TREES 101

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The Life Cycle of a Tree

Seed → Sprout → Sapling → Mature Oak → Snag
What is a Tree?
What is a Tree?

“A tree may be defined as a woody plant reaching 20 feet or more at maturity, with a single trunk and a definite crown”

Harlow, Harrar, Hardin and White; Textbook of Dendrology
The Roots absorb water and nutrients with help from Root Hairs. Also, stores the complex sugars created by the leaves.

The Leaves process water and carbon dioxide (Photosynthesis) to form complex sugars (fuel).

The Branches & Stem/Trunk transports water and solutes (Diffusion & Osmosis), to the crown via the Xylem and sugars to the roots via the Phloem.
$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

Sunlight

Nutrients

Organic compounds
Actively growing right before dormancy and right before bud break.

Inactive in soil above about 90-92 degrees
5% Leaves
15% Limbs
60% Trunk
15% Woody Roots
5% Absorbing

Tree Biology
Outer Bark protects tree from injuries.

Inner Bark (phloem) carries prepared food from leaves to cambium layer.

Cambium (microscopic) builds the cells.

Sapwood (xylem) carries food from roots to leaves.

Heartwood (inactive) gives strength to tree.
Tree Defense Systems

- Trees DO NOT have immune systems
- Defense adaptations: Physical
  - Thick bark
  - Hairy leaves
  - Thorns
  - Thick cuticle
- Chemical:
  - Resist insect feeding or animal browsing (bad taste)
  - Pathogen infection or decay (barriers)
C.O.D.I.T.

Compartmentalization Of Decay In Trees

1. Stops Vertical Spread
2. Stops Inward Spread
3. Stops Lateral Spread
4. New growth closes wound
   (this is what we see on the bark)
Species Selection

- Mature size matters
- What grows well in your area
- Avoid invasive species
### How Much Soil to Grow a Big Tree?

<table>
<thead>
<tr>
<th>Projected Mature Tree Size (feet)</th>
<th>Canopy Diameter (DBH)</th>
<th>Trunk Diameter (in)</th>
<th>Water Storage (ft³)</th>
<th>Stormwater Storage (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>39'</td>
<td>24&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36'</td>
<td>20&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32'</td>
<td>16&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27'</td>
<td>12&quot;</td>
<td>300 ft³</td>
<td>2,244 gal</td>
<td></td>
</tr>
<tr>
<td>21'</td>
<td>8&quot;</td>
<td>200 ft³</td>
<td>1,496 gal</td>
<td></td>
</tr>
<tr>
<td>14'</td>
<td>4&quot;</td>
<td>100 ft³</td>
<td>748 gal</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**
- A 16" Diameter Tree Trunk (35' Canopy Diameter) Requires 1000 ft³ of Soil.
- 1000 ft³ of Soil Stores 200 ft³ of Stormwater.
Tree roots need space

Smaller trees need less root space
Shallow roots can damage structures and are hazardous
What grows well in your area?

http://texastreeplanting.tamu.edu/
Custom Tree Selector

I will plant my tree in this county: **Please Select** ▼

Option 1: The space available for my tree is...
- A small area, less than 120 sq. ft. or with growing space restrictions (overhead wires, on the sides)
- Somewhat restricted, less than 180 sq. ft.
- A large space, more than 180 sq. ft.
- Not sure

Option 2: I want a tree that is...
- Small, 20 ft. tall or less at maturity
- Medium, 20-40 ft. tall at maturity
- Large, more than 40 ft. tall at maturity
- No preference

Option 3: I want a tree with leaves that are...
- Deciduous, leaves drop in fall
- Evergreen, leaves stay green all year
- No preference

Option 4: I want a tree that... (check all that apply)
- Is a Texas native
- Has reliable fall color
- Has showy or fragrant flowers
- Has attractive fruits or seeds
- Has fruits or seeds eaten by wildlife
- Is Firewise

Option 5: The place I will plant my tree... (check all that apply)
- Is extremely dry or droughty
- Is poorly drained or stays wet
- Is shady all or most of the day
- Has salty soil or sea-spray
- Has highly alkaline soil (> 7.5 pH)

Read more about soil conditions

Show Trees  Start Over
Recommended trees for Travis County:

**American Elm**
*Ulmus americana*
*Leaf Type: Deciduous*
*Comments: Fast-growing, vase-shaped shade tree that tolerates a wide range of conditions.*

