

Protecting Existing Trees on Building Sites



How Much Do You Know?

Answer these questions first: Then read on to find the answers.

1. What process has more to do with saving trees on a construction site than any other? *For answer see Page 2.*
 Grading Communication Design
2. Which of the following would be the best candidate for saving on a construction site? *For Answer See Page 3.*
 A group of mixed hardwoods at the front of the property.
 A large oak near the proposed building entrance.
 A cluster of mature dogwoods in an island in the parking lot.
3. If a house is worth \$100,000 on open land with no trees, what is a good guess of its value if it were on a wooded lot? *For Answer See Page 4.*
 \$90,000 \$110,000 \$120,000

If the root zone of a mature, 12" caliper tree is protected to 10 feet out from the trunk during construction, this should be adequate to keep the tree alive. *For Answer See Page 6.*

 TRUE FALSE

When placing a utility trench across a root zone of a 12" diameter tree, the least amount of roots will be destroyed if the line is placed in what location?. *For Answer See Page 8.*

 Under the tree 5 feet away 15 feet away
6. What amount of fill over the root zone of a mature tree is acceptable with no additional special techniques? *For Answer See Page 10.*
 Up to 12" Up to 6" Up to 2" None of the Above
7. Which of the following can cause serious injury or death to a tree on a construction site? *For Answer See Page 11.*
 A roto-tiller A cement mixer A trenching machine
 All of the above None of the above
8. If the tree to be saved produces new leaves the year following construction, protection practices have been successful. *For Answer See Page 12.*
 TRUE FALSE

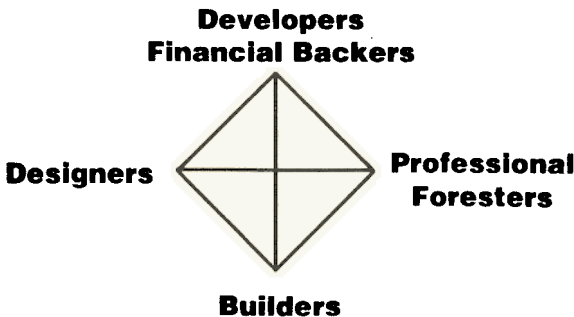


I Hear You.

The answer to quiz question Communication. Without it the rest of the information in this booklet is useless.

If you believe it's bulldozers that damage trees on construction sites, you're only partly right. It's the bulldozer driven by the operator who wasn't told by his supervisor who never talked to the general contractor about it, who never made it clear because the plans from the designer didn't show it, because the designer and developer did not discuss the importance of the existing trees ahead of time.

- **Good communication between developers, designers, consultants and contractors is absolutely essential to any tree protection effort.** The correct processes must happen in the correct order if valuable trees are to be saved. This takes constant awareness on the part of all those involved in the construction process.
- **Never assume that somebody else knows what is going on.** One mistake can destroy half the pore space in the soil under a tree and spell its doom. If existing mature trees are important, it is important to communicate that fact to everyone on the site.
- **It costs money in time and special construction practices to save trees.** Take the extra time to keep lines of communication open between the four groups of "players" in the tree protection game:





What Trees To Save?

The answer to quiz question Save the mixed hardwoods at the front of the property.

Three factors need to be considered when choosing trees to save on a construction site:

- **Species**
- **Location**
- **Age and Health**

The large oak near the proposed entrance of the building is a wonderful design feature, clearly adding to the character and scale of the project. However, any large tree also has a very large root zone, and if it were near the foundation of the building, it is very likely that a large portion of the roots would be destroyed in the excavation process. **Older trees are less adaptable and are more likely to be damaged irreparably by the construction process.**

The clump of dogwood would add color and a sculptural effect to the parking lot. Also, saving a group of trees is often easier than saving one specimen. The dogwood, however, is an understory tree. If the overhead canopy of tall trees were removed and the dogwoods were left to re-adapt to the hot sun and dryness of a parking lot, no matter how well their roots are preserved they will probably not survive. **Make sure the species you protect is adapted to change and to the situation it will experience post-construction.**

A mixture of species in a group, where a large area beneath can be protected from compaction and mechanical damage is your best bet. If one species proves intolerant to the construction process, others can fill in its place. The location of the trees is important. Near the building where foundation work is to be done, damage may occur from excavation. **Identify trees to be preserved in groups whenever possible, and away from proposed building foundations.** Shallow-rooted trees such as maple and dogwoods need particular care. Some, like scarlet or white oaks, may look fine the first year, but will decline and die after several more. **Always choose healthy, disease-free stands of trees to protect.** Construction stress will make any pre-existing pest or disease problems worse. Consult a professional arborist, forester or landscape architect to help choose trees you wish to save.



