

**City of Los Angeles
Recreation and Parks Department**

*Urban
Forest Program*



City of Los Angeles

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URBAN FOREST PROGRAM

City of Los Angeles
Department of Recreation and Parks

The City of Los Angeles, Department of Recreation and Parks (DRP) has developed the Urban Forest Program to raise the level of understanding of our natural ecosystems within the Los Angeles Basin and to elevate a regard and appreciation for our urban forest. This guidebook has been designed for all City staff members -- the gardener, the planner, the administrator, the construction staff, the activity programmer, and the facility director – it is available for everyone, in hopes that they may better understand our most precious natural resource, urban trees. The accompanying **Tree Care Manual** provides useful information regarding the daily supervision, care, and protection of this valuable link to our ecosystem, and is a guide for the custodianship of our ecological community.

An ecosystem is a specific biological community interacting with its physical environment. A community consists of all the populations of living things in a given area, including people. The physical environment includes climate, temperature, soil and light. Both the biological community and the physical environment are continually interacting.



Children at play at Shane's Inspiration, Griffith Park

The physical factors significantly influence the biological community, and in turn the biological community uses and modifies the environment. To assist our efforts in developing successful landscapes, it is necessary to develop an understanding of the many relationships existing between all living things and their significance to the Los Angeles basin ecosystem.



Sharing the environment with all living things....



The Department of Recreation and Parks' Forestry Division is charged with the responsibility to care for and oversee this sizeable portion of our public urban forest, and operates according to their mission:

To provide an attractive, safe, and beneficial urban forest through high quality tree management and maintenance practices that respect the ecosystem, while serving the needs of the Department of Recreation and Parks, the community, and all park visitors.



The Forestry Division cannot sustain an urban forest alone. The future of the Los Angeles urban forest requires the involvement of us all. The Urban Forest Program has been developed as a guide to promote healthy trees through our daily behavior, planning and decision-making, and to ultimately guarantee the sustainability of our urban forest.

Purpose:

The purpose of the Urban Forest Program is to develop a single resource that will provide direction to Department of Recreation and Parks (DRP) staff and promote the sustainability of a healthy urban forest. Since the Los Angeles ecosystem has been changed dramatically to accommodate the needs of a growing population, the natural cycles that govern a natural ecosystem have been disturbed and in some locations completely broken. In order to survive within these altered conditions, trees in City parks must rely on human intervention. The Urban Forest Program manual represents established procedures and standards that encourage tree preservation and enhance an urban ecosystem that is vulnerable to destruction. The procedures and standards include criteria for the removal, maintenance, and planting of diverse tree species, including the care of California native trees.

The Urban Forest Program addresses three following subject matters:

- **Citywide Tree Management:**

- *Recreation and Parks Forestry Division* oversees tree operations within City of Los Angeles parkland. Tree maintenance is performed in two ways: by Department staff supervised by International Society of Arboriculture Certified Arborists, and/or by a contracted tree company administered and overseen by Department Certified Arborists. The Forestry Division also oversees proper species selection in the Department's Reforestation Program
- *Bureau of Street Services, Street Tree Division* manages parkway trees along City parks and streets
- *Los Angeles Department of Water and Power* manages pruning near electric utilities
- *Recreation and Parks Planning and Construction Division* advises on proper tree selection for new Department projects and implements trees protection during project construction

- **Urban Forest Sustainability and Tree Planting Programs:**

The DRP implements pruning techniques that prolong tree health and longevity. Special care is given to applying only pruning techniques that reduce the size of the crown, maintain structural integrity and the natural form of the tree, and delay the need for re-pruning. *Crown cleaning, crown thinning* and *crown raising* are the most common types of tree pruning in City parks. If crown reduction is necessary, branches are removed by thinning techniques. Heading and topping are destructive pruning techniques and are neither practiced nor accepted in Los Angeles City parks.

The Forestry Division oversees proper tree selection as a part of its ongoing parks reforestation. The Division also coordinates tree-planting efforts with non-profit organizations, seeks out funds within existing resources and programs (i.e., Trees for Green LA Program funded by LADWP) and seeks new funds through grant writing.

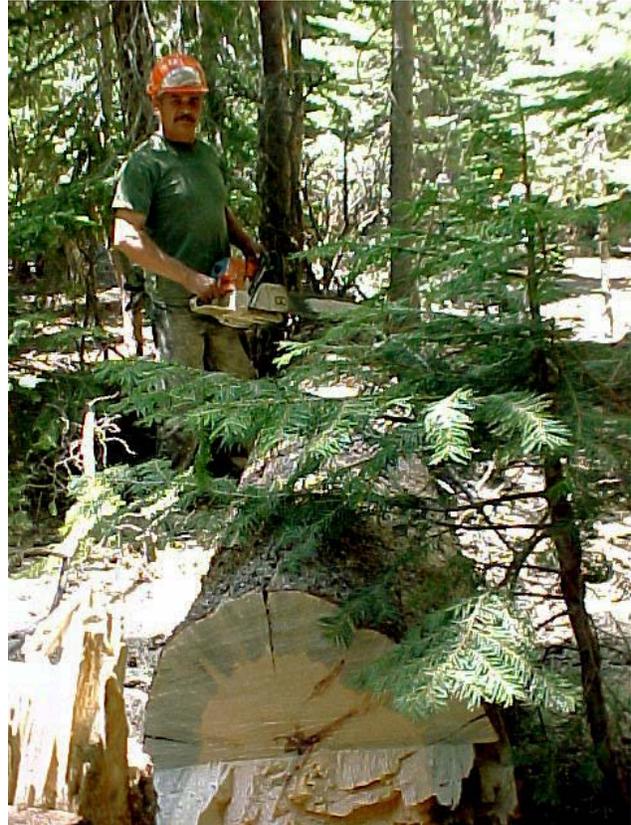
- **Tree Preservation and Management Regulations:**

The DRP adheres to three existing regulations:

- Oak Tree Ordinance – *Los Angeles Municipal Code Section 46.00*
Enforced by the Bureau of Street Services, Street Tree Division
- Landscape Policy – *Los Angeles City Council File Nos. 70-1899; 132989 S-1 & S-2; and 145282 S-1* under purview of the City Planning Department
- R&P Tree Preservation Policy - under enforcement by Forestry Division and Planning and Construction Division

The preceding policies are regulatory tools for the DRP and provide for orderly protection of specified trees in City parks. The **TREE CARE MANUAL** companion and training documents provide information regarding existing codes, technical regulations, standards and specifications necessary to implement the above policies, and contain guidelines for the required and recommended care, removal and replacement of regulated trees.

The DRP Forestry crewmember works at Camp High Sierra removing dead fir trees infested with Bark Beetles



RECREATION AND PARKS

TREE CARE MANUAL

Intent and Purpose:

City parks are graced with a large population of trees, including magnificent individual trees, groupings of trees, heritage trees, special habitat value trees, and many other ornamental trees from climates around the world. These trees provide large cooling islands for the City and offer an escape to a natural environment. Trees are a key component in the ecosystem and are aesthetically pleasing to neighborhood landscapes. Trees provide economic benefits to the community and contribute to a high quality of life.



Heritage tree – tipu tree, (Tipuana tipu) – one of the largest specimens in the Los Angeles area grows in the Chavez Ravine Arboretum at Elysian Park among many more species of rare and unique trees.

Sustaining trees in developed environments presents a challenge that requires careful planning and attentive maintenance. The remnants of the original native plant life of the Los Angeles Basin are increasingly vulnerable after more than a century of development. In order to meet these challenges, the Urban Forest Program has been developed and approved as a policy of Department of Recreation and Parks.

The **Recreation and Parks Tree Preservation Policy** is the primary regulatory tool that gives direction for orderly protection of specified trees, maintains their value, and avoids significant negative effects to the ecosystem. By assuring preservation and protection through regulation and standards of care, these resources will remain significant contributions to the environment and landscape, and continue to add to the unique character of Los Angeles City Parks.



Heritage tree – unusual Eucalyptus lehmanii in Pacific Palisades Park



Heritage tree in Green Meadows Park – odd-looking African sausage tree, (Kigelia africana), rare and unique in Los Angeles landscaping.



The **Tree Care Manual** is a separate document issued by the General Manager through the Divisions of Forestry and Planning & Construction. This document establishes specific technical regulations, standards and specifications necessary to implement the DRP *Tree Preservation Policy* (Appendix A) and defines the City's tree preservation goals. These goals are intended to provide consistent care and to serve as indicators of achievement. Their purpose is to:

- Insure and promote preservation of the existing tree canopy cover within Los Angeles City parks
- Provide standards of maintenance required for protected trees
- Increase survivability of trees during and after construction by providing protection standards and best management practices
- Provide standards for the replacement of trees and the planting of trees as part of the Reforestation Program
- Define criteria for tree risk assessment and economical evaluations
- Establish safety standards for tree care operations
- Provide safety criteria for employees and the public



Moreton Bay chestnut (Castanospermum australe) and 60 foot tall Mahoe (Hibiscus elatus) provide spectacular flower shows each year



Queensland kauri (Agathis robusta) - another exceptional tree in Los Angeles City Parks

TREE CARE MANUAL

City of Los Angeles Department of Recreation and Parks

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TREE CARE MANUAL

City of Los Angeles Department of Recreation and Parks

1.0 Introduction to Section Items

In order to provide the required and recommended care for removal and replacement of regulated trees, the **Tree Care Manual** provides information regarding existing codes, technical regulations, standards, and guides and specifications necessary to implement the best management practices for trees regulated by Ordinances, Policies, and Procedures.

The DRP recognizes and implements regulatory procedures for trees specified in the Tree Preservation Policy under four categories: *Trees Protected by LA City Ordinances*, *Heritage Trees*, *Special Habitat Value Trees*, and all other *Common Park Trees*. For a detailed reference of protected trees, please see the *DRP Tree Preservation Policy* (Appendix A).

2.0 Definitions

This section is a list of the arboricultural and construction-related terms and their definitions as used in the *Manual*. They serve to outline uniform concepts and provide an understanding of events as discussed in the document.

3.0 Tree Maintenance Guidelines

This section provides best management practices for tree care operations that meet standards with minimal harm to trees. It provides information based on tree biology and arboricultural research over the last decade. It discusses techniques vital to maintaining good tree structure. It also outlines specifications for maintaining trees growing in turf. This section describes practices to avoid and recommends maintenance applications that promote tree health.

4.0 Protection of Trees During Construction

This section provides information necessary to preserve trees during all stages of construction. It discusses tree growth characteristics as they pertain to construction. It provides alternative solutions to minimize or eliminate damage to trees. It explains the tree preservation process from evaluating the resource through planning, design, impact evaluation, construction, and post-construction management. This section includes instructional handouts and references for a wide-range of applications on construction sites.

5.0 Tree Removal, Replacement, and Planting

Procedures for tree removal and replacement specify step-by-step actions that are taken when a tree or group of trees require removal. The chapter also discusses the latest specifications for tree selection and planting. It includes the **Tree Planting and Selection Guidelines** established for the DRP.

6.0 Tree Evaluation for Hazard and Economical Value

All trees have the potential to fail, but only a relative few actually do fail. In establishing criteria to evaluate trees for hazards, the focus is given to trees in urban areas, recognizing the unique combinations of species and site character found in cities. An understanding of hazard evaluation, risk management and liability are critical for Department managers and arborists. The general public often does not understand the criteria for tree removal, and the DRP's position regarding the removal of hazardous trees is clarified in this chapter. In situations when trees must be appraised, a method is provided that is most useful in City park settings.

7.0 Safety Standards

The latest American National Standards Institute (ANSI) safety standards for tree care operations are contained here, including safety criteria for employees and the public. The DRP Code of Safe Practices, established exclusively for the Department's Forestry Operation, is presented here.

8.0 Appendices

Sources are provided for technical information and supplemental material referenced within the Manual. These are highly recommended for any Department staff interacting with trees or making decisions affecting trees. Source material is given for the preservation of trees and the sustainability of the urban forest.

9.0 Assumptions

The DRP assumes no responsibility for matters legal in character that are contained in this *Manual*. The *Manual* was created to conform to current standards of care, best management practices, established technical specifications, evaluation and appraisal procedures, and sound arboricultural practices as recommended by the sources listed in the References section.

10.0 References

Various reference resources were used to compile the Urban Forest Program. All of the resources are listed. It is recommended that these materials be obtained and kept as desk references.

2.0 Definitions

The Definitions section is a list of the arboricultural and construction-related terms and their definitions as used in the *Manual*. They serve to outline uniform concepts and provide an understanding of events as discussed in the document.

Aeration - In soil, the process by which air from the atmosphere is brought into the soil. Usually to reverse loss of macropores resulting from compaction.

Adventitious Buds and Suckers - Lateral buds whose growth was previously suppressed by an auxin (growth hormone) produced by the dominant leader or side branch. As the suppressing chemicals become weaker, adventitious buds produce a large quantity of new sprouts or sucker growth near the point of the pruning cut or wound break.

Aging - Orderly changes of an organism over time, or its parts as it are genetically designed. In trees, the ratio between volume of wood with living cells being walled off to volume of wood with living cells being generated.

Allelopathy - Chemical inhibition of growth and development of one plant by another.

Amendment (Soil) - Any substance other than fertilizers, such as lime or sulfur. For example, gypsum and sawdust are used to alter the chemical or physical properties of soil, generally to make it more productive.

ANSI A300 - American National Standards Institute - reference source for standards for pruning trees and shrubs.

ANSI Z133.1 - American National Standards Institute - reference source for standards for arboricultural operations.

Apical Dominance - Apical Dominance, or upright growth, is one of the ways a tree attempts to regain its natural form when limbs or branches are removed through pruning, disease, or accident.

Arboriculture - The science and art of caring for trees, shrubs, and other woody plants in a landscape setting.

Branch - A secondary shoot or stem arising from the main stem or trunk.

Branch Collar - Trunk tissue (usually marked by a swelling or collar) that forms around the base of a branch between the main stem and the branch or a branch and a lateral. As a branch decreases in vigor or begins to die, the collar usually becomes more pronounced and more completely encircles the branch.

Branch Bark Ridge - A ridge of bark in a branch crotch that marks where branch and trunk tissues meet and often extends down the trunk.

Caliper - Synonym for trunk diameter used to measure the size of nursery stock.

Callus - Undifferentiated tissue initially formed by the cambium around and over a wound.

Cambium - The tree cell generator. A layer of cells between the inner bark and wood. By the cell division a **cork cambium** forms the outer tissue of the tree's bark; on the inside a **vascular cambium** divides in an outward direction producing phloem and on the inner side xylem.

Canopy - The part of the tree composed of leaves and small twigs.

Certified Arborist - Individual who obtained arborist certification from the International Society of Arboriculture based on knowledge and competence, and who receives on regular basis continuing education administered by the ISA.

City Arborist - Recreation and Parks employee who possesses current certification from the International Society of Arboriculture.

Circling roots - Roots that grow around the trunk in a circular manner, rather than laterally away from it.

Compaction - Breaking down soil particles by mechanical means, resulting in loss of soil macropores and leading to lack of oxygen and water in soils. A major cause of death of tree roots. See also Soil Compaction.

Compartmentalization - Physiological process that creates the chemical and physical boundaries that act to limit the spread of disease and decay organisms.

Compost - Organic residues or mixture of organic residues and soil, that have been piled, moistened, and allowed to undergo biological decomposition.

Conifer - Plant that bears seeds in a cone.

Crotch - The angle formed at the attachment between a branch and another branch, leader or trunk of a woody plant.

Crown - The above ground parts of the tree, including the trunk.

Crown Cleaning - Crown cleaning refers to the removal of dead, dying, diseased, crowded, weakly attached, and/or low-vigor branches from a tree crown.

Decay - Process of degradation of woody tissues by fungi and bacteria through the decomposition of cellulose and lignin.

Deciduous - Perennial plant that loses all its leaves at one time during the year.

Decurrent - Round-headed or spreading plant with no main leader to the top of the plant. Example: coast live oak.

Disturbance - Various activities from construction or development that may damage trees.

Dripline - The width of the crown, as measured by the lateral extent of the foliage.

Drop-Crotch - Reduction cut which reduces the length of a branch or stem back to a live lateral branch large enough to assume apical dominance- this is typical at least one-third the diameter of the cut stem. Branches are selectively pruned or removed at varying distances resulting in a thinning out of the tree canopy.

Epicormic Shoot - Shoots growing from mature branches or near large pruning wounds. Most of these shoots arise from latent buds and seldom firmly attached to the stem from which they arise.

Evergreen - Plant that retains its leaves for more than one growing season.

Excurrent - Tree with cone-shaped crown with a central leader that outgrows and subdues lateral branches. Example: liquidambar.

Final Cut - The last cut made on a limb. It could be the only cut, or the last cut in a series. Final cuts should be made a minimal distance from the parent stem just outside of the branch collar.

Flush Cut - Pruning technique in which both branch and stem tissue are removed; generally considered poor practice.

Grading - Altering existing terrain and elevation of land, usually performed by the use of large equipment.