**American Holly**
*Ilex opaca*
*Leaf Type: Evergreen*
*Comments: A striking landscape tree, can be used as a screen. Plant away from pedestrian areas.*

**American Smoketree**
*Cotinus obovatus*
*Leaf Type: Deciduous*
*Comments: One of the best trees for fall color. Might be hard to find in the nursery.*

**Anacacho Orchid-tree**
*Bauhinia congesta*
*Leaf Type: Deciduous*
*Comments: Delicate-looking native tree with showy flowers.*

**Arizona Cypress**
*Cupressus arizonica*
*Leaf Type: Evergreen*
*Comments: Good plant for screening that is well-suited to limestone soils.*

**Baldcypress**
*Taxodium distichum*
*Leaf Type: Deciduous*
*Comments: Adaptable to many soil and moisture conditions. Grows well in wet areas.*

**Bigtooth Maple**
*Acer grandidentatum*
*Leaf Type: Deciduous*

**Bluewood**
*Cordia hookerii*
*Leaf Type: Evergreen*
# Invasive Plants to Avoid

Invasive plants are those that spread into areas where they are not native. Their introduction causes or is likely to cause economic or environmental harm or harm to human health.

The following plants have already invaded preserves and greenbelts in Austin. They spread by seeds, berries and spores that can be easily transported long distances. For a more extensive list, visit www.texasinvasives.org.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Botanical Name</th>
<th>Non-Invasive Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bamboo, Running</td>
<td>Phyllostachys aurea</td>
<td>Evergreen Yaupon, Bamboo Muhly</td>
</tr>
<tr>
<td>Cat’s Claw Vine</td>
<td>Macfadyena unguis-cati</td>
<td>Carolina Jessamine, Crossvine</td>
</tr>
<tr>
<td>Chinaberry</td>
<td>Melia azedarach</td>
<td>Chinquapin Oak, Texas Red Oak</td>
</tr>
<tr>
<td>Chinese Parasol Tree</td>
<td>Firmiana simplex</td>
<td>Bald Cypress, Arizona Cypress</td>
</tr>
<tr>
<td>Chinese Pistache</td>
<td>Pistacia chinensis</td>
<td>Chinquapin Oak, Texas Red Oak</td>
</tr>
<tr>
<td>Chinese Tallow</td>
<td>Sapium sebiferum</td>
<td>Viable alternative unknown</td>
</tr>
<tr>
<td>Giant Cane*</td>
<td>Arundo donax</td>
<td>Evergreen Yaupon, Roughleaf Dogwood</td>
</tr>
<tr>
<td>Japanese Honeysuckle</td>
<td>Lonicera japonica</td>
<td>Coral Honeysuckle</td>
</tr>
<tr>
<td>Kudzu</td>
<td>Pueraria lobata</td>
<td>Virginia Creeper, Coral Vine</td>
</tr>
<tr>
<td>Ligustrum, Wax Leaf</td>
<td>Ligustrum japonicum</td>
<td>Barbados Cherry, Cherry Laurel</td>
</tr>
<tr>
<td>Ligustrum, Japanese</td>
<td>Ligustrum lucidum</td>
<td>Evergreen Sumac, Evergreen Yaupon</td>
</tr>
<tr>
<td>Mimosa (non-native)</td>
<td>Albizzia julibrissin</td>
<td>Desert Willow, Redbud</td>
</tr>
<tr>
<td>Mulberry, Paper</td>
<td>Broussonetia papyrifera</td>
<td>Cherry Laurel, Texas Persimmon</td>
</tr>
<tr>
<td>Mulberry, White</td>
<td>Morus alba</td>
<td>Bush Germander, Texas Sage, Barbados</td>
</tr>
<tr>
<td>Nandina (berrying</td>
<td>Nandina domestica</td>
<td>Bush Germander, Texas Sage, Barbados</td>
</tr>
<tr>
<td>varieties)</td>
<td></td>
<td>Cherry Laurel, Texas Persimmon</td>
</tr>
<tr>
<td>Photinia, Chinese</td>
<td>Photinia spp.</td>
<td>Evergreen Sumac, Evergreen Yaupon</td>
</tr>
<tr>
<td>Privet, Common</td>
<td>Ligustrum sinense, Ligustrum vulgare</td>
<td>Evergreen Yaupon, Dwarf Burford Holly</td>
</tr>
<tr>
<td>Pyracantha</td>
<td>Pyracantha spp.</td>
<td>Evergreen Sumac</td>
</tr>
<tr>
<td>Russian Olive</td>
<td>Elaeagnus angustifolia</td>
<td>Cherry Laurel, Texas Persimmon</td>
</tr>
<tr>
<td>Tamarisk, Salt Cedar</td>
<td>Tamarix spp.</td>
<td>Arizona Cypress, Bald Cypress</td>
</tr>
<tr>
<td>Tree of Heaven</td>
<td>Ailanthus altissima</td>
<td>Chinquapin Oak, Lacey Oak</td>
</tr>
<tr>
<td>Vitex</td>
<td>Vitex agnus-castus</td>
<td>Mexican Buckeye</td>
</tr>
</tbody>
</table>

