Maintaining Tree Longevity

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Young vs Old Trees

More vigorous, responsive & adaptable
Withstand budding & severe pruning
No or few flowers or fruit
More photosynthetic active tissue to non-photosynthetic tissue
New tissue forms faster than old becomes inactive.

Slowing Mature Tree Decline

Structural Failure
- Pruning: Balance structure
  - Open tree, but retain inside leaves for trunk & branch taper
  - I / 2 foliage on branches arising in lower 2 / 3 of the tree
  - Small Target Pruning cuts
  - Begin to cut back declining top branches
- Ensure trunk stability
  - Girdling roots - root collar inspections
  - Decay of main roots
  - Protect from excess water - many trees have natural protection
- Cabling and Propping

Environmental Degradation - Know the Symptoms
- Minimize:
  - Drought & over-watering
  - Construction injury
  - Soil compaction - Restrict traffic
    - Mulch
    - Aeration -
      - Soil fracturing
      - Vertical mulching
        - Radial trenches
          - Hydraulic & pneumatic
- Fertility level.?. Swedish studies
  - Usually only N & Fe – if needed
    - Slow growth = Long life??
    - Adequate water

Parasitic Invasion
- Know plants, pests & diseases; usually a limited number

Inspect & Keep Records

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As trees mature they become less vigorous and less responsive and adaptable to changes in their environment. Not only do mature trees have less photosynthetic tissue relative to non-photosynthetic tissue, but the leaves of mature trees are not as productive as those of younger trees. Current needles of 250-year-old conifers have been shown to be only 70 percent as productive as those of SO-year-old trees. Proper care of mature trees is certainly more critical **than that of younger trees.**

Mature trees weaken and can fail due to structural problems, environmental degradation and parasitic invasion. **This discussion will be limited to those problems about which a landscape manager may have some possibility to avoid, prevent,** moderate or correct.

INSPECT and RECORD

Regular inspection of plantings, particularly large trees, **is essential for successful long-term care. Equally important is** maintaining records of changes observed, actions planned and **practices** performed.

MAINTAINING STRUCTURAL STRENGTH

Trees become more prone to structural failure as they **mature. Weak branch attachments and long, little-tapered,**

horizontal branches are subjected to increased loading. Decay of branches, trunk or roots increase the likelihood of tree failure. Girdling roots can cause failure at the root collar. Shallow or extremely wet soil may not be able to hold a tree upright, particularly in a wind.

Sturdy tree structure is evidenced by main branches at their attachment being relatively smaller in diameter than the trunk; branch attachments free of included bark; main branches well-spaced'vertically and radially on the trunk; tapered main branches with laterals along their length; a broad root flare; and the crown symmetrically balanced on its trunk.

Summer branch drop. In recent years we have become more aware that a limb(s), some more than two feet in diameter, may break out of mature trees on or following a hot, calm afternoon for no apparent reason. The break most commonly occurs 3 to 5 feet out on the limb, much less frequently at its attachment. This phenomenon, now known as summer branch drop, was first reported in the United States in California as early as 1882. Although it has been more frequently reported in California, it happens throughout the country. The loss of a five-foot-diameter, 35-ton limb from the Wye oak in Maryland a few years ago was probably related to summer branch drop. Kew Gardens in England has large signs at entrances, "The Older Trees, particularly Beech and Elm, are liable to shed large Branches without Warning?

Experience suggests that if a tree has lost one limb, it is more likely to lose another than is an adjacent tree of the same

species and size to lose its first limb. Branches that drop are usually more horizontal than vertical and extend to or beyond the edge of the tree crown.

Safety pruning Pruning to reduce the spread, weight and wind resistance of suspected failure-prone branches **can increase** their safety. To the extent possible, numerous small pruning cuts are preferred over **a** few large ones. The cuts should remove a branch completely or cut it back to a **lateral large enough to assume the terminal role (the lateral cut to, should be at least** one-third the diameter of the pruning cut).

