Selection and the proper planting of trees

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Poor vs. good quality

Advantages to selecting quality trees

- 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

Conclusions about root pruning

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.

FIELD-GROWN TREES AND ROOTS PLUS GROWERS

- A field-grown tree is planted into native soils, grown to a harvestable size., trunk.
- Trees in a field-grown nursery are maintained with drip irrigation, fertilizer, selective shoot pruning, and root pruning.
- Field-grown trees are hardened-off or cured after harvesting. This hardening-off process lasts 3 to 4 weeks and it simply involves providing the tree with optimum irrigation during the few weeks after harvesting.
- New roots that have begun to develop are ready to grow immediately into the landscape. These new roots growing outside of the burlap are a sign of quality.

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

Selecting the right tree size

- Irrigation capabilities:

  When irrigation is limited…

- Site drainage:

  If drainage is poor…

- Weed control and mulch management:

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

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

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

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

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

- Production method
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- Root ball dimensions
- **Root collar location**
- Root defects
- Root ball: caliper: height relationship
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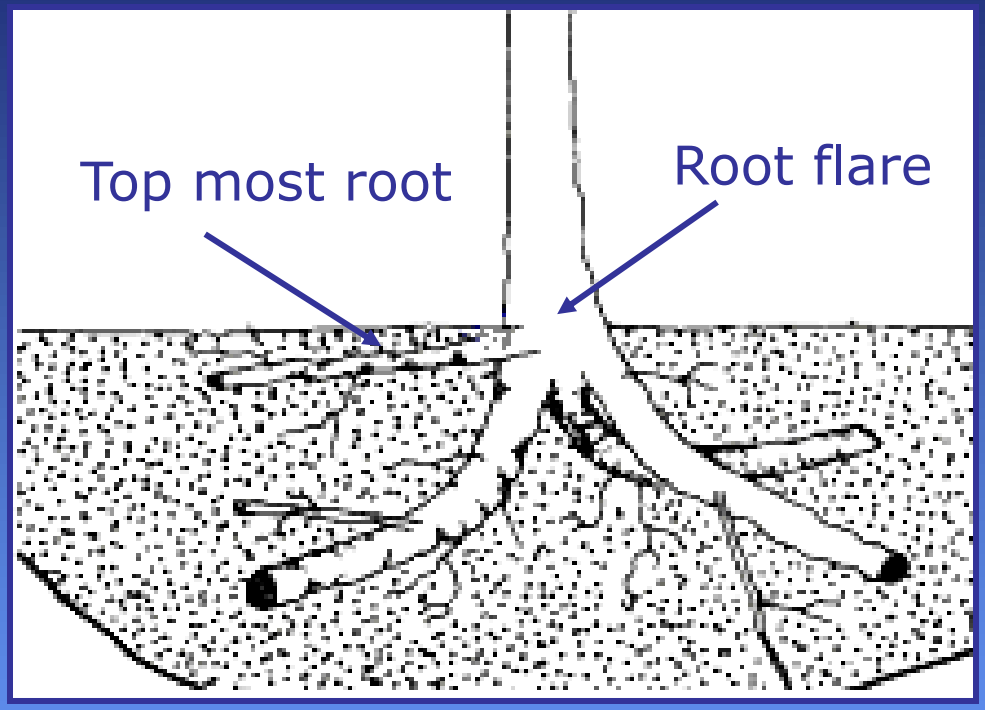
- Other

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

Conclusions about trees planted too deep

- 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
- Maximum size at planting
- Root ball dimensions
- Root collar location
- **Root defects**
- Root ball: caliper: height relationship
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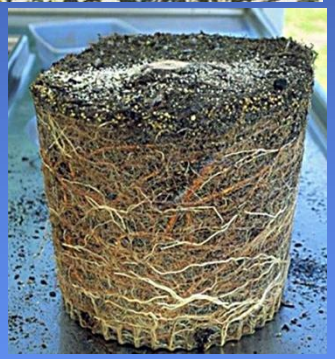
Types of root defects

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



Circling roots

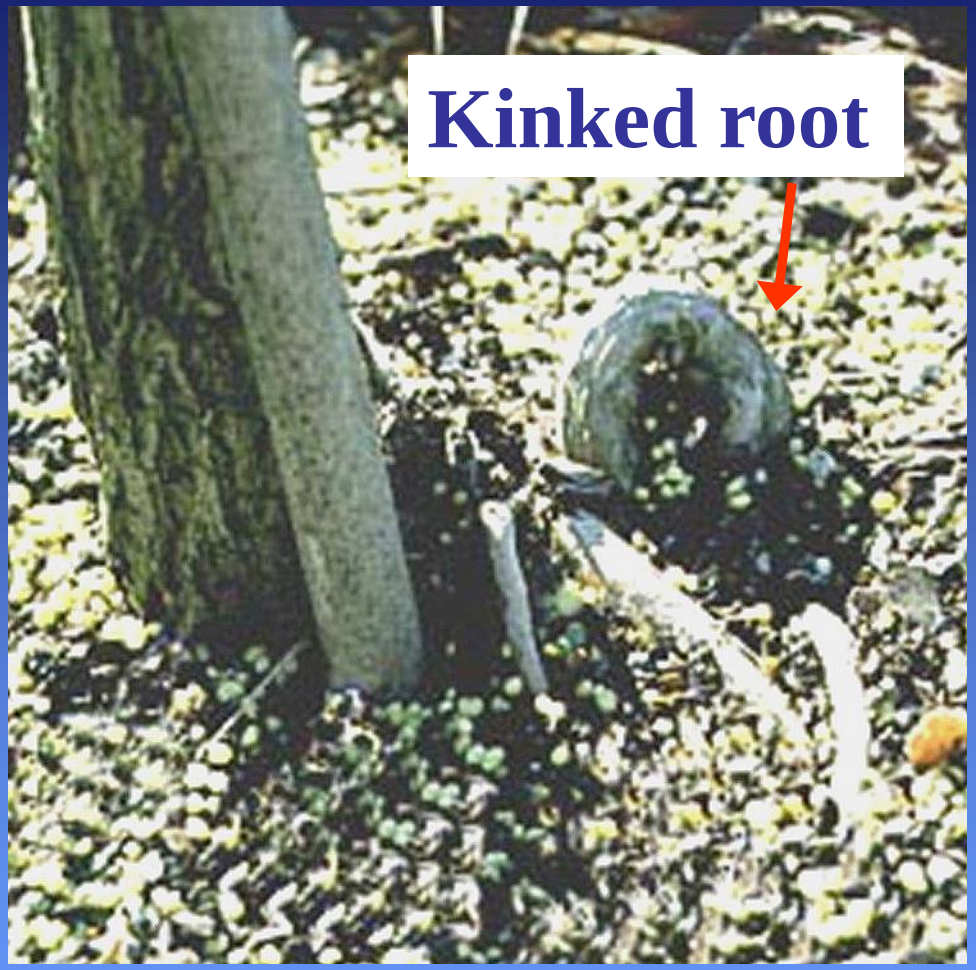
Notice roots circling at the top and sides of the root ball.

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.

