



# Urban Forest Hurricane Recovery Program

<http://treesandhurricanes.ifas.ufl.edu>

# Selecting Quality Trees from the Nursery



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# Poor vs. good quality



# Advantages to selecting quality trees

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- Higher survival post-planting
- Greater longevity in the landscape
- Reduces period of time needed for establishment
- Reduces likelihood of failure from structural defects during a hurricane

# Important considerations for selection

- **Production method**
- Maximum size at planting
- Root ball dimensions
- Root collar location
- Root defects
- Root ball: caliper: height relationship
- Trunk and branch structure
- Other



# Tree production methods

- Container
  - above ground
  - pot in pot
  - fabric
- Bare root
- Balled in burlap (B&B)
  - root pruned prior to transplanting
  - not root pruned



# Choose among tree production methods based on weight and staking capabilities

Production method	Root ball weight	Need for staking
Container: above ground or pot-in-pot	light	frequently
Fabric containers in ground	light to moderate	usually
B&B not root pruned	heavy	sometimes
B&B root pruned	heavy	sometimes
Bare root	very light	usually

\* B&B = Balled-in-burlap

# Tree survival in the landscape can depend on the production method and irrigation practices after planting

Production method	Survival with frequent irrigation after planting
Container: above ground or pot-in-pot	very good to excellent
Fabric containers in ground	very good to excellent
B&B not root pruned	fair to good
B&B root pruned	excellent
Bare root	excellent

\* B&B = Balled-in-burlap



# Tree survival in the landscape can depend on the production method and irrigation practices after planting

Production method	Survival with frequent irrigation after planting	Survival with infrequent irrigation after planting
Container: above ground or pot-in-pot	very good to excellent	fair
Fabric containers in ground	very good to excellent	poor to fair
B&B not root pruned	fair to good	poor to fair
B&B root pruned	excellent	good
Bare root	excellent	good

\* B&B = Balled-in-burlap

# Here is the summary story

## Under limited irrigation:

- Root pruned, hardened-off B&B – last to die
- Containers – in the middle
- Recently dug B&B – first to die

## Under appropriate, intensive irrigation:

It does not appear to matter

# Oak not root pruned



# Root pruned last production year only



# Root pruned last year and year before



# One year after transplanting

Not root pruned



Root pruned last  
production year



Root pruned last 2  
production years



# Conclusions about root pruning

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Root pruning during production provides a product that:

- 1) is slightly smaller
- 2) has a denser, more fibrous root system
- 3) has a more uniform root system
- 4) transplants more successfully

**Note: Not all species require root pruning. Some have a dense fibrous root system without root pruning.**

# Important considerations for selection

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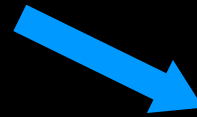




# Selecting the right tree size

- Irrigation capabilities:

When irrigation is limited...



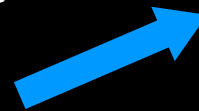
- Site drainage:

If drainage is poor...

...then select small nursery stock such as 1.5 to 3 inch caliper trees.

- Weed control and mulch management:

If weeds are not controlled and compete with tree for water...



# Tree size impacts tree establishment rate



# Tree size impacts tree establishment rate

Percent caliper, height, and spread increase between May and October 2005 for live oak transplanted from #15 and #45 containers to the field.

Container Size	% caliper increase	% height increase	% spread increase
#15 (1" caliper)	60.4a	36.5a	55.8a1
#45 (2.5" caliper)	14.8b	9.1	36.4b

# Conclusions about tree size

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- Smaller trees take less time and water to establish.
- Survival of smaller nursery stock is greater if irrigation capabilities are limited.
- Growth rate of small trees is significantly greater than when the same species is planted at a larger size.
- Unless plenty of water can be supplied, it is better to plant smaller trees.

# Important considerations for selection

- Production method
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# Root ball dimensions



- Root balls of any shape perform equally well in well-drained soil.
- Tall root balls help keep deeper roots moist.
- Wide and shallow root balls are better suited for planting in poorly-drained and compacted sites.
- Shallow root balls dry quicker on well-drained sites.