When removing a branch completely, the **pruning cut should be made in branch tissue just outside the branch bark ridge and the branch collar. In so doing if decay should get started, it will usually be confined to branch tissue and not invade the trunk. When pruning to a lateral, the cut should be made from just above the branch bark ridge in the branch** crotch to a point **at the same level as the beginning (bottom end) of the branch bark ridge on the trunk.**

The American National Standards Institute (ANSI) has published the ANSI A300 Standard for Tree Care Operations which primarily focuses on tree pruning. This standard and the International 'Society of Arboriculture's Tree-Pruning Guidelines provide information to better understand tree pruning practices and terminology. They can be used to identify the kind of pruning needed, to write pruning specifications and to inspect the results.

Ensure trunk stability

As trees mature most become more susceptible to unfavorable soil conditions at the trunk and major roots. Continuously wet soil decreases soil oxygen and increases the possibility of decay and disease organisms infecting the trunk and/or roots near the soil surface.

Trunk health and stability of mature trees can best be ensured by keeping the soil around the trunk free of other plants (turf, ground covers and bedding plants) and standing water. Plants around tree trunks not only increase the possibility of problems but hide those that become established.

Roots of some large mature trees have been killed so quickly that adventitious roots have grown from the live trunk base fast enough to supply the top with water adequate to keep the top looking normal. In the mean time, the dead structural roots begin to decay and weaken enough that the tree can no longer be held upright. Many arborists now routinely do a "root collar" inspection before climbing mature trees to be sure the roots are alive and the trunk base is not girdled by circling roots.

Maintenance people should be alert to trunk changes from the vertical, particularly after rain and/of wind storms. Raised soil on the windward side of the trunk is an indication of increased instability and danger of the roots failing to hold the tree upright. The possibility of tree failure can be minimized by reducing crown height and weight, particularly on the leaning (downwind) side. Depending on the tree and its value in the landscape, if pruning alone does not make low branches and a

leaning tree safe, it can be propped after pruning.

A tree that has been protected by surrounding trees or -structures is less able to stand if protection is significantly reduced. Compared to trees exposed to the elements, protected trees grow taller with little taper and a smaller root system making them more vulnerable to wind throw. A tree that has lost its protection should be crown thinned to reduce its top weight and wind resistance. For a valuable tree, installing guy cables with compression-spring inserts will protect the tree from being blown down and will allow some top movement to increase the tree's ability to withstand adverse weather.

OVERCOMING OR PREVENTING ENVIRONMENTAL DEGRADATION

Environmental degradation problems you can do something about are primarily soil related.

Water: a hazardous necessity

Too little or too much water can be fatal to most plants. Irrigated landscapes are more commonly over- than under-watered. Water is essential for plant survival, growth and function. Too much water, however, on or in the soil, excludes enough oxygen for roots of most species to grow and function satisfactorily. Wet soil fosters soil-borne diseases. Wet soil is easily compacted when subjected to traffic or even rain or sprinkler drops.

Automatic irrigation systems greatly decrease labor costs but often are poorly managed, usually applying more water than

needed. In California after two drought years in the late 1970s when golf courses were allowed only fifty percent as much water as previously used, course superintendents reported that not only did their trees and shrubs look better than before but also their turf. Money will be saved and plants will do best if water application is keyed to evapotranspiration (water loss to the air from soil and plants) of the landscape.

Soil compaction

Soil compaction is usually the most serious problem facing landscape managers. Soil compaction breaks down soil structure (arrangement of soil particles into aggregates) resulting in smaller soil pores to hold and transport air and water. Root growth and function are greatly reduced in compacted soil.

Public landscapes are particularly vulnerable to foot and vehicular traffic. The pressure per square inch of soil surface is about equal whether compacted by a person's shoe heel or an auto tire. Try to have people stay on foot paths and paved areas so as to minimize compacting the soil as well as damaging plants. Keep people and vehicles off bare soil within the dripline of trees.

Construction of buildings, roads, and walks and the installation of underground utilities can play havoc with soil structure and tree roots. Construction plans should be carefully reviewed to determine possible impacts on trees or to areas where trees are to be planted. The importance of trees can be emphasized by having existing trees appraised and the contractor

held liable for any damage. A thick mulch over construction roadways and work areas around the actual building site can do much to reduce soil compaction. Material and supply storage areas and vehicle parking sites should be carefully chosen away from trees and their exclusive use required.