Money Does Grow on Trees.

The answer to quiz question \$120,000. Studies have shown that trees contribute as much as 27% of the appraised land value in certain markets.

Clearly, trees have a value that goes beyond the beauty and shade that they provide. They are a salable resource for both homeowners and developers. **The retention of a stand of healthy mature trees on a building site can translate into a higher sale value than a cleared site, all other things being equal.**

A cost benefit analysis of existing trees on a site should consider several factors:

- **Marketability of wooded lot:** Are trees in a place where they can be an asset to the design of the development or building? What size are they? What is the condition of the trees? What species?
- **Appraisal of tree value:** The Council of Tree and Landscape Appraisers has developed a method for estimating the dollar value of trees. This formula is: **Basic Tree Value x Species Class x Location x Condition.**

Some Basic Tree Values (will vary by region)*

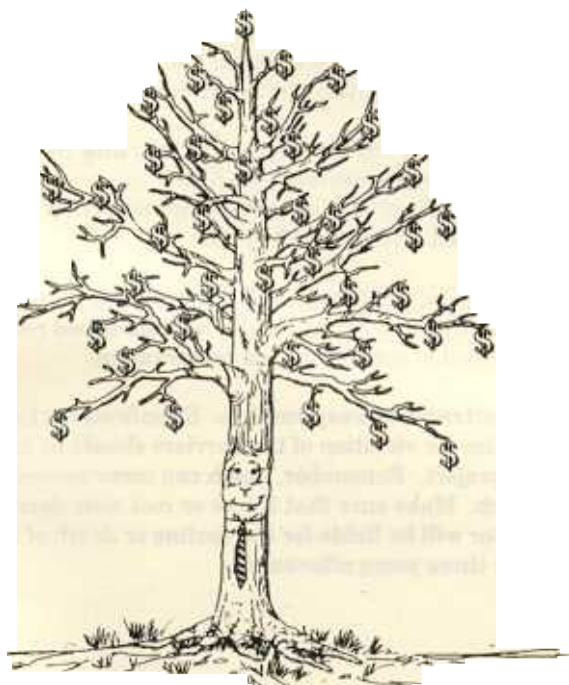
10 in. diameter	\$1729
14 in.	\$3388
18 in.	\$5588
26 in.	\$11682
30 in.	\$15554

- **Species Class:** A percentage figure based on the relative quality of a species in each region of the country.
- **Location:** Again, a percentage based on the location of trees on the property. Trees close to a driveway, for example, might not have as high a location value as trees off the corner of the building.
- **Condition:** Trees with diseases, construction or storm damage, etc. can lower this rating and affect the value of a tree.

*From "How Valuable Are Your Trees" by Gary Moll, an article in the April, 1985 issue of *American Forests* Magazine.

• **Other factors to consider:** Unhealthy, declining or diseased trees are usually not valuable. Healthy, strong specimens are often worth it. To replace the effect they create will take 40 years or more with newly-planted trees. Long-lived species of trees, like oaks, elms, maples, etc. are very valuable. They will continue to be an asset for generations. Trees with shorter lives, like Bradford Pears, locusts, willows, etc. are worth less because the cost of protecting them may only have a 10 or 15 year payback. Large, open grown specimens are worth the most (and cost the most to protect).

• **Trees continue to pay off:** Remember, the dollars and cents of tree protection does not stop with the aesthetic value of the tree. **Trees can reduce energy costs.** Stands of trees can lower the temperature around them as much as 7° through evapo-transpiration and, compared to adjacent sunny spots, the shade provided by trees can lower the temperature at ground level by up to 20° . Shade cast on buildings can lower cooling bills by 10-30%





Don't Tread On Me.