# Good for poorly drained site



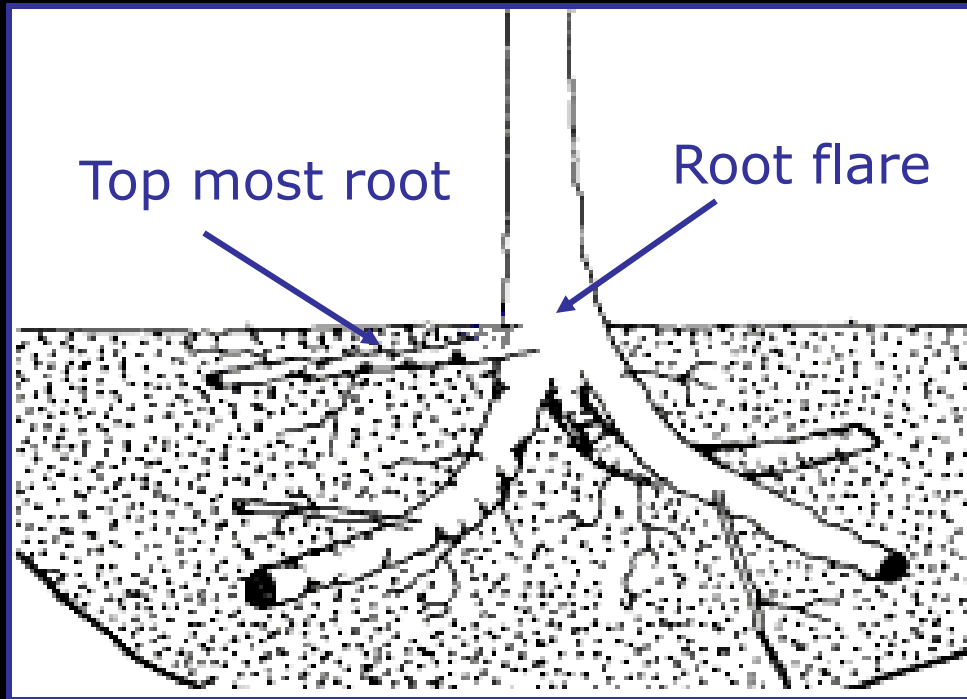
# Important considerations for selection

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# Root collar location



- Remove soil or media around the base of the trunk until you locate the top-most root.
- The top-most major root should be within 2-3” of the surface of the root ball.