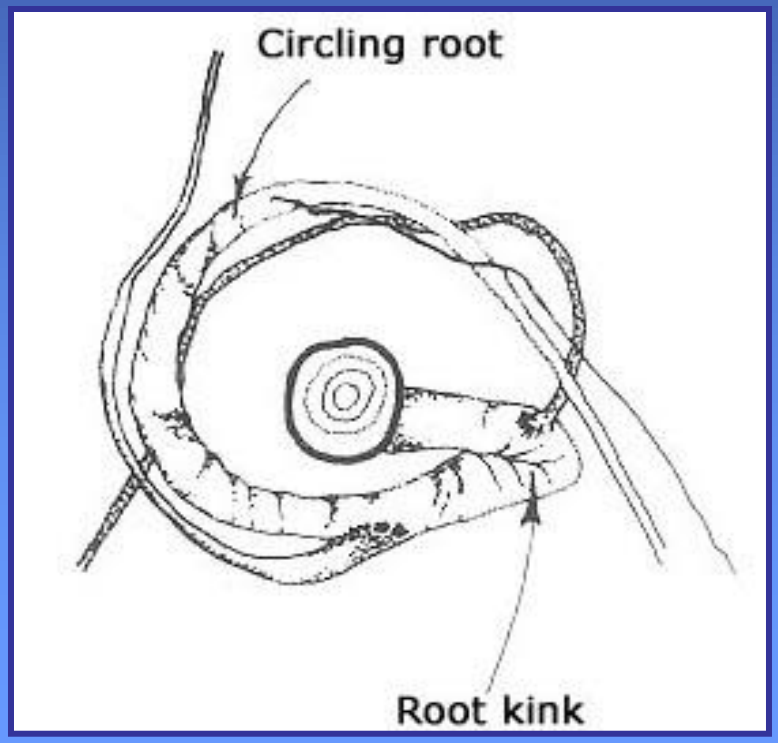
This tree was found leaning after a hurricane.

The cause …
circling roots

Kinked roots



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



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.

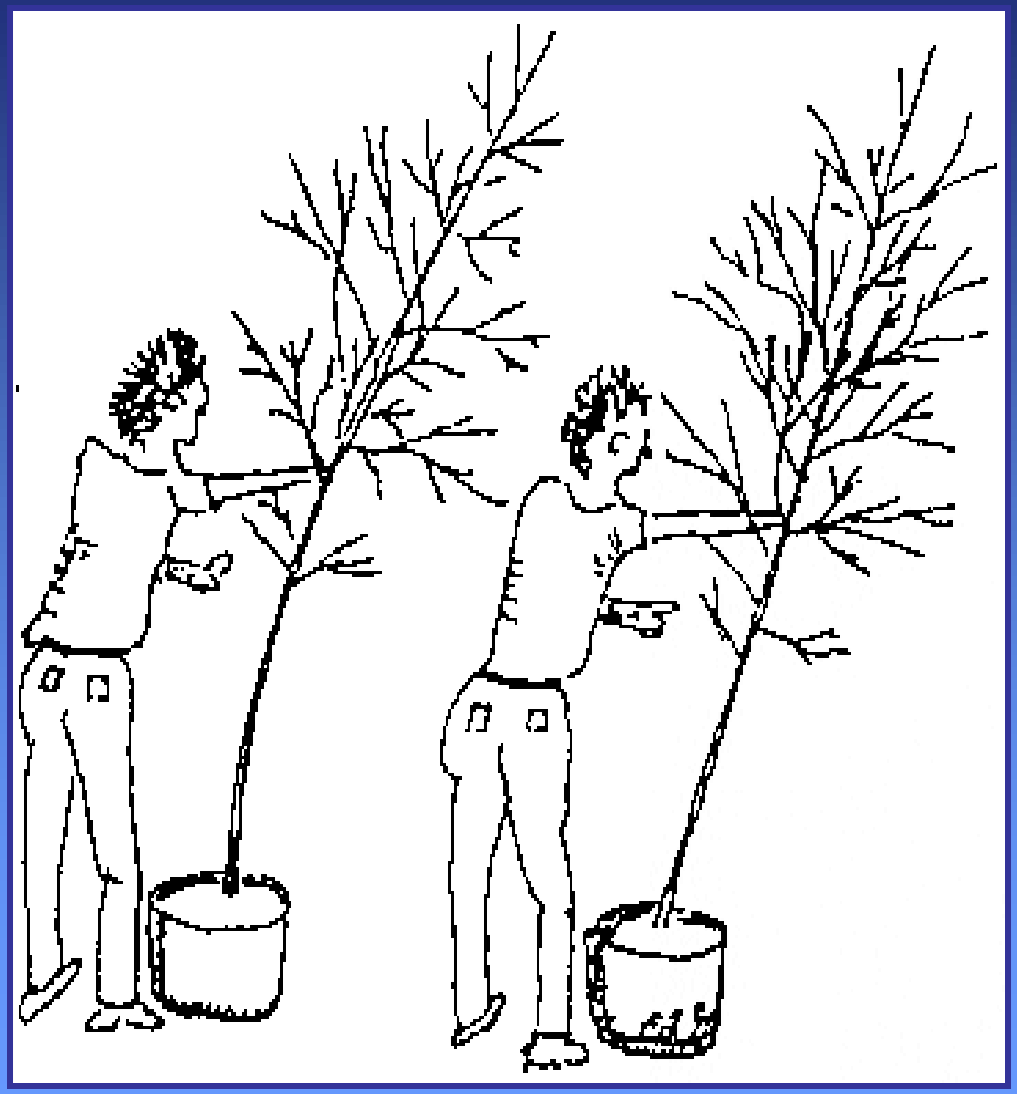
This causes a physical barrier, preventing the tree from spreading roots into the landscape soil after planting.

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

- 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 **field grown** shade trees	Min root ball diameter on **fabric container** grown trees	Min **container** 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

Important considerations for selection

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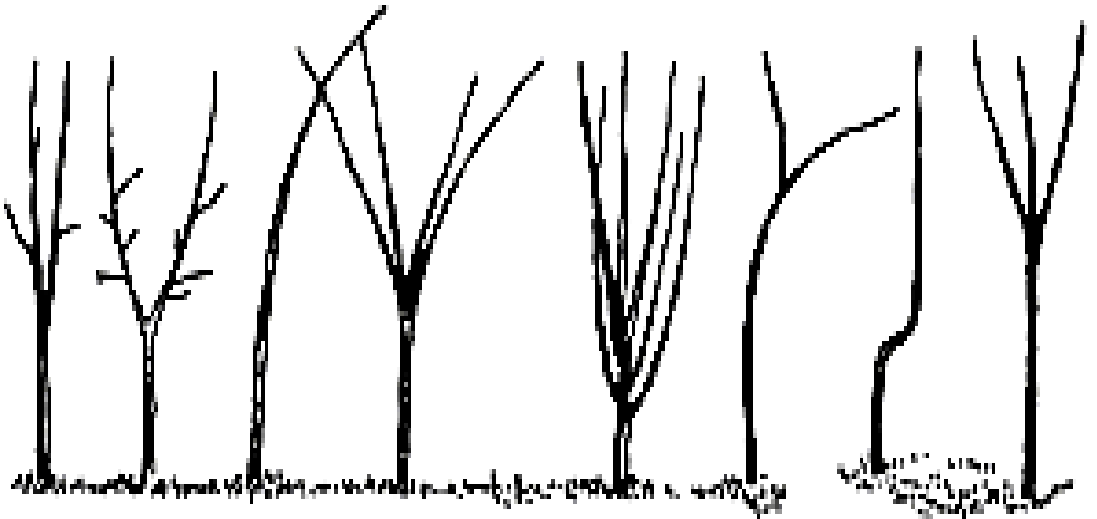
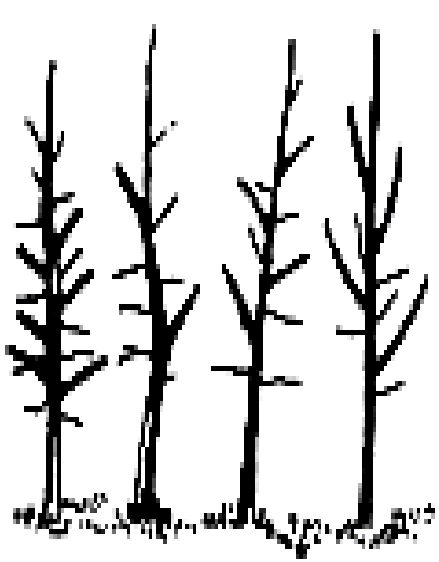
- **Trunk and branch structure**
- Other

