

(This is a reprint of the original document.)

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1.0 TREE PROTECTION DURING CONSTRUCTION

According to Florida Forest Statistics, 1987, (USDA Forest Service Resource Bulletin SE-101) during the period 1980-1987, almost 600,000 acres of Forest Land was lost to other Land uses, primarily urban. While most of the trees, are removed, many are "saved" on home sites or commercial sites only to die later. Construction damage to trees is the most common cause of tree decline in urbanizing areas, often taking several years to be noticed.

The causes of decline and their effects can be grouped into five major categories:

A. Direct Trunk or Branch Injury

This type of injury disrupts the movement of water and sugars throughout the tree and may lead to decay and hollows. Less often considered is the possibility that severe root injury may have occurred for the equipment to have damaged the trunk.

B. Changes in Grade

1. Lowering the Grades Around Tree

Contrary to popular belief, the majority of a trees root system is close to the surface, usually within the top eighteen inches. The fine feeder roots are often within the top six inches. Loss of these roots may lead to desiccation and mineral deficiencies. Loss of major support roots may make the tree unstable. Note - very few trees have a true tap root. Lowering the grade may also cause changes in the drainage patterns on the site.

2. Placement of Fill

While roots are rarely removed (as in lowering the grade) fill operations may still cause great harm. Often the timeframe between fill and the onset of decline is several years. Fill reduces aeration to the root zone by lowering available oxygen (O₂) levels while CO₂ and ethylene levels rise. Use of fill having a different soil texture than the native soil may change drainage patterns in the soil. Fill placed over existing sod or leaves may create a smothering effect.

C. Soil Compaction

Native soils have a large volume of pore space. This space permits air, water and roots to move through the soil. Soil compaction whether intentional (prelude to paving, foundations) or unintentional (driving equipment, storing materials) reduces these pore spaces resulting in decreased aeration and water infiltration. The type of soil often has a strong influence on the amount of damage. Clay and organic soils compact far more easily and have more roots close to the surface than sandy soils.

D. Utility Installation

Often unexpected, installation and maintenance of utilities result in a large amount of tree injuries. Trenching causes the complete loss of the root system outside of the trench area. Tree trunks and branches may be damaged by equipment. Poor quality pruning may result

in dieback or decay of the tree.

E. Chemical Injury

The shallow nature of most roots makes them more prone to chemical injury than most people realize. Some of the damaging chemicals are obvious - motor fuels and oils; cleaning agents such as paint thinner. Others are less obvious - concrete truck washouts (raised soil pH), herbicides, weed-n-feed fertilizers (which contain herbicide), and excess fertilization which can burn plant tissues.

2.0 SYMPTOMS OF TREE DECLINE

In some cases such as truck damage it is obvious why the tree is doing poorly. Other times you must examine the tree closely to recognize construction injury. Some of the more common effects are:

- Slow rate of growth compared to undisturbed trees.
- Sparse, undersized, distorted, or chlorotic leaves.
- Adventitious sprouting, especially on the trunk.
- Browning of leaf margins.
- Premature autumn color.
- Abnormally large crops of fruit.
- Progressive dieback of twigs or branches.
- Insect or disease infestation.

3.0 SOIL COMPACTION

Most compaction of a soil occurs during the first pass of equipment, and two or three additional trips will compact it about as much as the vehicle is capable of compacting it (fig. 2). For this reason, most land managers favor concentrating skid trails to limit the area affected by logging.

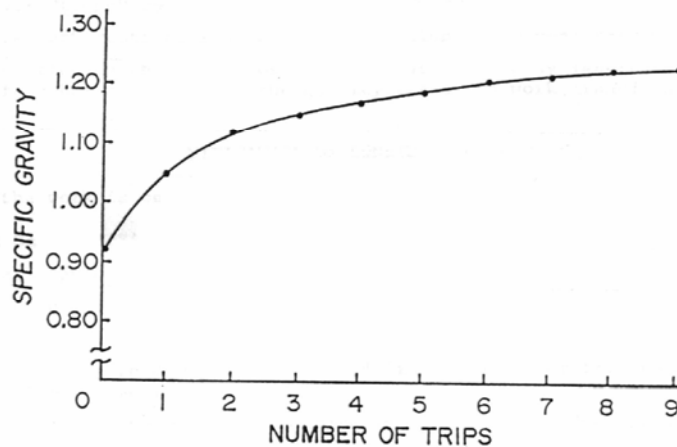


Figure 2.