# Nicely positioned root collar

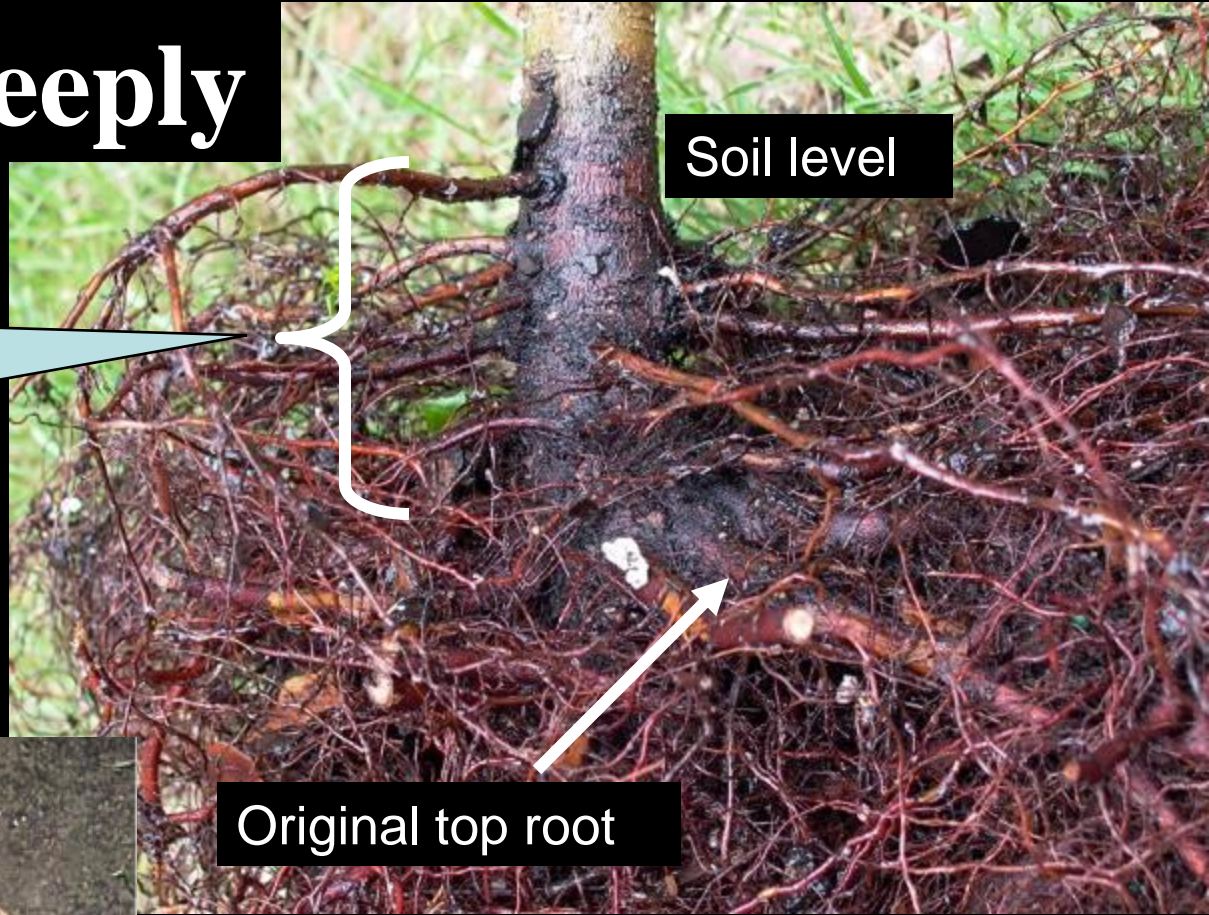


Trunk without flare  
should trigger a  
root check



# Planted too deeply

**Roots  
generated  
after  
planting**



**Soil level**

**Original top root**

**Most common**

**Less common**

**No roots  
generated  
after  
planting**



# Conclusions about trees planted too deep

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- Do not purchase the tree.
- Soil, media, and roots growing above the original top-most root should be mostly removed prior to planting.

# Important considerations for selection

- Production method
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# Types of root defects

- Circling roots
- Kinked roots
- Girdling roots
- Root-bound



# Circling roots



Notice roots circling at the top and sides of the root ball.

Circling roots develop when trees are grown in containers for a prolonged period, causing roots to be deflected by the container wall and to circle the outside of the root ball.



This tree was found leaning  
after a hurricane.