Growth Ring (Annual Ring) - Width of secondary xylem (wood) produced by the stem in 1 year.

Hazard Tree (Hazardous Tree) - Any tree or tree part that poses a high risk of failure or fracture that causes damage to property or injury to people.

Heading - Cutting a currently growing or 1-year old shoot back to a bud, or cutting an older branch to a stub or a tiny twig not sufficiently large enough to assume the terminal role. This technique is rarely appropriate on established trees and should not be used to reduce the height or size of trees.

Heartwood - Nonliving xylem in the center of a trunk or branch; wood is darker in color and may be a site for storage; provides structural strength to a tree.

Included Bark - Bark that occurs in a crotch between branch and trunk or between co-dominant stems. Included bark usually:

- prevents the trunk from growing around a branch.
- occurs on defective V-shaped crotches in which the bark grows inward and on itself, causing a physical weakness where the co-dominant leaders meet.

Indigenous Plants - Plants occurring or living naturally in an area; not introduced; native.

Lateral - A branch or twig growing from a parent branch or stem.

Leader - A dominant upright stem, usually the main trunk. There can be several leaders in one tree.

Limb - Same as branch, but usually larger and more prominent.

Mature Trees - Trees that have reached at least 75 percent of their typical final height and spread.

Mycorrhizae treatment - Soil injection with mycorrhizae spores to increase symbiotic relationship of tree roots and beneficial fungi.

Mulching - Any material such as sawdust, woodchips, leaves, plastic film, gravel, and loose soil that is spread on the surface of the soil to protect the soil and roots from the effects of raindrops, soil crusting, freezing, and evaporation. May aid in reducing soil compaction.

Parent Branch or Stem - The tree trunk; or, the larger limb from which lateral branches grow.

Permanent Branches (Permanent Limbs) - Branches that will remain on a tree for many years, perhaps until maturity.

Phloem - The food conducting tissue of trees. Formed by the division of the outside layer of the vascular cambium. New phloem is produced yearly; older cells are crushed and compacted.

Protected Trees - Trees protected by the R&P Tree Preservation Policy.

Pruning - Systematic removal of branches of a plant, usually a woody perennial.

Root Buffer - A temporary layer of material to protect the soil texture and roots. See section 4.20.5-B for details.

Root Collar - The junction between the root of a plant and its stem, often indicated by the trunk flare.

Sapwood - Functional, conductive and youngest layer of secondary xylem positioned next to the bark tissues; transports and stores water, mineral elements, and carbohydrates.

Scaffold - In decurrent trees a large limb that is or will be part of the permanent branch structure of a tree.

Soil Compaction - Compression of soil particles that may result from the movement of heavy machinery and trucks, storage of construction materials, structures, paving, etc. within the tree dripline.

Species (Tree Species) - Group of plants that resemble each other closely and that interbreed freely.

Sucker - Vigorous upright epicormic shoot that arises from latent buds below soil level or the graft union.

Sustainability - Maintenance of ecological, social, and economic functions and benefits over time.

Taper - The thickening of a stem (trunk) or branch toward its base.

Target - People or property potentially affected by tree failure.

Temporary Branch - A branch that will remain on the tree for only a short period; not a permanent limb. Usually lower temporary branches are left on young trees to encourage taper and sturdy trunk development.

Thinning - Pruning technique in which branches are removed at their point of origin.

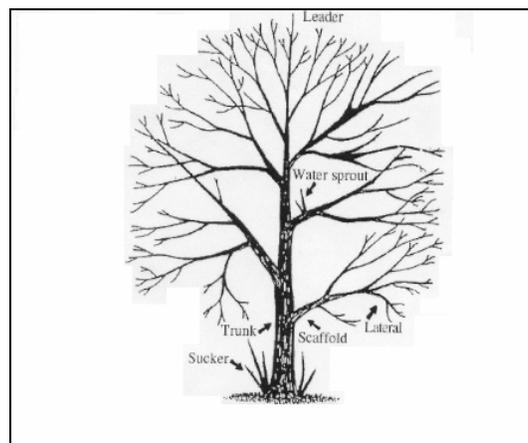
Topping - Pruning technique to reduce height by heading of large branches. Generally considered poor practice. See also heading.

Tree Protection Zone - Area identified by City Arborist in which no soil disturbance is permitted and activities are restricted. Usually the area of a temporary fenced tree enclosure.

Trenching - Any excavation to provide irrigation, install foundation, utility lines, services, pipes, drainage or other property improvements below ground.

Undercut - Cutting partway through the underside of a limb to prevent the bark from tearing. Failure to make an undercut can cause the bark of a tree to tear down.

Watersprout - Vigorous, upright, epicormic shoots that grow from latent buds in older wood. Reciprocal are suckers that arise above the soil level or graft union. Seldom firmly attached to the stem from which they arise.



Virginia State University, 2002. *A Guide to Successful Pruning*

Typical Tree Framework

Wound - An opening that is created when the tree's protective bark covering is penetrated, cut, or removed, injuring or destroying living tissue. Pruning a live branch creates a wound, even when the cut is properly made.

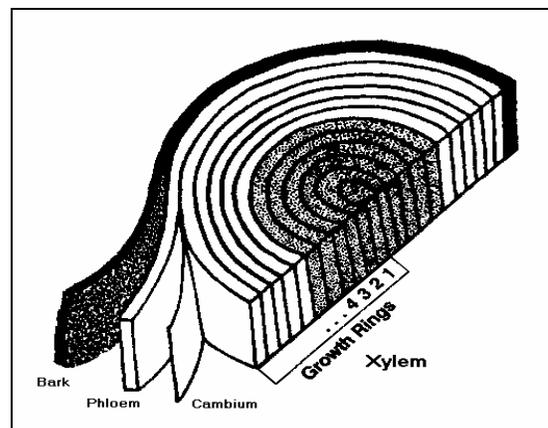
Wound Closure - The closing of a wound, necessary for the continued health of the tree. Wounds do not *heal* (return to restore to original condition or integrity) because wounding breaks or destroys the cambium; they *close*.

Woundwood - Differentiated woody tissue that forms after initial callus has formed around the margins of a wound. Wounds are closed primarily by woundwood.

Vertical Mulching - Technique designed to increase aeration of compacted soils. Holes are drilled into the ground and coarse textured or organic materials are added to replace the removed soil.

Xeriscape - Style of landscape design, construction, and maintenance focused on minimizing the need for supplemental irrigation.

Xylem - Cells formed by the division of the vascular cambium. Xylem cells function to transport and store water and mineral elements as well as provide mechanical support.



ISA, 1998. *Tree Climber's Guide*

Relative locations of the phloem, cambium and xylem

3.0 Tree Maintenance Guidelines

Introduction

Trees are a major element of city parks and Department staff should continue to learn more about tree care in order to prolong the health of all trees. All DRP Divisions should perceive the cost of tree maintenance as an investment in its capital assets. It is the intention of the following sections to provide guidelines to maintenance practices that result in the best environment for park trees.

3.10 Care of trees listed in the *DRP Tree Preservation Policy*

Pruning performed on park trees adheres to the latest standards and recommendations made available by industry professionals and the International Society of Arboriculture (ISA). In the following sections watering, fertilizing, and general maintenance practices will be discussed. Work performed to trees protected by the *L.A. City Ordinance*, as well as *Heritage Trees* and *Special Habitat Value Trees*, must always adhere to these recommendations.

For trees protected by the *L.A. City Ordinance*, a permit must be obtained from the Board of Public Works to perform any alteration to the tree or pruning of any branches larger than 2 inches in diameter. Permitted pruning shall be done in compliance with the Oak Tree Pruning Standards set forth by the Western Chapter of the International Society of Arboriculture.

Trees recognized as DRP *Heritage Trees* and *Special Habitat Value Trees* can be pruned with the approval of the DRP Forestry staff. Pruning shall be done in accordance with the Oak Tree Pruning Standards set forth by the Western Chapter of the International Society of Arboriculture. Any work within the tree's dripline also requires approval from DRP Forestry staff.

Park trees recognized as *Common Park Trees* are to be protected by applying the most current ANSI (American National Standards Institute) and ISA recommendations for tree pruning, as well as maintenance practices as described in the following sections.

3.15 Request for Tree Work Guidelines

To date, the Department has not established a pruning cycle, and tree care performed by the Forestry Division is by demand only. Field staff shall call the Forestry office at (213) 485-4826 any time tree pruning or inspection is required. Trees by nature shed bark and drop leaves, fruits, seeds, and small branches. In many instances, the Forestry crew will not be able to solve tree litter problems by pruning. It is important for field staff to evaluate tree pruning needs before calling in the work order. Misleading information and calling regular tree pruning needs as emergency requests results in inefficient use of the Forestry crews. Below is a guideline of regular job order requests and emergency requests for tree work.

3.15.1 Regular Work Order Requests:

Regular work order requests are for all tree maintenance that does not fall under the Tree Emergencies category. These types of requests include pruning of trees not posing an immediate hazard to human life or property or for large-scale projects (for example, trees blocking light fixtures, signs, or impeding walkway/road clearance), and require a work order submitted to the Forestry Division. The Lead Sr. Gardener, Park Maintenance Supervisor, or Sr. Park Maintenance Supervisor must call in all work order requests. Work orders will be reviewed and prioritized by the respective Principal Park Maintenance Supervisors.

3.15.2 Tree emergencies:

The following is a list of possible tree emergencies in priority order:

High Priority:

1. Trees or limbs that have fallen and caused accidents or personal injury
2. Trees or limbs that have fallen and caused damage to vehicles or structures
3. Trees or limbs which are in immediate danger of falling or breaking
4. Broken hanging limbs adjacent to structures, roads, or in picnic or play areas, play areas
5. Trees or limbs that blocking streets or roads

Medium to Low Priority:

1. Trees or limbs that have fallen and are not an immediate hazard
2. Trees or limbs that have fallen and are not blocking roads or streets
3. Hanging tree limbs that may not be in immediate danger of falling
4. Dead or severely declining trees without a target present

3.20 DRP Pruning Standards

Pruning means the removal of leaves or dead parts of plants, especially branches, to achieve the following:

- maintain or direct plant form
- enhance health and appearance
- influence flowering, fruiting, and vigor
- regulate growth
- control plant size
- invigorate declining plants

Trees and other woody plants respond biologically to pruning (wounding) in specific and predictable ways. Careful study of these responses has led to pruning practices that can best develop, preserve, and enhance the structural integrity, beauty and functional value of trees.

3.20.1 Industry Standards

The *ANSI A300-2001-Pruning* presents performance standards for the care and maintenance of trees, shrubs, and other woody plants (Appendix C).

Best Management Practices – Tree Pruning is the companion publication to the ANSI A300-2001 (Appendix D)

3.20.2 Types of Pruning

The DRP uses seven types of pruning: structural, crown cleaning, thinning, raising, reducing, restorative, and pruning of palms and conifers.

Climbing spikes shall not be used to climb park trees or palms for the purpose of pruning. Climbing spikes may be used to rescue an injured worker or remove dead, dying, or hazardous trees.

The DRP Forestry staff evaluates trees from the ground before determining the type of pruning by referring to the *Tree Operations Manual*.

Considerations are based on tree species and can include the following:

- Species growth characteristics
- Time of year
- Tree form (ex: excurrent or decurrent)
- Tree condition (health)
- Tree structure—presence of weaknesses or defects

Staff determines from the ground what limbs need to be removed to achieve or enhance a tree's structural integrity, appearance, or desired size.

➤ **Pruning for Structure**

Structural pruning is the removal of live branches and stems to influence structural integrity. It usually follows four procedures: 1) Canopy cleaning by removing dead, broken, diseased and dying branches, 2) development or re-establishment of a dominant leader, 3) establishment of the lowest permanent scaffold limb and 4) establishment of scaffold limbs by removing competing stems or branches.

➤ **Pruning to Clean**

Cleaning is the selective removal of dead, diseased, detached, rubbing and broken branches. This type of pruning is done to reduce the risk of branch failure and the transmission of decay, insects and diseases.

➤ **Pruning to Thin**

Thinning is the selective removal of small live branches to reduce crown density. Branches are ¼ to 1-inch in diameter. 10-15 percent of live foliage can be removed at one time. If more pruning is desired, it should not exceed 25 percent in a single year. Excessive removal of small branches on the lower two-thirds of a branch or stem is called lion tailing and may have an adverse effect on the tree – it is not an accepted practice.

➤ **Pruning to Raise**

Raising is the selective removal of branches to provide vertical clearance. Caution must be taken to not remove too many lower branches. This can cause slow development of trunk taper, cause cracks or decay in the trunk, or transfer too much weight to the top of the tree.

➤ **Pruning to Reduce (Drop Crotch)**

Reduction is the selective removal of branches and stems to decrease the height and/or spread of a tree. This type of pruning is done to minimize the risk of failure, to reduce height or spread, for utility clearance, to clear vegetation from buildings or other structures, or to improve tree appearance. Crown reduction shall be accomplished with reduction cuts rather than heading cuts.

➤ **Pruning to Restore**

Restoration is the selective removal of branches, sprouts, and stubs from trees that have been topped, severely headed, vandalized, lion-tailed, broken during a storm, or otherwise damaged. Full restoration usually requires several pruning events over a number of years.

➤ **Pruning Palms**

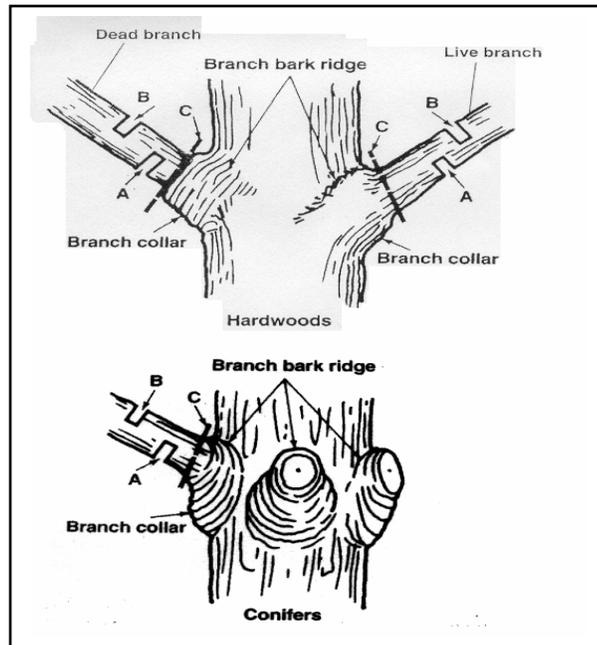
Palm pruning primarily removes dead and chlorotic fronds. Green fronds growing at an angle of more than 45 degrees from horizontal shall be retained. DRP Forestry staff minimizes the risk of disease transmission by pruning green fronds of *Washingtonia* and *Phoenix* species with handsaws disinfected in 1 % bleach solution after each tree is pruned.

➤ **Pruning Conifers**

Conifers are primarily pruned to control the density of branching, the shape of young trees, and the size of older ones. They are intolerant of topping or heading. Conifers typically have an excurrent growth habit, which is usually maintained throughout the lifespan of the tree. The DRP strives to prune conifers outside of hot summer months when the infestation of the bark beetles is more likely to occur. Thinning, by the selective removal of small branches, is the most appropriate method when pruning conifers.

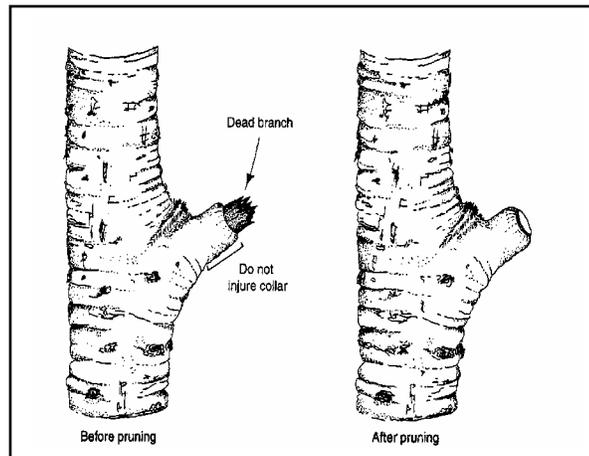
3.20.3 Pruning Cuts

A proper pruning cut causes very little injury to the adjoining stem. When the pruning cut is properly made a ring of woundwood forms above and below the wound during the first growing season after the cut. Pruning cuts are not covered with wound dressings or sealants. DRP Forestry staff sometimes applies a light coating of a nonphytotoxic material for aesthetical purpose. The DRP typically uses two types of cuts: 'Branch Removal Cut' (thinning cut) and 'Reduction Cut' (drop-crotch cut). Flush cuts, those made "flush" with the parent stem, removes chemical barriers that counter decay and is no longer an accepted practice.