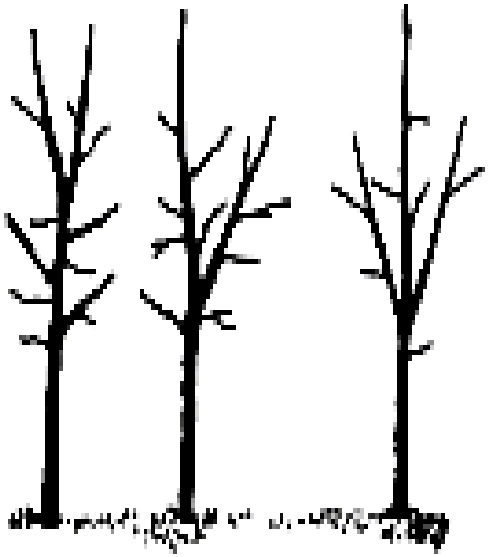
Trunk structure



poor quality



best quality

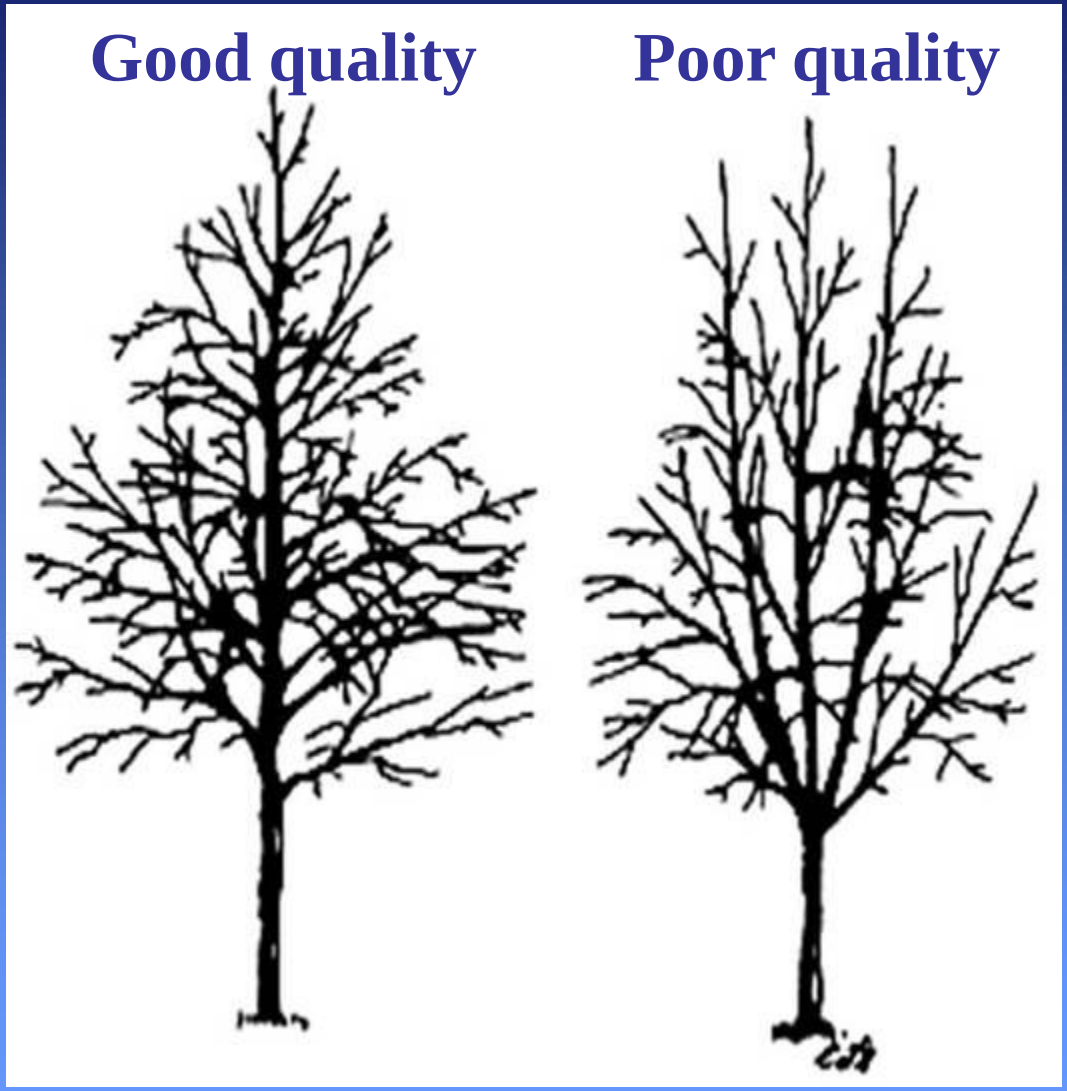


good quality

- 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.



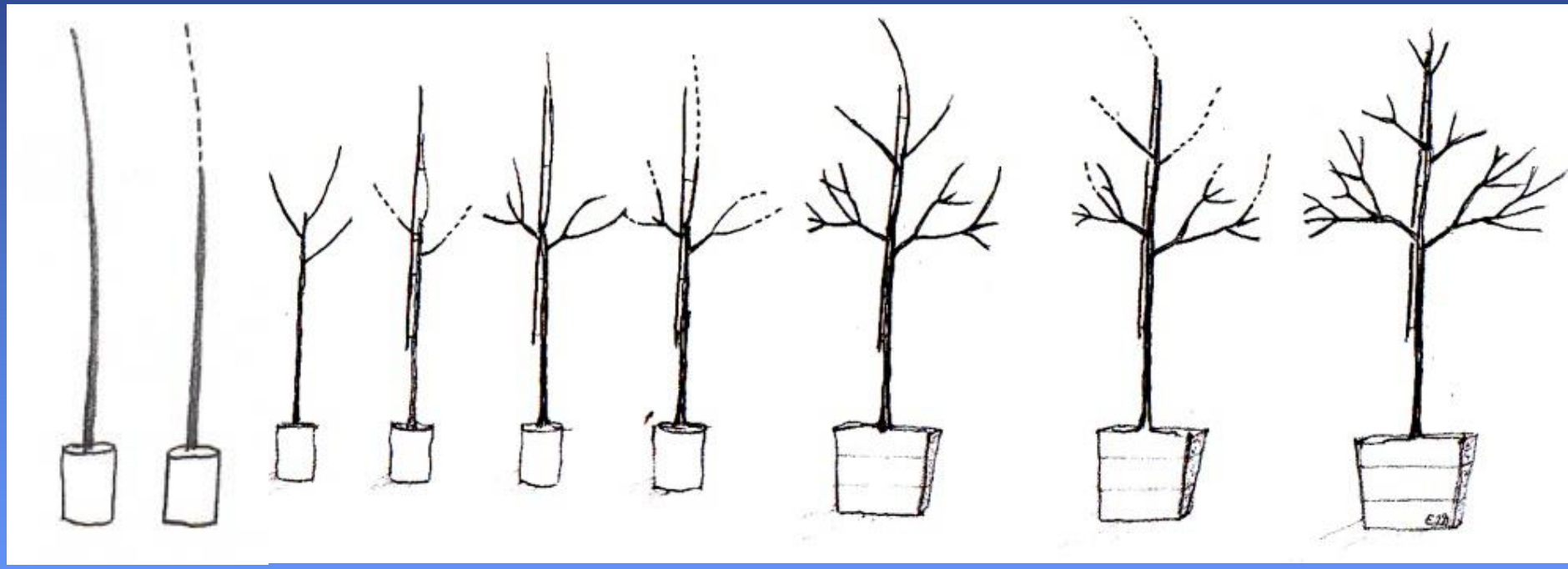
Young quality tree

- 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

How it is done in the nursery



Heading the leader promotes branching (left to right). The top shoot is tied to a stake and the others are headed to promote branching. This process continues throughout the production process

Conclusions about structure

- 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.

