



# 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?

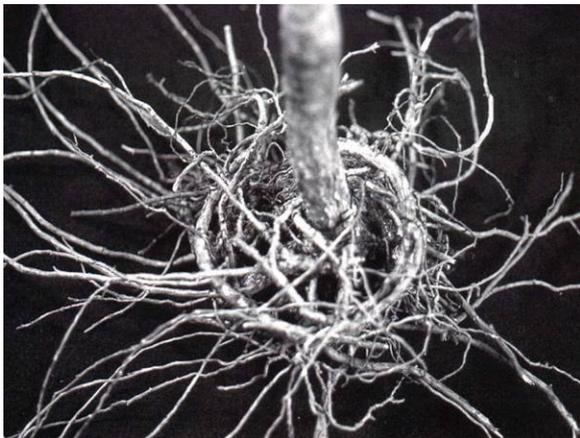
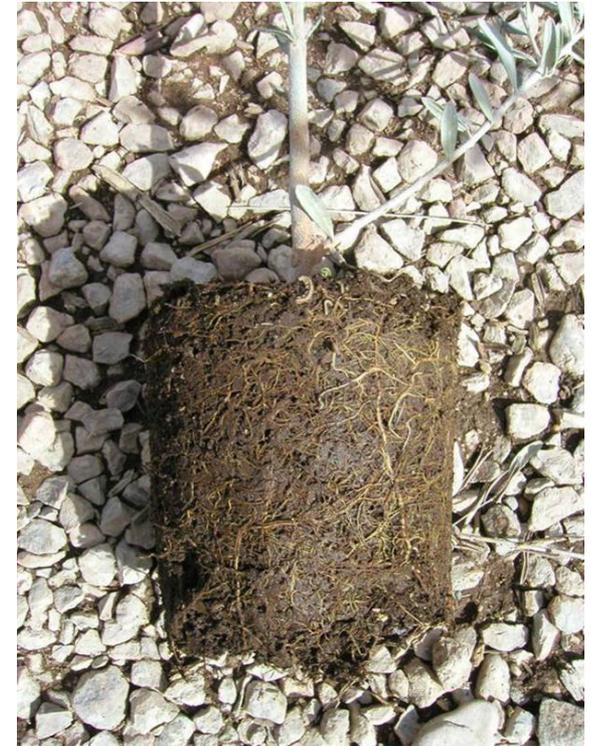
- Stabilizes trunk to hold crown and withstand wind.
- Leaving lower temporary lateral branches on trunk and allowing the trunk to move in the wind promotes caliper and taper.



