as much as 66% of the sucrose stored in the previous growing season in addition to what was used to meet the winter BMR.

Current best practices is to never remove more than 20% of the photosynthetic capacity in a single year.

PHOTOSYNTHETIC CAPACITY

Where that 20% is removed impacts the future growth habit.

Leaves at the branch tips support the least amount of sink.

Don’t remove more that 20% from any major branch.

Distribute the leaves over the length of the branch, don’t lions' tail.

Don’t remove any live canopy on trees that are damaged and struggling. Especially root loss.

ROOTS AND PHOTOSYNTHETIC CAPACITY

Roots are the great harvesters and hunter gatherers of the tree.

Roots and leaves are in balance and are grown in response to the size or expansiveness of the other. This is expressed by the Gibberellin and Cytokinin plant hormones.

Cytokinin is produced in the roots and is responsible for not only root growth but can encourage lateral bud expression. A good year for roots means the following year will have more structure and buds to develop leaves. (this is over simplified but works for our discussion on pruning)

FREEZE DAMAGE TIE IN

Freeze Damage! – What are we seeing and why?

Extracellular (outside the cell) and intracellular fluid (inside the cell) vary in water purity. The higher the concentration of plant nutrients, minerals, and sugars the lower the freezing point.

Areas of low sugar concentrations will freeze at a higher temperature. Areas of a tree that would have lower sugar would be near branch bases and root flare.

FREEZE DAMAGE TIE IN

Vascular tissue in a tree is made up of Xylem and Phloem structures. Xylem tissue is to the inside and hangs around year to year making the wood.

Phloem is just to the outside of the cambium layer and is regrown each season. Phloem carries the photosynthate, sugars.

Water expands as it freezes rupturing cells and extracellular spaces.

C.O.D.I.T.

Compartmentalization Of Decay In Trees

Weather it is a pruning cut or frozen cells the cells in the area die. Cells are not replaced in plants and cell death is permanent. The tree protects itself by creating walls around the damage. The CODIT model describes four walls constructed by woody plant material.

C.O.D.I.T.

Walls

1. Plugging the vascular tissue above and below the dead cells (wound)
2. Is the boundary of the previously created latewood, or ring.
3. Ray cells are a physical barrier and may also produce a chemical shield.
4. New growth called the barrier zone, is produced on the outside of a tree.

NOW BACK TO FREEZE DAMAGE TIE IN

When phloem tissue freezes the tree responds as seen in the CODIT model taking with it the xylem tissue leading into and out of the damaged area. This takes away the resources needed by the canopy to make food. Phloem tissue leading into the damaged area is also closed off depriving it of energy needed to feed the tissues below the damaged area.

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