

URBAN FORESTRY STANDARDS for CONSTRUCTION SITE TREE PRESERVATION



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INTRODUCTION TO CONSTRUCTION SITE TREE MANAGEMENT

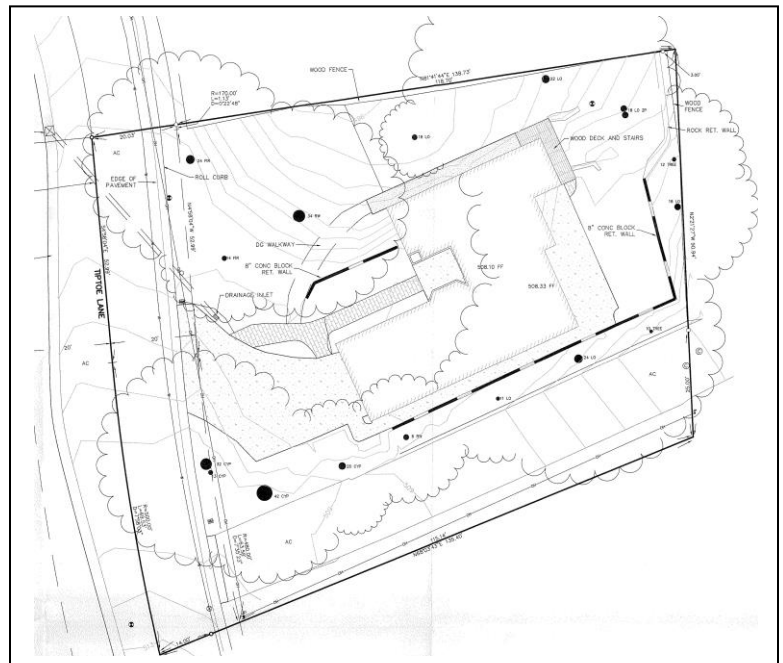
A tree inventory, sometimes called a "tree resource evaluation" or "tree survey report", is the first step in documenting the existing trees on a proposed development or building project site.

This survey is used to aid in planning and plan review, for the identification and location of trees on the site during the design of the project, architectural placement of structures, driveways, utilities, and planning of construction activities.

The inventory also is used to identify trees of designated size and species that are protected under the municipal or county code that is applicable for the site location. And if required by the governing agency, or requested by the property owner, can be used to establish appraised monetary values of individual trees and groups of trees. The appraisals are used in establishing property value, and sometimes for bond requirements for contractors, to deter careless damage to trees and potential loss of tree resources for the owner and the community.

The report shall inventory all trees that are on site (or only trees of a designated size and species, as specified in the arborist assignment) including trees to be removed, relocated and retained on the property. This includes trees on neighboring properties that overhang the project site and/or have root zones extending into the property of the project site, and all street or park trees in the public right-of-way adjacent to the project site.

Suitability for preservation should be included in the evaluation. depending on tree condition assessment, risk assessment, and location in relation to planned development or improvements. Tree Protection Zones should be established for planning purposes.



| # | TREE NAME | DIAM | HGT | CONDITION | RECOMMENDATION | TPZ |
|----|------------------|----------|------|-----------|----------------|-----|
| 1 | DEODAR CEDAR | 28" DBH | 60' | GOOD | PRESERVE | 19' |
| 2 | COASTAL LIVE OAK | 30" @ 2' | 35' | FAIR | PRESERVE | 20' |
| 3 | INCENSE CEDAR | 30" DBH | 65' | FAIR | PRESERVE | 20' |
| 4 | COASTAL REDWOOD | 41" DBH | 114' | GOOD | PRESERVE | 27' |
| 5 | COASTAL REDWOOD | 37" DBH | 80' | GOOD | PRESERVE | 25' |
| 6 | COASTAL REDWOOD | 28" DBH | 65' | GOOD | PRESERVE | 19' |
| 7 | SILK TREE | 16" DBH | 15' | FAIR | PRESERVE | 11' |
| 8 | HORSE CHESTNUT | 13" DBH | 20' | FAIR | PRESERVE | 9' |
| 9 | COASTAL LIVE OAK | 40" DBH | 35' | FAIR | PRESERVE | 27' |
| 10 | PERUVIAN PEPPER | 32" DBH | 30' | GOOD | PRESERVE | 26' |
| 11 | COASTAL LIVE OAK | 17" DBH | 33' | FAIR | PRESERVE | 12' |
| 12 | COASTAL LIVE OAK | 16" DBH | 29' | GOOD | PRESERVE | 11' |
| 13 | COASTAL LIVE OAK | 28" DBH | 45' | GOOD | PRESERVE | 19' |
| 14 | WILLOW | 26" @ 3' | 35' | FAIR | PRESERVE | 17' |
| 15 | COASTAL LIVE OAK | 11" DBH | 35' | FAIR | PRESERVE | 8' |
| 16 | COASTAL LIVE OAK | 10" DBH | 25' | FAIR | PRESERVE | 7' |