# 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.





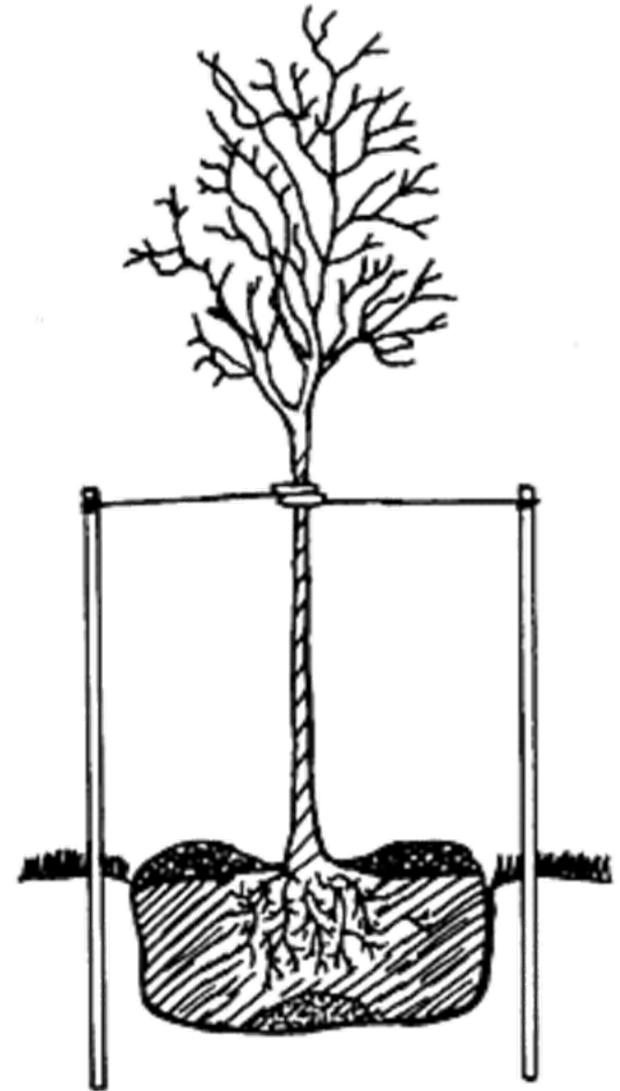






# Planting Specifications

- 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**

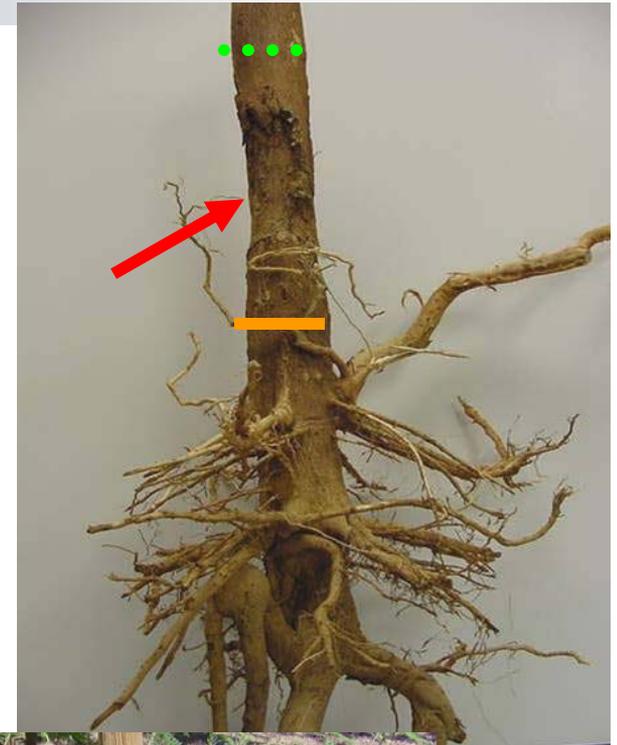
# Tree root system

- 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

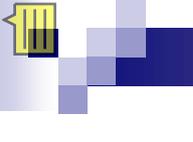
- Reduces new root growth
- Reduces trunk growth and tree stability