Wood chips, other organic material, or even gravel and uncemented pavers can greatly protect soil. Organic mulches (wood chips are usually available) have many benefits when applied on the soil surface within the dripline of trees and shrubs and beyond. Organic mulches should be applied 3- to 4-inches deep on the soil surface and not worked in. Keep mulch 4 to 6 inches away from tree and shrub trunks.

A mulch, particularly organic, moderates soil temperatures, reduces soil erosion, keeps rain and sprinkler water near where it falls, improves water and air movement in the soil, slows evaporation from the soil, reduces soil compaction, provides cleaner walking surfaces sooner after a rain or irrigation, reduces weeds and provides plant nutrients as it decomposes. Roots can grow closer to the soil surface where air and nutrients are most abundant.

<u>Overcoming soil compaction</u>. Soil compaction is difficult to overcome. Treatment of a new planting area (no existing trees) depends on its size and importance to the overall site. Compacted soil in small areas in important locations could be excavated, the excavated area scarified and brought to grade by adding similar soil of good.structure.

More extensive tree-free areas would probably have to be

deep ripped, irrigated to moisten large clods, allowed to come to moisture equilibrium before deep plowing and being brought to grade.

Mitigating soil compaction problems around and under existing trees in a timely manner is difficult at best. Compaction can be overcome by applying an organic mulch on the soil, keeping the area free of people and vehicles and waiting. The wetting and drying, warming and cooling of the soil and activities of roots and microorganisms will slowly improve soil structure. The tree(s), however, may not be able to wait that long, nor the property owners and visitors.

Various methods to overcome compaction problems have and are being tried with varying success. Holes, as close as 2-foot on centers, have been drilled mechanically or by using a jet of water under and beyond the tree canopy. Tree improvement has been observed but the procedure is time consuming and the soil auger injures roots. Water jetting is less damaging and the holes can be put in at an angle influencing a larger volume of soil. Depending on the use of the area, the holes may be filled with soil, a special mix or left open.

Researchers have tried different patterns of trenches radiating outward beginning about half way between the trunk and the dripline and continuing beyond the dripline. Some trenches were dug, others excavated using water and sewer-vacuum equipment to remove the mud slurry. The second method appears promising, but it is messy and disposal of the mud slurry and refilling the trenches are problems. I understand that equipment to excavate

soil around and under roots using air and vacuum equipment that may soon be available is being developed under contract by the . Electrical Power Research Institute.

In recent years, at least two soil-fracturing pieces of equipment are being marketed and used. A hole, about two-inches in diameter, is drilled and then a blast of compressed air injected at the bottom of the hole. Fertilizer, expanded-rock pellets and/or water can also be injected. The blast of air usually lifts the soil for a radius of at least ten feet. If the soil is lifted above the air blast, it must be compacted below it. To date the results have been disappointing.

Fertilization

Fertilization of mature trees is not needed if shoot growth is modest and leaves are of average size and color for the species. Trees will usually respond to applications of nitrogen with increased growth and larger, greener leaves. Except in alkaline soils, which may cause iron and/or manganese deficiency) trees usually will not respond favorably to additions of other nutrients. More growth is seldom wanted in a mature tree--the tree may become too large sooner than desired and must be pruned more often.

Short shoot growth and small, pale-green leaves that color and fall early are symptoms of nitrogen deficiency. Similar symptoms, however, can be caused by compacted soil, lack of water, and root and trunk infections. If nitrogen is applied, it can be spread on the soil and watered in.

PARASITIC INVASION

A given tree species is usually subject to a few specific disease organisms, insects or other pests. For the more common tree species in your area, become familiar with their pests and disease symptoms, life-cycles, season of appearance and the proper management strategies for each. Plant health care approaches explore a range of cultural techniques before resorting too the more toxic chemicals.

SEEK ASSISTANCE

When confronted with difficult problems about which help is needed, contact the local cooperative extension horticultural agent, agricultural commissioner, competent nursery person or knowledgeable colleague.

Much can be learned by keeping records of how the plants are doing, unusual weather conditions, what cultural practices are used, how the plants respond and thoughts for future plantings and practices.

FOR FURTHER REFERENCE

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