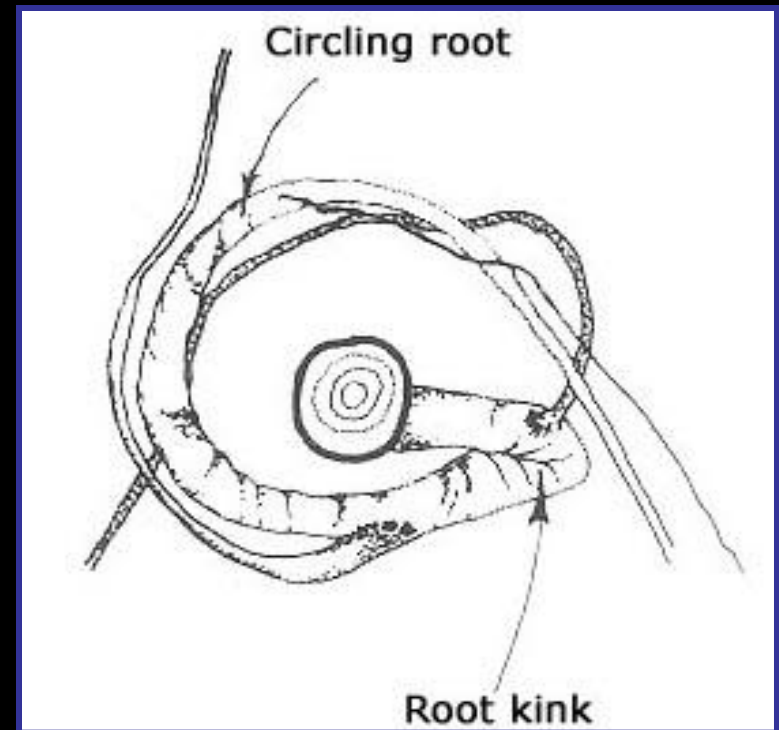
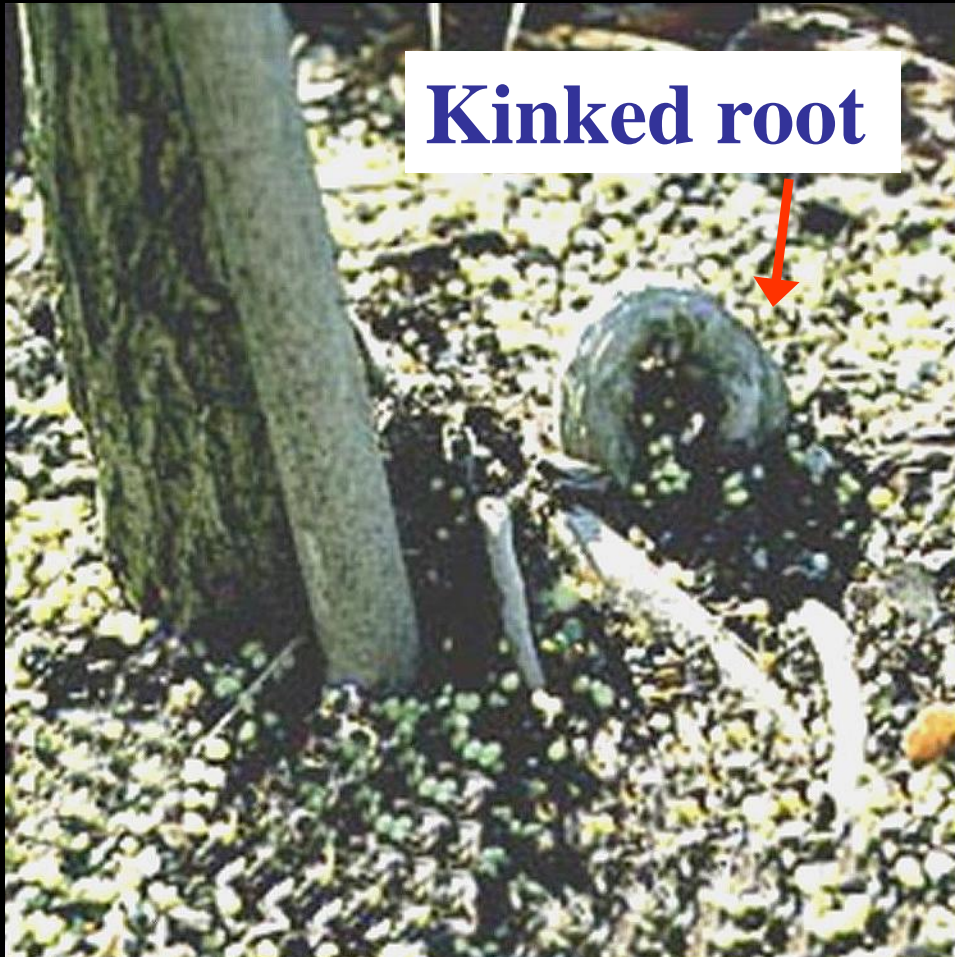
The cause ...  
circling roots



# Kinked roots

Kinked roots occur if roots are folded into a propagation bed at the seedling stage.

**Kinked root**



# Girdling root



Girdling roots are formed when regenerated roots grow perpendicular to a cut root, or from growing in a container too long.

As the tree grows, these roots may meet the trunk and begin to strangle it.

# Girdling root brings down a giant



Indented trunk



# Root-bound



Root-bound trees have many roots circling around the outside of the root ball.