The answer to quiz question False. Most of a tree's feeder roots extend well out from the trunk, often well beyond the "drip-line". In this case a 10' protected area may only protect 2% of the feeder roots.

- **Protect the Root Zone.** A common misconception is that a tree's roots stop at the "drip-line" or the extent of the outermost branches. As a rule of thumb, roots generally extend at least 1 1/2 times the height of the tree (50' tree will have roots 75' from the trunk) and much more in certain circumstances. The system of woody and non-woody roots holds the tree up and provides it with a means to obtain oxygen, moisture and nutrients necessary for it to produce food and continue to live. In other words, damage the roots...kill the tree.

- **Tree protection means soil protection.** If the soil beneath the tree becomes compacted by piles of building material, foot or vehicle traffic or pavement, the tree will "suffocate". If the proper organic nutrients are not present, the tree will not be able to produce its food and it will "starve".

- **Protect the tree and its soil by restricting all activity in the root zone.** Build a barrier around the tree as far away from the trunk as feasible. If you build the barrier to protect less than the area within the "drip-line", you must accept the risk that the tree will suffer serious damage and will die within 2 to 5 years. The barriers should be built this way:

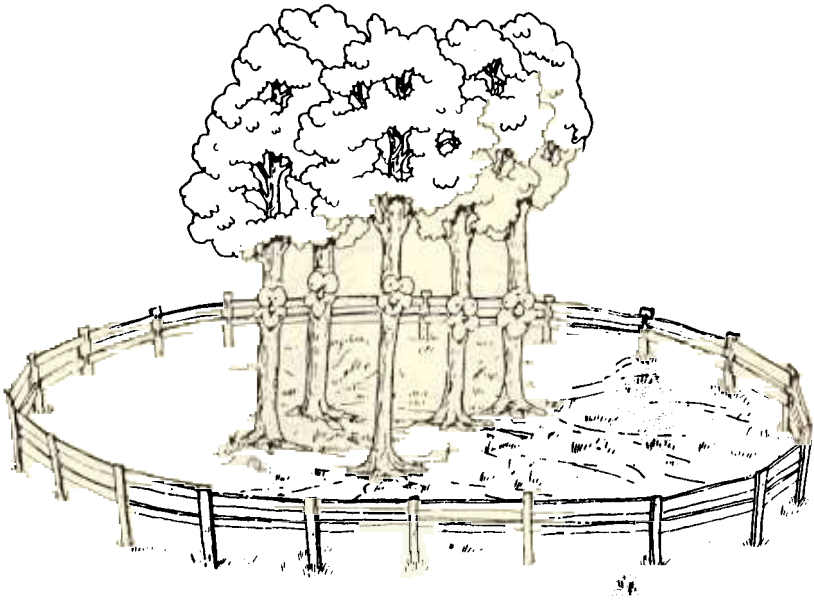
- Use 4"x4" posts, 1" x 6" rails, one at the top, one in the middle.
- Build the barrier a minimum 3'-6" high
- Erect signs indicating that no building materials or equipment is allowed to be stored within the barrier

- **Whenever possible, protect groups of trees in a large common root area.** The greater the area of continuous non-disturbed root zone, the greater the likelihood of success in tree preservation.

- **Make your contractors responsible.** Specifications for the protected areas and penalties for violation of the barriers should be set forth in the contract for the project. Remember, death can occur several years after damage on the job. Make sure that if tree or root zone damage is done on site that the contractor will be liable for the decline or death of the tree for a period of at least three years afterward.

• **Care for your soil.** If an area outside the barricade is to be disturbed or excavated, and it is likely that tree roots will grow in this area after construction, amend the soil that is to be backfilled so that it has plenty of organic matter (leaf mold, organic topsoil, etc.)

• **Protect trees during cleanup.** Often the best laid and best executed tree protection plans go down the tubes during the cleanup process. All it takes is one front-end loader carrying a pile of refuse to back over the root zone, and 50% of the pore space in the soil is lost. Always require that tree barriers be the very last item removed from the site! Haul debris away. Do not allow it to be burned or buried on-site. If it must be burned, burn in an area where flames and heat cannot reach branches or roots.





