Planting for Success

Handling the Root of the Matter

Barbara Fair, Associate Professor, PhD

Properly planted and Placed trees = long-term benefits

- Trees perform significantly better with more rooting space
- **Trees planted correctly are healthier and produce larger canopies**
- Want more bang for you tree buck? Plant large-maturing trees
  - Provide more stormwater benefits
  - Provide higher levels of carbon sequestration
  - Can help mitigate urban temperatures better

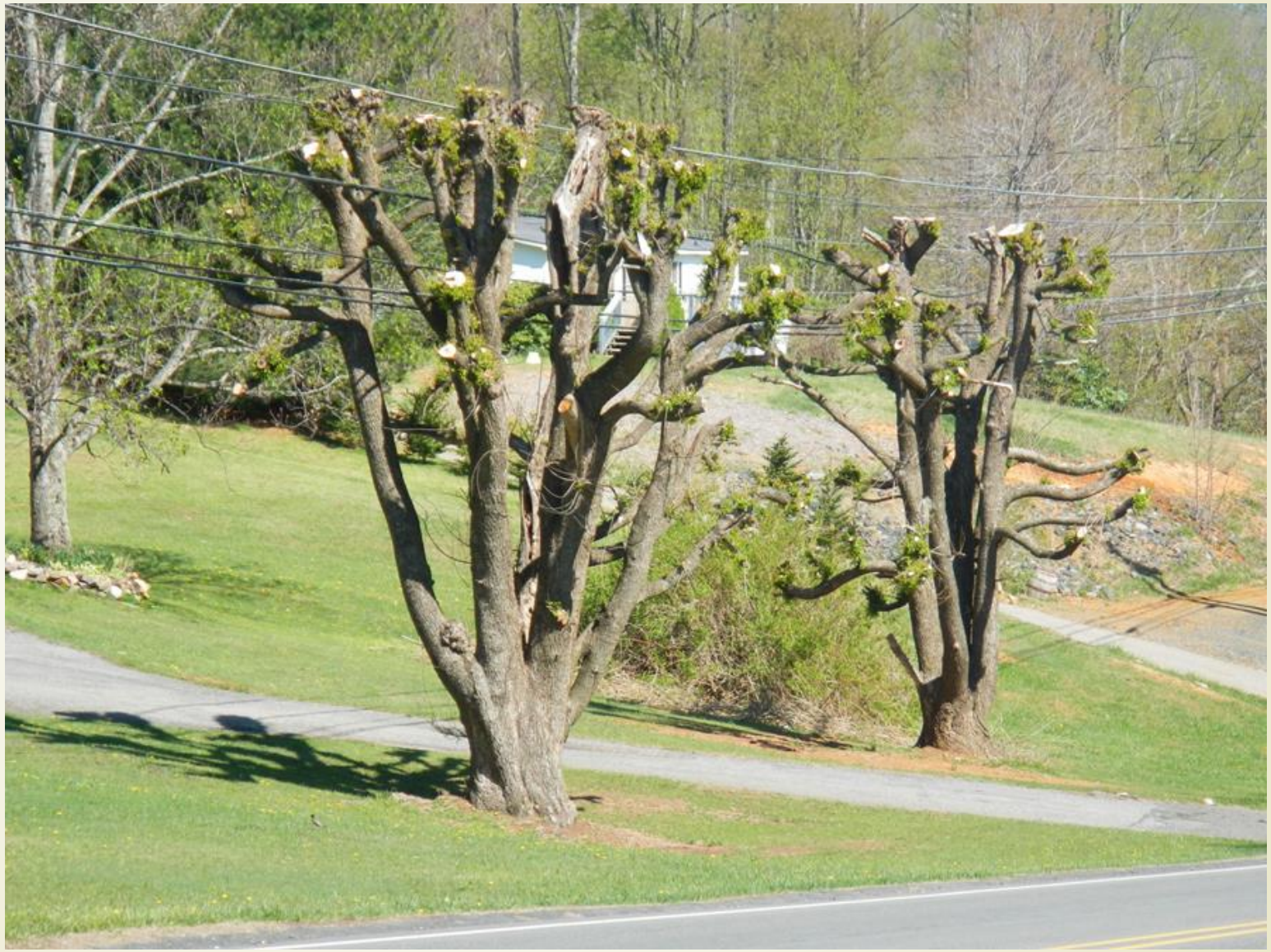
Longevity

- Even after 5-10 years trees can still die from improper planting
  - Consider this when diagnosing tree problems
- Larger tree at planting- longer to establish and longer to tolerate potentially challenging conditions
  - Trees may be dying from the moment installed

Proper Plant Selection

- IS CRITICAL TO A SUCCESSFUL PROJECT!

Proper Placement is Key to Success



Proper site/soil prep

- Many urban/suburban soils have issues:
  - Compaction
  - No topsoil
  - No organic matter
  - Lack of fertility
  - Presence of contaminants
  - Altered water and air movement and poor drainage

Good versus Bad Soil

- Soil is:
  - Countless particles, some tiny
  - Pure surface area!
  - Chemical and biological reactions- occur on the surfaces and in tiny, tiny pores

- WHAT CAN WE DO TO MAKE SOILS "BEHAVE"?