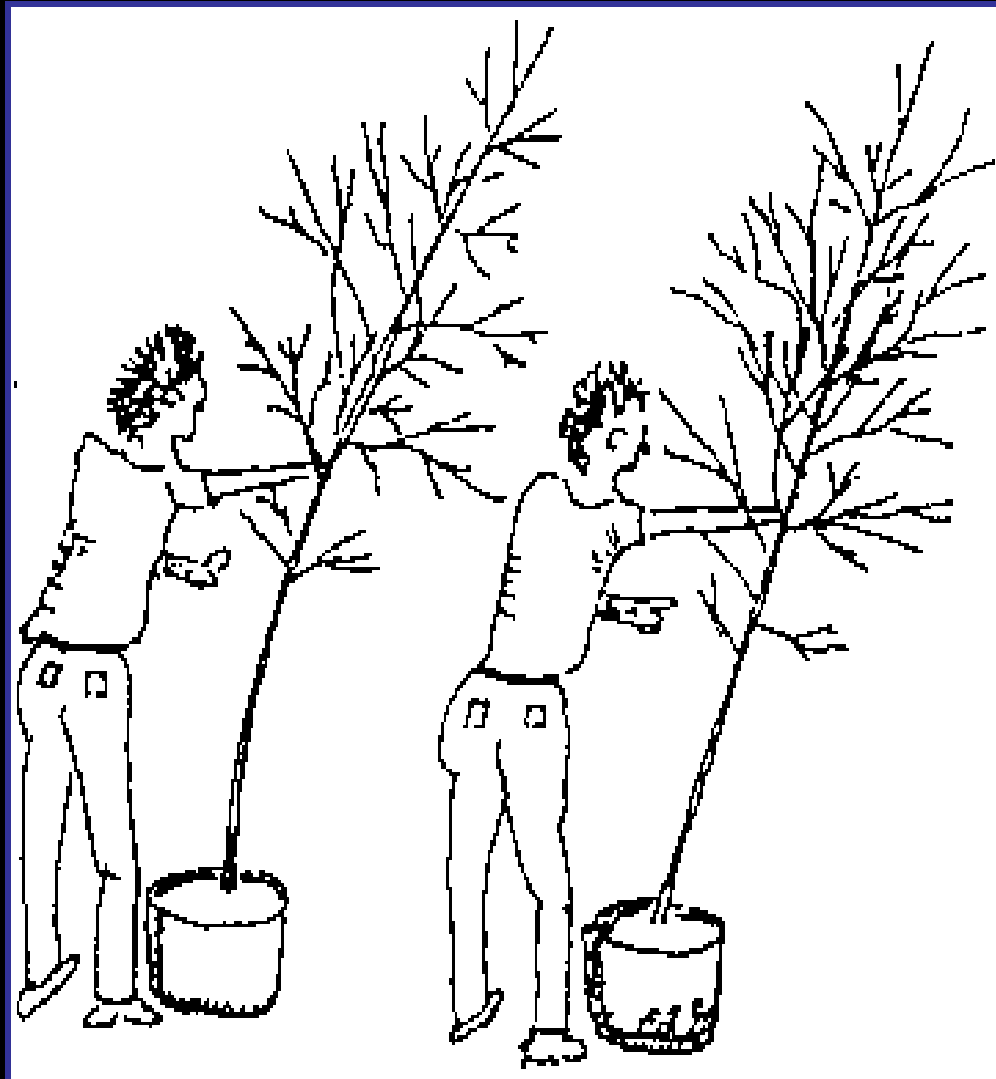
This causes a physical barrier, preventing the tree from spreading roots into the landscape soil after planting.

Many roots inside but few on the edge of root ball indicate quality.



# Quick test for root quality

Good  
Quality



Poor  
Quality

Trunk bends

Trunk does  
not bend

# Conclusions about root defects

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- Root defects have a significant impact on tree performance in the landscape.
- Defects can occur on all trees regardless of the production method.
- Problems are easier to correct in the nursery when the tree is young; some correction can occur at the time of planting.