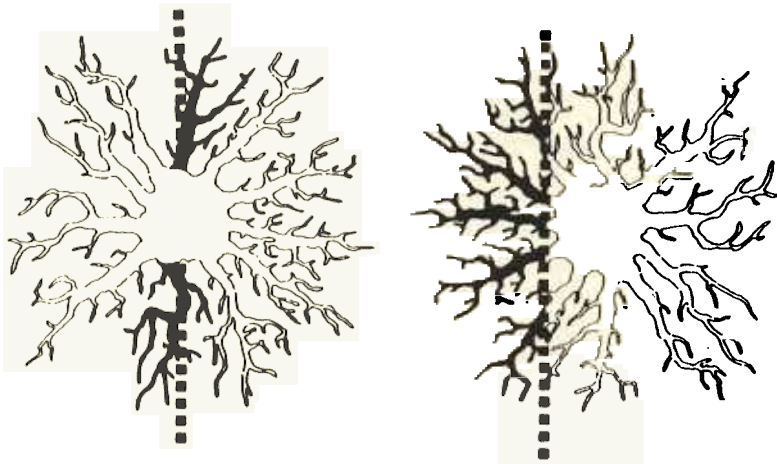
Watch Where You Dig.

The answer to quiz question Directly under the tree. See the illustration below to show how the other options destroy more roots.

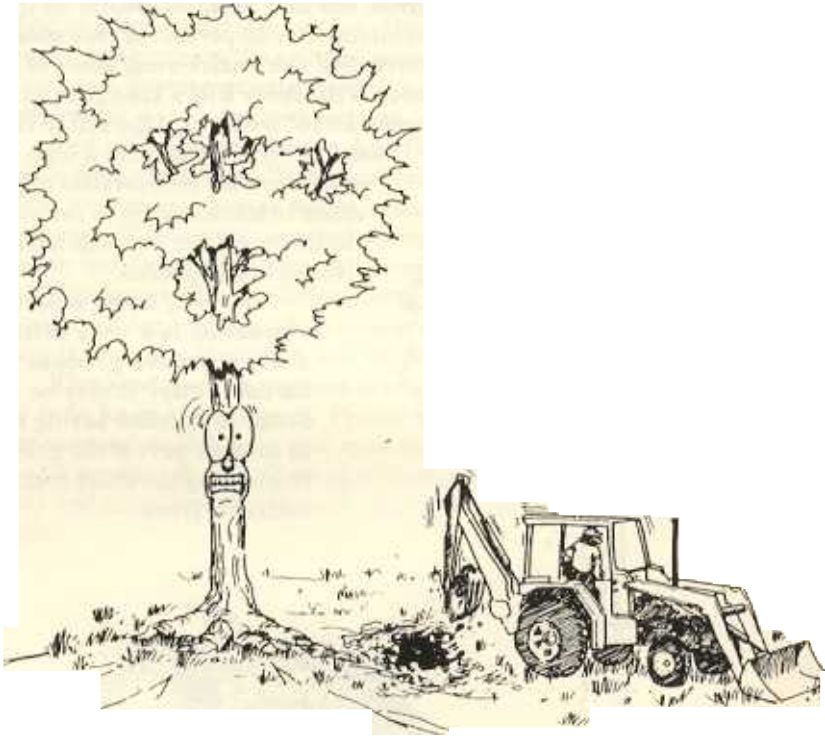
Excavations for underground utility lines can undo all the other good work you may have done to protect your trees. Plan the location of trenches carefully. It may seem to fly in the face of common sense, but **aim the lines directly for the trunk of the tree you want to save.** The illustration below shows how up to 50% of a tree's roots can be severed by trenching across one side or the other, while trenching up to the trunk and tunneling beneath will damage or destroy only about 10% of the roots.

Excavations for utility lines are not the only digging processes that will sever roots. **Plan carefully the location of building foundations relative to trees you wish to protect.** Bear in mind that, as a rule of thumb, tree roots extend out from the trunk generally 1 1/2 times the height of the tree.