A tree protection plan is a set of recommendations and requirements provided by a qualified tree care professional, intended to minimize injuries and harmful impacts to trees designated for preservation.

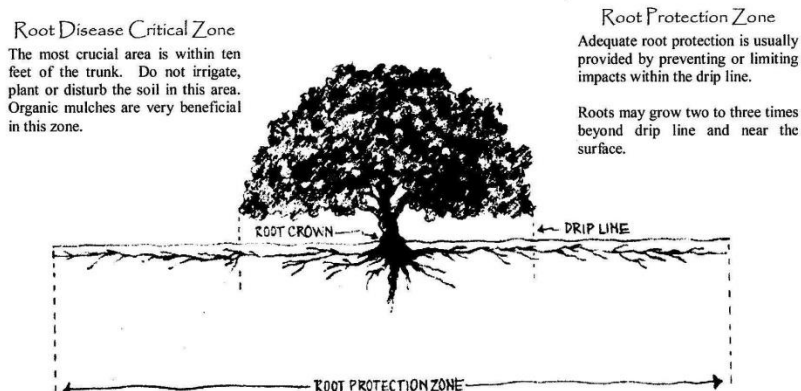
Construction activities can result in injury to trees during site preparation and construction phases, from equipment move-in, clearing and grading, import and storage of materials, excavation for utilities installations and structures, and other site activities.

Immediate damage and also long-term negative impact can occur from mechanical injury to roots and root collar, tree trunks and scaffold limbs. Soil compaction can affect tree health by altering drainage, soil moisture availability and aeration. Harmful effects on trees can be incurred from grade changes, accumulation of soil or other materials in the root zone or against the base of the tree, or from materials storage, chemical or fuel spills. Trees are sometimes destabilized from root cutting, they can be over-pruned, causing negative physiological stress and possible pre-disposition to pest and disease problems.

The primary tree protection measure is the establishment of a Tree Protection Zone (TPZ), a designated area surrounding a tree that is delineated and fenced, as protection for the tree trunk, foliar crown, branch structure and the critical root zone. The critical root zone includes structural and absorbing roots that support tree stability and physiology.

Some tree care standards use "drip-line" (outer circumference of the foliar canopy spread) as the only guideline for determining the critical root zone. But modern arboriculture (and common sense) recognizes that the drip-line is not always a good measure of where the structural and absorbing roots of a tree are located, due to site and species considerations. Modern standards may consider the drip-line, but primarily utilize a measurement based on the trunk diameter and species tolerance to construction impact, to determine a TPZ.

Guidelines For Tree Protection
Figure 1



(Source: California Oak Foundation)

The TPZ for a specific tree or group of trees, is established by the experience-based judgment of the project arborist, considering the tree species and site-specific conditions, and utilizing guidelines in ***Best Management Practices for Managing Trees During Construction***, second edition, a publication of the ISA (International Society of Arboriculture), and the ***ANSI A-300 Part 5, Construction Management Standard*** of the American National Standards Institute.

Once the TPZ is delineated and fenced, essentially prior to any site work, landscape construction, equipment and materials move in, construction activities are only to be permitted within the TPZ if allowed for and specified by the project arborist. **The fenced TPZ areas are considered "non-intrusion zones" and should not be altered or breached.**

Construction activities outside of the established TPZ can also affect the protected trees. Designated tree removals, stump removals, pruning, grading, soil and drainage management, and other factors need to be considered by the project arborist and regulated if needed to protect the trees intended for preservation.

Additional tree protection measures to consider are irrigation, fertilization and Integrated Pest Management practices that invigorate the trees and enhance physiological resistance to stress-related disorders and suppression of pests and diseases.