These plants travel by runners, rhizomes, spores and stems. While they are not generally transported long distances, they can invade nearby or “downstream” areas. Avoid planting near parks and preserves.

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<th>Common Name</th>
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<tr>
<td>Elephant Ear</td>
<td>Alocasia spp., Colocasia spp.</td>
<td>Arrowhead, Crinum Lily, Tuckahoe</td>
</tr>
<tr>
<td>English Ivy</td>
<td>Hedera helix</td>
<td>Leadwort Plumbago, Mountain Pea</td>
</tr>
<tr>
<td>Holly Fern</td>
<td>Cyrtomium falcatum</td>
<td>River Fern</td>
</tr>
<tr>
<td>Vinca</td>
<td>Vinca major &amp; V. minor</td>
<td>Leadwort Plumbago, Mountain Pea</td>
</tr>
<tr>
<td>Wisteria (non-native species)</td>
<td>Wisteria sinensis, W. floribunda</td>
<td>Passion Vine</td>
</tr>
</tbody>
</table>

Already have these plants? Most plants can be controlled by trimming back berries, seedheads or runners.

*Illegal to sell

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* This PLANT LIST IS ONLY A RECOMMENDATION AND HAS NO LEGAL EFFECT IN THE STATE OF TEXAS. IT IS LAWFUL TO SELL, DISTRIBUTE, IMPORT, OR POSSESS A PLANT ON THIS LIST UNLESS THE TEXAS DEPARTMENT OF AGRICULTURE LABELS THE PLANT AS NOXIOUS OR INVASIVE ON THE DEPARTMENT’S PLANT LIST.
High Quality Trees

- A strong form with well-spaced, firmly-attached branches
Poor Quality Trees

A trunk with wounds from mechanical impacts or incorrect pruning
Poor Quality Trees

- A weak form where multiple stems squeeze against each other or where branches squeeze against the trunk.
Poor Quality Trees

- Crushed or circling roots in a small root ball or small container
- ‘Pop the Pot’
Don’t Forget the Roots!!!

• Shop for good structure AND good roots.
• Natural root flare should be evident.
• Check the integrity of the root ball.
• Check for an abundance of fibrous roots.

The amount and condition of the roots in the root ball greatly affect survival. Don’t be afraid to pop it out of the pot.
What if you’re stuck with Poor Quality Trees?
What you really need to know for successful tree planting:

1. Start with the right species
2. Choose the right specimen
3. Location, location, location
4. Call 811 for utility locate
5. Dig a wide, shallow hole – don’t bury the root flare
6. Don’t spoil it rotten – no amendments
7. Protect from wind or vandalism with stakes – ONLY IF NECESSARY
8. Protect from heat, drought and competition – Mulch, mulch, mulch
9. Adequate water

If you’re starting with a poor specimen:

1. Root prune - No circling or girdling roots
2. Correct crown defects early
3. Just say NO! Take it back to the nursery.
Planting Containerized & Container Grown Trees

Check for natural root flare & girdling roots
Planting Containerized & Container Grown Trees

- Sides of root ball should be roughened
- Root pruning is often necessary (nursery standards)
Proper Planting

- Top of root ball level with ground
- Flood partially backfilled hole with slow-running hose.
- Keep mulch away from trunk.
- Mulch 2-3” depth
- Bottom of root ball on firm soil
- Soil dam
- Backfill hole with original soil.
- Planting hole 2-3 times root ball diameter
October – Mid March Is Best Time To Plant

- Better Survival
  - Cooler Temperatures
  - Adequate Moisture

- Increased Growth

- Palms are the exception – April and May are great.
Proper Planting

- Planting hole vs. burial pit
Prepare Site

• Call 811 to locate utilities

• Remove grass

• Dig hole **at least** 2-3x larger than root ball of tree

• Dig hole no deeper than root ball is deep

• The key is wide and shallow
Planting Trees

- Do not add gravel, sand or soft soil to the bottom of the hole. (Capillarity)
- Limit backfill amendments
- Do not add fertilizer.
- Mycorrhizae should only be used with trees grown in conditions unexposed to inoculum and planted on new sites where native inoculum may not be present.
Establishment

• Proper planting is only half the battle. Trees suffering from transplant shock need adequate early care to increase the chances of survival.