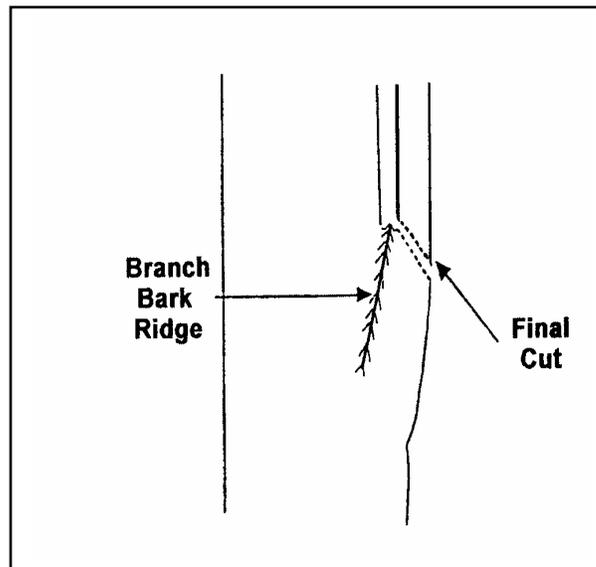
University of Illinois at Urbana-Champaign, *Plant Health Care for Woody Ornamentals*

The first cut (A) undercuts the limb. The second cut (B) removes the limb. The final cut (C) should be just outside the branch collar to remove the resulting stub. A pruning cut that removes a branch at its point of origin shall be made close to the trunk or parent limb, without cutting into the branch bark ridge or collar, or leaving a stub. Branches too large to support with one hand shall be precut to avoid splitting of the wood or tearing of the bark.



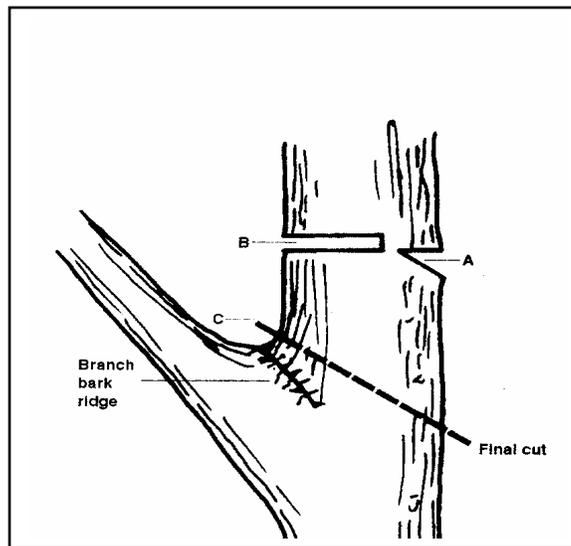
Gilman, E.F. 2002. *An Illustrated Guide to Pruning*

When removing a dead branch, do not cut into the swollen collar growing around the dead branch, even if it is large. Removing the collar from around the dead branch will injure the trunk since this is composed of trunk wood.



ANSI A300

A final cut that removes a branch with a narrow angle of attachment should be made from the outside of the branch to prevent damage to the parent limb.



University of Illinois at Urbana-Champaign, *Plant Health Care for Woody Ornamentals*

A reduction cut shortens a stem back to a lateral branch. The exact location of the final cut will vary from branch to branch.

3.20.4 Timing of Pruning

Hazardous trees of any species may be pruned any time of the year. Removal of dying, diseased, broken, rubbing, or dead limbs can also be accomplished at any time with little negative effect on the tree. Light pruning (removing less than 10 percent of the foliage) can be performed safely on most species at any time providing the trees are in good health.

Plant development can be slowed and plant size maintained if pruning takes place soon after growth is complete for the season. Such pruning should not be so severe or so early as to encourage new shoot growth. If maximum dwarfing is desired, most plants should be pruned in the period from early to midsummer. This will reduce leaf area for the longest period.

Most deciduous plants can be pruned during the dormant period between leaf fall to the end of winter with similar growth results. Avoid pruning broadleaf trees in early to late spring. Evergreens will be set back the least if they are pruned in the late winter. This also minimizes bark beetle attack on conifers.

Pruning when trees are dormant can minimize the risk of pest problems associated with wounding (attracting insects to fresh wounds), and can allow trees to take advantage of the full growing season to close and compartmentalize wounds. Avoid pruning trees, and especially stressed trees during or soon after the initial growth flush in spring. This is when the cambium is active and bark is particularly vulnerable to being torn loose.

Corrective pruning may be easier during the growing season. Branches that hang too low from the weight of leaves or fruit can be thinned and dead and weak limbs can be more easily spotted for removal.

It is a recommended practice to evaluate each tree before pruning. If necessary, alternate the schedule according to condition. For example, if oak tree dieback (caused by *Diplodia quercina*) is found, pruning should be performed between November and January. If oak twig blight (caused by *Cryptocline cinerescens* or *Discula quercina*) is identified, reschedule pruning during dry weather in the summer or fall. To prevent trees from the attack of boring insects, pruning should be performed during the least favorable time for these insects to relocate, commonly in cooler winter months.

During bird nesting season, DRP Forestry staff does not schedule large pruning projects for park trees. Forestry staff also takes special precautions to watch for signs of bird activity on the ground and scouts trees for occupied nests before beginning pruning projects. On occasions when the birds are present and the tree does not appear to be at risk, the pruning project is delayed for a few months.

3.20.5 Pruning Stressed Trees

Pruning is cutting into a tree's life tissue. Therefore, it is important to apply pruning practices that do not compound stress. This is especially true if pruning is performed on trees that are already stressed from various other factors. When a tree is stressed, its defense system is weakened. When defense systems are weakened and a pathogen is present, infection usually takes place that may result in tree decline.

- If the tree has been recently damaged by injury or disturbance, remove all broken branches. If necessary, restore the crown to preserve structural integrity.
- If the tree is stressed from receiving inadequate care, prune moderately to clean the crown, thin and reduce end weight, or restore the entire crown.

Care must be taken to prune stressed trees during the best time of the season for the species and when common pests are not present.

3.20.6 Pruning Young Trees

The average life expectancy for trees growing in harsh urban conditions is less than 20 years. Pruning trees early can improve tree vitality and preserve structural integrity. They may be pruned at planting time to remove branches damaged during handling and transplanting, and to establish the tree's permanent framework. Lower branches are typically retained as "temporary branches" – they serve to strengthen and protect the trunk. The following should be pruned:

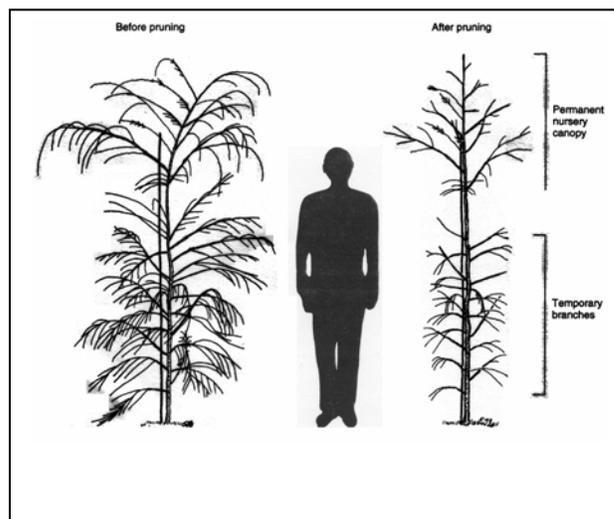
- Broken, dead, and diseased branches
- Sucker growth arising from the base or watersprouts growing vertically from a branch
- Crossing and rubbing branches

Staking may be necessary to temporarily support, anchor, or protect young trees.

Subtle pruning cuts have a dramatic effect on the future structure of a tree. The goal is to develop trees with one dominant leader, strong and balanced scaffold branches, good trunk taper, and to correct weaknesses such as included bark or codominant stems

It is important for the field maintenance staff to:

- Monitor and adjust rubbing tree stakes and ties that are too tight. In a park setting, most properly developing trees should have stakes removed after three to five years.
- Maintain temporary branches for the first three to five years after the tree has been planted. To allow mowing and prevent breaking, shorten temporary branches to 12-18 inches as shown below.



Gilman, E.F. 2002. *An Illustrated Guide to Pruning*

Temporary branches on the lower part of the trunk are to remain for 3-5 years after planting. These branches will nourish the trunk, build caliper, and prevent over extension of the leader. Be sure to shorten any temporary branches growing into the permanent canopy.

Temporary branches are crucial in the development of young trees. They allow for flow of photosynthates, nutrients and water between the trunk and temporary branches and leaves. Temporary branches aid in the development of a robust tapered trunk, and can result in a tree that withstands greater stress from wind, stands erect, and is better equipped to support a crown mass at maturity. These branches should be shortened to about 12-18 inches and remain for at least 3-5 years after planting. When they are permanently removed they should be pruned according to established guidelines. Do not “flush cut” or leave stubs, which are invitations to disease.

3.30 Prohibited Acts

Any damaging acts or alterations to protected trees are prohibited. We discuss a few of the most common harmful practices below.

3.30.1 Excessive pruning

The most common offense in urban areas is excessive pruning. People often see different tree pruning styles and assume that these practices are good for trees. Forestry staff is cautious to trim only as much as necessary to achieve these results: a healthy and beautiful tree, increased public awareness, and the greatest ecological benefit.

3.30.2 Topping and Heading.

Topping is the indiscriminate cutting back of tree branches to stubs or lateral branches that are not large enough to assume the terminal role.

“Topping is perhaps the most harmful tree pruning practice known. Yet despite more that 25 years of literature and seminars explaining its harmful effects, topping remains a common practice” ISA, *Why Topping Hurts Trees*.

Other names for topping include “heading”, “tipping”, “hat-racking”, and “rounding over”. A common misconception is that a tall tree poses a hazard and its height should be reduced to make it safer. Topping may reduce the hazard in the short term, but is not a viable method for height reduction.

Topping stresses trees -- Topping often removes 50-100% of the leaf-bearing crown of a tree. Since the leaves are the “food factories” of a tree, topping can temporarily “starve” a tree. The severity of the pruning triggers a kind of survival mechanism. The tree activates latent buds, forcing rapid growth of multiple shoots below each cut. The tree needs to form a new crop of leaves as soon as possible, and if it doesn’t have the stored energy to do this, it is seriously weakened and may die.

A stressed tree is more vulnerable to insect and disease infestations. Large, open pruning wounds expose the sapwood and heartwood to attack. The tree may lack sufficient energy to chemically “defend” the wounds against invasion. Some insects are actually attracted by chemical signals to stressed trees.

Topping causes decay -- Cuts made along a limb between lateral branches create stubs. The tree may not be able to close these wounds and the exposed tissues are subject to decay. Normally a tree will compartmentalize these decaying tissues, but few trees can defend against multiple, severe wounds caused by topping.

Topping can lead to sunburn -- When leaves are removed the remaining branches and trunk are suddenly exposed to high levels of light and heat. The result may be sunburn of the tissues beneath the bark. This can lead to cankers, wood decay, bark splitting and death of some branches.

Topping may create hazards -- Stubs left from topping usually decay. Shoots that are produced below the cut are often weakly attached and may be at risk of failure. Unlike normal branches that develop normally, the outermost layer of the parent branches only connects these new shoots. The new shoots grow quickly and may become heavy and prone to breakage.

Topping makes trees ugly -- The natural branching structure of a tree is a biological wonder. Topping removes the ends of the branches, often leaving ugly stubs. Topping destroys the natural form of a tree.

3.30.3 Other prohibited actions

- “Lions tailing”. This practice removes all or most secondary and tertiary branches from the interior portion of the crown, leaving most live foliage at the perimeter of the canopy.
- Excessive root pruning that damages more than 25% of the root zone.
- Excessive tree raising.
- Compacting soil within the dripline because of unnecessary driving or parking.
- Recreation activities that will damage trees.

3.40 Maintaining Tree and Turf Association

Trees and turf are mutually exclusive in nature. It is rare to see many trees growing in grasslands and conversely, grass is not common on the forest floor. Each plant group has its own demands and strategies to inhibit the growth of the other, leading to competition for water, nutrients, sunlight, and rooting space. Turf requires morning sunlight for optimum growth, health, and stand density. Golf course design considers tree location and species selection with respect to placement of turf areas. The DRP uses many design alternatives at their golf courses—for example, aligning maintenance requirements by using indigenous plants, or using mulch to minimize compaction and enhance tree health. More information is provided in Appendix P in Training Leaflet 3 – *Trees and Turf Associations*.

3.40.1 Mulching as Turf Alternative

Mulching the root areas of trees is perhaps the simplest but most beneficial practice we can perform to enhance tree health and minimize competition with turf. The application of mulch can:

- aid in soil moisture retention
- moderate soil temperature
- eliminate weed and turf competition and reduce allelopathic interference
- condition the soil and improve microbial activity
- reduce irrigation requirements

By design, mulch keeps mowing equipment from damaging tree trunks and eliminates the need for herbicide applications. It is also aesthetically pleasing.

Mulch should be applied between 4 and 6 inches deep and kept a minimum of 6 inches away from tree trunks. Mulching a large area will visually and physically tie groupings of trees together.

3.40.2 Mowing and other Equipment

Mowing equipment, spray rigs, aeration equipment, and skip loaders can all cause irreversible mechanical injury to trees. Severe damage can occur and tree trunks can eventually become girdled and die when trees are hit repeatedly with equipment such as string trimmers. Sometimes referred to as “mower blight”, trunk wounds also serve as entry points for diseases, borers, or other insects.

The DRP commonly uses mulch around trees as a deterrent against this kind of damage. Tree guards are also used to protect the trunks of young trees. They should be routinely examined and either readjusted or removed as trees mature.

3.40.3 Fertilizing Standards and Mycorrhizae Treatments

Trees require certain essential elements to function and grow. Although turf in City parks is fertilized regularly, trees typically do not require supplemental fertilizer for optimum growth. With the exception of nitrogen, most soils supply adequate amounts of nutrients. Excess and unnecessary fertilizer applications can predispose trees to disease and insect infestation, pollute ground water, and create salt buildup in the soil. If a tree appears to have a nutrient deficiency, a laboratory soil or foliar analysis should be performed before fertilizer is applied.

Mycorrhizae are root structures that are created when young lateral roots are invaded by specific fungi that form symbiotic associations to the advantage of each¹. Plants benefit from mycorrhizae by enhanced nutrient uptake and *may* improve water absorption and drought resistance.

The DRP has had success applying mycorrhizae adjacent to trees growing in infertile urban soils. Analysis of tree roots for the presence of native mycorrhizal fungi should be performed before application of inoculants.

3.50 Watering Practices

Water needs of trees vary by species, tree age, soil type, and environmental conditions. The relationship between soils, plants, and water is a complex subject and is only briefly discussed in this section.

Supplemental irrigation for mature trees should be deep and infrequent. Deep watering can increase drought tolerance and encourage deep roots less likely to damage hardscape. Excess irrigation can promote root-rotting fungi and lead to tree decline, whereas frequent shallow watering encourages surface roots that provide poor anchorage.

Watering frequency depends on temperature, humidity, wind, soil type, and drainage. The DRP uses a soil probe to determine soil moisture and establishes its irrigation schedules accordingly. The Department endeavors to water in the early morning when there is little wind, irrigation is less likely to interfere with park activities, and foliage is allowed to dry during the day, an important consideration for trees that are susceptible to fungal-related foliar diseases.

Proper irrigation is key to the survival of newly planted trees. If rainfall is not sufficient for tree establishment, supplemental water is necessary. The best indicator is to probe the soil to determine the moisture content of root ball.

The DRP avoids using overhead irrigation that wets tree canopies or tree bases, especially of those trees that are susceptible to foliar diseases or diseases caused by crown- or root-rotting fungi.

Native trees adapt to environmental conditions of the region and after establishment rarely require supplemental irrigation. Planting native and drought tolerant trees in turf-dominated City parks requires careful irrigation management.

More information on watering practices can be found in Appendix P – Leaflet 4 - *Watering Practices* and Leaflet 7 – *Maintaining Young Trees*.

3.60 Soil Condition

Soil compaction is the largest single factor responsible for the decline of mature trees. Ninety percent of the damage to the upper 18 inches of soil occurs during the first pass by heavy equipment and cannot be reversed. DRP staff makes every effort and encourages the KOOL Program (Keep Off Our Lawns) to avoid soil compaction by not parking or driving within the dripline of trees.

¹ *Arboriculture*, p. 107.

The following aeration methods and drainage systems are recommended to improve soil porosity in compacted soils:

3.60.1 Drainage

Adequate drainage must be provided when planting new trees. If trees are planted in impermeable soil with low water infiltration rates (less than 2 inches per hour), the DRP may employ one of the following drainage systems:

- French drains, at a minimum depth of three feet
- Drain tiles or lines installed beneath trees
- Drain holes augered at the bottom of the planting pit at a specified diameter and depth, and filled with medium-sized sand or fine gravel.