Defining the Tree Protection Zone

A tree's Critical Root Zone (CRZ) is the area around the trunk where roots essential for tree health and stability are located. A Tree Protection Zone (TPZ) is an arborist-defined area surrounding the trunk intended to protect roots and soil within the critical root zone and beyond, to ensure future tree health and stability. There are many methods for determining size for a TPZ (see Matheny and Clark's *Trees and Development*). The dripline method uses the tree's canopy dripline to define the boundary of the TPZ (Figure 1). The entire area within the dripline is considered the TPZ.

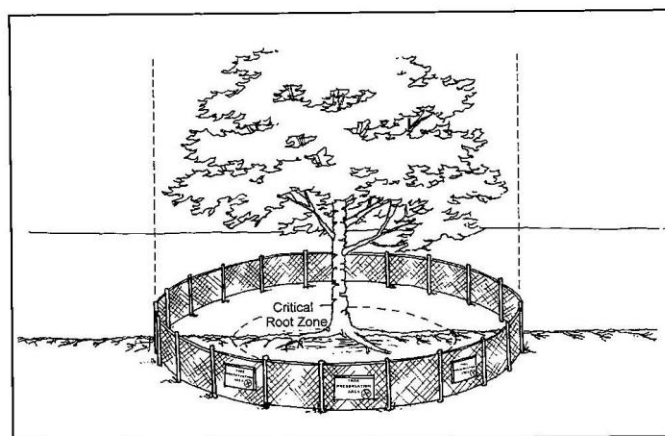


Figure 1. Dripline method of establishing a TPZ.

Source: ***Best Management Practices for Managing Trees During Construction***
International Society of Arboriculture

In most cases, the preferred method of establishing a TPZ is the "trunk formula" method, where the size of the tree trunk is measured and utilized as a guideline to how far the root system may extend and require protection. Tree species characteristics and case histories of tolerance to construction activities are used, as documented in the ISA-BMP publication. (Trunk diameters are measured at a standard distance above soil grade, which is 54 inches or 1.4 meters. This measurement is known as "diameter at breast height" or "dbh", or alternatively "diameter at standard height" - "dsh".)

A ratio is established relating the proposed radius of the TPZ to the trunk diameter. This can be 6:1 for a young tree with good tolerance, up to 18:1 for an over-mature tree of a species with poor tolerance to disturbance.

For example, a 20" dbh 'California coast live-oak' would be a mature tree with high tolerance, so the TPZ would be delineated at an 8:1 ratio, and fenced at 13-feet from the tree trunk. A mature 'California black-oak' (medium tolerance) of the same size would receive a 12:1 ratio, or a 20-foot TPZ.