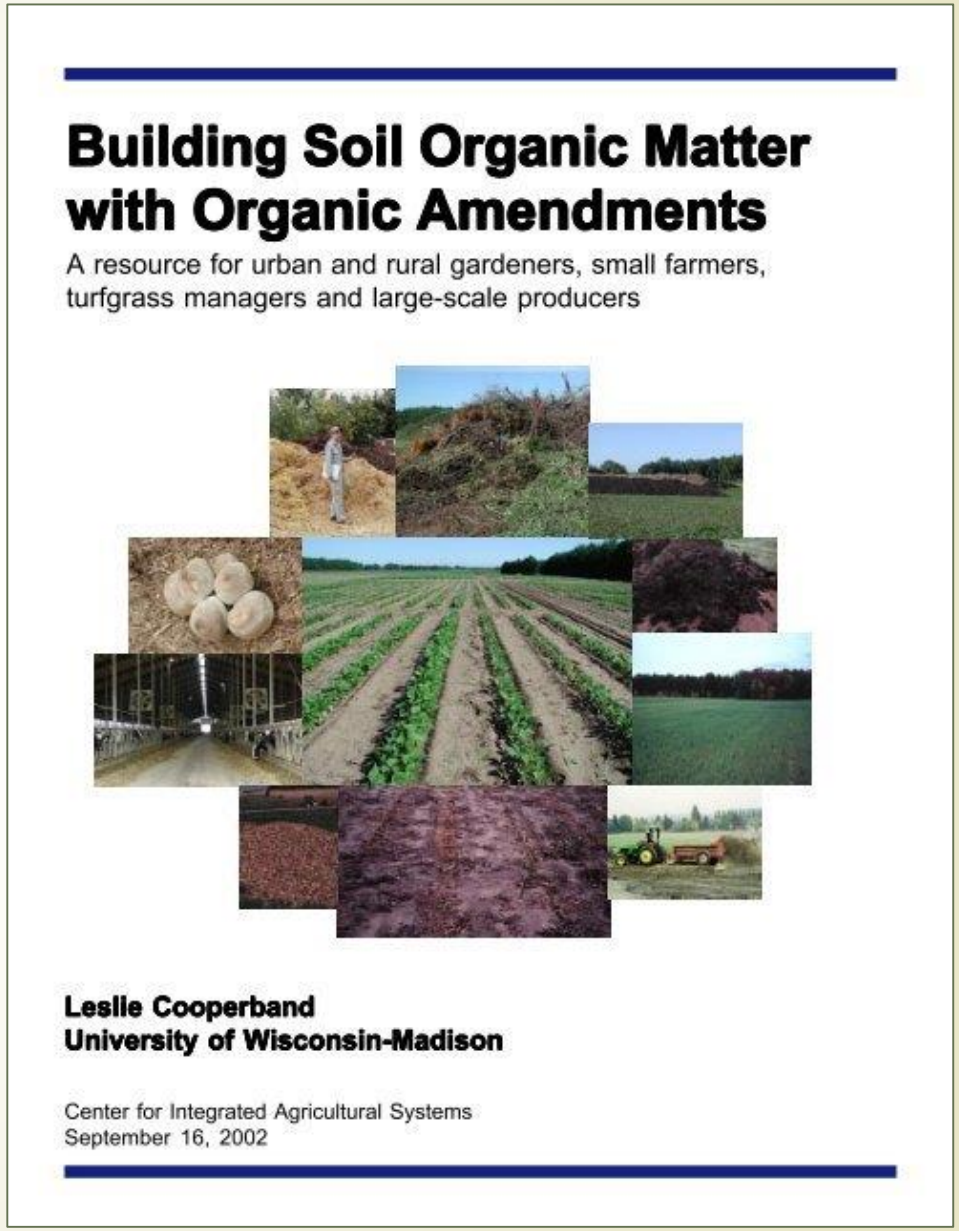
Air spade tool

Why amend?

- Mitigate compacted soil
- Alter moisture and nutrient-holding capacity
- Alter entire rooting area
- Creates healthy balance of beneficial organisms
- Induce plants to fight disease (systemic acquired resistance)
- Favors beneficial micro-organisms
- **To alter texture- amendment must constitute 50% of soil volume**

Age old method

- What?
  - Add 2-4" organic matter over surface and till in as deeply as possible
- Soil responses:
  - Reduced bulk density; increased hydraulic conductivity; higher porosity
- Plant responses:
  - Amending to entire bed or raised beds benefits root and shoot growth (Bir & Ranney, 1993), (Bryan et al., 2011)
  - Species relationship, but- caliper and biomass increased



Physically fracture soil + organic matter

- What?
  - Spread 4 – 7" organic matter (OM) over entire area
  - Use excavator bucket to pick up soil and OM to depth of ~18"
  - Drop soil from bucket to mix