# 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



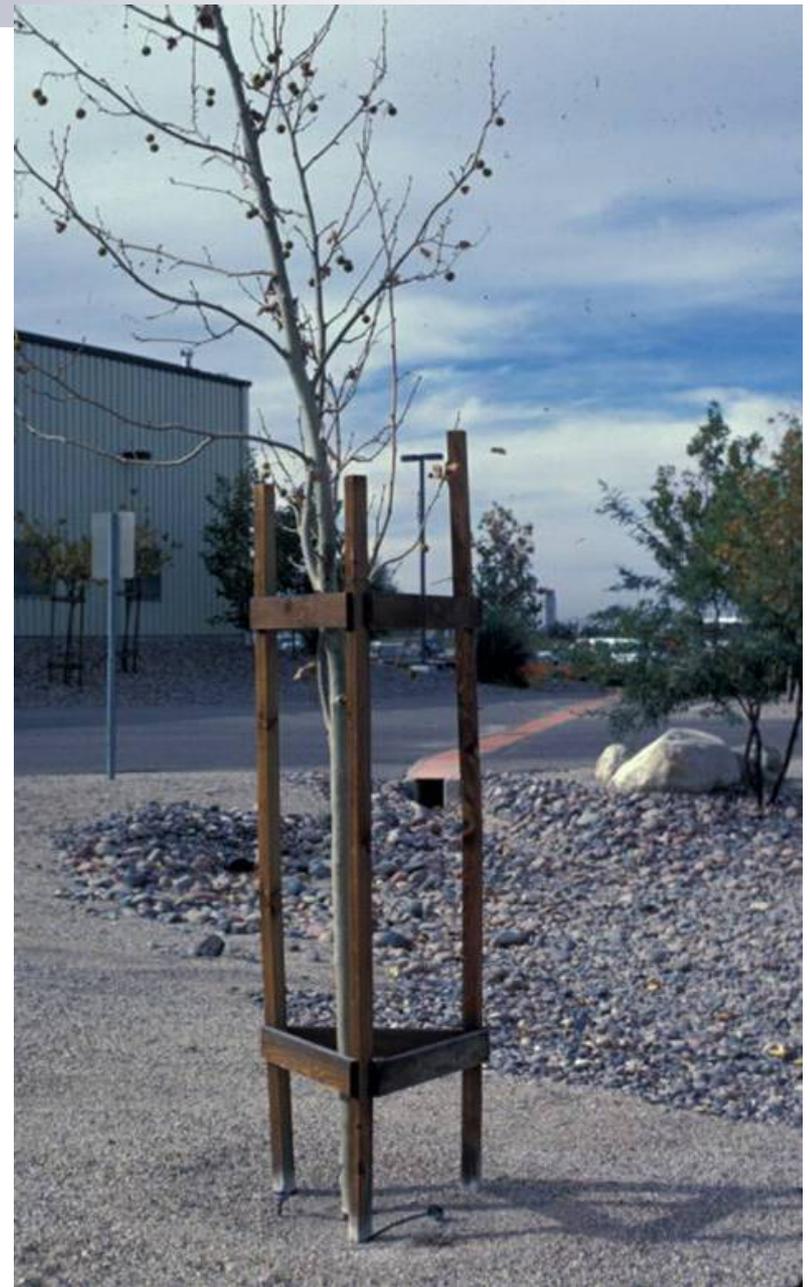
**If the tree is tall and the stakes do not support the tree, the leader will often bend and become sun burned. A new leader will ultimately develop.**





# 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

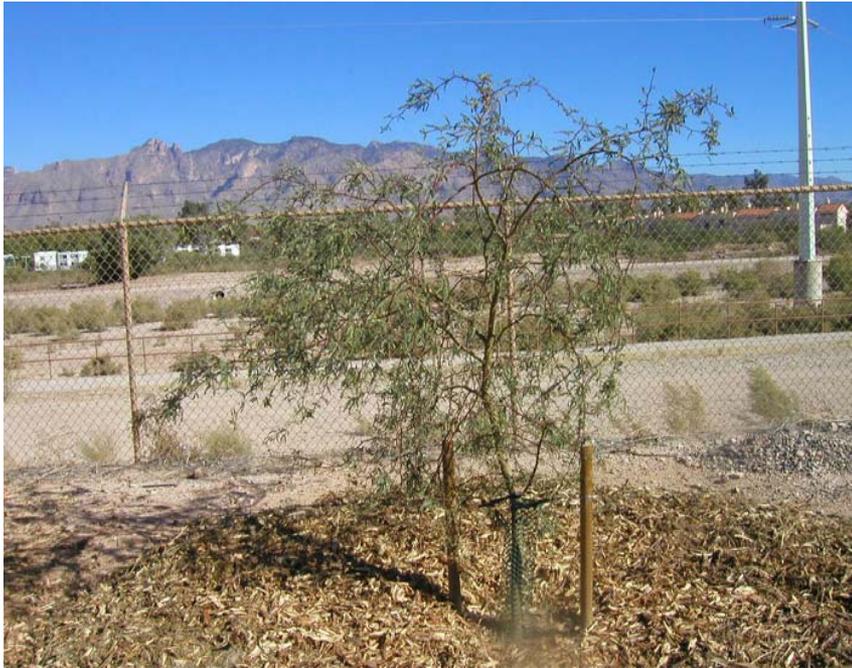
- **Trunk movement is very important to strengthen the stem**
- **Increases stem taper**
- **Increases caliper**
- **The nursery stake should be removed at transplanting**