Important considerations for selection

- Production method
- Maximum size at planting
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- Root ball: caliper: height relationship
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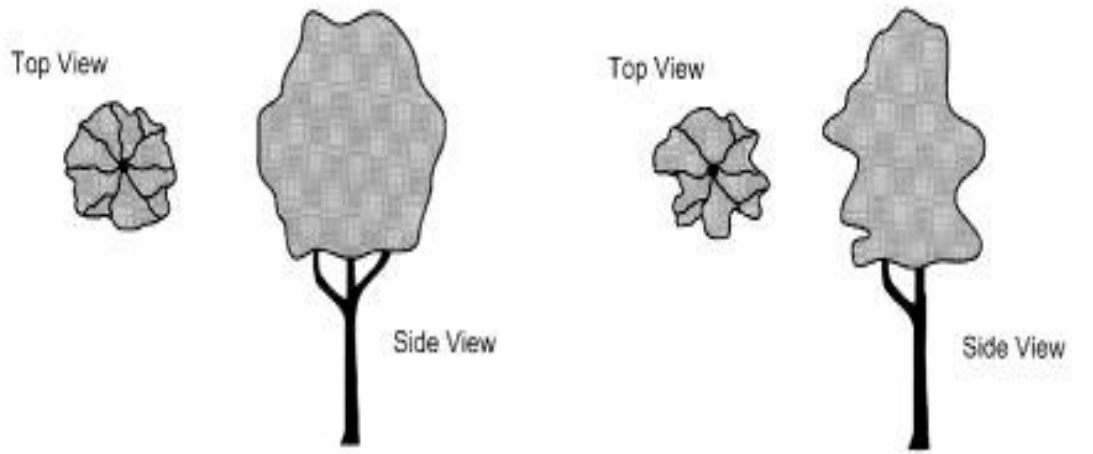
- **Other**

Other factors influencing tree quality

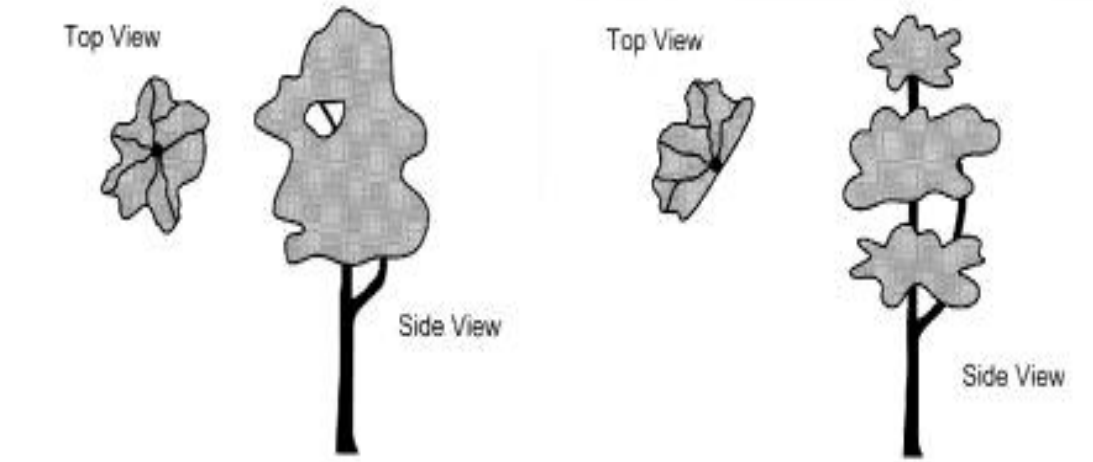
- Trunk injury or broken branches.
- Tree wrap (may be covering up wounds).
- Disease or insect damage.
- Canopy uniformity and fullness.
- Quality of old pruning cuts.
- Seed or propagule source.
- Foliage color and size.
- Presence of stakes.

Carefully inspect the tree for disease or insect damage.