- Soil responses:
  - Reduced compaction, increased carbon storage, increased aggregate stability, higher nutrient levels
- Plant responses: NOT SHOWN, but presumed BETTER
- Sax, Bassuk, et. al (Urban Forestry and Urban Greening, May 2017, Vol. 24

Soil profile rebuilding

Photo-Rachel A. Layman

- Spread organic matter- 4" depth across entire area (about 25%)
- Use backhoe to incorporate to 24" depth
- Add 4 - 8" of topsoil, till in
- Plant
- Puts "soil" components in place for restoration similar to undisturbed soils
- Complete restoration process requires: root activity many years.

https://www.urbanforestry.frec.vt.edu/SRES/#spec

- Soil rebuilding creates:
  - “veins” of compost deep in soil profile
    - Creates root channels
  - formation of soil aggregates over time

Common planting Issues

Volcano mulch? Or
Planted too high?

Planted too low?

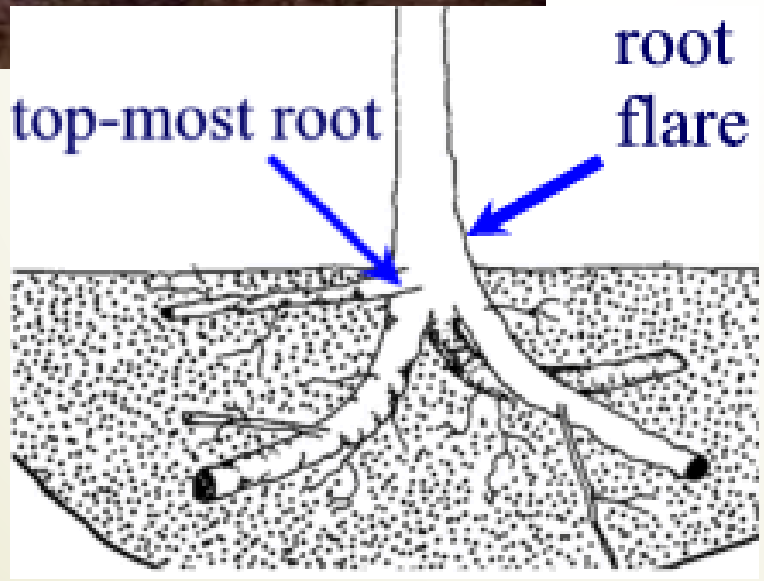
Not only unattractive but can lead to problems