When cutting a slope in a previously level grade, leave as great an area beneath the tree undisturbed as possible. **Use retaining walls rather than grading.**



Use raised walkways and decks whenever possible. Most of a tree's feeder roots are in the top 6" of soil. Many of them can be severed or destroyed by so simple a process as the installation of a sidewalk. Driveway pavement not only severs or damages roots in construction and compacts soil in root zones, but creates an impervious surface through which tree roots can no longer breathe or absorb moisture. Plan your driveways in areas where re-planting of new trees is to occur.





Prevent Tree Suffocation.

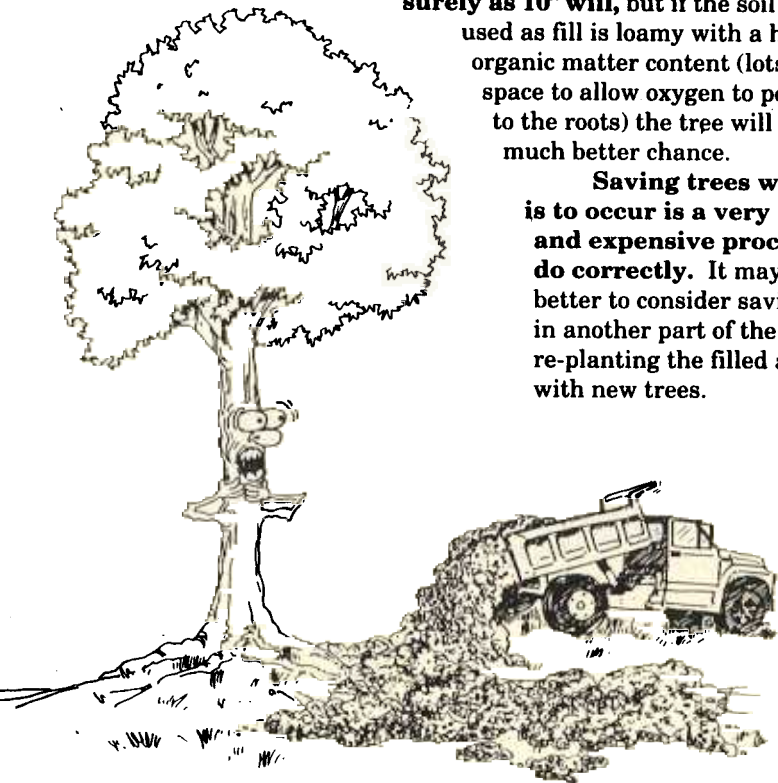
The answer to quiz question None of the above. Even though many experts would accept varying amounts of fill, always pay attention to the composition of the soil.

Trees absorb oxygen through their roots. Most of the feeder roots are in the top several inches of soil. If these roots are covered with fill, the oxygen supply to the roots may be cut off and destroy the tree. Building a dry well around the base of the trunk will not suffice to let these feeder roots breathe. **An engineered system of air vents made out of drain tile or perforated PVC pipe built across the entire extent of the root zone is necessary where fill is to occur over tree roots.** The use of filter fabric and a bed of small stones will also help keep a ventilation system at work under the soil fill.

2" of fill may not be fatal to trees, but that depends greatly on the composition of the fill, tree species, maintenance and percent of root zone covered. **2" of heavy clay backfill covering the entire root zone of a tree with no additional maintenance will likely kill a tree just as surely as 10' will,** but if the soil to be

used as fill is loamy with a high organic matter content (lots of pore space to allow oxygen to penetrate to the roots) the tree will have a much better chance.

Saving trees where fill is to occur is a very difficult and expensive process to do correctly. It may be better to consider saving trees in another part of the site and re-planting the filled areas with new trees.





The Machine in the Garden.

The answer to quiz question All of the above. We can do a lot of damage with machines.