3.60.2 Aeration

Aeration of soil supporting turfgrass is performed with caution and avoided within the tree's drip line. Hollow-tine aeration can lead to the elimination of tree roots in the upper few inches of soil and usually results in improved turf root growth. Soil that is disturbed or compacted within the dripline is loosened or aerated to promote root growth and enhance tree vitality. One of the following aeration methods should be specified to correct compacted soil conditions:

- Vertical mulching. Auger holes 2-4 inches diameter, 2-3 feet deep on 4-foot centers and backfill with porous material such as perlite, vermiculite, volcanic rock, peat moss or mixture thereof.
- Radial Trenching. Using an air excavator, excavate a soil trench 3-6 inches wide and a minimum of 12 inches deep from approximately three feet from the trunk radiating out to the edge of the dripline. The trenches shall radiate out from one foot at the closest point.
- Soil Fracturing. Using pneumatic soil probe (e. g., Gro-gun) to deliver a sudden burst of air that cracks loosens or expands the soil to improve the root-growing environment.
- Subsurface injections under moderate hydraulic pressure, using a three-foot probe and applied on 3-foot centers within the dripline.

3.70 Insect and Disease Control

Appropriate species selection and providing for a tree's basic growth requirements are critical components of pest management. Proper planting techniques, irrigation, pruning and aftercare all contribute to a plant's tolerance of and defense to pests.

Many factors contribute to plant stress and pest susceptibility. Drought conditions and smog, for example, are stressors. In the 1980's, thousands of blue gum *Eucalyptus* trees died when drought increased their susceptibility to longhorn borers. Years of repeated defoliations caused by the redgum lerp psyllid has resulted in the death of thousands of *Eucalyptus* trees and the removal of 5,000 specimens from City parks.

A vigorous plant is best equipped to stave off pest infestation.

DRP implements Integrated Pest Management (IPM), a strategy that is designed to prevent and suppress pest problems with minimum adverse effects on human health, the environment, and non-target organisms. The Vegetation Management Unit of the Forestry Division is responsible for pest identification and actions taken or recommended to control, and if needed, eradicate pests before damage to a tree is irreversible. It is important for DRP staff to notify the Unit at (213) 485-4826 with your observations and/or concerns. Accurate timing is critical for success.

3.80 Training Material (Appendix P)

The DRP believes that providing training and sufficient information to enhance the knowledge of those involved in maintenance, construction, or recreation activities around trees is the best solution to unintentional tree damage. Training also provides additional information that helps field staff make their own decisions.

Training material is available in various formats:

- leaflets that may be distributed during Tailgate meetings
- informational brochures
- PowerPoint training presentation (available in outline form)

The information included in the training material focuses on the most common situations and problems occurring in our parks and explains how trees respond to these situations. The material offers recommendations, alternatives, and practices to avoid or apply when working around trees. If additional training material not provided in Appendix P is required, please contact the Forestry office. Appendix P includes the following:

- ***Oak Tree Ordinance***
- ***Tree Wounds***
- ***Tree and Turf Associations***
- ***Watering Practices***
- ***Mulch and Its Benefits***
- ***Tree Staking***
- ***Maintaining Young Trees***
- ***Tree Care Presentation (PowerPoint)***
- ***Video Guide –Tunneling and Trenching***
- Brochures of ***The Green in Your City series***

3.90 Tree Inventory

The successful management of any resource begins with an inventory of the resource, and the urban forest is no exception. Inventories are essential for planning, scheduling, and monitoring maintenance tasks, and in assisting in management decisions, particularly when developing a monetary budget.

The DRP is exploring means to inventory an estimated 800,000 park trees. Currently, the Forestry staff is investigating a variety of inventory systems to provide the level of information needed to make sound decisions. Since park trees grow randomly in open space, it is difficult to refer to and identify tree locations. When using fixed reference points is not possible, a global positioning system (GPS) and geographic information

systems (GIS) are best for collecting and representing data. GPS employs a handheld unit that locates a point (e.g., a tree) on the ground via a satellite system. This information can then be readily transferred to GIS. These systems of collecting data provide “layers” of information that is important to other park functions, and can reduce field data collection time by 30 percent.

A tree inventory provides descriptions of tree location, species, size, condition, and management needs. The inventory information is used to develop integrated pest management strategies by identifying species to avoid, analysis of specific problems, location of trouble spots, and pest monitoring: this data can transform the DRP’s approach to park tree management from reactive to proactive. The information also can be used to enhance the ecological value of park trees and provide direction regarding the planting of trees that are attractive and beneficial to wildlife and the connection of wildlife corridors.

An inventory is essential in locating planting sites, identifying management needs, and locating hazardous trees in need of pruning or removal. The inventory also can be used in public relations as a news release that describes public tree resources, both in terms of the number and value of trees.

Once completed, the inventory will be updated on a continuous basis by connecting to an existing computerized Forestry Work Order System and by collecting data regarding newly planted trees. In summary, the tree inventory for park trees carried out on continuous basis will establish a baseline of where the tree population has been, where it is now, and where it is going in the future.

This information was written at a time (April 2003) when funds for the tree inventory have not yet been identified. When the tree inventory program is in progress, this section will be re-written and will provide more specific information on the system used in our Department.

4.0 Protection of Trees During Construction

Introduction

The objective of this section is to reduce the negative affects of construction on trees to a less than significant level.

Land development is a complex process and is even more challenging when trees are involved. Construction is one of the greatest causes of tree decline and death in urban areas.

The long-term goal of the Forestry Division is urban forest sustainability. This describes the maintenance of social, recreational, ecological and economic functions of trees and their benefits over time. Stewardship of naturally occurring and planted trees is a central element in forest sustainability. Concerns about tree health and structure, preservation during development and redevelopment, species and site selection, quality of planting stock, standards of performance, maintenance practices in our parks, and recycling are integral to a sustainable urban forest.

Tree protection should not begin subsequent to construction. If preservation measures are delayed or ignored until construction begins, the trees may be destined to fail. Because in most cases construction affects to trees cannot be completely eliminated, the goal for our parks planners and designers is to keep injury to trees to a minimum and allow building projects to proceed at the same time.

Successful tree preservation occurs when designers, construction personnel, and project managers are committed to tree preservation. All members of the project team must be familiar with the rudimentary aspects of tree growth and development in order to understand the relationship between tree survival and construction practices. Myths about how trees grow.

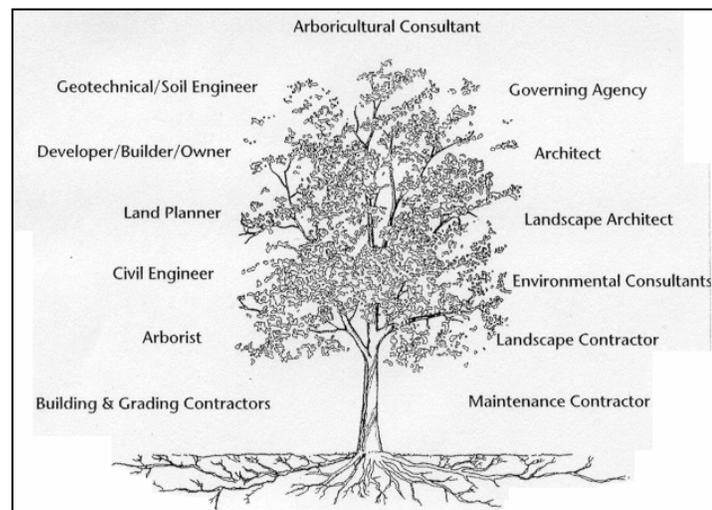
For example, above ground parts of trees is not a “mirror” of what lies below ground. In actuality, typically four to eleven large roots radiate from the base of a tree’s trunk. These “buttress” roots extend from the root crown and sometimes are visible when the trunk flares away from the root crown or collar. These large roots decrease in taper rapidly and branch repeatedly so that at distances of ten feet or more from the trunk they are about ½ inch in diameter or smaller.

These roots grow horizontally through the soil and depending on the tree can extend 40 feet or more beyond the branch tips. These smaller roots are primarily responsible for water and mineral absorption. There can be hundreds of roots in a cubic inch of soil— thus any removal of soil or root severance forces a tree to compromise its physiological processes to sustain the loss.

All trees cannot and should not be preserved. Trees that are structurally unstable, in poor health, or unable to survive effects of construction become a liability to the project and should be removed. A realistic tree preservation program acknowledges that conflicts between trees and development may sometimes result in the removal of some

trees and recognizes the detrimental effect to the project and community when trees die after construction is completed.

Successful tree preservation occurs when construction impacts to trees are minimized or avoided altogether. The challenge is to determine when impacts will be too severe for the tree to survive, not only in the short term, but also in the long term. There are no quantitative methods to calculate this critical level. Determining the optimum tree protection zone provides a guideline, although trees often survive and flourish with smaller protection areas.



Matheny, N.P. and Clark, J.R. 1998. *Trees and Development*

Tree Preservation during development requires the commitment of everyone involved in the project's planning, design, construction, and management.

The following are the three guiding principles for tree preservation:

- The acknowledgement that not all trees are in excellent health or have good structural stability.
- Tree preservation cannot be the responsibility of the Forestry staff alone. Each development participant must understand that his or her activities and decisions influence the success of tree preservation efforts.
- The ability of an arborist to cure construction injury is very limited, so the focus of preservation efforts is the *prevention* of damage.

Following the above principles will increase the chance for success and reduce the possibility that trees will die.

Efforts at preservation must include acknowledgement of the tree and its ecological support system.

4.10 Planning for All Projects

Capital improvement projects, in-house construction projects, sport field renovations, and even the addition of a few sprinkler lines affect trees. Our department considers trees as important assets and requires plotting tree locations on plans for all projects.

4.10.1 Planning and Designing for Capital Improvement Projects

Projects are designed by in-house design staff and by outside design firms. Either design team should be given set of guidelines defining the Department's *Tree Preservation Policy* (Appendix A) and *Tree Protection Guidelines* (Appendix G and Appendix I), to assure that trees are accounted for from project initiation forward.

A) Survey before Planning

The survey must accurately plot the trunk locations within the project site. Include construction staging areas and delivery routes.

B) Plan and Design with Knowledge of Trees

The health and structural confirmation of the surveyed trees must be evaluated in order to anticipate how well they will respond to development. The evaluation must describe the character of trees and their suitability for preservation at a level of detail appropriate for the project and phase of planning. An arboricultural or forestry consultant must be obtained for this evaluation.

C) Plan with a Vision

Disruption of any tree by construction activities may negatively affect its physiological processes, and cause depletion of energy reserves and decline in vigor, often resulting in tree death. Typically this does not manifest until many years after the tree is disrupted. Preservation of mature trees during construction has limitless benefits to the success of a project.

When new trees are planted, consideration should be given to species diversity and appropriateness of location. To prevent destructive clearance pruning in future years, keep in mind the ultimate canopy and root spread.

D) Plan for all Aspects and Entire Duration of Project

Construction projects are multi-level and often require participation of various construction trades and subcontractors. It is important to plan for tree protection with an understanding of construction dynamics. Trees must be protected in the staging area, construction employee parking area, adjacent properties, as well as on the actual construction site.

4.10.2 Managing In-House Construction Projects

The in-house Construction team should be given set of guidelines that define the Department's *Tree Preservation Policy* (Appendix A) and *Tree Protection Guidelines* (Appendix G and Appendix I), and to assure that trees are accounted for from project initiation forward.

A) Survey before Planning

For all in-house projects, contact the Forestry Division for an accurate survey of trees on the job site.

B) Plan and Design with Knowledge of Trees

In order to better understand the condition of the affected trees, the Forestry Division will make available the results of the tree evaluation. This evaluation will provide you with knowledge of the resources and the anticipated construction tolerance of the affected trees.

C) Plan with a Vision

Obtain information about trees and minimize negative impacts on the urban forest. Conduct all projects with tree preservation in mind.

D) Plan for all Aspects and for the Entire Duration of the Project

Trees must be protected in the staging area, construction employee parking area, and during demolition and grading. Arrange with the Sr. Park Maintenance Supervisor for trees to be watered and for the soil to be protected from compaction.

4.20 Pre-Construction Requirements - Tree protection and Preservation Plan

Prior to the commencement of a development project, the R&P Project Manager, and/or City-Wide Construction Supervisor, and/or Regional Head must be assured that if any activity of the project is within the dripline of *Protected Trees*, a site specific tree protection plan is prepared. The following six steps shall be incorporated as part of the Tree Protection and Preservation Plan:

4.20.1 Site Plan

For all projects, site plans must indicate accurately plotted trunk locations and *the dripline* areas of all trees or group of trees to be preserved within the development area. Additionally, for all *Protected Trees* the plans shall accurately show the trunk diameter, dripline and clearly identified *tree protection zones*. The type of protective fencing shall be specified and indicated with a bold dashed line.

4.20.2 Protective tree fencing for all categories of *Protected Trees*

Fenced enclosures shall be erected around trees to be protected. This will achieve three primary goals, (1) to keep crowns and branching structure clear from contact by equipment, materials, and activities; (2) to preserve roots and soil condition in an intact and non-compacted state and; (3) to identify the *Tree Protection Zone* in which no soil disturbance is permitted and activities are restricted, unless otherwise approved by the DRP Arborist.

All trees to be preserved shall be protected with five to six (5 to 6) foot high chain link fences. Fences are to be mounted on two-inch galvanized iron posts, driven into the ground to a depth of at least two feet and at no more than ten-foot centers. Install a two-foot wide access gate for tree maintenance. Tree fences shall be erected before demolition, grading, or construction begins and remain until final inspection of the

project. The ‘Warning’ sign shall be prominently displayed on each protective fence. The sign shall be a minimum of 8.5 inches x 11 inches and clearly state the following:

TREE PROTECTION ZONE
This Fence Shall Not be Removed

All work within the *Tree Protection Zone* requires approval of the DRP Arborist.

A) Type I Tree Protection Fence is for trees to be preserved throughout the duration of the project. The fences shall enclose the entire area under the canopy dripline or *Tree Protection Zone*, if specified by the DRP Arborist. If fencing must be located on paving or concrete that will not be demolished, an appropriate grade level concrete base may support the posts.

B) Type II Tree Protection Fence is for trees situated in small planting areas, where only the planting area is enclosed with the required chain link protective fencing. The walkways and traffic areas are left open to the public.

C) Type III Tree Protection Fence is for trees in small tree wells, building site planters or sidewalk planters. Trees shall be wrapped with 2 inches of orange plastic fencing from the ground to the first branch and overlaid with 2-inch thick wooden slats that are bound securely (slats shall not be allowed to dig into the bark). During installation of the plastic fencing, caution shall be used to avoid damaging branches. Major scaffold limbs may also require plastic fencing as directed by the DRP Arborist.

No storage of material, topsoil, vehicles, or equipment shall be permitted within the fenced area throughout the entire duration of the construction project.

4.20.3 Verification of tree protection

The project contractor or construction supervisor shall verify in writing that all pre-construction tree preservation conditions have been met as follows:

- A) Tree fencing installed
- B) Erosion control secured
- C) Tree pruning completed
- D) Soil compaction preventive measures installed
- E) Tree maintenance schedule established

The Planning and Construction Project Manager, City-wide Construction Supervisor, or Region Head Superintendent and Head of Recreation and Parks Urban Forest must sign this verification.

4.20.4 Pre-construction meeting

The DRP Arborist shall attend all pre-construction meetings to assure that everyone fully understands previously reviewed procedures and tree protective measures concerning the project site, staging areas, hauling routes, watering, contacts, etc.

4.20.5 Tree Protection Zone

Each tree to be retained shall have a designated *Tree Protection Zone* identifying the area sufficiently large enough to protect it and its roots from disturbance. The *Tree Protection Zone* shall be shown on all site plans: Demolition, Grading, Irrigation, Electrical, Landscape, etc. Improvements or activities such as paving, utility and irrigation trenching including other ancillary activities shall occur outside the *Tree Protection Zone*, unless otherwise specified. The protection fence shall serve as the *Tree Protection Zone*.

A) Activities prohibited within the *Tree Protection Zone* include:

- Parking vehicles or equipment, storage of building materials, refuse, or excavated soils, or dumping poisonous material on or around trees and roots. Poisonous materials include, but are not limited to paint, petroleum products, concrete, stucco mix, dirty water or any material that may be harmful to tree health
- The use of tree trunks as a backstop, winch support, anchorage, as a temporary power pole, signpost or other similar function
- Cutting of tree roots by utility trenching, foundation digging, placement of curbs and trenches, or other miscellaneous excavations without prior approval of the DRP Arborist
- Soil disturbance or grade change
- Drainage changes

B) Activities permitted or required within the *Tree Protective Zone* include:

- **Mulch:** During construction, wood chips may be spread within the *Tree Protection Zone* to a four to six inch depth, leaving the trunk clear of mulch. This will aid in inadvertent soil compaction and moisture loss. Mulch shall be 2-inch unpainted, untreated shredded wood or approved material.
- **Root Buffer:** When areas under the tree canopy cannot be fenced, a temporary buffer is required and shall cover the root zone and remain in place at the specified thickness until the final grading stage. The protective buffer shall consist of shredded wood chips spread over the roots at a minimum of 6-inches in depth (keeping the trunk clear of chips), and layered by ¾-inch quarry gravel to stabilize the 3/4-inch plywood sheets laid on top. Steel plates can also be used.
- **Irrigation, Aeration, fertilization, Mycorrhizae** treatments or other beneficial practices that have been specifically approved for use within the *Tree Protection Zone*.