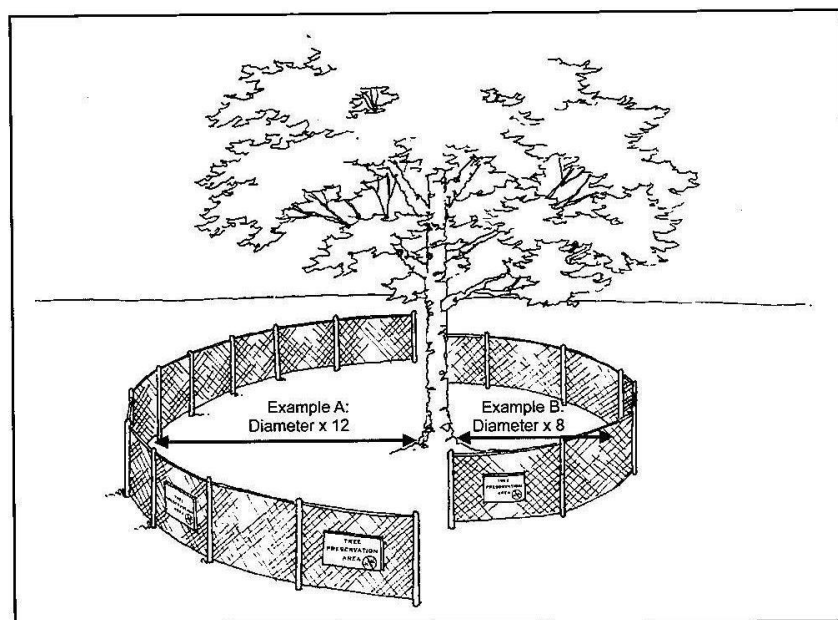
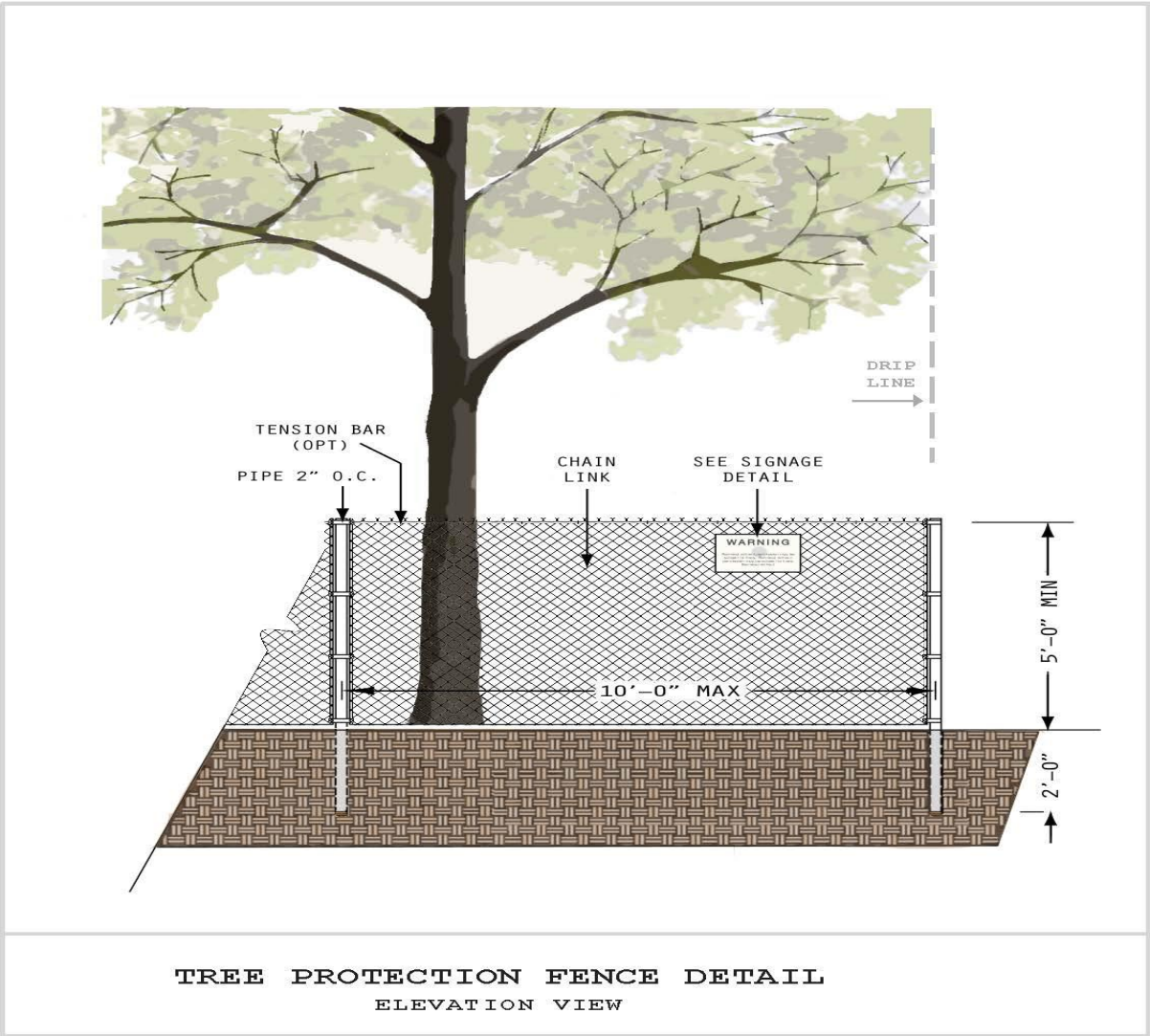


Figure 2. Measurements to use the trunk formula method of determining distances from the trunk to the TPZ.

Source: *Best Management Practices for Managing Trees During Construction*
International Society of Arboriculture

TREE PROTECTION ZONE FENCING

Prior to beginning any equipment or materials move in, demolition, site work and grading operation, all significant trees are to be fenced according to arborist TPZ recommendations.