# Important considerations for selection

- Production method
- Maximum size at planting
- Root ball dimensions
- Root collar location
- Root defects
- **Root ball: caliper:**  
**height relationship**
- Trunk and branch structure
- Other



# Root ball standards

Trunk Caliper (Inches)	Min ball diameter on <b>field grown</b> shade trees	Min root ball diameter on <b>fabric container</b> grown trees	Min <b>container</b> size (gallons)	Min tree height on standard trees	Min tree height on slower grown trees	Max tree height
1	16	12	5	6	5	10
2	24	18	20	10	8	14
3	32	20	45	12	9.5	16
4	42	30	95	14	10.5	18
5	54	36	95			

Way over-grown



# Conclusions about root: height ratio

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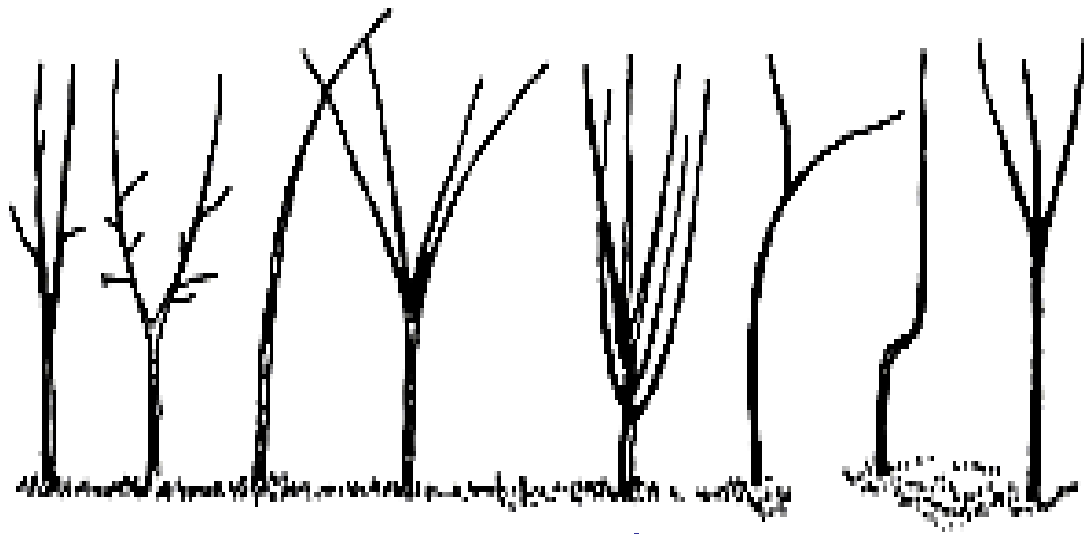
- Ideally, the dimensions of the root ball should exceed the minimum that is recommended.