C) Erosion Control:

If a tree is adjacent to or in the immediate proximity to a grade slope of 8% (23 degrees) or more, approved erosion control or silt barriers shall be installed outside the Tree Protection Zone to prevent siltation and/or erosion within the zone.

4.20.6 Tree Pruning and Removal

Prior to construction, various trees may need to be pruned away from structures or proposed construction activity. **Construction or contractor personnel shall not attempt pruning.** Only personnel approved by the DRP Arborist can perform pruning operations.

Removal of trees adjacent to trees that are to remain requires a great amount of finesse. Only personnel approved by the DRP Arborist shall engage in tree removal. Removal of trees that extend into branches or roots of protected trees shall not be attempted by the demolition or construction crew, or by grading or other heavy equipment. Before removing tree stumps, the project manager shall determine if roots are entangled with trees that are to remain. If so, these stumps shall have their roots severed before extracting them.

4.30 Activities During Construction and Demolition Near Trees

Soil disturbance or other damaging activities within the Tree Protection Zone is prohibited unless approved by the DRP Arborist and mitigation for specific injuries is implemented. **No encroachment within 10 feet of a trunk will be permitted under any circumstances.**

4.30.1 Soil Compaction

Soil compaction is the largest single factor responsible for the decline of trees on construction sites. The degree of compaction depends on several factors: amount and type of pressure applied, presence and depth of surface organic litter, soil texture and structure, and soil moisture level.

The greatest increase in soil density occurs during the first few equipment passes over the soil, which underscores the importance of implementing protective measures before the project begins and equipment arrives at the site. To dispense traffic weight mulch and temporarily root buffers can be used.

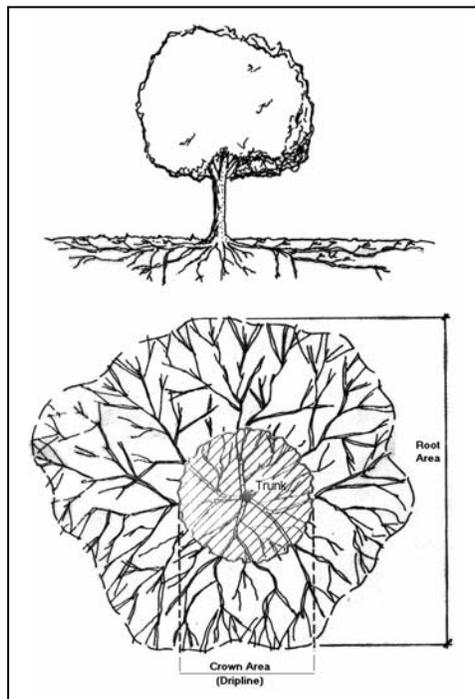
The following techniques can lessen compaction: vertical mulching, soil fracturing, core venting, and radial trenching. Do not compact soil to higher density than needed: to 95% Proctor density (moisture – density) in improved areas for asphalt or concrete pavements, and not to exceed 85% in unimproved open landscape areas that use water jet compaction.

4.30.2 Grading Limitations within the Tree Protection Zone

Lowering the grade around trees can have an immediate and long-term effect on trees. Typically, most roots are within the top 3 feet of soil, and most of the fine roots active in water and nutrient absorption are in the top 12 inches.

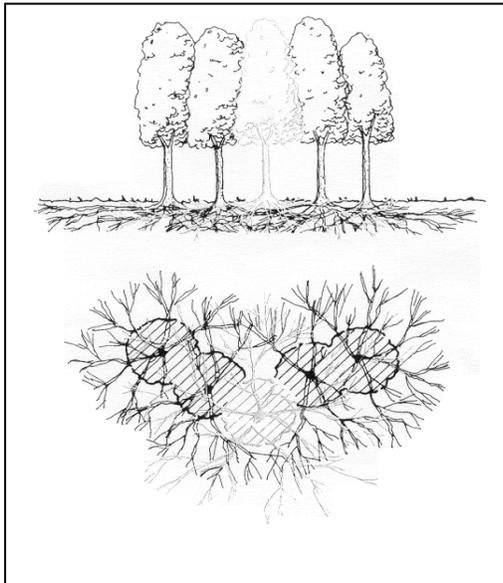
- A) Grade changes within the *Tree Protection Zone* are not permitted.
- B) Grade changes outside the *Tree Protection Zone* shall not significantly alter drainage.
- C) Grade changes under specifically approved circumstances shall not allow more than 6 inches of fill soil or allow more than 4 inches of existing soil to be removed from natural grade, unless mitigated.
- D) Grade fills over 6 inches or impervious overlay shall incorporate an approved permanent aeration system, permeable material, or other approved mitigation.
- E) Grade cuts exceeding 4 inches shall incorporate retaining walls or an appropriate transition equivalent.

The pictures on the next pages illustrate the pattern of tree root development and areas where encroachments may have an adverse effect on tree health. See Training Leaflets (Appendix P) for a list of information offered by the Forestry Division. The video, *Guide for Excavating Near Trees, Tunneling and Trenching* (International Society of Arboriculture) can be borrowed from the Forestry Office.



Matheny, N.P. and Clark, J.R. 1998. *Trees and Development*

Tree root system of a tree can be described as shallow and widespread, extending far beyond the edge of the canopy.



Matheny, N.P. and Clark, J.R. 1998. *Trees and Development*

In many parks where trees grow closely together, root systems of individual trees overlap and intertwine, forming a dense mat of roots.

4.30.3 Trenching, Excavation and Equipment Use

Trenching, excavation or boring within the *Tree Protection Zone* shall be limited to activities approved by the DRP Arborist. Explore alternatives for trenching outside the root zone. Avoid exposing roots during hot, dry weather. Backfill trenches as soon as possible with soil and soak with water the same day. Small roots can die in 10 to 15 minutes and large roots may not survive an hour of exposure. If the trench must be left open all roots must be kept moist by wrapping them in peat moss and burlap.

If trenching is unavoidable, the following distances should be maintained:

TRUNK DIAMETER (measured at 4.5 feet above natural grade)	DISTANCE FROM BOTH SIDES OF THE TRUNK
Up to 6 inches	Past dripline
6-9 inches	5 feet
10-14 inches	10 feet
15-19 inches	12 feet
over 19 inches	15 feet

A) **Root Severance.** No roots greater than 2 inches in diameter shall be cut without approval of the DRP Arborist. Tunneling under roots is the approved alternative. Prior to excavation for foundation/footing/walls, or grading or trenching within the *Tree Protection Zone*, roots shall be severed cleanly one-foot outside the *Tree Protection Zone* to the depth of the planned excavation. When roots must be cut, they shall be cut cleanly with a sharp saw to sound wood and flush with the trench site.

B) Excavation. Any approved excavation, demolition, or extraction of material shall be performed with equipment that is placed outside the *Tree Protection Zone*. Hand digging, hydraulic, or pneumatic excavation are permitted methods for excavation within the *Tree Protection Zone*.

C) Heavy Equipment. Use of backhoes, Ditch-Witches, steel tread tractors or other heavy vehicles within the *Tree Protection Zone* is prohibited unless approved by the DRP Arborist. If allowed, a protective root buffer is required.

4.30.4 Tunneling and Directional Drilling

Approved trenching or pipe installation within the *Tree Protection Zone* shall be either cut by hand, air-spade, or by mechanically boring a tunnel under the roots with a horizontal directional drill using hydraulic or pneumatic air excavation technology. In all cases, install the utility pipe immediately, backfill with soil and soak with water within the same day. Tunneling under the root system can greatly reduce both damage to the tree and the cost to repair landscape and other features destroyed in the trenching process. There are times, such as when working in rocky soils and slopes, when tunneling is not a reasonable alternative.

The following recommendations for tunneling depths should be observed:

TRUNK DIAMETER (DBH)	MINIMUM TUNNEL DEPTH
Less than 12 inches	24 inches
12 inches or more	36 inches

4.30.5 Alternative Methods for Hardscape to Prevent Root Cutting

The following remedies should be considered as an alternative to severing tree roots:

- A) Grinding a raised walkway or concrete pad
- B) Ramping the walkway surface over the roots or lifted slab with pliable paving.
- C) Routing the walkway around tree roots
- D) Permeable paving materials (e.g., decomposed granite), interlocking pavers, or flagstone walkways on sand foundations

4.30.6 Using Alternative Base Course Materials

Engineered structural soil mix is an alternative material for hardscape areas near trees. More information can be found at www.amereq.com.

4.40 Tree Maintenance During Construction

Providing adequate maintenance can mitigate stressful changes that occur to a tree's environment during construction. To remain vigorous the tree needs to maintain stored carbohydrates and preserve the effectiveness of its growth regulators. It is recommended that large projects provide:

4.40.1 Irrigation

Providing supplemental irrigation for trees under water stress may be the single most important treatment. Irrigation should be designed to wet the soil within the *Tree Protection Zone* to the depth of the root zone and to replace that water once it is depleted. Light, frequent irrigation should be avoided. Create a six-inch berm around trees at the edge of the *Tree Protection Zone* and fill with no more than six inches of mulch. Fill the basin with water. Irrigation should wet the top two to three feet of soil to replicate similar volumes and normal seasonal distribution.

4.40.2 Soil Compaction Mitigation

To prevent negligent encroachment into the *Tree Protection Zone*, trees to be preserved during construction must have the specified type of protection fences in place at all times. Removal of fences, even temporarily, to allow deliveries or equipment access is not allowed unless approved by the DRP Arborist and a root buffer is installed. The root buffer components: mulch, gravel and plywood, must be maintained continually to assure its effectiveness against soil compaction.

4.40.3 Dust Control

During periods of extended drought, wind or grading, trunks, limbs and foliage should be sprayed with water to remove accumulated construction dust.

4.50 Damage to Trees

4.50.1 Reporting Injury to Trees

Any damage or injury to trees shall be reported as soon as possible to the Project Manager or Construction Supervisor, and always to the Park Maintenance Supervisor. The Park Maintenance Supervisor needs to be aware of an injured tree in order to monitor its recovery or progress. Injuries to roots and branches must be repaired immediately.

4.50.2 Contractor Subject to Penalties.

If a tree designated to remain is removed or irreversibly damaged as determined by the Recreation and Parks Arborist, a contractor may be required to install a replacement tree matching in size, quality and variety, using a contractor designated by the Recreation and Parks Arborist. If an acceptable replacement tree is not available, the contractor may be required to pay damages to the City for the value of the damaged tree in accordance with the guidelines set forth in the Guide for Plant Appraisal, 9th Edition, using the Trunk Formula Method.

4.50.3 Employees Subject to Discipline

In the event of damage to above- or below-ground parts of park trees, the Construction Supervisor or Park Maintenance Supervisor shall conduct an investigation to determine the cause of the damage. If it is found that damage was caused due to the error, negligence, or willfulness of a Department employee, then that employee may be subject to appropriate disciplinary action.

4.60 Documents to be Included in all Projects

4.60.1 Model Tree Protection Specifications for Designers and Project Managers (Appendix G)

This document should be distributed to the Planning and Construction Designers, Project Managers, City Inspectors, bidding contractors, and contracted designing firms.

4.60.2 Tree Protection Summary and Instructions on How to Prevent Damage to Trees During Construction (Appendix I)

This document should be distributed to the Construction and Maintenance staff for implementation during all in-house projects.

4.70 Right Of Entry Permits and Documents to be included with every permit

Carnivals and festivals that are celebrated in our parks provide exceptional and enriching opportunities that bring our communities together. These activities can potentially affect the park environment. Filming crews, food concessions, permitted vendors, and special events activities affect the physical properties of our parks and trees.

In order to sustain a healthy urban forest, it is imperative that all Department staff understands the need to protect park trees. Every individual, organization or agency given a Right of Entry, permit or agreement to enter Department property, should be in compliance with Department policies protecting park trees and be given documentation the will help to ensure tree protection during the permitted activity. The document titled Instructions on How to Prevent Damage to Trees During Construction (Appendix I) shall be distributed to every permittee and the permittee shall comply with these instructions.

5.0 Tree Removal, Replacement and Planting

Introduction

Trees in City parks are components of an ecosystem undergoing dynamic physiological processes. These trees like any others grow, develop, may become diseased and decayed, and die. To manage a sustainable urban forest a methodology must be in place to direct us when trees need to be removed, when it is necessary to replace them, and how to prolong the longevity of an urban forest as a whole, through reforestation with young, diverse, and appropriately located tree species.

5.10 Tree Removal

Trees in city parks are removed for the following reasons: the tree (s) is dead or dying, it is diseased, it is damaged or injured to the extent that is likely to die or become diseased, or it constitutes a hazard. Furthermore, its removal should enhance the health of remaining trees within the immediate vicinity and be consistent with good forestry practices.

Nuisance trees are also removed when any part of the tree (s) causes or is about to cause impairment of city operations (including recreation) or damage to buildings, hardscape, or permanent infrastructure lines that cannot be relocated, and in the opinion of the DRP Arborist, pruning will too severely compromise the tree's structure.

Proposed capital improvement projects that recommend tree (s) removal must have consensus of the community. Participants must agree to the removal of all trees specified in a project before the project proceeds to the next phase.

5.10.1 DRP Tree Removal Procedure

The procedures outlined in Appendix J must be followed when trees are removed. Disciplinary action may apply to DRP staff if these procedures are not precisely followed.

5.10.2 Notification Protocol for Large Scale Tree Removal Projects

When a large number of trees have been approved for removal the Notification Protocol must be followed before the project begins (Appendix K). The protocol assures that information is communicated to the public, City council offices, the Park Advisory Board, and to the department Divisions affected by the removal project. This protocol provides an opportunity for the public to become involved with forestry issues and for good department coordination.

5.10.3 Tree Removal—Four Categories of DRP Protected Trees

A) Trees Protected by LA City Ordinances must always have permit and an approval by the Board of Public Works before any alteration to the trees is made. The only exception is if the tree poses an immediate threat to life or public safety. The DRP Forestry Staff has the discretion to conduct emergency tree removal. Documentation (including digital photos) shall follow after the hazard has been mitigated. The request for the removal of a tree in this category must begin with the DRP Forestry Division.

B) Heritage Trees must follow the DRP Tree Removal Procedure before any alteration to the trees is made. Furthermore, the General Manager of DRP or his/her designee must approve the removal recommendation before any action is taken. The only exception is if the tree poses an immediate threat to life or public safety. The Forestry Staff has the discretion to conduct emergency tree removal. Documentation (including digital photos) shall follow after the hazard has been mitigated. A record of the event will be entered to the designated Heritage Trees list.

C) Special Habitat Value Trees must follow the DRP Tree Removal Procedure before any alteration is made to them. Additionally, the General Manager of DRP or his/her designee must approve the removal before any action is taken. The only exception is if the tree poses an immediate threat to life or public safety. The Forestry Staff has the discretion to conduct emergency tree removal. Documentation (including digital photos) shall follow after the hazard has been mitigated. A record of removed tree(s) will be entered to the Forestry Work Order System.

D) Common Park Trees: The removal of any park tree is not permitted without approval. If the tree is not a Tree Protected by the LA Ordinance or DRP Tree Preservation Policy (Appendix A) as a Heritage Tree or Special Habitat Value Tree, the DRP Tree Removal Procedure takes precedence.

5.20 Tree Replacement

Tree replacement is guided by the Los Angeles City Landscape Policy (Appendix M) and by the objectives and functions as defined by the Recreation & Parks Department. DRP trees are planted according to the DRP Reforestation Program. Sometimes when crowding or other physical constraints make it impossible to plant the same tree in the same place where it was removed, an alternate location is found. Undesirable tree species are not replaced.

5.30 Tree Planting

The role of the urban forest is to improve environmental quality and increase the economic, physical, and social health of communities. As communities continue to grow urban forests will become even more important to the quality of life.

“A Society grows great when old men plant trees whose shade they know they shall never sit in” – Greek Proverb

Part of sound urban forest management is to plant desirable, sustainable trees in the urban environment. The ideal park tree is a shade tree with minimum susceptibility to wind damage and branch drop, does not require frequent pruning, produces slight litter, is deep-rooted, has few serious pest and disease problems, and tolerates a wide range of soil conditions, irrigation regimes, and air pollutants. Since relatively few trees have all these traits, it is important to match the tree species to the planting site by determining what issues are most important on a case-by-case basis.

5.30.1 DRP Reforestation Program

The Program represents a general evaluation of tree canopy in each of the City parks with respect to age class, tree size, and variety of evergreen, deciduous, coniferous trees. The program calls for the gradual planting of trees at each park facility in the coming decade. The DRP Reforestation Program is available in the Forestry Division and in each Region Headquarter office.

5.30.2 Planting Guidelines for Park Trees

Recreation and Parks Tree Planting and Selection Guidelines (Appendix N) are guidelines to assist staff in making the best possible match of tree species to a specific location. They provide a starting point for species selection and are not intended to be limiting.

Our Department guidelines include priorities for native habitat restoration or enhancement, prevention from large canopy losses caused by pest epidemics, and geographic consideration for species selection.