Planting Stock

- Bare root
- **Container-grown**
- B&B

Bare root stock

- 100% of roots
- Easy to move, issues with planting
- Few nurseries produce
- Species limitations



Ball & Burlap and Container-grown Stock

- Machine or hand dug
- 80-85% of roots lost
- Typically in basket
- Transportation- EXPENSIVE
- Common for large material

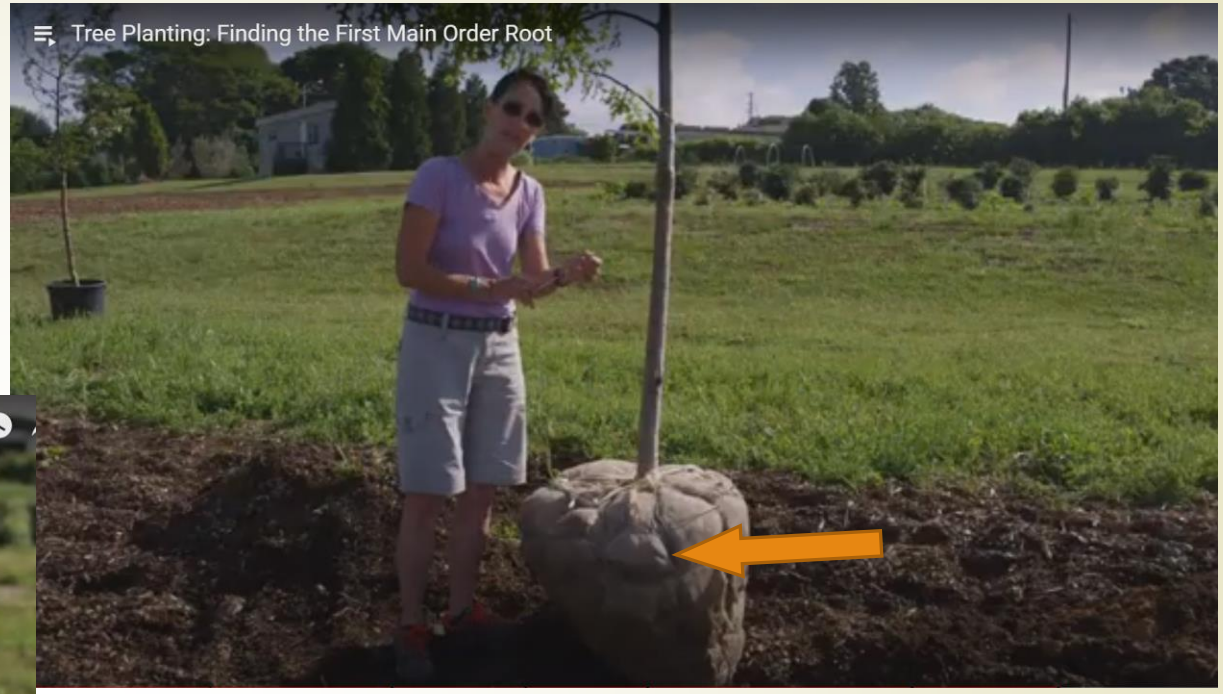
- Maintain 100% of roots
- Often root bound; girdling roots
- Transportation easy
- Easy planting-quick to dry out