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# Trunk structure



poor quality



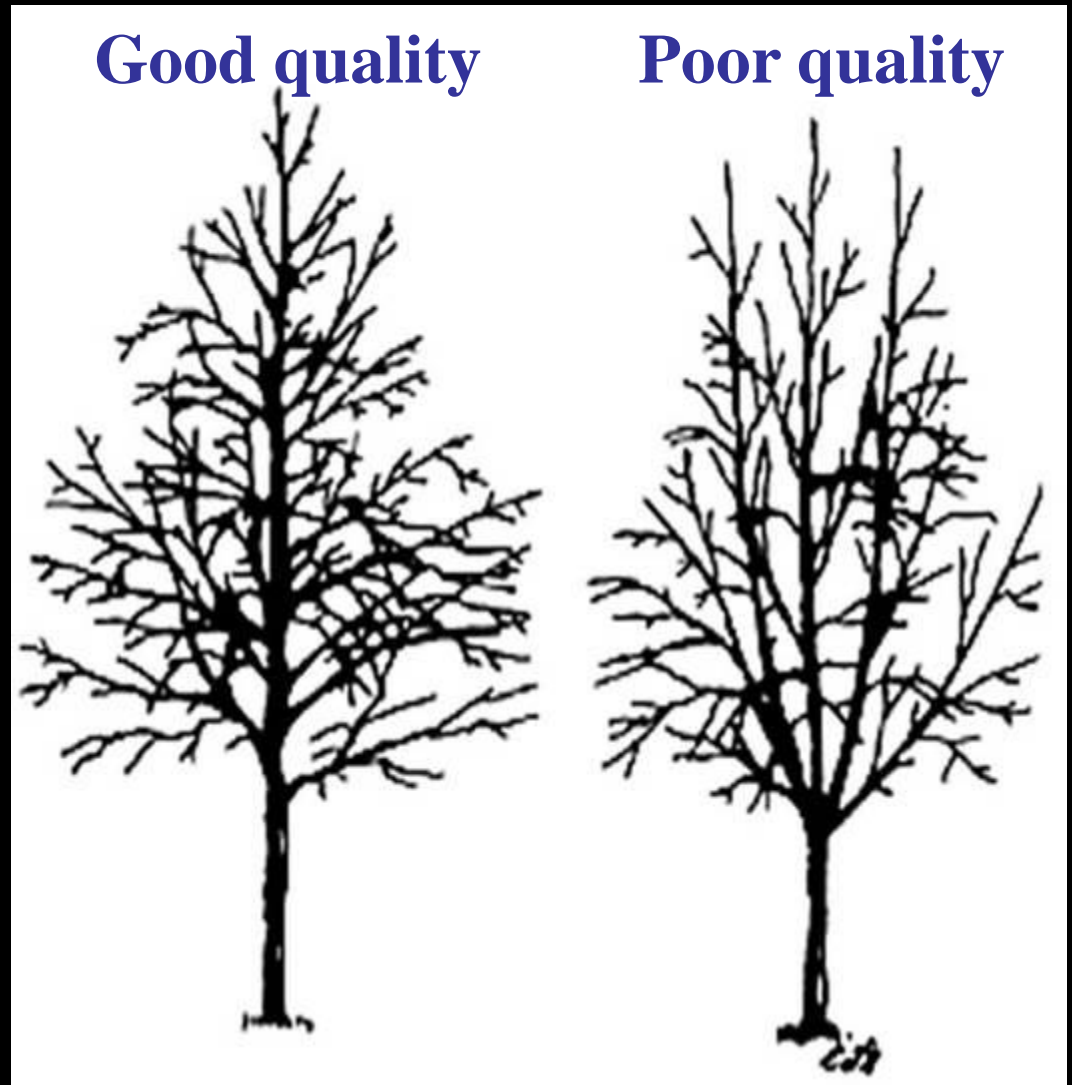
best quality

good quality

- Shade trees of lesser quality have two or more trunks
- Best quality shade trees have one dominant trunk

# Branch arrangement

- Major branches and trunks should not touch.
- Branches should be less than  $2/3$  trunk diameter.
- Main branches on shade trees should be spaced apart.



# Young quality tree

- Small temporary branches are OK
- Lower branches help the root system and lower trunk grow
- Protects trunk by forming a barrier to mechanical injury.







# Poor quality

- Codominant stems
- Major branches/ trunks touching
- V-shaped crotch
- Included bark

# Conclusions about structure

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- Choose trees that have been trained in the nursery to have good structure.
- Trees with good form at time of planting will need maintenance to keep one dominant trunk.
- Trees with poor structure will need more severe and time-consuming pruning visits.

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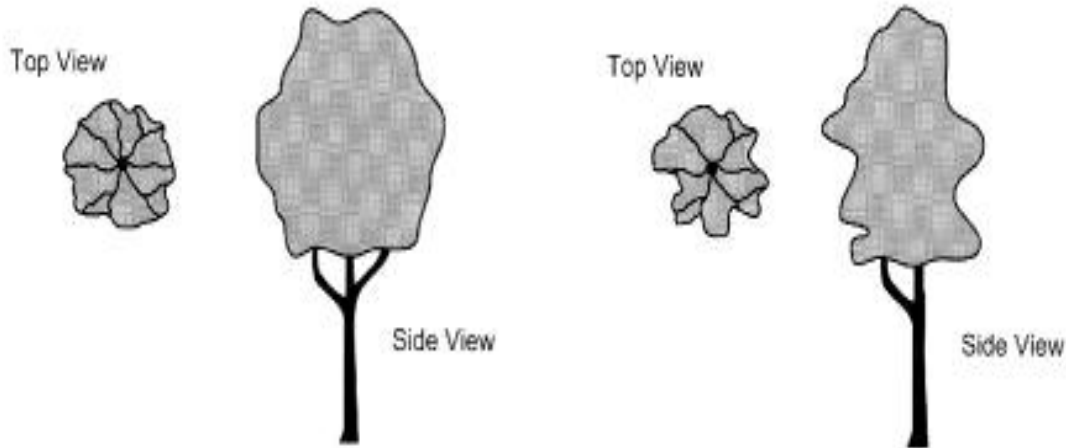
# Other factors influencing tree quality

- Trunk injury or broken branches.
- Tree wrap (may be covering up wounds).
- Disease or insect damage.
- Canopy uniformity and fullness.
- Quality of old pruning cuts.
- Seed or propagule source.
- Foliage color and size.
- Tree wrap
- Presence of stakes.