Relationship of bulk density of surface soil to number of vehicular trips with 10 pounds per square inch of ground pressure. Note: Most compaction occurs during the first three passes.

Typical Ground Pressures of Equipment: (based on 48 sq. in. per tire):

Wide Flotation Machine	05 PSI
Crawler Tractor (Bulldozer)	10 PSI
Rubber-Tire Skidder	20 PSI

4000 lb. Pickup Truck

20 PSI

From: *Managing Site Damage From Logging*, USDA Forest Service General Technical Reports SE-32

4.0 TREE PROTECTION STRATEGIES

A number of tree protection strategies are often employed to minimize damage during construction:

1. Barricades - RPZ - Root Protection Zone - 2' diameter/1" DBH or Dripline.
2. Terracing to maintain original grade.
3. Tree wells and aeration systems.
4. Tunneling under roots instead of trenching.
5. Pervious pavements.
6. Heavy mulch cover 6" - 10" deep to reduce compaction.
7. Invigorate trees prior to construction - light fertilizer (1 lb. N/1000 SF) (water if possible).
8. Favor groups of trees over individuals. Favor young over old trees. Favor "tough" species.
9. "Pre-cut" roots at limits of construction to prevent tearing by equipment.
10. Education is the key - most injuries are caused by ignorance. Plan before building, locate the quality trees and work around them.

5.0 MITIGATION OF CONSTRUCTION DAMAGE

A. After the work is complete, evaluate its effect on the trees:

- IF A SAFETY HAZARD - REMOVE!
- Number 1 priority is water to prevent desiccation.
- Aerate soil by drilling holes, removing fill.

B. Pruning

- Limit pruning to damaged or unwanted limbs. wait for tree to show which other limbs need removal.
- Excessive pruning may lead to sprouting which will reduce root regeneration.

C. Treatment of Wounds to Trunk, Branches, or Roots

- If very recent, tack bark back in place, cover with black plastic for 3 months.
- If old, remove loose bark. Do not enlarge wound. Do not paint wound.
- Cut broken roots off cleanly. Do not paint.
- Spray pines to prevent beetle infestation - Dursban or Lindane.

REMEMBER: Injury may two 2-5 years or more to manifest itself. Often insects or diseases are blamed for decline and death.

Plant new, uninjured quality trees in open areas where they can grow quickly to replace construction damaged trees.

6.0 TREE PROTECTION STRATEGIES

Tree barricades and root protection zones (RPZ)

During the planning process, trees desired to be saved should be located on the site plan. A root protection zone (RPZ) may then be drawn based on two (2) times the tree diameter (inches) in feet.

Example: 20 inch diameter Live Oak $RPZ = 2 \times (\text{diameter inches}); RPZ = 2 \times (20) = 40'$ circle

If the majority of this area can be left undisturbed, the tree will likely suffer minimal damage. If more than 1/2 of this area will be disturbed, consider moving the improvements or removing the tree or trees.

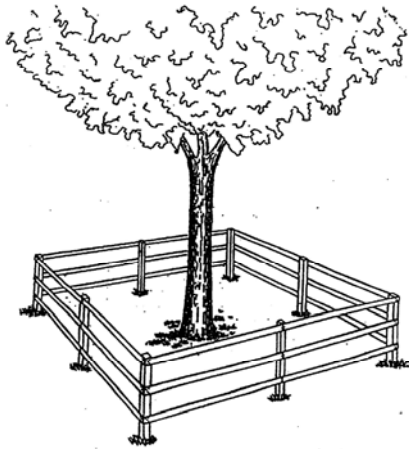


Figure 1.
A simple barrier to protect the tree trunk and part of the root system from mechanical injury.