# 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

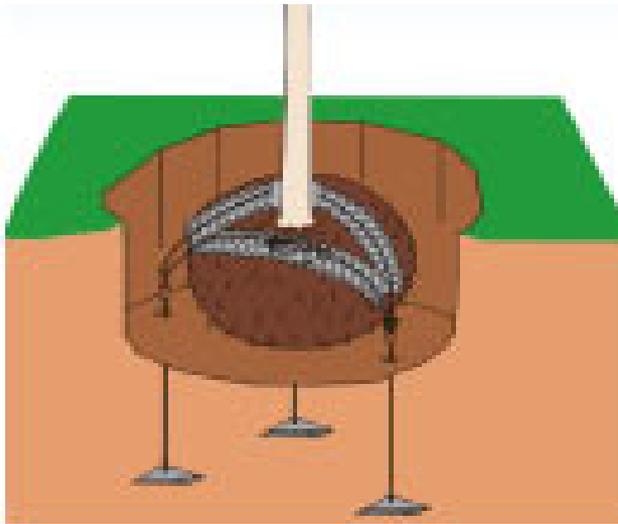


## Undesirable materials

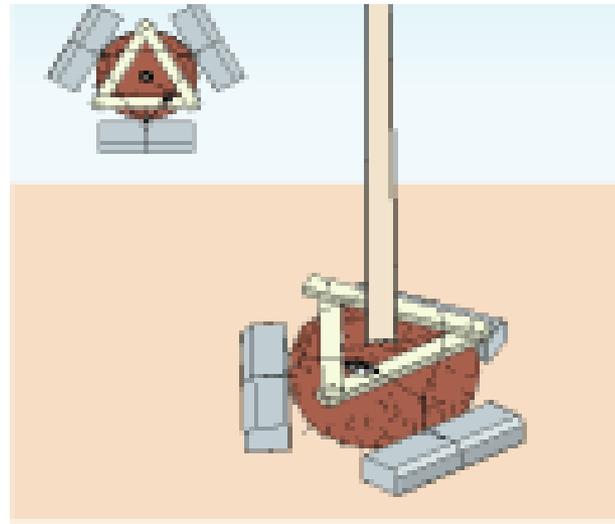
- Wire covered with irrigation tubing
- Electrical wire, rope, string wire