5.30.3 Nursery Specification for Park Trees

Specifications for purchase of trees by the DRP Department call for high quality, healthy plant stock. Healthy and vigorous park trees begin with plants that meet the specifications outlined in Appendix O. DRP staff may refuse plants that do not meet the specification with any cost for replacement.

6.0 Tree Evaluation for Hazard and Economical Value

Introduction

Evaluation of trees for possible hazards and removal is critical if we are to provide a safe environment in our city parks. A Certified Arborist in the DRP's Forestry Division performs the evaluation and must consider risk management and liability. Unlike in the natural forest where a tree manager might permit a tree with a history of branch failure to continue to be retained, in a public area the manager must call for tree removal in order to eliminate the possibility of injury. If a tree was identified as a hazard, the DRP is responsible if the tree fell and caused injury.

Because of the value of trees to neighborhoods, if a tree is to be removed the reason for removal is made public. Trees beautify neighborhoods, provide energy savings, offer a pleasant park setting for recreational activities, and add value to the property. Research shows that trees add 15 to 25 percent to property values.

6.10 Hazardous Trees

All trees have the potential to fail, but only a relatively few actually do so. In establishing criteria to evaluate trees for hazard, a focus is given to trees in urban areas, recognizing the unique combinations of species and site characteristics found in cities. Documentation of tree hazard assessment is kept in the Forestry Work Order System. For *Protected Trees*, the ISA Tree Hazard Evaluation Form (Appendix L) is completed.

6.10.1 Emergency Removal of Hazardous Trees

If in the judgment of the Arborist of the Forestry Division, a tree poses an immediate threat to life or public safety, it is removed immediately. If the tree is *Protected Tree*, documentation (including digital photos) will follow after the hazard has been mitigated.

6.10.2 Criteria Determining Hazardous Trees

For a tree to be considered hazardous, the following criteria must exist:

- A) The tree has a defect that creates an unreasonable risk of branch, stem or root failure.

- B) A "target" must be present, and if the tree fails, damage to property or personal injury/death could result.

6.10.3 Public Notification

Removal of any trees, other than hazardous, within the limits of DRP Department must follow the Tree Removal Procedure (Appendix J). The Notification Protocol must precede removal of large number of trees for Large Scale Tree Removal Projects (Appendix K); the document contained in this appendix informs respective Council Districts and the public by the posting of notification signs on trees two weeks prior to their removal.

6.20 Tree Appraisal

Values of trees are subjective—it is difficult to appraise the true worth of a tree. The DRP applies the following three methods of tree appraisal:

A) Trunk Formula - This method is used the most in the urban forest evaluations and when the plant is removed and too large to be replaced. The method evaluates a tree by determining its basic value and then adjusting it by the tree's condition and location. This method allows for special circumstances such as trees with historical, cultural, or size considerations.

Appraised Value = Basic Value x Condition x Location. Appraised value uses the cost of replacing the largest locally available plant and adjusting for the size difference and the condition and location of the appraised tree.

B) Cost of Repair - This method assesses the cost of tree damage and calculates the expenses to perform any treatments including pruning, fertilizing, watering, aeration, alleviation of compacted soil, other soil improvements, and insect and disease treatments.

C) Cost of Cure - This method is similar to the Cost of Repair method, but it calculates the expenses necessary to bring a damaged tree as close to its original condition as possible.

7.0 Safety Standards

Introduction

Safe tree maintenance is the most important objective for the supervisory staff of the DRP Forestry Division. Employees are trained on a continuous basis regarding all tasks of tree operations. DRP recognizes safety standards, which are represented in the following two documents:

7.10 ANSI Z133.1 Safety Standards for the Tree Care Industry

The publication (Appendix E) establishes safety standards for tree care operations in the United States and provides safety criteria for workers and the public. The following are topics covered in the publication:

- General safety requirements
- Electrical hazards
- Vehicles and mobile equipment
- Portable power hand tools
- Hand tools and equipment
- Work procedures

The booklet also provides:

- Glossary of terms used in the tree industry
- Recommended guidelines for standard performance and safety training
- General safety procedures that apply to all tree work
- Available resources
- Weight of green logs
- Impact of OSHA & ANSI Standards upon municipal forestry Departments.

7.20 DRP Code of Safe Practices for Forestry Operations

The Recreation and Parks Department Safety Officer established this code to be recognized by all employees working in tree operations within our Department (Appendix F).

7.30 Safety Practices to Secure Work Areas, including Flagging

Proper traffic control techniques are developed for a purpose. They: reduce accidents, minimize injury to workers and the public, reduce damage to private and public property (including damage to the project and equipment), minimize the possibility of claims and litigation arising from work zone accidents, reduce confusion to motorists, expedite traffic flow, and improve public relations. More information is provided in a document used by the DRP Forestry Division *Tree Operations Manual*.

7.40 Rigging

Rigging, as it relates to tree work, is an assemblage of tackle (lines, pulleys, gear and equipment) arranged to gain mechanical advantage when hoisting, lowering, hinging (pivoting), and pulling. It is, in essence, the how, where and why the trimmer places his lines, whether they are butt-lines, guide-lines, or fall-lines, in order to enhance his

control over his ever-changing environment, the tree. The trimmer must assess and adjust his rigging procedure with each job because each tree is unique. Details are discussed in the Forestry Division *Tree Operations Manual*.

7.50 Knotting

Knotting in the tree industry is necessary to perform safe tree operations. Before each use, the Tree Surgeons shall inspect climbing lines, work lines, and other climbing equipment for damage, cuts, abrasions, and/or deterioration, and shall remove it from service if signs of excessive wear or damage are found. The DRP's *Tree Operations Manual* contains terms used in tree industry and descriptions of how knots are to be tied.

8.0 Appendices

A.	DRP Tree Preservation Policy	Page 2-4
B.	LA City Oak Tree Ordinance	Page 5-8
C.	ANSI A300 (part 1)-2001 Pruning	Page 9
D.	Best Management Practices, Tree Pruning	Page 10
E.	ANSI Z133.1-2000 Safety Requirements	Page 11
F.	DRP Code of Safe Practices for Forestry Operations	Page 12-13
G.	Tree Protection Guidelines for Designers and Project Managers	Page 14-15
H.	Major Construction Impacts and Methods to Minimize Damage	Page 16
I.	How to Prevent Damage to Trees During Construction	Page 17-19
J.	Tree Removal Procedure	Page 20-21
K.	Notification Protocol	Page 22-23
L.	ISA Hazard Evaluation Form	Page 24-25
M.	LA City Landscape Policy	Page 26-28
N.	DRP Tree Planting and Selection Guidelines	Page 29-34
O.	Nursery Specifications for Park Trees	Page 35-38
P.	Training Leaflets	Page 39-53

DRP TREE PRESERVATION POLICY

Purpose

The purpose of the Tree Preservation Policy is to establish a regulatory tool to provide orderly protection of specified trees, protect their value, and avoid significant negative impacts to the ecosystem. The Policy regulates protection of trees in four categories: Trees Protected by LA City Ordinances, Heritage Trees, Special Habitat Value Trees, and all other Common Park Trees.

Trees Protected by LA City Ordinances:

The current City of Los Angeles Ordinance protects coast live oak (*Quercus agrifolia*), valley oak (*Quercus lobata*), or any other tree of the oak genus indigenous to California measuring eight inches or more in diameter, four and half feet above the ground level at the base of the tree. The Board of Public Works must issue a permit before any alterations to protected trees are made that could cause them to be damaged, relocated or removed. Pruning also requires a permit and must comply with the Oak Tree Pruning Standards set forth by the Western Chapter of the International Society of Arboriculture. Illegal pruning or willful damage to any protected oak tree can result in a \$10,000 fine and/or 6 months in jail. If the tree poses an immediate threat to life or public safety, the DRP Arborist has the discretion to modify this process, maintaining proper documentation, including digital photographs. Oak trees identified as dead by the DRP Arborist can be removed without a permit.

Heritage Trees:

Heritage trees are individual trees of any size or species that are specifically designated as heritage because of their historical, commemorative, or horticultural significance. The list of designated Heritage Trees remains open for new designations and provides useful information to DRP staff regarding the importance of their actions while planning activities near heritage trees. Since Heritage Trees are protected trees, recommendations from the DRP Arborists must be obtained before any alterations to the protected trees is made that may cause the tree to become damaged, relocated, or removed. The General Manager of DRP or his/her designee must approve the recommendation before any action proceeds. Pruning also can cause irreversible damage to the tree and must be in compliance with the ISA Tree Pruning Guidelines. Pruning must be performed under supervision of an ISA certified staff only. If the tree poses an immediate threat to life or public safety, the Arborist of the Forestry Division may compromise the process, if proper documentation, including digital photographs, is kept. Heritage trees identified as dead by the DRP Arborist will be removed and recorded into the designated Heritage Trees list. The Heritage Trees list can be obtained from Regional Headquarters Office and the Forestry Division.

Special Habitat Value Trees:

After more than a century of development, the native and indigenous landscape throughout the City has changed significantly. Special habitat value trees, because of decreasing numbers and their fragility in an urban setting, are particularly noteworthy here.

- California native trees provide habitat for state or federally protected animal species.
- California native trees that are located in the Pacific Flyway are important to thousands of migratory birds each spring and fall during migration season.
- Native trees provide a foundation for a healthy ecosystem

The following California native trees are protected in this group: California sycamore (*Platanus racemosa*), California bay (*Umbellularia californica*), box-elder (*Acer negundo* 'Californica'), big leaf maple (*Acer macrophyllum*), California walnuts (*Juglans californica* and *J. hindsii*), toyon (*Heteromeles arbutifolia*), native cherry trees (*Prunus ilicifolia*, *Prunus lyonii*), cottonwood (*Populus fremontii*, *P. trichocarpa*), and native willow trees (*Salix hindsiana*, *S. laevigata*, *S. lasiandra*, *S. lasiolepis*). Additional species may be included in this group with respect to their species habitat value.

Special Habitat Value Trees are protected trees. Before any alterations to protected trees are made that may cause them to be damaged, relocated, or removed, a recommendation for action must be obtained from the DRP Arborists. The recommendation, which outlines measures to protect and preserve and in some circumstances remove, must be approved by the General Manager of DRP or his/her designee before any action proceeds. Some forms of pruning also can cause irreversible damage to trees and must be in compliance with the ISA Tree Pruning Guidelines. Pruning must be performed under supervision of ISA certified staff only. If the tree poses an immediate threat to life or public safety, the DRP Arborist may intervene, maintaining documentation and digital photos. Special Habitat Value trees identified as dead by the Forestry Arborist will be removed and recorded into the Forestry Work Order System.

Common Park Trees

Most City parks contain mature exotic trees that have great value beyond the shade they provide to park users. They are a scenic resource to surrounding neighborhoods and their removal or disfigurement by extreme pruning for construction clearance or other reasons diminishes the value of the urban forest and often provokes public protest. Some trees have not been designated under a protected group of trees but still provide aesthetic, sentimental, economical, and environmental value.

Appendix A

The large number of trees in our parks has a significant cooling effect on the urban environment in Los Angeles, where tree canopy represents only 25% of the land. Every tree in our City parks is recognized as a valuable asset and must be protected. The TREE CARE MANUAL provides guidelines for protecting trees during construction and offers suggestions and alternative technical solutions to avoid damages to trees. The Department's Regional Head is responsible for seeing that the Maintenance, Recreation, and Construction staff follows and implements tree preservation and protection practices outlined in the TREE CARE MANUAL.

Oak Trees - Los Angeles Municipal Code Section 46.00

Sec. 46.00. Oak Tree Regulations.

No oak tree may be relocated or removed except as provided in Article 7 of Chapter I or Article 6 of Chapter IV of this Code. The term "removal" shall include any act which will cause an oak tree to die, including but not limited to acts which inflict damage upon the root system or other part of the tree by fire, application of toxic substances, operation of equipment or machinery, or by changing the natural grade of land by excavation or filling the drip line area around the trunk. (Added by Ord. No. 153,478, Eff. 4/12/80.)

Sec. 46.01. Definition.

"Oak Tree" means Valley Oak (*Quercus lobata*) and California Live Oak (*Quercus agrifolia*), or any other tree of the oak genus indigenous to California which measures eight inches or more in diameter, four and one-half feet above the ground level at the base of the tree. This definition shall not include the Scrub Oak (*Quercus dumosa*) or any oak tree grown or held for sale by a licensed nursery, or trees planted or grown as a part of a tree planting program. (Added by Ord. No. 153,478, Eff. 4/12/80.)

Sec. 46.02. Requirements for Permits.

No person shall relocate or remove any oak tree, as that term is defined in Section 46.01, where said oak tree is located on a lot larger than one acre in size and is not regulated pursuant to Article 7 of Chapter I of this Code, without first having applied for and obtained a permit from the Board of Public Works or its designated officer or employee, except as otherwise provided herein.

An application for a permit shall indicate, in a manner acceptable to the Board of Public Works, by number on a plot plan, the location of each oak tree, and shall identify each oak tree proposed to be retained, relocated or removed. If any grading is proposed which may affect such a tree, a copy of the grading permit plan shall be submitted with the application.

(a) Exemptions.

The Board of Public Works shall exempt from and not require issuance of a permit for the relocation or removal of an oak tree where said Board is satisfied that:

1. The proposed relocation or removal of the oak tree has been approved by the Advisory agency pursuant to Article 7 of Chapter I of this Code, or has been approved by the Advisory Agency prior to the effective date of this Code Section; or
2. The land upon which the oak tree is located has been the subject of a determination by the City Planning Commission, the City Council, a Zoning

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Administrator or the Board of Zoning Appeals prior to the effective date of this Code Section, the appeal period established by this Code with respect to said determination has expired, the determination is still in effect, and pursuant thereto the oak tree's removal would be permissible; or

3. A building permit has been issued for any property prior to the effective date of this Code Section and is still in effect with respect to the property under consideration and its implementation would necessitate such removal or relocation.

(b) Board Authority.

The Board of Public Works may grant a permit for the relocation or removal of an oak tree, unless otherwise provided herein or unless said tree is officially designated as an Historical Monument or as part of an Historic Preservation Overlay Zone, if said Board determines that the removal of the oak tree will not result in an undesirable, irreversible soil erosion through diversion or increased flow of surface waters which cannot be mitigated to the satisfaction of the City; and

1. It is necessary to remove the oak tree because its continued existence at said location prevents the reasonable development of the subject property; or

2. The oak tree shows a substantial decline from a condition of normal health and vigor, and restoration, through appropriate and economically reasonable preservation procedures and practices, is not advisable; or

3. Because of an existing and irreversible adverse condition of the oak tree, the tree is in danger of falling, notwithstanding said tree having been designated an Historical Monument or as part of an Historic Preservation Overlay Zone; or

4. The presence of the oak tree interferes with utility services and roadways within or without the subject property and the only reasonable alternative to the interference is the removal of the tree; or

5. It has no apparent aesthetic value which will contribute to the appearance and design of the surrounding properties, or is not located with reference to other trees or monuments in such a way as to acquire a distinctive significance at said location.

(c) Additional Authority.

The Board of Public works or its authorized officer or employee may:

1. Require as a condition of a grant of permit for the relocation or removal of an oak tree, that the permittee replace said tree within the same property

Appendix B

boundaries by at least two oak trees of a variety included within the definition set forth in Section 46.01 of this Code, in a manner acceptable to the Board. Each replacement tree shall be at least a 15-gallon, or larger, specimen in size, measuring one inch or more in diameter one foot above the base, and be not less than seven feet in height measured from the base. The size and number of replacement trees shall approximate the value of the tree to be replaced

2. Permit oak trees of a lesser size or trees of a different species to be planted as replacement trees, if replacement trees of the size and species otherwise required pursuant to this Code are not available. In such event, a greater number of replacement trees may be required.

3. Permit an oak tree to be moved to another location on the property, provided that the environmental conditions of said new location are favorable to the survival of the tree and there is a reasonable probability that the tree will survive.

Sec. 46.03. Permit Conditions.

(Added by Ord. No. 153,478, Eff. 4/12/80.)

- (a) A permit issued pursuant to this article shall (1) specify and approve the location or locations to which said tree may be relocated, (2) designate the species, number, and size of any replacement tree or trees, and (3) set forth any other conditions or requirements deemed necessary by the Board of Public Works, or its authorized officer or employee, to implement the provisions of this article.
- (b) It shall be a misdemeanor for any person to fail or refuse to comply with, or to willfully violate, any condition or requirement imposed in a permit issued pursuant to this article.

Sec. 46.04. Fees.

(Amended by Ord. No. 165,675, Eff. 5/11/90.)

A fee shall be charged for issuance of any permit pursuant to this article which permits the removal or relocation of five or less oak trees. Any permit for the removal or relocation of more than five such trees shall require an additional fee for each additional unit of five or fewer trees.

The fees herein shall be determined and adopted in the same manner as provided in Section 12.37-I, 1 of the Los Angeles Municipal Code for establishing fees.

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Sec. 46.05. Appeal. (Added By Ord. No. 153478, Eff. 4/12/80.)