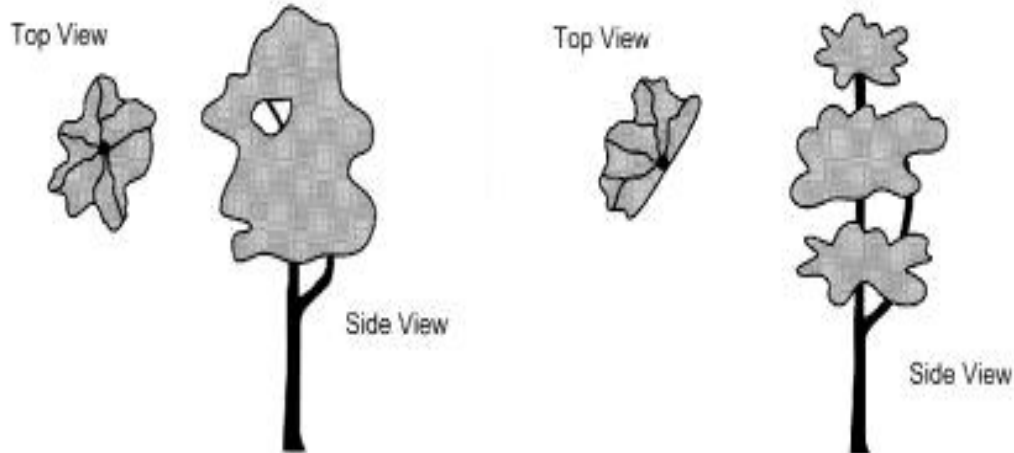


**Carefully  
inspect the tree  
for disease or  
insect damage.**



Good uniformity and fullness

# Canopy uniformity and fullness

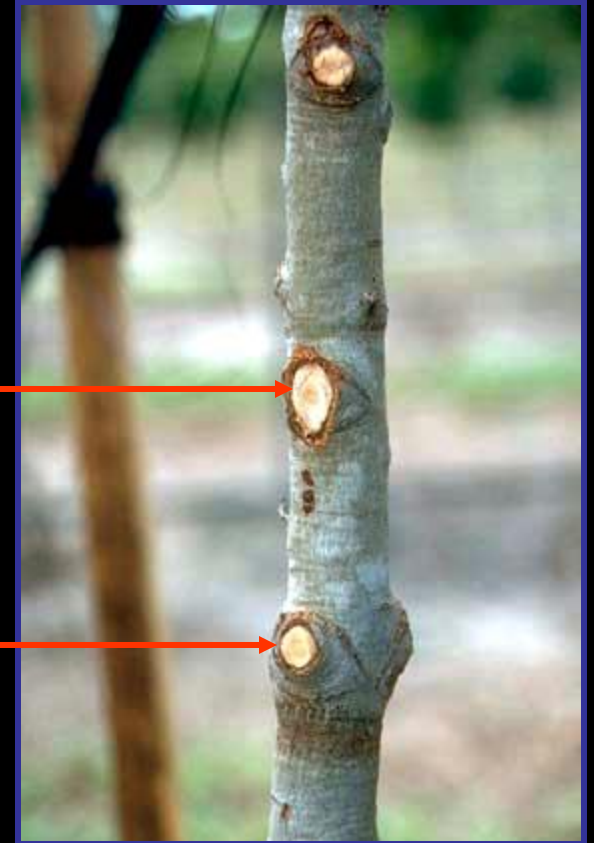


Poor uniformity and fullness

# Quality of old pruning cuts



Flush  
cut



Good cut



Callus forming only around sides of  
flush cut. Branch collar no longer  
present.



**Seed or  
propagule  
source**





**Foliage  
color and  
size**

# Presence of stakes



# Example of a good quality tree



- One dominant trunk
- Branches spaced evenly
- Canopy full and uniform

Visit the website **Trees and Hurricanes:**

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