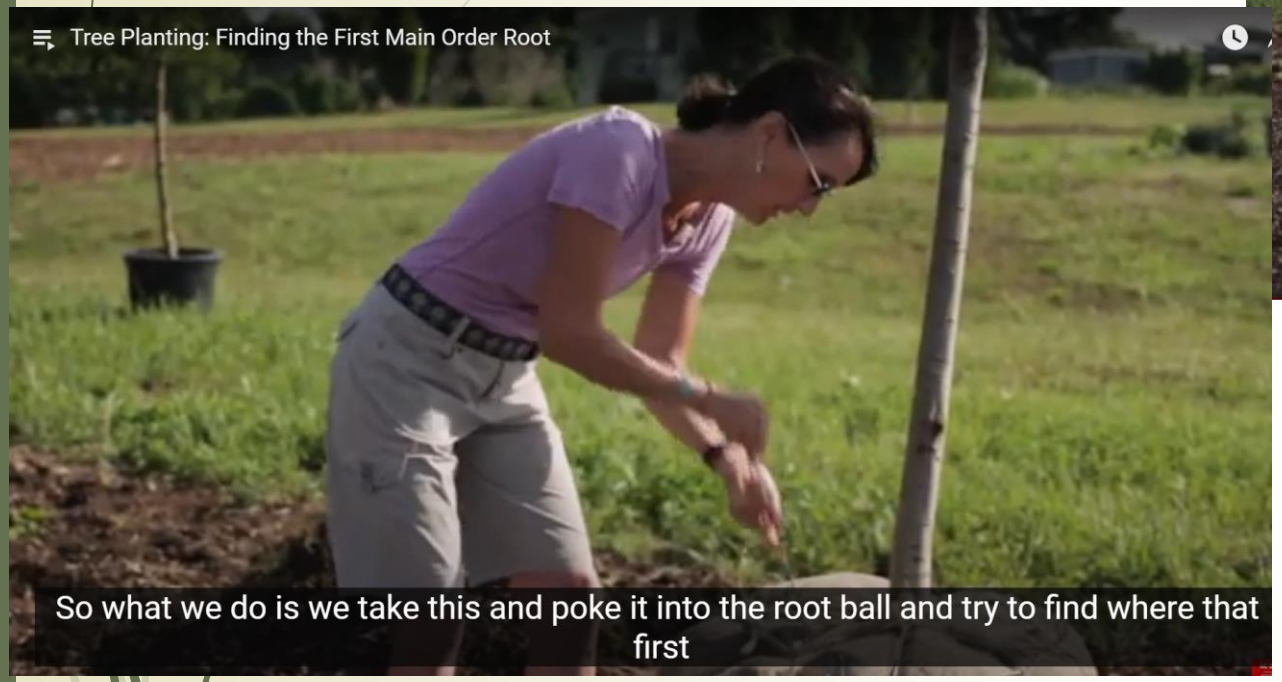
Planting hole- B&B and container-grown

- Sloping sides of hole improves establishment by increasing water infiltration (Arnold and Welsh, 1995)
- Holes 2-3 x larger in diameter had quicker rate of root growth than holes 1.2 times bigger (Watson, Kupkowski, and von der Heide-Spravka, 1992)
- Depth?
  - Based on “true” depth of root ball
  - Locate first main order root


PARKING

How deep?


Tree Planting: Finding the First Main Order Root


Tree Planting: Finding the First Main Order Root
So what we do is we take this and poke it into the root ball and try to find where that first


Tree Planting: Finding the First Main Order Root
would take our shovel ,use the end of our shovel and then we determine ,all right! this is the depth of the hole that we need to make

Root pruning

- Shave around outer edge of rootball and slice radially, "butterflying" the root ball, staying about 3" out from the trunk

Gilman, E. F.; Harchick, C.; Wiese, C. 2009

Research shows that compacted soil means- delayed establishment, plant dieback and death!!!