In the event an application for a permit under this article is denied, the applicant shall be notified of such denial in writing, said applicant's right to file an appeal with the Board of Public Works, the time limits, and other requirements for the filing of said appeal.

No appeal shall be considered by the Board unless said appeal has been filed with the Board no greater than 10 days after the date said notice of denial is mailed.

The Board shall conduct a hearing within 30 days after receiving an appeal, and shall render a written decision approving, conditionally approving, or disapproving the issuance of the permit applied for.

Appendix C

**ANSI A300 (Part 1)-2001 Pruning – American National Standard Institute
Standard for Tree care Operations – Tree, Shrub, and Other Wood Plant
Maintenance – Standard Practices.**

The publication can be obtained from the International Society of Arboriculture (ISA), P.O. BOX3129, Champaign, IL 61826-3129

Phone: (217)355-9411, Fax: (217)355-9516

Order toll-free 1-888-ISA-TREE

www.isa-arbor.com

Appendix D

Best Management Practices, TREE PRUNING. Companion publication to the **ANSI A300 Part 1: Tree, Shrub, and Other Wood Plant Maintenance – Standard Practices, Pruning.**

The publication can be obtained from the International Society of Arboriculture (ISA), P.O. BOX3129, Champaign, IL 61826-3129

Phone: (217)355-9411, Fax: (217)355-9516

Order toll-free 1-888-ISA-TREE

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Appendix E

ANSI Z133.1-2000 – American National Standard Institute Standard for Arboricultural Operations – Pruning, Repairing, Maintaining, and Removing trees and Cutting Brush – Safety Requirements.

The publication can be obtained from the International Society of Arboriculture (ISA), P.O. BOX3129, Champaign, IL 61826-3129

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**CITY OF LOS ANGELES
DEPARTMENT OF RECREATION AND PARKS
CODE OF SAFE PRACTICE
FORESTRY DIVISION**

1. Employees shall follow all safety rules and regulations established by Federal, State, and local Government. Employees shall report any unsafe condition or practice immediately to their supervisor.
2. All employees shall be given accident prevention instruction at least every ten working days.
3. Any employee known to be under the influence of illegal drugs or alcohol shall be removed from the job site and reported immediately to supervision.
4. Horseplay, scuffling or other acts which can have an adverse effect on employee safety shall be prohibited.
5. Supervisors shall ensure that employees engaged in tree work shall be instructed in a set of safe operating rules. Employees shall be trained and instructed in the hazards involved in their job assignments, including proper use of equipment.
6. Each work location where tree trimming, tree repairing or removal is to be done, shall be under the direction of a qualified tree worker
7. Employees shall be instructed to ensure that all protective guards and devices are in place.
8. When removing a tree, the work area shall be clear to prevent injury and provide escape. A notch and back cut shall be used when removing a tree over 10 inches in diameter.
9. No employee shall knowingly be permitted to work if that employee's ability is impaired by fatigue or illness and might unnecessarily cause injury to other employees.
10. No employee shall operate power equipment that requires specific training and certification unless they have been trained and possess the current certification for that equipment.
11. No employee shall operate a motor vehicle without a current California Driver-license for the class of vehicle assigned. All accidents involving City vehicles shall be reported immediately to supervision and the Police Department
12. All on the job injuries shall be reported immediately to your supervisor no matter how slight.

13. Prior to climbing the tree, the tree shall be visually inspected to determine the safest method of entry into the tree. Employee shall be trained in the identification of poisonous plants and harmful animals.
14. An employee is responsible for inspecting all hand and power tools before the start of each shift. Any damaged or defective hand or power tools shall be removed from the job immediately and tagged out of service.
15. Rotary drum or disk-type brush chippers shall be fed from the side of the center line, operators shall immediately turn away from the feed table when brush is taken into the equipment.
16. Employees shall never place hands, arms feet, legs, or any part of their body on the feed table while a brush chipper is in operation. Materials such as stones, nails, or sweeping shall be feed into the brush chipper.
17. Power saw engines shall be stopped when carrying for a distance greater than 100 feet or on slippery surfaces or heavy underbrush. Saw engines shall be stopped for all cleaning, refueling and adjustments.
18. All personal protective equipment such as head, hand, face and hearing shall be worn at all times when required. All tree workers' saddles and ropes shall be inspected daily.
19. Employees engaged in tree maintenance or removal in the proximity to electrical equipment and conductors, shall consider all such equipment energized at all times.
20. When working aloft, employees shall wear an approved tree worker's saddle and tie-in with an approved safety strap or rope.
21. Employees shall be instructed to give an audible warning before a limb is dropped or tree is felled. Tree workers shall never carry tools while climbing.
22. Employees shall maintain a safe working distance from other employees when using power tools, and shall not drop or throw tools from trees unless a warning has been given and the ground area is clear of personnel.
23. Supervisors shall establish rescue procedures and provide training in first-aid, cardiopulmonary resuscitation (CPR) and aerial rescue.
24. Chopping tools shall be swung away from the feet, legs, and body. Chopping tools shall not be driven as wedges or used to drive metal wedges.
25. The employee shall work from the uphill side whenever possible when doing limbing or bucking.

MODEL TREE PRESERVATION SPECIFICATIONS
VERSION 1.4 - 5/16/03

These specifications shall be made a part of all construction documents. They were developed in order to protect all trees that have either direct or indirect encroachment into their driplines during construction within City parks.

A Recreation and Parks Arborist shall be invited to the Job Start Meeting and also notified 48-hours prior to construction. Contact Teresa Prosciewicz (213) 485-6547 or Steve Dunlap (213) 485-4826.

GENERAL REQUIREMENTS

1. No equipment is to be operated or parked under a tree, nor is any material to be stored within the dripline of a tree or leaned against a tree trunk. Do not pile or compact soil within a dripline.
2. In areas of construction, protect soil surface from traffic compaction with 3" of mulch or overlapping 3/4" plywood sheets.
3. No surface irrigation shall be installed within the dripline of a tree.
4. All work shall be in accordance with the City of Los Angeles DRP Tree Preservation Policy.
5. No chemical herbicides are to be used within 100 ft. of a tree's dripline.
6. Do not nail grade stakes or anything else to trees.
7. Encroachment from paving or structures within the dripline of a tree shall be permitted only with written authorization from the Department's Arborist. No encroachment within 10' of a tree trunk will be permitted under any circumstances.
8. Do not strip topsoil around trees. Any vegetation to be removed should be removed by cutting at ground level rather than pulling out by equipment.
9. Use a pneumatic drill to excavate under woody roots larger than 2" in diameter. Do not cut any root larger than 2" diameter. If roots must be severed, cuts are to be made by an arborist and soil backfilled immediately.

TYPICAL WORK PROCEDURES

All work around any existing oak trees and all trees designated to remain and to be protected shall follow this work procedures program. This program has been developed to minimize the impacts to each tree and protect them from unscheduled damage.

1. All work within a tree's root zone shall follow the DRP Tree Care Manual.
2. The extent of all work affecting any protected tree shall be staked by field survey and reviewed with the Recreation and Parks Arborist prior to construction.
3. A Recreation and Parks Arborist shall approve any pruning of protected trees prior to the start of construction.

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4. Hand dig the vertical trench at the final cut line and to the final grade; cleanly cut roots behind torn ends. There is no need to apply any kind of pruning seal, since roots will form their own internal barriers to decay.
5. Type I, II, or III tree protection fencing shall be constructed at the limit of approved work to protect the trees from unauthorized damage. It shall remain in place until landscape work commences.
6. No further work within the root zone shall be done beyond that which was approved without obtaining written approval from the Recreation and Parks Arborist, prior to proceeding.
7. The area within the chain link fence shall not be used for material or equipment storage, or parking during construction.
8. During construction, the impacted trees should be closely monitored for symptoms of shock. The contractor should be prepared to provide temporary water to irrigate and if needed, wash dust from foliage. Irrigation should wet the top 2-3 feet of soil to replicate similar volumes and normal seasonal distribution. Contact a Recreation and Parks Arborist if a decline in tree condition is noted.
9. Recreation and Parks Arborists Teresa Prosciewicz (213) 485-6547 and Steve Dunlap (213) 485-4826 are available to answer any general questions regarding trees in parks.

DAMAGES

If a tree designated to remain is removed or irreversibly damaged as determined by the Recreation and Parks Arborist, a contractor may be required to install a replacement tree matching in size, quality and variety, using an contractor designated by the Recreation and Parks Arborist. If an acceptable replacement tree is not available, the contractor may be required to pay damages to the City for the value of the damaged tree in accordance with the guidelines set forth in the Guide for Plant Appraisal, 9th Edition, using the Trunk Formula Method.

IMPLEMENTATION

Please direct questions about construction adjacent to oak trees to Steve Davis, Landscape Architect, Planning and Construction (213) 485-7507. The qualifications of Oak tree consultants shall also be reviewed prior to report preparation. If tree removals are requested, the Street Tree Division reviews applications and passes their recommendations to The Board of Public Works for action. If pruning is required, contact Steve Dunlap, Tree Surgeon Supervisor III, at Central Service Yard, (213) 485-6547.

Appendix H

Matheny, N.P. and Clark, J.R. 1998. *Trees and Development. A Technical Guide to Preservation of Trees During Land Development*. International Society of Arboriculture. Champaign, IL. Exponent Publisher Inc. Hagerstown, IN.

The publication can be obtained from the International Society of Arboriculture (ISA), P.O. BOX3129, Champaign, IL 61826-3129

Phone: (217)355-9411, Fax: (217)355-9516

Order toll-free 1-888-ISA-TREE

www.isa-arbor.com

TREE PROTECTION SUMMARY and INSTRUCTIONS

HOW TO PREVENT DAMAGE TO TREES DURING CONSTRUCTION

Land development is a complex process and even more challenging when trees are involved. Construction is one of the greatest causes of tree decline and death in urban areas.

The long-term goal of the Forestry Division is urban forest sustainability. The Division seeks to maintain social, recreational, ecological and economic functions of trees and their benefits over time. Stewardship of naturally occurring and planted trees is a central element in forest sustainability. Concerns integral to a sustainable urban forest are tree health and structure, preservation during development and redevelopment, species and site selection, quality of planting stock, standards of performance, maintenance practices in our parks, and recycling.

Tree protection should not begin subsequent to construction. If preservation measures are delayed or ignored until construction begins, the trees may be destined to fail. Since in most cases construction affects to trees cannot be completely eliminated, the goal for our parks planners and designers is to keep injury to trees to a minimum and allow building projects to proceed at the same time.

Successful tree preservation occurs when designers, construction personnel, and project managers are committed to tree preservation. All members of the project team must be familiar with the rudimentary aspects of tree growth and development in order to understand the relationship between tree survival and construction practices.

Myths about how trees grow:

For example, above ground parts of trees is not a “mirror” of what lies below ground. In actuality, typically four to eleven large roots radiate from the base of a tree’s trunk. These “buttress” roots extend from the root crown and sometimes are visible when the trunk flares away from the root crown or collar. These large roots decrease in taper rapidly and branch repeatedly so that at distances of ten feet or more from the trunk they are about ½ inch in diameter or smaller.

These roots grow horizontally through the soil and depending on the tree can extend 40 feet or more beyond the branch tips. These smaller roots are primarily responsible for water and mineral absorption. There can be hundreds of roots in a cubic inch of soil—thus any removal of soil or root severance forces a tree to compromise its physiological processes to sustain the loss.

Appendix I

All trees cannot and should not be preserved. Trees that are structurally unstable, in poor health, or unable to survive effects of construction become a liability to the project and should be removed. A realistic tree preservation program acknowledges that conflicts between trees and development may sometimes result in the removal of some trees and recognizes the detrimental effect to the project and community when trees die after construction is completed.

Successful tree preservation occurs when construction impacts to trees are minimized or avoided altogether. The challenge is to determine when impacts will be too severe for the tree to survive, not only in the short term, but also in the long term. There are no quantitative methods to calculate this critical level. Determining the optimum tree protection zone provides a guideline, although trees often survive and flourish with smaller protection areas.

The following are the three guiding principles for tree preservation:

- The acknowledgement that not all trees are in excellent health or have good structural stability.
- Tree preservation cannot be the responsibility of the Forestry staff alone. Each development participant must understand that his or her activities and decisions influence the success of tree preservation efforts.
- The ability of an arborist to cure construction injury is very limited, so the focus of preservation efforts is the *prevention* of damage.

Following the above principles will increase the chance for success and reduce the possibility that trees will die.

The Forestry Division conforms to the International Society of Arboriculture guidelines and would like to extend our knowledge in the field of forestry for protecting the urban forest from preventable damage. Many times, destruction of trees can be easily avoided if information on tree protection reaches the appropriate staff. Furthermore, we would like to extend an offer to meet with your staff to carefully review these guidelines.

Attached you will find instructions regarding the prevention of damage to trees during construction. These have been designed to be used by planning, construction, and maintenance staff.

If you have any questions or to schedule training for your staff, please call the Forestry Office at (213) 485-6547.

INSTRUCTIONS HOW TO PREVENT TREES FROM DAMAGE DURING CONSTRUCTION

An arborist should be called in as a consultant to the construction site before any work is started. The arborist will recommend the removal of trees that are not likely to survive construction activities regardless of the scope of work.

In general, the contractor is responsible for preventing trees from damage. The construction and maintenance staff must make the best effort to avoid unnecessary activities within the dripline of trees.

- **FENCES** Construction fences shall be erected around trees that are to remain. The fences should be placed as far from the trunk as possible in order to protect the above ground portion of the trees as well as the root system.
- **STORING AND PILING** Leaning objects against tree trunks and piling soil over the root zone is prohibited.
- **PRUNING** Pruning for vertical clearance of buildings, traffic, and construction equipment shall be performed by an arborist only, and not by construction or maintenance personnel.
- **COMPACTION** Driving equipment and walking within the dripline causes soil compaction and is a serious cause of tree decline and death, and usually manifests long after construction is complete. Fences around trees reduce unnecessary traffic. If traffic cannot be avoided, it is recommended to spread a 6-12 inch thick layer of mulch to reduce compaction. As an added precaution, placing large plywood sheets over the mulch can disperse weight.
- **EXCAVATION** Excavation causes major damage to trees. Digging and trenching should be planned ahead to minimize the root loss. When roots must be severed, clean cuts shall be made and sealed by an arborist. The soil shall then be backfilled immediately to minimize drying of the roots.
- **TREE MAINTENANCE** Abruptly terminating regular tree maintenance is another cause for tree decline. Provide supplemental irrigation to replicate similar volumes and normal season distribution.

TREE REMOVAL PROCEDURE

All park trees are valuable assets of the Department of Recreation and Parks. The steps listed below have been developed to have the least effect on park property when it is necessary to remove a tree. These steps must be adhered to at all times:

STEP ONE: Submit a Tree Removal Request to Forestry Division when:

- 1) A tree is confirmed to be dead by the Park Maintenance Supervisor (PMS).
- 2) A tree is diseased or damaged and the PMS determines that it poses a safety hazard.
- 3) A tree is determined to be an obstacle to infrastructure repairs or causes impairment to a park function.
- 4) Other reasons as determined by the Senior Park Maintenance Supervisor (SPMS).

STEP TWO: Provide Detailed Information

- 1) Contact Forestry Division at (213) 485-4826.
- 2) Indicate what "protection category" the tree is in: *Tree Protected by LA City Ordinances*, *Heritage Tree*, *Special Habitat Value Tree*, or *Common Park Trees*.
- 3) Provide a Project Outline that includes a timeline and the proposed work necessary to be done within the tree's dripline.

STEP THREE: Forestry Division Actions

- 1) Evaluation of the Tree Removal Request
- 2) Confirmation of tree's protection category
- 3) Inspection and evaluation of the tree with appropriate staff
- 4) Discussion of alternatives and recommendations
- 5) All information is entered into the Forestry Work Order System

STEP FOUR: Obtain Final Approval for Removal of Tree

- 1) For trees that are protected by L.A. City Ordinance, Forestry Division personnel will contact the Department of Public Works and initiate the process necessary to obtain a tree removal permit.
- 2) For *Heritage* or *Special Habitat Value Trees*, the Forestry Arborist makes a recommendation to the General Manager for removal. The General Manager or designee must make the final approval before the tree can be removed.
- 3) For a *Common Park Tree*, the Forestry Arborist may recommend removal.

STEP FIVE: Hazardous Tree Removal Procedures

During routine tree removal operations, forestry staff may determine that a tree must be removed for safety or other reasons. Staff members should:

- 1) Contact the Tree Surgeon Supervisor III and explain the situation.
- 2) The TSS III will contact all appropriate DRP staff to obtain further instructions and final approval before authorizing the tree to be removed.
- 3) **EXCEPTION TO THE RULE:** If any park tree poses an immediate life threatening emergency or safety hazard, the Forestry Division Arborist may bypass the regular procedure and authorize removal of the tree. Detailed documentation will be required; including digital photos of the tree, before and after the hazard has been mitigated.

STEP SIX: Notification Protocol for Large Scale Tree Removal

- 1) Forestry Division and Region personnel must follow established Notification Protocol when informing the public, local government officials, organizations, and department representatives about large scale tree removal projects.