# Below Ground Staking



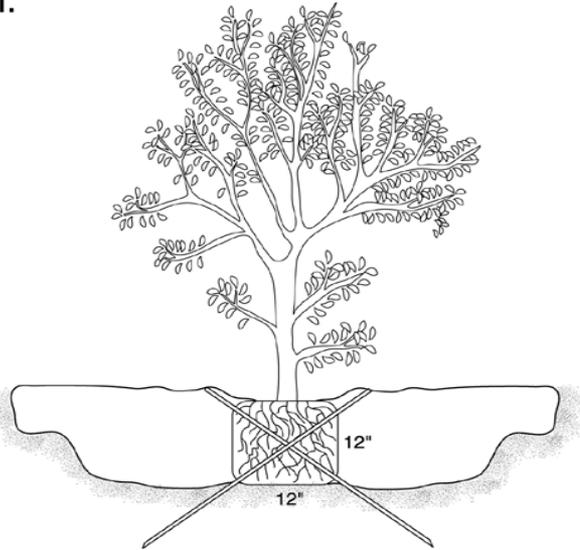
**Soil**



**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

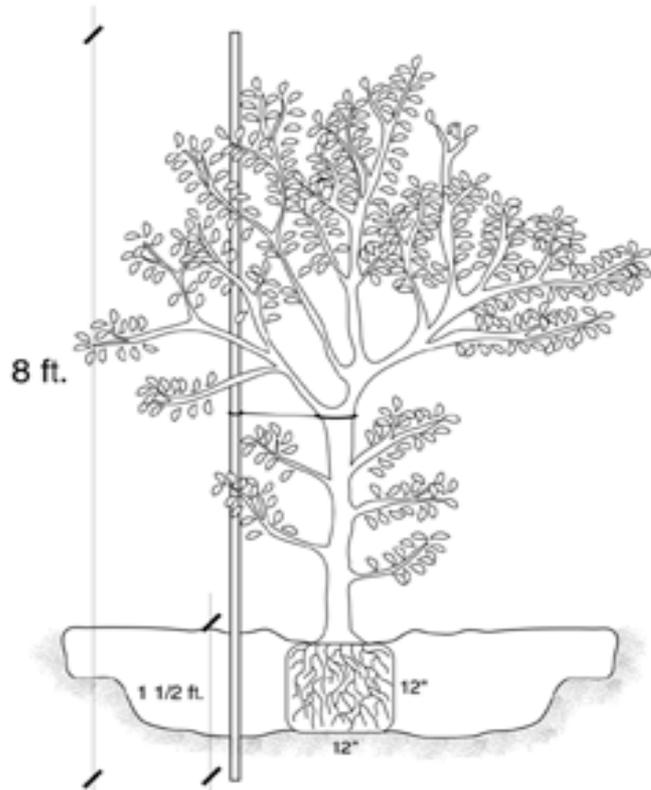


## **Conventional method: Two tall stakes, two ties**

- **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.

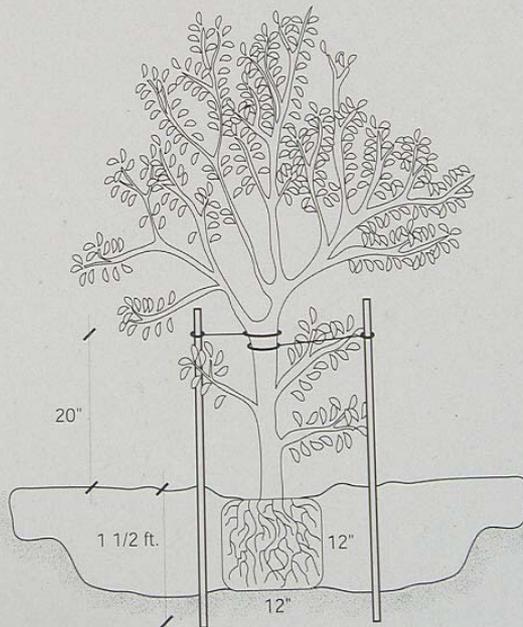




**Single stake, leader not well supported**

## 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.**



1



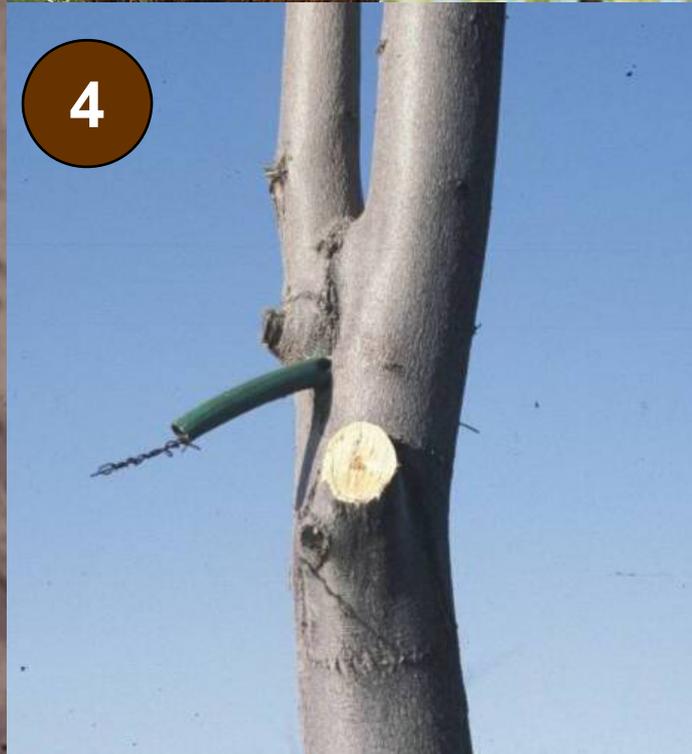
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3



4



5





## **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

- Arboriculture: Integrated Management of Landscape Trees, Shrubs, and Vines by R.W. Harris, J.R. Clark, N.P. Matheny, and V.M. Harris. 2004. Prentice Hall.
- Planting Trees and Shrubs by G.W. Watson and E.B. Himelick, 1997, International Society of Arboriculture.

## ■ 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>)