Selecting, Planting and Staking Trees

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Why do trees and shrubs fail?

- Poor production
- Poor selection
- Poor timing
- Poor planting
- Poor irrigation
- Poor maintenance
- Diseases, pests, abiotic stresses
Plant Selection

- Site analysis
  - Space above and below ground
- Environment
  - Climate zone
  - Exposure
  - Dry/wet locations
Plant Selection

- Soil
  - Depth (can root to depth of 36”)
  - Texture (sand, silt, clay)
  - Compaction/ drainage
  - pH (alkalinity/ acidity)
  - Salinity
  - Fertility/toxicity
Plant Function

- Plant size and shape
- Shading
- Screening
Selecting Plants

• Average size
• Vigorous and healthy shoots
  Avoid closely staked trees
  Good taper of trunk
  Central leader or multi-stemmed
  No evidence of insects or disease
  No physical damage
What is Taper?

Taper = trunk caliper is thicker at the base of a tree and decreases further up the trunk.

Why is taper important?

• Stabilizes trunk to hold crown and withstand wind.
• Leaving lower temporary lateral branches on trunk and allowing the trunk to move in the wind promotes caliper and taper.
Selecting Plants

Vigorous and healthy root system
- Avoid root bound plants
- Root ball should hold firmly together
- Root ball should be moist
- Container should be full of media and not partially full
Selecting plants

- Natural shape of trees – No heading back or severe pruning
- Bare root plants should still be dormant and not leaved out and should have fibrous, fresh, clean roots
- Plants grown locally or in a climate similar to the one where they will be established often adjust more rapidly and may perform better.
Planting Specifications

- Shallow wide hole with rough sloping walls
- No organic amendments in back fill
- Root ball on undisturbed soil
- Organic mulch
- No unnecessary pruning
- Stake only if necessary
- Plant during late fall or early spring
Basis for Planting Specifications

- Root system distribution
- Root crown susceptibility
- Soil interfaces
- Ineffective organic amendments
- Benefits of organic mulches
- Effects of pruning
- Hazards of staking
Tree root system

- Tap roots – usually non-existent in nursery grown stock
- Shallow, wide system – 1.5 to 4 X canopy width
- Distribution is limited by genetics and soil compaction
- A wide hole promotes root establishment
Root Crown Susceptibility

- Trunk bark is more vulnerable to soil related problems and wetness than root bark
- Settling deeper into the soil exposes the trunk to these problems – a leading cause of failure
- Plant in a shallow hole to avoid settling and trunks buried in soil
Severely root bound tree

Root growth of oak one year after planting
Soil Interface

- Roots will not easily penetrate dense clay or compacted soils

- The sides of the planting hole should be roughened to facilitate root penetration

- Going from ‘organic’ to clay soils can present problems with establishment
Failure of Bottle Tree

- Planted from 15 gal. container
- Blew down after 5 years
- 24 ft. tall, 4” trunk caliper at 4.5 ft. above the ground
University of Arizona Study showed that organic amendments were ineffective in backfill:

- Backfill in test plots were amended with 33% organic material or native soil.
- Organic amendments did not promote root and shoot growth.
- Roots of oak trees planted in amended soils were 15% less in length than those planted in native soil.
Benefits of Organic Mulches

- Reduces evaporation
- Reduces weed growth
- Insulates soil surface
- Recycles nutrients
- Produces humus
- Promotes root growth
- Promotes trunk growth
Effects of Pruning

- Reduces new root growth
- Reduces trunk growth and tree stability
Finishing Planting

- Cover root ball with no more than 1” of soil.

- Watering plants in immediately after planting settles soil and prevents root ball from drying out.
Reasons for Staking*

- Anchorage
- Support
- Protection

*Stake only if necessary

Remove stakes after 1 – 2 seasons
Staking for Anchorage

- Keep root ball from moving until new roots grow into surrounding soil
  - Full or over grown trees with small root balls
  - Wet or loose soils
Staking for Support

- Keep tree straight in excessive wind or until trunk is strong enough

- Weak trunks without taper

- Tall trees without bottom branches

- Some species e.g., (Eucalyptus, Prosopis hybrid, Nerium, Acacia)
Support staking: Cushions used on large cactus and palms to protect the stem or tissue.
Support staking for two seasons succeeded in upright trees
If the tree is tall and the stakes do not support the tree, the leader will often bend and become sun burned. A new leader will ultimately develop.
Staking for Protection

- A barrier around the trunk protects the tree from vehicles, humans, animals, equipment and vandals. These barriers are not attached to the tree trunk.