• Generally, it will take one year per inch of caliper for a tree to recover from planting. Bigger trees are not necessarily better.
Establishment -- Watering

• Watering schedule is highly dependent upon the soil type – capillarity

• Rule of thumb is one inch per week during the growing season

• Overwatering is one of the leading causes of transplant death – the signs of overwatering are very similar to the signs of too little watering, pay attention to the soil!
Watering New Trees
Fertilization

• Over fertilizing can cause water stress (fertilizer burn)

• Fertilization is almost never necessary the first year. If you must fertilize, use a slow release nitrogen.

A top dressing of compost or coffee grounds works well.
Mulch

Mulching is one of the most beneficial things you can do for a new tree

• Reduces water loss

• Reduces competition from weeds

• Improves soil structure
Mulch

- Many types of mulch available – generally comes down to personal choice.

- Organic mulches (tree bark, wood chips, straw, etc) will break down over time which releases essential nutrients and improves the soil structure, but will need to be replenished from time to time.

- Inorganic mulches (stone, pulverized rubber, fabric, etc) will not break down and won’t need to be replenished.
Mulch

- Mulch should be 1-2 inches deep

- Do not volcano mulch
  mulch against the trunk can cause infections, adventitious roots, rodent feedings and encourage insects.
Mulch

• The broader the mulch circle the better – generally for a tree 1-2 inches in caliper, the mulch circle should be at least 6 feet in diameter.

• Don’t use black plastic – it will restrict water movement and reduce oxygen availability.
Staking/Guying Guidelines

- Use only when necessary and only for as long as necessary – remove after the first year. If left in place for more than 2 years, it can reduce the ability of the tree to support itself and increase the risk of girdling.
Staking/Guying Guidelines

• Do not attach ties to the tree so high that the top portion of the tree is not allowed to move freely. (usually 1/2 – 2/3 of total height)

• Use caution with the materials you choose to be in contact with the trees!

• Stakes for guy wires should be inline with direction of the wire.
Staking/Guying Guidelines

- Often not necessary but ...
  Can protect against equipment damage and reduce vandalism and theft.

- Do not stake too tightly – trees need to move to develop proper taper.

- Be careful to drive the stakes outside the root ball – don’t damage the roots.
Tree Wraps and Guards

• Current research indicates that tree wraps can actually cause more damage than not wrapping:
  – Increased temperature differentials
  – Hold moisture against trunk
  – Insects can burrow between wrap and trunk
Tree Wraps and Guards

- Tree guards of plastic or metal can be placed around the trunks of trees to ...
  - Help minimize damage from mowers and string trimmers
  - Minimize animal feeding damage
Pruning at Planting

- Prune broken branches and major structural problems only.
- Heavy pruning should be avoided until the tree is established.
- Structural/Training pruning should be done while tree is young.
Pruning Mature Trees – Know your Goals

The kind of pruning you choose is dictated by your goals.

Less is ALWAYS more.
Safety

• Think head to toes
  – Hard hat
  – Eye protection
  – Ear protection
  – Long sleeves
  – Gloves
  – Long pants
    • Chainsaw chaps
  – Boots
    • Hard toe

• Don’t forget
  – Hydration
    • Before, during, and after
  – Sunscreen
    • 30 minutes ahead
  – Stretch/warm up
What are your goals when pruning?

- Better form
- Improve safety
- Improve health
- Improve aesthetics
- Provide clearance
Structural - Training

• Start young
• Improve form by proper spacing between branches and around the tree
Crown thinning

• Believed to reduce “wind sail” and make the tree more stable in areas with lots of wind and/or shallow soils
• Easy to remove too much and end up with “lions’ tailing”
• Outdated practice now and will no longer be in the ANSI A300 standards
Crown Raising

• 8 feet over sidewalks, 14 feet over streets
Outside the branch collar
Three Cut Method
Cut 1 – Undercut
Cut 2 – Through-cut
Cut 3 – Final cut
• Trees respond to pruning cuts by forming wound wood
Flush cuts create more surface area than the tree can easily cover, the tree will often grow sprouts for increased energy.
Thank You!

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