Canopy uniformity and fullness



Good uniformity and fullness

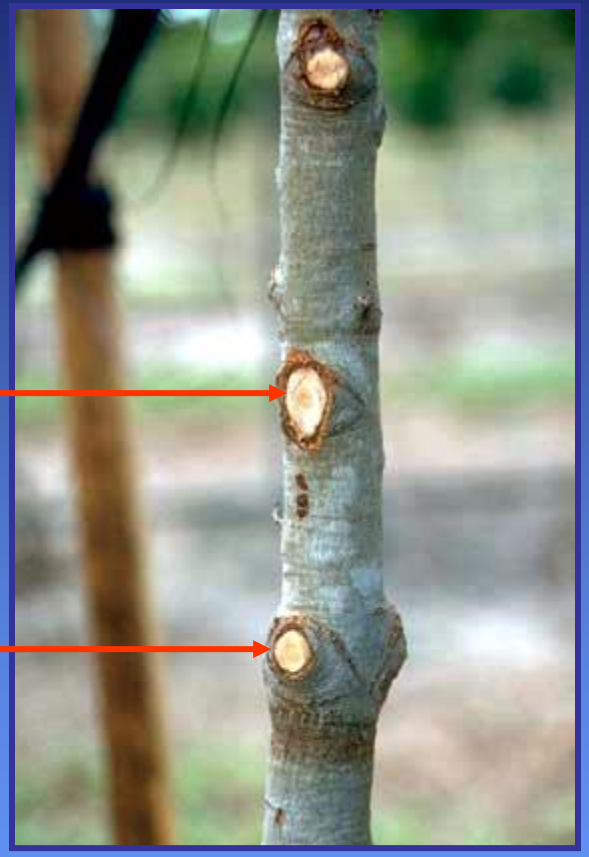


Poor uniformity and fullness

Quality of old pruning cuts

Flush cut

Good cut

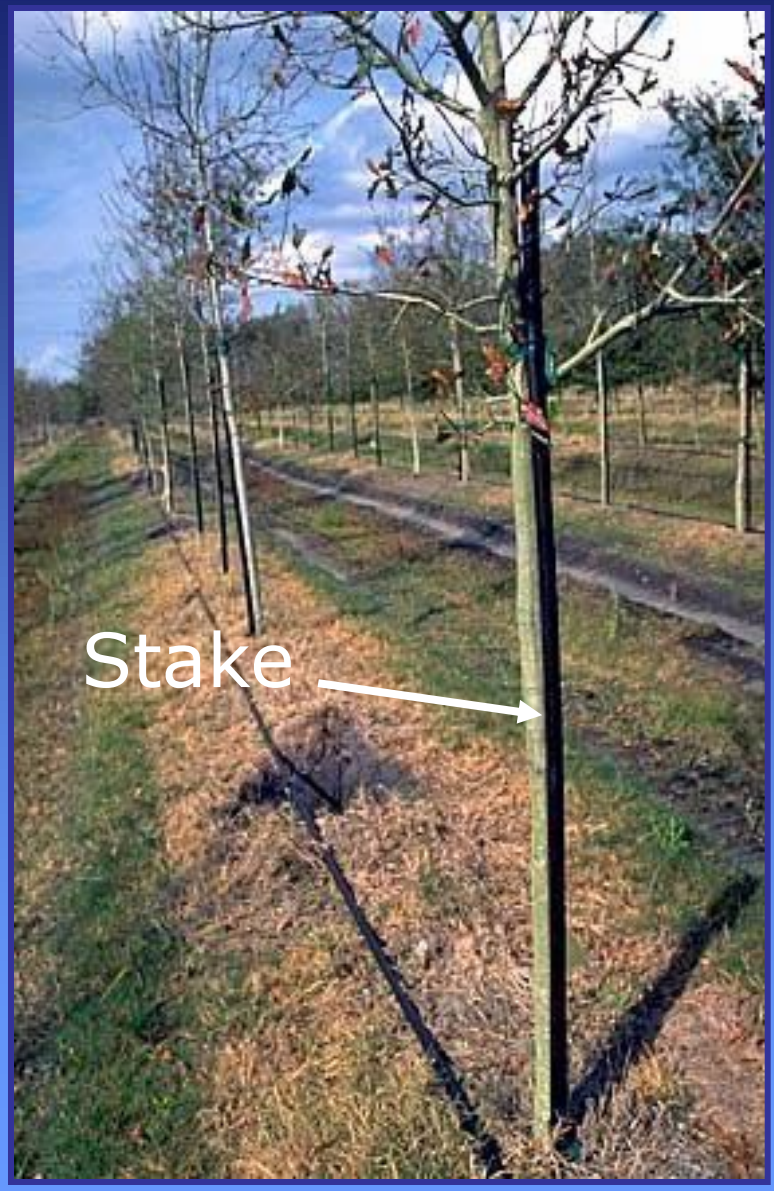


Callus forming only around sides of flush cut. Branch collar no longer present.

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

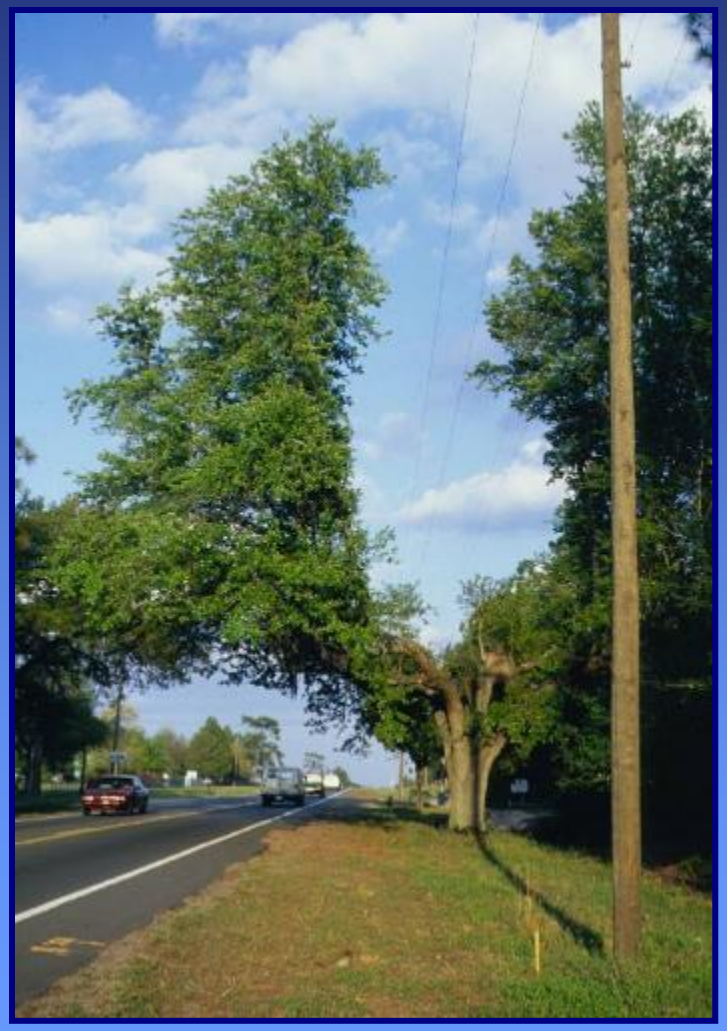
Trees and Hurricanes:

Now that you have picked out a good one…..plant it properly

Ten steps to proper tree planting

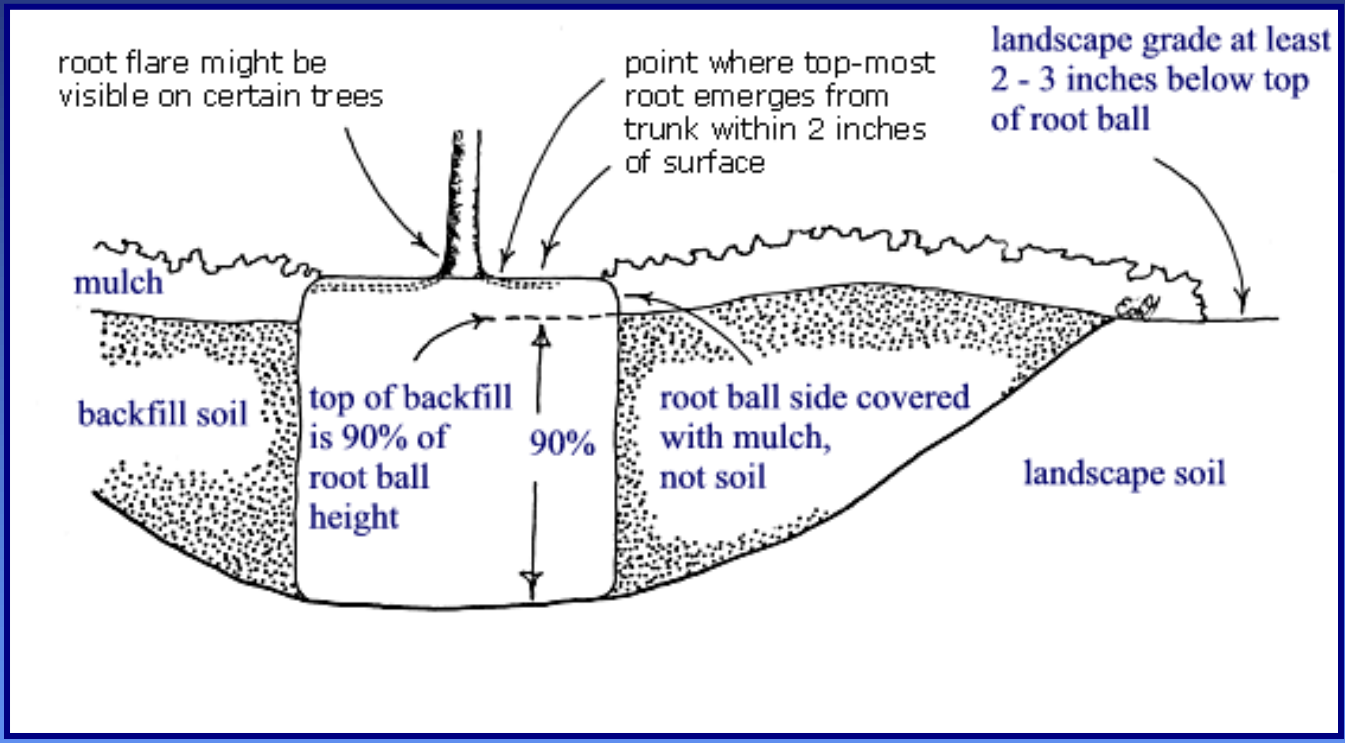
1. Look up for wires and lights
2. Dig shallow and wide hole
3. Find the topmost root and treat root defects
4. Carefully place tree in hole
5. Position top root 1-2 inches above landscape soil
6. Straighten tree
7. Remove synthetic materials
8. Add and firm backfill soil
9. Add mulch
10. Stake and prune if needed

Look up!