The project arborist shall inspect the trees and installed fencing prior to commencement of site work. The fencing must remain throughout the course of construction.

Tree fencing requirements:

Fencing and specialized trunk and scaffold limb protection shall be installed as designated in the tree protection plan, and be monitored by the project arborist.

All trees to be preserved shall be protected with chain link or welded wire fences with a minimum height of five feet (5') above soil grade.

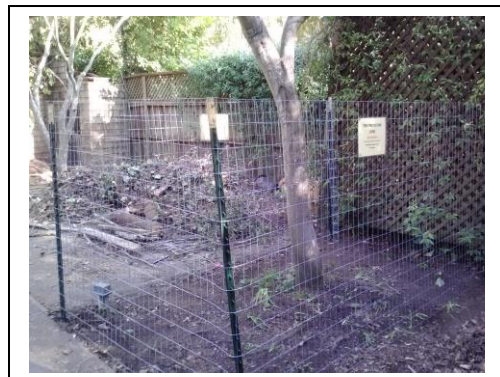
Fences are to be supported by steel posts at no more than 10-foot (3-meter) spacing, driven into the ground to a depth of at least eighteen inches (1.5' or 0.5 m).

Signage attached to the fencing is to indicate Tree Protection Zone, with project manager and/or project arborist contact information.

Fencing shall be rigidly supported and maintained during all construction periods.

No movement or storage of equipment, vehicles, materials or debris shall be allowed within the TPZ.

No trenching or grading shall occur within the TPZ of any trees.



TPZ fencing and trunk protection barriers

TREE PROTECTION GUIDELINES AND RESTRICTIONS

The following restrictions and guidelines apply to the designated tree protection zones:

- (1) Before the start of site work, equipment or materials move in, clearing, excavation, construction, or other work on the site, every tree to be retained shall be securely fenced-off as delineated in approved plans. Such fences shall remain continuously in place for the duration of the work undertaken in connection with the development.
- 2) If the proposed development, including any site work, will encroach upon the tree protection zone, special measures shall be utilized, as approved by the project arborist, to allow the roots to obtain necessary oxygen, water, and nutrients.
- (3) Underground trenching shall avoid the major support and absorbing tree roots of protected trees. If avoidance is impractical, hand excavation undertaken under the supervision of the project arborist may be required. Trenches shall be consolidated to service as many units as possible. Boring/tunneling under roots should be considered as an alternative to trenching.
- (4) Concrete or asphalt paving shall not be placed over the root zones of protected trees, unless otherwise permitted by the project arborist.
- (5) Compaction of the soil within the tree protection zone shall be avoided.
- (6) Any excavation, cutting, or filling of the existing ground surface within the tree protection zone shall be minimized and subject to such conditions as the project arborist may impose. Retaining walls shall likewise be designed, sited, and constructed so as to minimize their impact on protected trees.
- (7) Burning or use of equipment with an open flame near or within the tree protection zone shall be avoided. All brush, earth, and other debris shall be removed in a manner that prevents injury to the tree.
- (8) Oil, gas, chemicals, paints, cement, stucco or other substances that may be harmful to trees shall not be stored or dumped within the tree protection zone of any protected tree, or at any other location on the site from which such substances might enter the root zone of a protected tree.
- (9) Construction materials shall not be stored within the tree protection zone of a protected tree.
- (10) Any new plantings within the tree protection zone should be designed to be compatible with the cultural requirements of the retained tree(s), especially with regard to plant selection, irrigation and fertilizer application. In protection zones where native drought tolerant trees are located, no summer irrigation should be installed and no

vegetation installed requiring excessive irrigation, such as exotic species, turf and flowerbeds.

Surface drainage should not be altered so as to direct water into or out of the tree protection zone unless specified by the project arborist as necessary to improve conditions for the tree.

(11) Site drainage improvements should be designed to maintain the natural water flow and levels within tree retention areas. If water must be diverted, permanent irrigation systems should be provided to replace natural water sources for the trees.

TREE HEALTH CARE

In addition to prevention of damaging practices, it is good tree protection strategy to provide the best possible growing conditions and reduction of stress through soil and water management.

