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Pruning Roots during Plant Production

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Objectives:

The overall goal of this presentation is to acquaint you with procedures used for pruning roots of woody plants during nursery production. These procedures are directly applicable for commercial nurseries that produce ornamental and native plants. The procedures described should be used carefully since pruning roots can stunt shoot growth of plants. Specific presentation objectives include:

1. Describe and summarize root pruning techniques and their timing.
2. Summarize the effects of root pruning on plant growth and nursery production.
3. Describe undercutting practices used at commercial nurseries.

I. PRUNING ROOTS¹

A. Reasons to Prune Roots of Nursery Stock Production

1. Stimulate a dense, compact root system for a high root to shoot ratio
2. Confine the root system to facilitate digging – keep in a smaller volume
3. Avoid root problems later in time – circling or kinked roots in containers
4. Limit the rate of shoot growth for plants growing too fast

B. Definitions for Pruning Roots

1. Undercutting - pruning roots of plants while they are growing in the field

¹ This handout is available at: <http://extension.ag.uidaho.edu/nursery/>

- a. Usually involves cutting the taproot and deep roots
 - b. Roots are cut or severed
 - c. Results in a fibrous root system, and shoot growth is usually slowed
2. Wrenching - is a nursery operation that loosens the contact between the roots and soil
 - a. A tilted blade is often used for wrenching
 - b. This procedure should stress plants to slow their growth
 - c. Usually only seedlings are wrenched
 3. Root pruning - pruning roots while they are out of the soil, such as at transplanting time
 - a. Small stock is pruned before planting into pots or the field
 - b. This procedure helps improve the root system – size and shape
 - c. This procedure may also stimulate new root formation
 4. Box pruning - making lateral cuts on all four sides of the root system, using a disk or knife blade implement. Roots are cut in one direction the first year and then the other direction the second year

C. Methods of Undercutting Roots in the Field

1. Bottom roots - pruned with a U-shaped blade
2. Sides of the root ball - pruned with a colter disk or knife-like blade

3. Depth of undercutting depends on the plant size
 - a. Seedlings should be undercut 4 to 8 inches deep
 - b. Shrubs and trees should be undercut between 10 to 36 inches, depending on plant size
4. Proper soil moisture is important when cutting roots to prevent or minimize plant wilting
 - a. Moist soil is less disturbed than dry soil
 - b. Plants should be watered soon after cutting roots to re-establish good soil-root contact

D. Plants to Undercut or Root Prune

1. Most bare-root, balled and burlapped, and transplant liners
2. Deep rooted field plants, especially those with taproots
3. Plant with sparse root systems
4. Seedlings in seed beds
5. Transplant liners
 - a. Trim or prune roots during transplanting
 - b. Cut roots so that they are shorter than the depth of the pot or planting hole
– AVOID bending, kinking or circling roots in the pot or planting hole

E. Timing of Undercutting

1. The time to complete undercutting depends on the production system (bare-root versus balled and burlapped), plant age, and species
2. Seedlings in bare-root production:
 - a. Seedlings are undercut in June or July after the growth flush hardens
 - b. Undercutting at this time allows several months to regenerate roots
3. Balled and burlapped plants - literature varies on the best time
 - a. Undercut roots in the fall (late September) – one possible time
 - i. new spring growth flush adjusts to less roots
 - ii. new spring growth stimulates root formation
 - b. Undercut roots after the growth flush hardens (mid-June to September) – the second potential time for undercutting
 - i. shoot growth is less stunted than that caused by the late September undercut timing
 - ii. foliage promotes root regeneration
 - iii. plant puts energy into root regeneration in late summer
 - c. For plants with indeterminate growth or several growth flushes, cut roots after the last flush (near September)
 - i. if cut early in the season, growth flushes are stunted
 - ii. later growth flushes are unaffected if undercutting in September

- d. Take home message: Consider how the timing of cutting roots affects subsequent shoot growth, since undercutting can severely stunt shoot growth!
4. Timing in relation to plant growth and harvest
- a. Seedlings - are undercut or wrenched in June or July and dug in fall or early the next spring
 - b. Older plants or balled and burlapped stock are under cut about one year before digging
 - i. if undercut too many years before harvest, then one root can predominate again
 - ii. if undercut too close too harvest, then too few new roots may form
- F. Summary Information on Undercutting or Lateral Pruning of Roots on Balled and Burlapped Stock
- 1. Make the cut size of the root ball smaller than the final size
 - 2. Dig the larger size root ball about one year later
 - a. Dig the root ball to nursery standards
 - b. The larger size root ball will include more roots than non-pruned stock

II. PRUNING ROOTS AT COMMERCIAL NURSERIES

- A. Undercutting Deciduous Trees at Carlton Plants in Oregon
- 1. Deciduous trees are undercut with a U-shaped blade in mid-October just before or slightly after leaf drop to avoid stunting shoot growth
 - 2. The undercutting depth and width is 18 to 24 inches depending on the species and plant size at harvest

3. Undercutting is good for species with coarse root systems or those difficult to transplant. Species undercut one year in advance of harvest *Celtis*, *Gymnocladus*, *Gleditsia*, *Quercus*, *Aesculus*, and *Fraxinus*.
4. Ash trees are undercut to control top growth. Shoots grow one-third less after undercutting.
5. Trees are harvested one year after undercutting.

B. Undercutting Conifer Liners at Sester Farms in Oregon

1. Conifer liners (3 years old) are undercut with a U-shaped blade in August.
2. Roots are cut in a perpendicular direction with a shovel (by hand).
3. Plants are dug in the fall and either potted or field planted.
4. Field trees are grown four more years and harvested as 5 foot tall trees.
5. Harvested trees are either sold or transplanted to the field to be grown as specimen trees.
6. All conifers are undercut, particularly pines due to their sparse root systems. This technique causes many pencil-sized diameter roots to form rather than just a few large roots.

C. Arborist Point of View – Root Pruning May Lead to Girdling Roots

1. Pruning roots in the nursery creates an artificial root system on plants.
2. Pruning roots disrupts balance of natural plant growth regulators (auxins and cytokinins) in the root tissues.

3. Results from cutting the roots are a profusion of secondary and tertiary roots forming, and these roots seem to grow faster than primary lateral roots.
4. Orientation of these rapidly growing roots seems to be tangential to the trunk rather than radial and away from the trunk.
5. Girdling roots have been seen on trees with 2-inch diameter trunks.

D. Summary

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