- If there is a wire, security light, or building nearby that could interfere with proper development of the tree canopy as it grows, plant elsewhere
- Or plant a small-maturing tree

Plant it high and it wont die

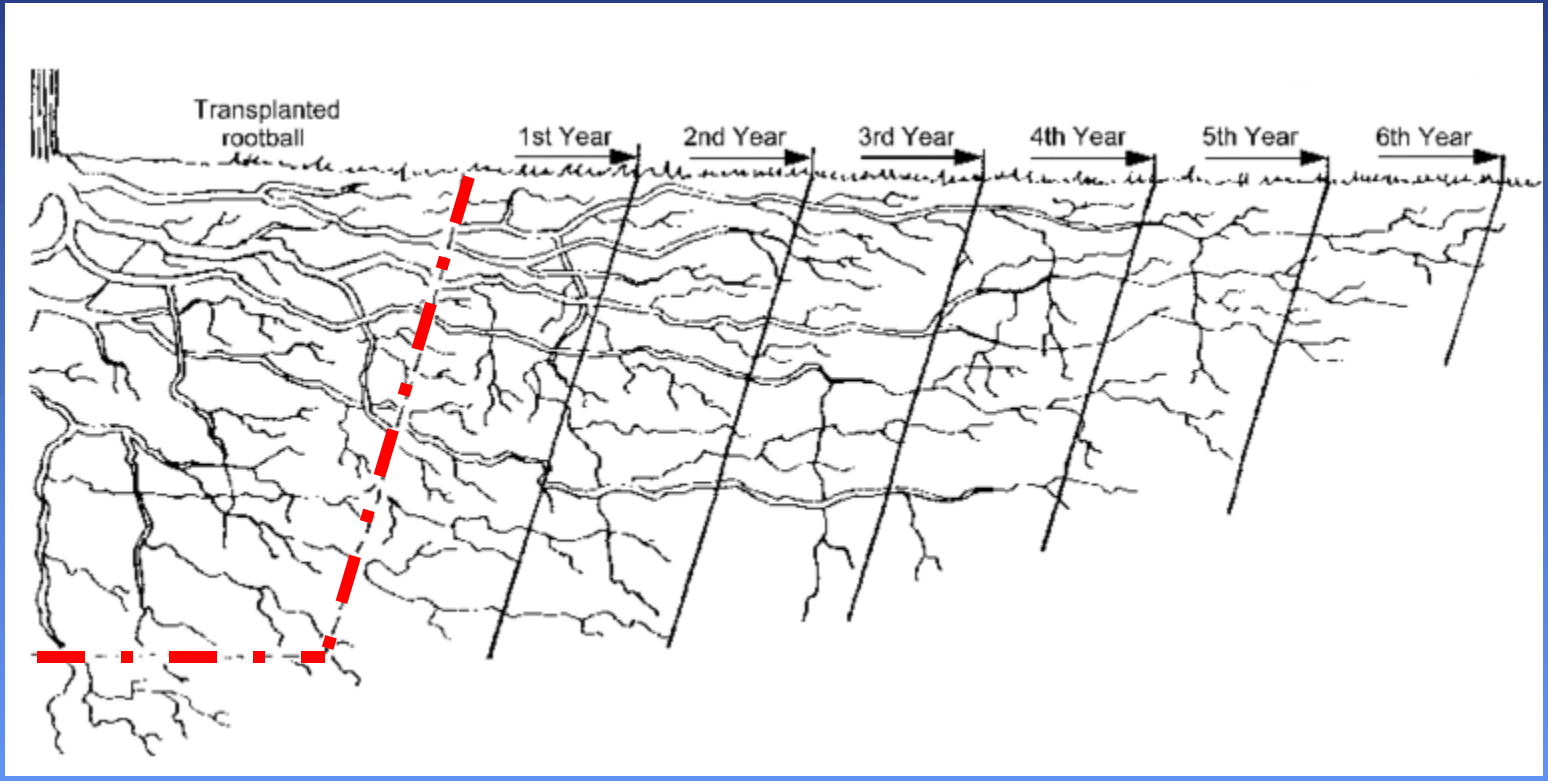


- Dig the planting hole as wide as possible
- The depth of the hole should be less than the height of the root ball

Where to add organic material

- Not just in the planting hole
- At least 2-3 times the rootball size
- Amend the entire planting site is best

Where to add organic material?



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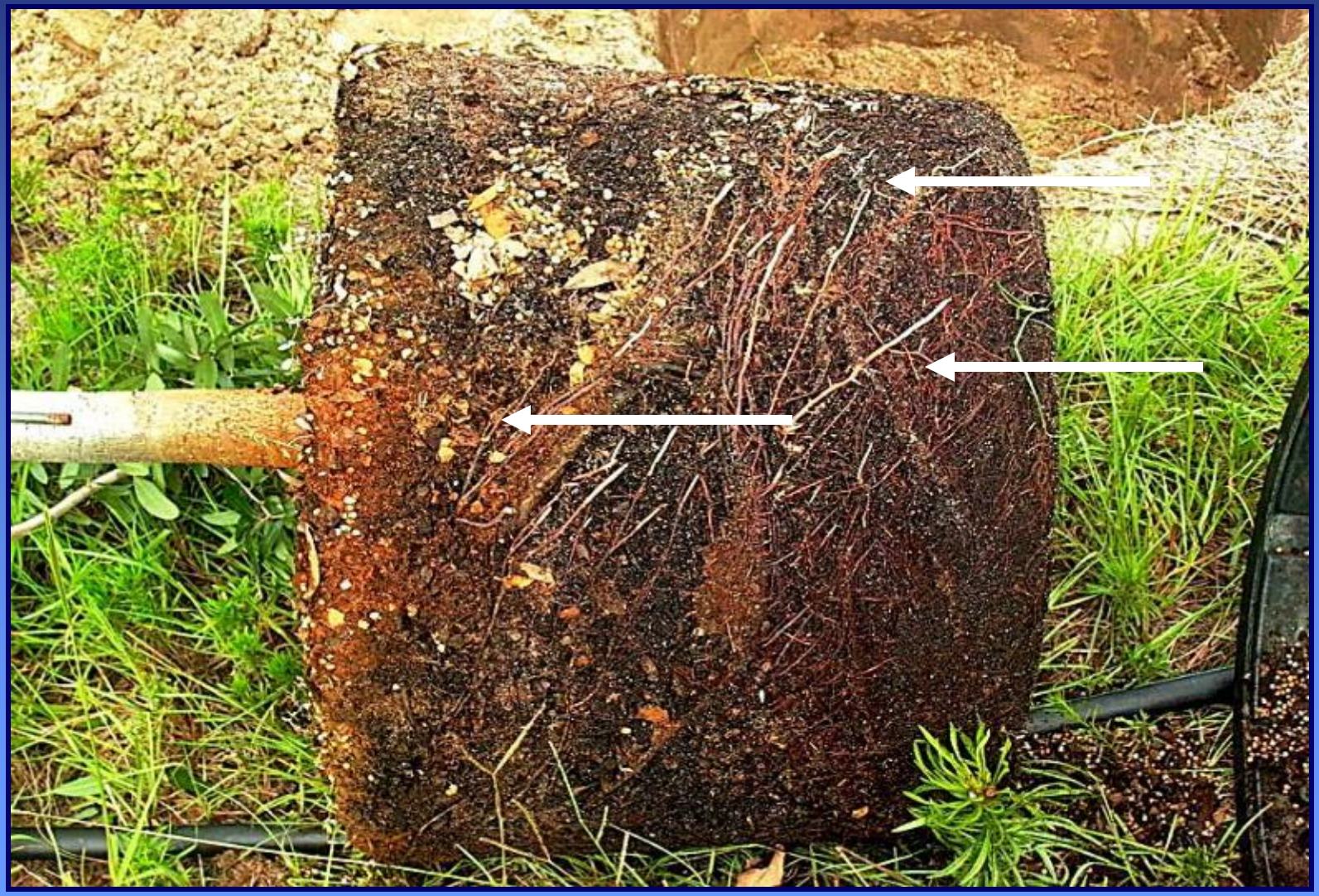
Pull the tree out gently

Circling roots – cut them



This is What we are trying to avoid!!