The "Mis-mulching of America"

- Finish off with proper mulching
  - No more than 3-4" hardwood on woody beds
  - No more than 4-6" pine straw on beds
  - No more than 1-2" in herbaceous/flower beds
  - Use good products

Proper Mulching

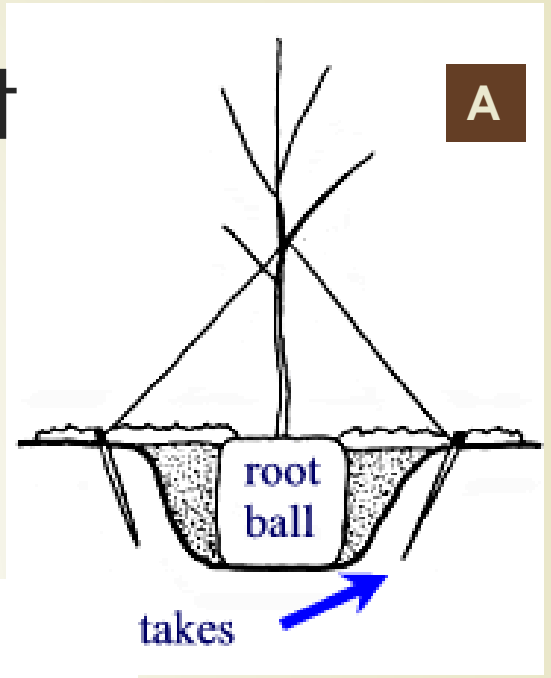
- Conserves soil moisture
  - Water lost ↓ by 21% in summer
- Reduces fluctuations of soil temperature
  - By 10° F in summer

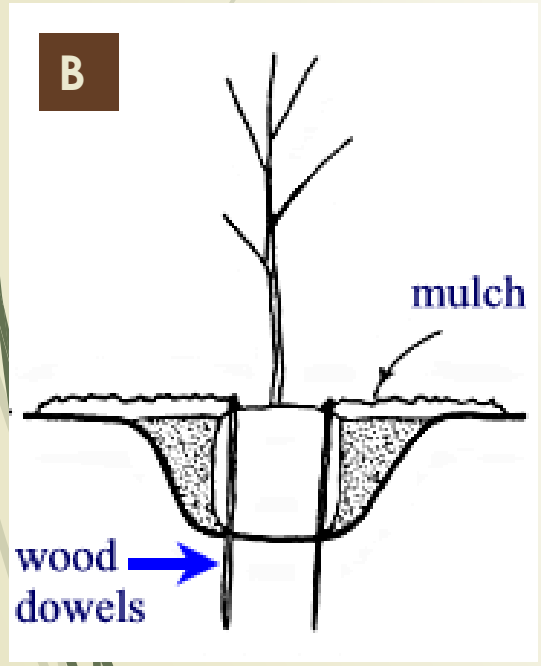
- Proper mulching:
  - Reduces weed competition by 80-90%
  - Reduces compaction and erosion
  - Reduces heaving of small plants