- 3 or 4 short stakes outside of the planted root ball

- Sturdy metal frame around the outside of the trunk.
Effects of Staking on Plants

A staked versus un-staked tree will:

- Grow taller
- Grow away from the stake if tightly secured
- Grow less in caliper near the ground
- May produce a decreased or reverse taper
- Is unable to sway in wind
- Have a greater potential for damage from stakes and ties
Effects of Staking on Plants

- Trunk movement is very important to strengthen the stem
- Increases stem taper
- Increases caliper
- The nursery stake should be removed at transplanting
Staking Methods

- Above Ground
- Below ground
- Stakes at different heights
- Different tie materials
Above Ground Staking

Single or multiple stakes
Tie Materials
should be wide, smooth, flexible, biodegradable

Desirable materials
- Elastic webbing
- Polypropylene straps
- Flexible tubing

Undesirable materials
- Wire covered with irrigation tubing
- Electrical wire, rope, string wire
Below Ground Staking

Soil

Planter
**Staking method:**
*Two stakes through root ball*

- Two steel rods 36” long with 5/8” diameter were driven at 45° angles through the root ball into the underlying soil to anchor the plant. Works well for trees that require little staking and stand upright on their own.

- Mesquite staked with this method developed greatest taper 6 months after transplanting compared to the other three staking methods.
- Acacias staked with this method are leaning and will require corrective pruning to establish a new leader.

- No above ground structures
- No maintenance
- No removal
- No damage to tree
Conventional method:
Two tall stakes, two ties

- Support staking for taller trees
- Install at lowest height possible on the trunk that keeps the leader upright, while allowing maximum movement of the crown.
- Stakes too tall for shorter trees.
- Potential problem: mechanical branch injury from stakes.
Staking method: Single tall stake

- Works well for taller trees requiring staking.
- Mesquite and acacias staked with this method developed more taper than conventional double staked trees 6 months after transplanting because trunks have more freedom of movement.
Single stake, leader not well supported
Staking method:
Two short stakes, two ties

- Works well for shorter trees and those requiring minimal staking, such as mesquite in this study.
- Acacias staked with this method were not kept upright and will require corrective pruning to establish a new leader.
- Stakes parallel to street are not always perpendicular to prevailing winds
- Nursery stake needs to be removed
- Lower branches will promote taper
- Stakes may be too tall
Staking can create hazards without maintenance. Fast growing species such as *Parkinsonia, Rhus, Ulmus, Schinus, Acacia* and *Prosopis* require frequent inspection of stakes during spring and summer.
Minimizing the need for staking

- Purchase plants that were not bound tightly to stakes during production.
- Select smaller trees or multiple trunk trees that generally do not require staking.
- Select plants with a well proportioned height to crown ratio that often require less staking.
Staking…

Many different ways to stake

Many reasons to stake

Many reasons not to stake
Keys to Successful Tree Establishment

- **Plant Selection**
  - Right plant for right place
  - Healthy roots and shoots
  - Minimal or no staking
  - Locally grown or adapted
  - Buy and plant during late fall or early spring
Keys to Successful Tree Establishment

- **Planting**
  - Planting hole should be no deeper than the root ball, 3-4 times as wide, with rough sides
  - No organic amendments in backfill
  - Remove nursery stake at planting
  - Cover root ball lightly with native soil
  - Irrigate immediately after planting
Keys to Successful Tree Establishment

- Stake if necessary
  - Use correct staking technique and materials
  - Inspect stakes and ties routinely
  - Remove within two growing seasons
By following the guidelines for selecting, planting, and staking, trees are ready to successfully establish and thrive in the landscape.
Resources

Books

Websites
- Plant Selection and Selecting your plants (http://ag.arizona.edu/pubs/garden/az1153.pdf)
- Planting Guidelines: Container Trees and Shrubs (http://ag.arizona.edu/pubs/garden/az1022.pdf)
- Arizona Master Gardener Manual (http://ag.arizona.edu/gardening/mgmanual/mgmanual.html)