- This tree was in the ground for 2 years
- The roots that were circling around the outside of the container are still circling.

Example: A tree before planting… Looks good right!!

Same tree 2 ½ years later

- This tree was in the ground for 2 ½ years. Notice where the roots are. More specifically, where they aren't.

PHOTO CREDIT CHUCK LIPPI

The key is to correct the defects at planting

Shave the roots prior to planting

Before and after shaving

When circling roots are
not
managed

Find the top root

Remove excess soil - containers

- If the top-most root is too deep, remove soil from the top of the root-ball so the top-most root is within the top 2” of soil

Three inches of soil and media were removed from the top of this ball

Top root at surface

Set tree in the hole

Set too deep - add soil to bottom of hole

Finished with loose soil

Soil over ball is not good

Water the backfill to settle

Prune to finish the job

- Remove broken branches
- Perform structural pruning if needed
- Do not prune to compensate for root loss

Ready for mulch

- Two or three inches of the root ball should remain above ground after all the backfill soil is added
- This ensures the top-most root remains above ground, even if the root ball settles

Mulching

- Apply a 3” thick layer of mulch to at least an eight-foot diameter circle
- Apply a thinner layer of mulch over the root ball, but keep it at least 10” from the trunk

Improper mulching

- If turfgrass grows up to the trunk, trees often perform poorly
- Turf and weeds rob trees of moisture and nutrients and some produce chemicals that inhibit tree growth

Improper mulching

- Never pile mulch in a volcano-like manner against the trunk. This cuts off oxygen to roots, can rot the trunk, can keep vital irrigation and rain water out and can keep roots too wet in poorly drained soils

Add a berm?

- When using a hose for irrigation, a 3” to 4” berm could be constructed at the edge of the root ball to prevent water from running off as seen here.

Make sure it is removed after

Traditional staking methods

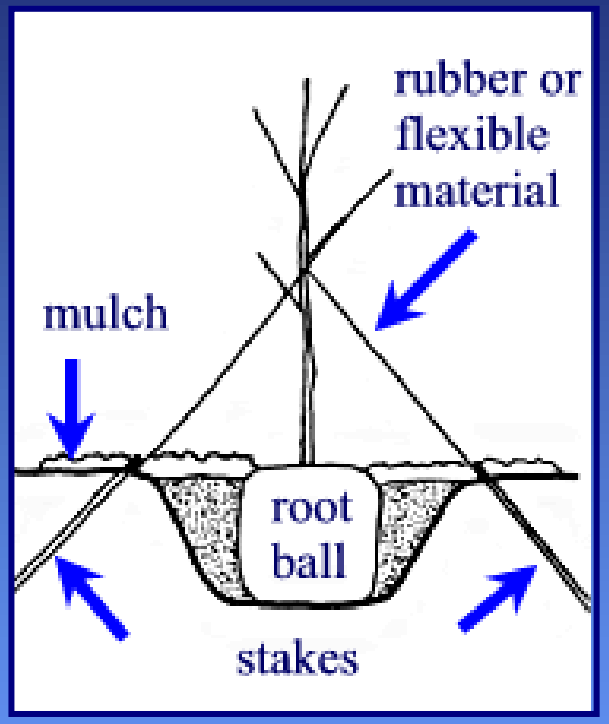


Figure 1

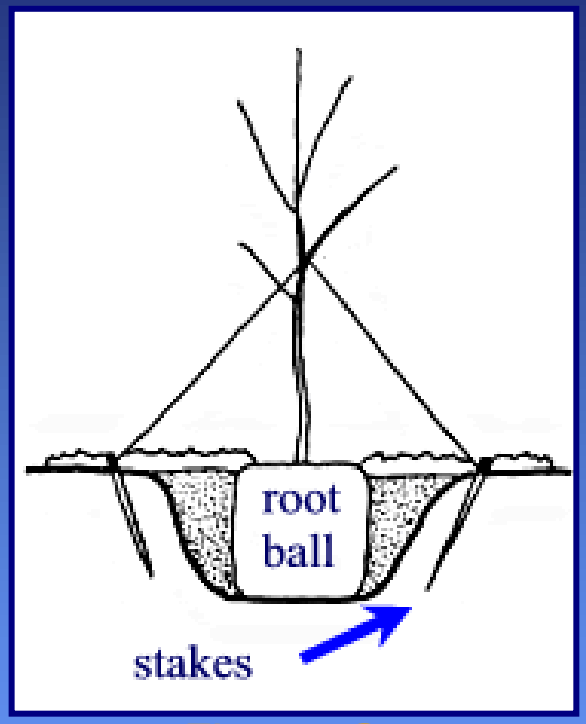


Figure 2

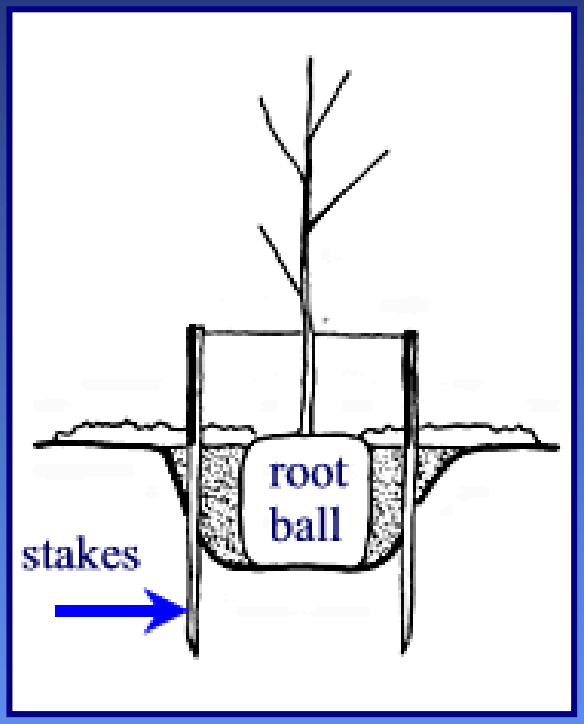
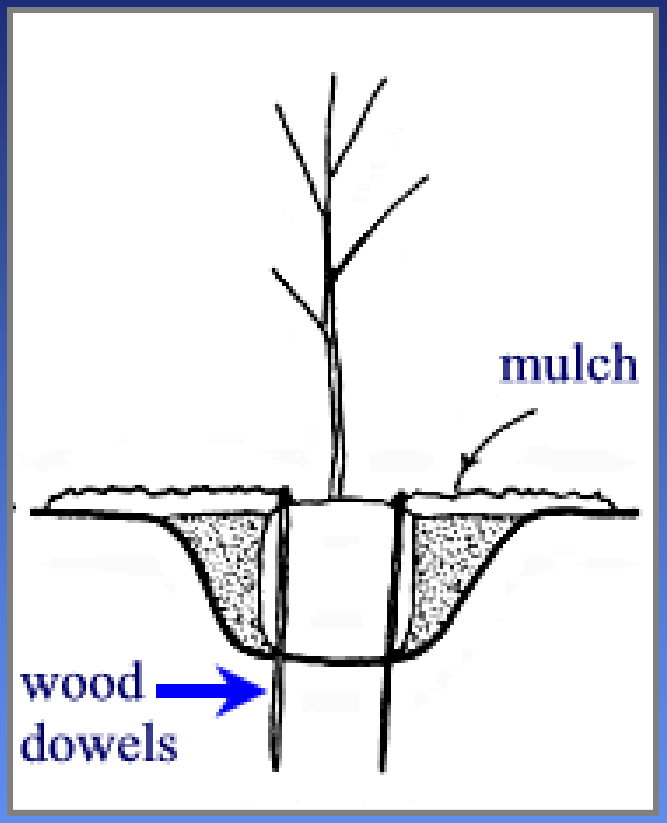
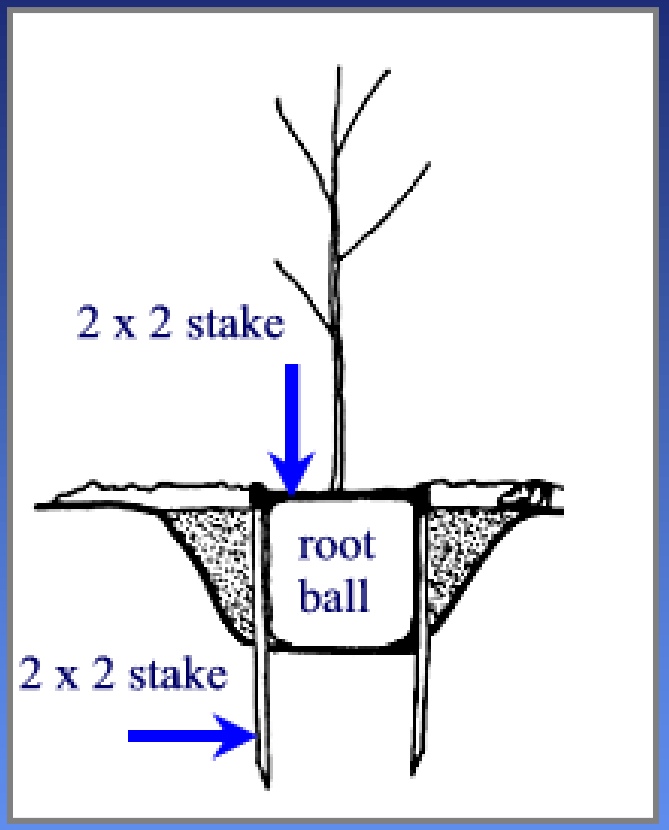