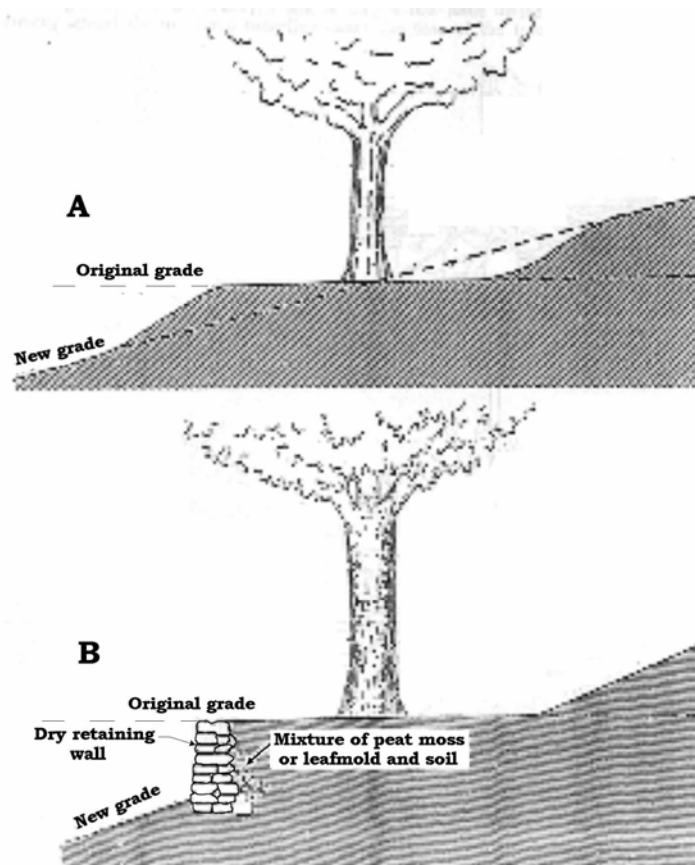


Figure 2.

Preserving a maximum number of tree roots when the general grade is lowered: A, by terracing; B, by erecting a dry retaining wall.

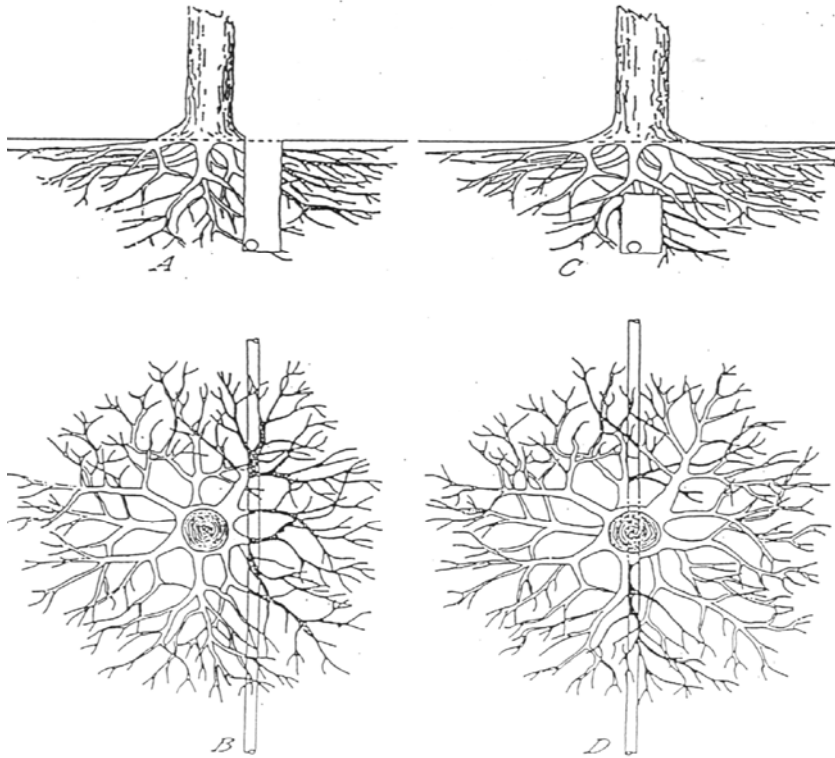


Figure 3.

Roots severed by digging trenches near a tree. Severed roots are indicated in solid black. Side and top view: A and B, Many roots destroyed by trenching close to a tree trunk; C and D, only a few roots destroyed by trenching directly toward the trunk and tunneling under the base of the tree.

END OF SECTION