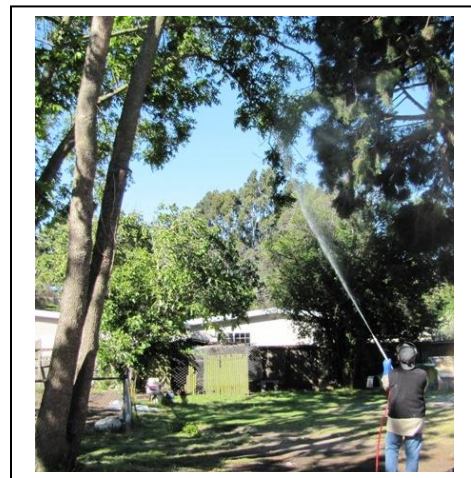
The project arborist should specify site-specific soil surface coverings (wood chip mulch or other) for prevention of soil compaction and loss of root aeration capacity.

An irrigation plan is vital, before, during and after the site work and construction phase.

Soil, water and drainage management shall follow the *ISA BMP for "Managing Trees During Construction"* and the *ANSI Standard A300(Part 2)- 2011 Soil Management (a. Modification, b. Fertilization, c. Drainage.)*

Soil analysis, fertilizer, soil amendment products, amounts and method of application are to be specified by the project arborist.

Pest and disease management is important to consider. Some tree species in some geographical areas are susceptible to stress and root-cutting related invasions and disorders.



PROJECT ARBORIST DUTIES & INSPECTION SCHEDULE

The project arborist is the person(s) responsible for carrying out technical tree inspections, assessment of tree health, structure and risk, arborist report preparation, consultation with designers and municipal planners, specifying tree protection measures, monitoring, progress reports and final inspection.

A qualified project arborist (or arboriculture firm) should be designated and assigned to facilitate and insure tree preservation practices. The project arborist should perform the following:

Inspection of site prior to equipment and materials move in, site work, demolition, landscape construction and tree removal: The project arborist will meet with the general contractor, architect, engineer, and owner or their representative to review tree preservation measures, designate tree removals, delineate the location of tree protection fencing, specify equipment access routes and materials storage areas, review the existing condition of trees and provide any necessary recommendations.

Inspection of site after installation of TPZ fencing: Assess the adequate installation of tree preservation measures. Review any requests by contractor for access, soil disturbance or excavation areas within root zones of protected trees. Assess any changes in the health of trees since last inspection.

Inspection of site at least monthly, and during excavation or any activities that could affect the trees: Review all activity within and near the Tree Protection Zones of preserved trees and when any recommendations are implemented. Assess any changes in the health of trees since last inspection.

Final Inspection of Site: Inspection of site following completion of construction. Inspect for tree health and make any necessary recommendations.

TREE WORK STANDARDS AND QUALIFICATIONS

All tree work, removal, pruning, planting, shall be performed using industry standards of workmanship as established in the Best Management Practices of the International Society of Arboriculture (ISA) and the American National Standards Institute (ANSI A 300 series), and safety (ANSI Z133.1).

Contractor licensing and insurance coverage shall be verified.

COMMUNICATIONS

The best intentions for tree preservation, plans and fencing can be overlooked, ignorantly or willfully violated. Tree protection measures are often an obstacle to grading and building contractors, and can create additional work and costs. It is important to communicate and enforce project expectations for tree preservation. Verbal and written directives must be used, and possible penalties established for violation of specifications and damage to trees.

Communications are important, starting at an early stage in the process. Property owners, architects, engineers, contractors, equipment operators, landscapers and tree workers must be informed of the intention and site-specific methods that are prescribed to preserve trees according to local laws and the property owner's and project arborist direction.

With good planning and good communications, trees can be preserved through the construction process in good health and structural integrity for the enjoyment of the property residents and future generations.



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“Tree preservation cannot wait until construction. If efforts at tree preservation are delayed or ignored until construction begins, they are largely doomed to failure. By the time construction begins, the decisions, plans, and documents associated with a project have been finalized and a detailed set of plans has been approved by the governing agency. Once the project has progressed to this point, it is very difficult and expensive to make significant changes.”

“Successful tree preservation begins when the project is conceived and continues through the planning, design, construction and maintenance phases. In that way decisions to preserve and remove specific trees can be discussed and determined at the same time as are decisions about the site layout, grading requirements, and construction techniques.”

From ***Trees and Development*** by Nelda Matheny and James R. Clark