Figure 3

- All these systems require removal within one year of planting

Alternative staking methods





- These inexpensive alternative staking systems do not need to be removed because they simply decay in a few years

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Watering
Fertilize with H2O

Table 1. Irrigation Scheduling for Recently Planted Trees

Size of nursery stock	Irrigation Schedule for Vigor [1,3]	Irrigation Schedule for Survival [2,3,4]
< 2 inch caliper	Daily for 2 weeks; every other day for 2 months; weekly until established.	Twice weekly for 2-3 months
2-4 inch caliper	Daily for 1 month; every other day for 3 months; weekly until established.	Twice weekly for 3-4 months
> 4 inch caliper	Daily for 6 weeks; every other day for 5 months; weekly until established.	Twice weekly for 4-5 months

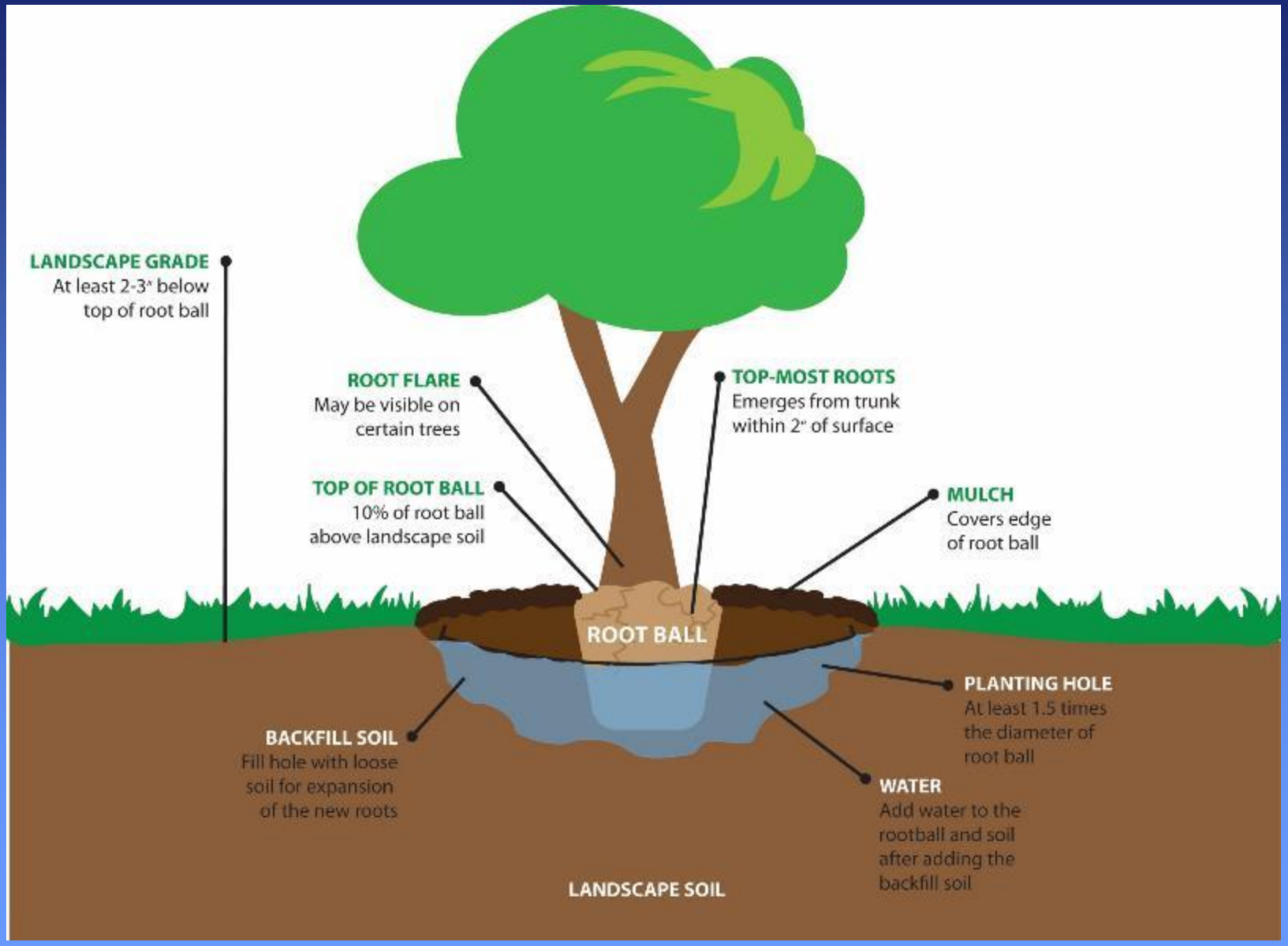
[1] Delete daily irrigation when planting in winter. Irrigation frequency can be reduced slightly (e.g. two to three times each week instead of every other day) when planting hardened-off, field-grown trees that were root-pruned during production. Establishment takes three (hardiness zones 10-11) to four (hardiness zones 8-9) months per inch trunk caliper.

[2] Irrigation frequency can be reduced slightly (e.g. to once or twice each week) when planting hardened-off, field-grown trees that were root-pruned during production.

[3] At each irrigation, apply two to three gallons per inch trunk caliper to the root ball. Apply it in a manner so that all water soaks into the root ball. Do not water if root ball is wet/saturated on the irrigation day.

[4] Trees take much longer to establish than three to four months per inch trunk caliper when under-irrigated. Be prepared to irrigate the following summer.

Proper planting - Review



Summary: Establishment

Encourages growth	Limits growth	Little or no effect
loose soil	compacted soil	peat or organic matter added to backfill soil
proper irrigation management	little or no irrigation	root stimulant products
mulch 8' or more around planting hole	grass and weeds close to trunk	fertilizing at planting
root flare slightly above soil surface	planting too deep	adding spores of mycorrhizae*
leaving top of tree intact	pruning at planting	water absorbing gels

*can enhance growth on seedlings under certain circumstances

A lot of information in a short period of time……..Questions???