If you read the previous page, you understand what a Ditch-Witch can do to tree roots, but even a roto-tiller can destroy the majority of the feeder roots located in the top 6" of soil in shallow-rooted trees. **Be very careful when using any machine that disturbs soil under existing trees whether a building is under construction or not.**

All sorts of machines are used on construction sites, and nearly all of them can do damage to trees. Mechanical damage is the first injury that is usually considered. Backing into a tree with a heavy machine will injure the bark and restrict the flow of moisture and nutrients from the roots, further stressing an already struggling tree. Driving across roots with heavy machinery will compact the soil and sever roots. Tire tracks will collect rainwater and drown more roots. Backhoes will excavate trenches and sever both structural and feeder root systems.

Not only the machines, but the products they use and produce can damage trees. Diesel fuel spilled in root zones will poison a tree. If cement mixers are cleaned under trees, the pH of the soil will be affected and damage will occur to some acid-loving trees such as oaks, beech, sweetgum, hemlock and spruce. All petroleum products associated with paints, lubricants or fuels will damage or kill trees. Marble chips and bluestone used for driveways has caused chlorosis from nickel contamination on many trees in the Maryland and Washington, D. C. area.

The best way to protect trees from machine and chemical injury is to keep them apart. Protect root zones by erecting barriers and holding contractors liable for root zone damage. Make sure all refuse is removed from site. Ensure that all cleaning and disposal of wastes is done properly and away from tree zones. Remember that tree protection is soil protection.



Only Time Will Tell.

The answer to quiz question False. Trees damaged in the construction process can decline and die as a result of their injuries up to 10 years after construction.

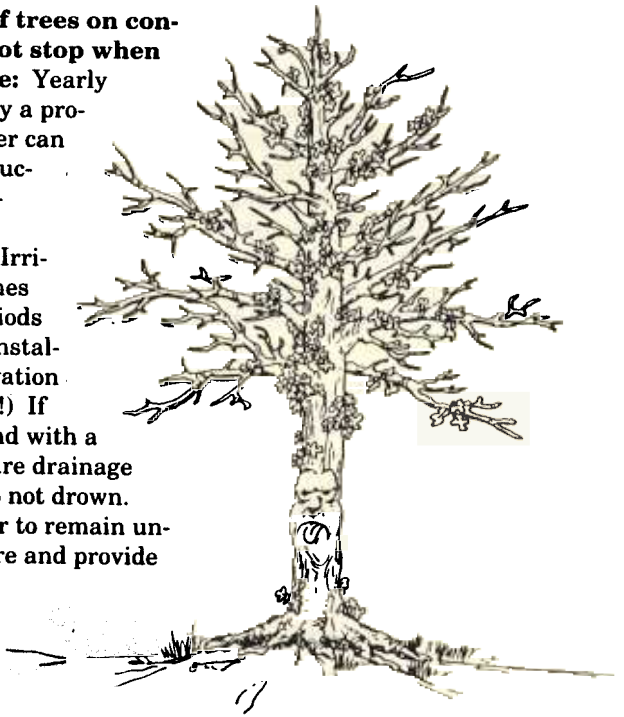
Damage to tree roots in the construction process can kill a tree outright before the next growing season, but more likely it will restrict the trees ability to support its continued growth and health. **Over time the inability of the tree to provide enough moisture and nutrients will contribute to a gradual decline that will culminate in the death of the tree during a drought or other stressful period.**

Often trees will give clues that there are serious construction-related problems. Trees show stress by epicormic growth, the production of leaves along large branches and the trunk of the tree. Hardwoods suffering from root damage may have small yellow leaves and many dead branches. Damaged trees may show fall color much earlier than other healthy members of the same species.

Secondary effects are also common. Trees damaged during construction are more susceptible to disease and insect infestation.

• **Care and protection of trees on construction sites should not stop when construction is complete;** Yearly

pruning and fertilization by a professional arborist or forester can help trees overcome construction injury. Prune only beyond the growth collar of a branch. Never flush-cut. Irrigation of protected root zones can help trees through periods of drought. (Be careful in installation of underground irrigation systems. Don't sever roots!) If trees are built into an island with a surrounding curb, make sure drainage is provided so that roots do not drown. Allow the natural leaf litter to remain under trees to hold in moisture and provide organic matter for the soil. Grass and shrubbery will compete with feeder roots of trees and require more maintenance.



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