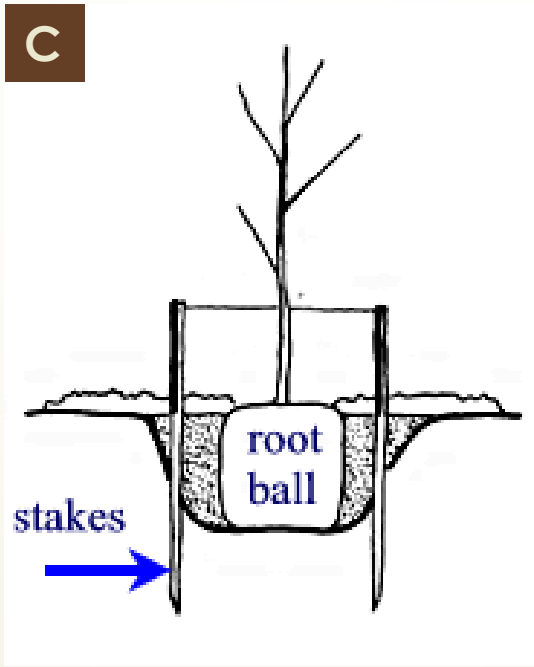
Stake properly or not at all

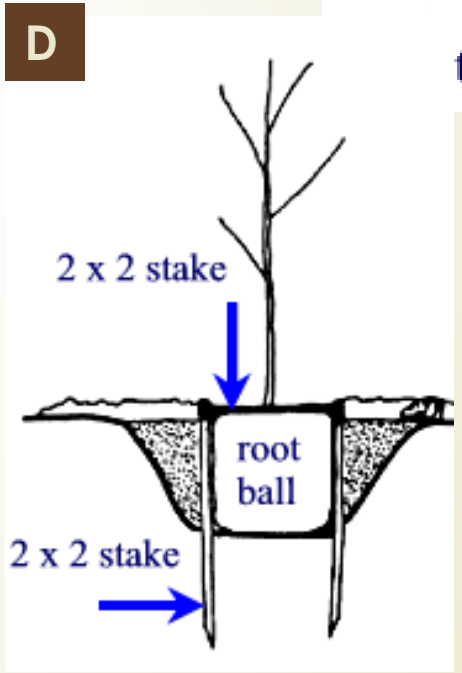

WAL★MART
SUPERCENTER

New staking methods can alleviate a lot of issues (if staking is necessary)









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Trunk Wrap

- Research indicates:
  - Does not protect against frost cracks
  - Likely does not protect against sunscald
  - Can protect against animal and mechanical damage

Water

- Lack of proper irrigation post-installation leads to:
  - Poor root establishment
  - Gradual decline of health
  - Nutrient deficiencies
  - Root rot issues
  - Weak or stunted growth

Amazing what a little water can do…

Plant Establishment- How long?

- **For a 2” caliper tree :**
- **6 months in zones 9-11**
- **1 year in zones 7-8**
- **2 years in zone 2-6**

What does established mean?

Most roots have grown a distance equal to 3X the distance from the trunk to branch tips

Procedures that encourage establishment

1. Loose soil
2. Proper irrigation Management!
3. Mulch ring of about 8' around planting hole
4. Root flare at or slightly above grade
5. Minimize pruning to serious structural issues

Information on tree establishment from Ed Gilman, U of Florida

Factors that limit growth

Not mulch!!!

1. Compacted soil
2. Little or no irrigation
3. Grass or weeds growing too close to trunk
4. Planting too deep or too high
5. Heavy pruning at planting

Factors that have little or no affect

1. Peat/organic matter added to backfill (single hole)
2. Root stimulant products
3. Fertilizer at planting
4. Adding mycorrhizae spores (can enhance seedling growth for some species)
5. Water absorbing gels

Watering Recommendations

Size of tree	Watering amount*	Watering duration	Watering frequency
<2" caliper (15 gallon container-grown tree)	5 – 10 gallons	2 – 5 minutes	2X per week during 1st growing season, then once a week as needed
2 – 4" caliper (15 – 25 gallon container grown tree)	10 – 25 gallons	5 – 10 minutes	2X per week during 1st and 2nd growing seasons, then once a week as needed
>4" caliper (>25 gallon container grown tree, or tree that has been in the landscape more than one year)	25 – 60 gallons	10+ minutes	2X per week during 1st – 3rd growing seasons, then once a week as needed

How to apply water?

The Bottom line…

- Species and soil texture dependent
- 2 to 3x diameter hole at right depth for root ball
- Plant trees in amended beds where possible
- DO NOT COMPACT FILL SOIL
- Stake where necessary and do it correctly
  - Lots more options available
- Plants are quite resilient!
- No one size fits all…

Resources

- Contact Barbara Fair, at bfair@ncsu.edu
- Check out my planting and pruning videos at-

https://cals.ncsu.edu/horticultural-science/people/bfair/

- For free, downloadable PDFs and Specifications for Planting (**CADD compatiable**) check out www.hort.ifas.ufl.edu/woody
- Thank you!