NOTIFICATION PROTOCOL FOR LARGE SCALE TREE REMOVAL PROJECTS AT LOS ANGELES CITY PARKS

1. The Forestry Division will notify the Superintendent of the respective Regions, Concessions Unit Manager regarding concessions, and Director of Public Relations regarding public information, as soon as the project is identified but no later than three weeks prior to tree removal.
2. The Forestry Division will notify the aforementioned parties of the scheduled removal dates at least two weeks prior to the commencement of the project.
3. The Regions will inform the appropriate Council Offices and the impacted Community Organizations, including the Park Advisory Boards, immediately on notification by Forestry.
4. The Forestry staff will post notices of "intent to remove" on each tree targeted for removal at least one week prior to the start of the project.

INFORMATION

Park Name

**SECTIONS OF THIS
PARK WILL BE
CLOSED**

**ON *Dates: from - to*
DUE TO DEAD
TREE REMOVALS**

**SORRY FOR THE
INCONVENIENCE**

**FOR MORE INFORMATION PLEASE CALL:
(213) 485-6547 or (213) 485-4826
City of Los Angeles, Department of Recreation and Parks**



TREE HAZARD EVALUATION FORM

All sections of this form must be fully completed.

Site/Address: _____
 Map/Location: _____
 Owner: public _____ private _____ unknown _____ other _____
 Date: _____ Arborist: _____ ISA#: _____
 Arborist's Signature: _____

HAZARD RATING:

_____	+	_____	+	_____	=	_____
Failure Potential		Size of part		Target Rating		Hazard Rating
_____ Immediate action needed						
_____ Needs further inspection						
_____ Dead tree						

TREE CHARACTERISTICS

Tree #: _____ **Species:** _____
DBH: _____ **# of trunks:** _____ **Height:** _____ **Spread:** _____
Form: generally symmetric minor asymmetry major asymmetry stump sprout stag-headed
Crown Class: dominant co-dominant intermediate suppressed
Live crown ratio: _____% **Age Class:** young semi-mature mature over-mature/senescent
Pruning History: crown cleaned excessively thinned topped crown raised pollarded crown reduced flush cuts cabled/braced
 none multiple pruning events **Approx. dates:** _____
Special Value: specimen heritage/historic wildlife unusual street tree screen shade indigenous protected by gov. agency

TREE HEALTH

Foliage Cover: normal chronic necrotic **Epicormics?** Y N **Growth obstructions:**
Foliage Density: normal sparse **Leaf size:** normal small stakes wire/ties signs cables
Annual shoot growth: excellent average poor **Twig Dieback?** Y N curb/pavement guards
Woundwood development: excellent average poor none other _____
Vigor class: excellent average fair poor
Major pests/diseases: _____

SITE CONDITIONS

Site Character: residence commercial industrial park open space natural woodland/forest
Landscape type: parkway raised bed container mound lawn shrub border wind break
Irrigation: none adequate inadequate excessive trunk wetted
Recent site disturbance? Y N construction soil disturbance grade change line clearing site clearing
% dripline paved: 0% 10-25% 25-50% 50-75% 75-100% **Pavement lifted?** Y N
% dripline w/fill soil: 0% 10-25% 25-50% 50-75% 75-100%
% dripline grade lowered: 0% 10-25% 25-50% 50-75% 75-100%
Soil problems: drainage shallow compacted droughty saline alkaline acidic small volume disease center history of fail
 clay expansive slope _____ aspect: _____
Obstructions: lights signage line-of-site view overhead lines underground utilities traffic adjacent veg. _____
Exposure to wind: single tree below canopy above canopy recently exposed windward, canopy edge area prone to windthrow
Prevailing wind direction: _____ Occurrence of snow/ice storms never seldom regularly

TARGET

Use Under Tree: building parking traffic pedestrian recreation landscape hardscape small features utility lines
Can target be moved? Y N **Can use be restricted?** Y N
Occupancy: occasional use intermittent use frequent use constant use

Appendix L

TREE DEFECTS

ROOT DEFECTS:

Suspect root rot: Y N Mushroom/conk/bracket present: Y N ID: _____

Exposed roots: severe moderate low Undermined: severe moderate low

Root pruned: _____ Root area affected: _____% Buttress wounded: Y N When: _____

Restricted root area: severe moderate low Potential for root failure: severe moderate low

LEAN: _____ deg. From vertical natural unnatural self-corrected Soil heaving: Y N

Decay in plane of lean: Y N Roots broken: Y N Soil cracking: Y N

Compounding factors: _____ Lean severity: severe moderate low

CROWN DEFECTS: Indicate presence of individual defects and rate their severity (s=severe, m=moderate, l=low)

DEFECT	ROOT CROWN	TRUNK	SCAFFOLDS	BRANCHES
Poor taper				
Bow, sweep				
Codominants/forks				
Multiple attachments				
Included bark				
Excessive end weight				
Cracks/splits				
Hangers				
Girdling				
Wounds/seam				
Decay				
Cavity				
Conks/mushrooms/bracket				
Bleeding/sap flow				
Loose/cracked bark				
Nesting hold/bee hive				
Deadwood/stubs				
Borers/termites/ants				
Cankers/galls/burls				
Previous failure				

HAZARD RATING

Tree part most likely to fall: _____

Inspection period: _____ annual _____ biannual _____ other _____

Failure Potential + Size of Part + Target Rating = Hazard Rating

_____ + _____ + _____ = _____

Failure potential: 1-low; 2-medium; 3-high; 4-severe

Size of part: 1 - <6" (15 cm); 2 - 6-18" (15-45 cm);

3 - 18-30" (45-75 cm); 4 - > 30" (75 cm)

Target rating: 1 - occasional use; 2 - intermittent use;

3 - frequent use; 4 - constant use

HAZARD ABATEMENT

Prune: remove defective part reduce end weight crown clean thin raise canopy crown reduce restructure shape

Cable/Brace: _____ Inspect further: root crown decay aerial monitor

Remove tree: Y N Replace? Y N Move Target: Y N Other: _____

Effect on adjacent trees: none evaluate

Notification: owner manager governing agency Date: _____

COMMENTS

**POLICIES FOR THE INSTALLATION AND PRESERVATION
OF LANDSCAPING AND TREES ON PUBLIC PROPERTY
Of Recreation and Parks Department**

Adopted by City Council, September 21, 1971; amended January 10, 1972 (Council File Nos. 70-1899; 132989 S-1 & S-2; and 145282 S-1)

1. GENERAL OBJECTIVES

The urban forest is recognized as a vital infrastructure system essential to the quality of life in the City of Los Angeles. Tree canopy and landscaping are important factors in every neighborhood, enhancing aesthetics, mitigating the heat island effect, improving air quality, reducing stormwater runoff, providing economic, psychological and sociological benefits to all inhabitants. Therefore, planting new trees, which will develop broad canopies, as well as the preservation of mature tree canopy, and landscaping shall be considered to be a priority on all public property.

2. PROPOSED IMPROVEMENT PROJECTS

All proposed improvement projects shall be planned to *provide* the optimum *tree cover* and landscaping required for conformance to the above general objectives. This shall apply to all improvement projects undertaken by the City, by other public agencies, or by the private sector.

Trees and landscaping shall be provided in or adjacent all parkways, on slopes adjacent streets, in isolated land remnants, in or adjacent all street frontages abutting public buildings or structures, in median and traffic islands, and on the grounds of public buildings.

In addition, priority shall be given to shading hardscape features such as parking lots, roofs, plazas, etc. An adequate number of trees shall be planted so that 50% of the parking stall area in parking lots will be shaded within ten years. The only exception is to be when a conflicting use is planned, and implementation is to be within the next 10 years.

During construction, if any portion of construction, its lay down areas, or its staging areas affects existing landscaping, detailed guidelines for tree preservation and protection during construction shall be implemented.

3. FINANCIAL RESPONSIBILITY

The installation of landscaping and trees which provide wide-spread general benefits to the public—may be paid for by the City, except that landscaping, other than trees, in parkway areas is generally provided by the abutting property owners. The benefiting property owners, community groups, or other parties may pay for landscaping and trees in parks.

4. AUTHORITY AND RESPONSIBILITY

a. Within the Recreation and Parks land

The Recreation and Parks Department is responsible for approving and maintaining trees and landscaping in all Recreation and Parks properties.

The Recreation and Parks' Planning and Construction Division is responsible for the preparation of improvement plans for landscaping and park tree installation within Recreation and Parks land.

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b. Adjacent Public Buildings and within Their Grounds, Including Parking Lots

The *Department of General Services* has *primary* responsibility for the landscaping and trees related to public buildings, their grounds *and parking lots* as well as the public ways immediately contiguous thereto, and for the preparation of related improvement plans.

5. REMOVAL

The cutting down or removal of structurally sound trees by City forces, or by private parties under contract with the City, shall be prohibited.

Unless necessitated by urgent reasons of safety, imminent death of the tree, *requirements of individual trees*, or to permit the installation of a greatly needed public facility, existing trees located on public property shall not be removed. Before removal of existing trees is approved, a detailed investigation of all possible alternatives so as to salvage the trees shall be made. Such alternates shall include, but are not limited to, the following:

- a. *Developing*, especially for streets, sidewalks, *and other hardscape, power and communications lines*, storm drains, and sewers.
- b. Jogging roadway alignments from one side of the right of way to the other to *avoid* existing *mature* trees.
- c. Relocating tree to an acceptable nearby location, where appropriate.
- d. Placing sidewalks immediately adjacent the roadway when location adjacent the property line causes interference with trees.
- e. *Relocating* proposed buildings or other structures, including their structural elements, to avoid interference with existing trees.

The cutting down or removal of sound trees is further prohibited between the hours of 6 p.m. and 7 a.m. and on any Saturday, Sunday, or legal holiday except emergencies.

Whenever the removal of five or more trees or any outstanding tree specimen, especially a large, historical or significantly handsome tree is proposed, the following procedure shall be followed:

The *Councilmember* of the respective district, the Planning and Construction Division, the Forestry Division, the General Manager of the Recreation and Parks Department, and *Community Forest Advisory Committee (CFAC)* shall be consulted regarding possible alternatives.

6. REPLACEMENT OF TREES

Whenever trees are removed, the existing trees' aggregate diameter, measured at breast height (D.B.H., or 4.5-feet above the ground; multi-trunk trees are to be measured immediately below the lowest trunk) shall be replaced at an equal or greater rate of caliper of new trees. Each one-inch D.B.H. of existing tree shall be replaced with a minimum one-inch caliper new tree. Replacement trees shall have a minimum caliper of ¼-inch. For example, a single-trunk tree whose D.B.H. is 9 inches may be replaced with 36 trees of ¼-inch caliper, or with 3 trees of 3-inch caliper. This replacement ratio should

Appendix M

represent a *minimum*. If the replacement ratio cannot be achieved on an individual project, it should be applied on an area-wide basis.

All replacement trees shall be healthy and free of kinked, overgrown, or otherwise defective roots.

7. TYPES OF TREES

The type of park trees installed in a particular area shall conform to the Urban Forest Program maintained by the Recreation and Parks Department. Deviations shall only be made with the- approval of the Recreation and Parks principal forester.

Tree types shall be selected with the viewpoint of maximizing environmental, aesthetic and other tree values balanced with acceptable maintenance levels. Wherever suitable, blooming and accent foliage trees shall be utilized. Trees that will eventually provide a wide canopy and significant shade shall be favored. When community plantings are planned, the consensus of the property owners shall be given heavy consideration

The landscaping of publicly owned properties and parking lots shall conform to the City's Landscape Ordinance.

8. MAINTENANCE OF TREES

Maintenance of landscaping based on the best available arboricultural practices and urban forestry practices using state-of-the-art professional standards for planting, pruning, and general maintenance including but not limited by use of the most recent management tools shall be the responsibility of the Recreation and Parks Department. Agencies shall develop a maintenance schedule for trees located on lands under their control

9. DESIGN PERSONNEL

To insure a high degree of professional expertise, personnel responsible for directly supervising the street trees and landscaping program, and for preparing related improvement plans shall be licensed professionals in the field of landscape architecture, arboriculture, or urban forestry.

10. COORDINATOR FOR LANDSCAPING AND TREE PROGRAMS

The Bureau of Street Services shall coordinate meetings as needed for program changes that affect multiple Departments. The Memorandum of Understanding between the multiple Departments need be kept in force to assure exchange of information, collaboration, contribution and equal cost share of the Arbor Day celebrated as a joint educational outreach. The Community Forest Advisory Committee (CFAC) shall advise City Departments in determining the landscaping and tree policy program and the coordination of that program. In addition, the CFAC shall report to City Council on a quarterly basis, the Departments' progress towards establishing their respective landscaping and tree policies.

Recreation and Parks Department Tree Planting and Selection Guidelines

The urban forest, which includes trees in our parks, improves environmental quality and increases the economic, physical, and social health of communities. Urban forests will be important to the quality of life as communities continue to grow in the next decade. Urban forests provide energy benefits, improve air and water quality, and have social benefits such as noise abatement, creation of wildlife habitat, reduce exposure to ultraviolet light, provide pleasure, improve individual health, provide jobs and educational opportunities, and increase land value.

The ideal park tree is a shade tree with minimum susceptibility to wind damage and branch drop, does not require frequent pruning, produces slight litter, is deep-rooted, has few serious pest and disease problems, and tolerates a wide range of soil conditions, irrigation regimes, and air pollutants. Since relatively few trees have all these traits, it is important to match the tree species to the planting site by determining what issues are most important on a case-by-case basis. **A tree list is provided to establish a uniform guiding principle, but is not meant to limit tree selection if another tree is a better choice for the planting site.**

Our Department recognizes a number of factors that should be considered when selecting park trees:

Below is a list of guidelines and recommendations that our Department recognizes as important when selecting and planting park trees:

- The use of California native tree species and trees that are indigenous to the area that have proven to adapt well
- Trees that conserve water and energy
- To avoid a monoculture, non-native trees from a diverse species list that represent a ratio of no more than 30% of one genera, 20% of one species, and 10% of one cultivar
- Trees must be compatible with climate zone recommended by the current edition of the *Sunset Western Garden Book*
- Trees are selected to provide shade. Large trees should be used only when space permits proper branch and root development
- Trees are selected to provide aesthetics with respect to color, shape, and texture
- Dense evergreen trees are recommended where windbreaks are desired

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- Tree species that drop fruit or seed pods should not be planted near paved areas used by pedestrians
- Trees (in their maturity) that will conflict with overhead power lines, lights, underground main water or sewer lines, signs, and buildings shall not be planted
- Newly planted trees are selected to match water requirements with those of surrounding plants
- Trees will only be planted in locations where adequate aftercare can be provided
- Nurseries that provide trees with their natural form intact will be used as suppliers (e.g., those that do not prune remove lower branches)
- Minimum 15 gallon sized trees are recommended for planting in our parks. Smaller sized specimens may be considered on slopes
- A minimum of 30 feet between newly planted trees is required. Denser spacing may be considered for palms or if the density does not interfere with the use of the park or hinder proper tree development
- Trees are required to be properly staked with three wooden stakes and cinch ties. Reddy Stakes© may be used when vandalism is not anticipated and aesthetics are an important consideration
- The possibility of vandalism needs to be considered when planning, planting, and establishing replacement agreements or policies
- For every tree removed, the replacement ratio is minimum 2 to 1
- A 6- foot diameter tree basin shall be established around all newly planted trees
- Trees must have root protection barriers installed when rodents are present. Root barriers are always installed according to the manufacturer's specifications

To establish a compatible climate zone and properly match the palette of tree species for each zone, the location of City parks are divided into two communities:

Inland Plant Community and Coastal Plant Community

The Department's arborists, horticulturists, landscaping and maintenance staff have selected the tree species listed below to be the primary tree palette. Trees on this list have proven to work well in California's temperate climate, require moderate pruning, and are considered to be pest and disease resistant. Other tree species will be considered on an individual basis.

TREE PALETTE FOR INLAND PARKS

Inland Community areas compared to coastal regions have hotter summers and higher levels of air pollution. This region's climate is still mild enough to grow a diverse mix of trees. The ocean influences the Inland Community climate less than 15% of the time. The community's boundaries correspond with *Sunset Western Garden Book's* climate zones 18, 19, 20, and 21.

Trees native to California

* Indicates that it may be difficult to obtain a large number or at a low price

<i>Acer macrophyllum</i>	big leaf maple
<i>Alnus rhombifolia</i>	white alder
<i>Calocedrus decurrens</i>	incense cedar
* <i>Cercidium floridum</i>	blue palo verde
* <i>Cercocarpus betuloides</i>	California mountain mahogany
* <i>Chilopsis linearis</i>	desert catalpa
* <i>Heteromeles arbutifolia</i>	toyon
* <i>Juglans californica</i>	black walnut
<i>Lyonothamnus floribundus asplenifolius</i>	Catalina Ironwood
<i>Platanus racemosa</i>	California sycamore
<i>Populus fremontii</i>	Fremont cottonwood
<i>Quercus agrifolia, Quercus lobata,</i>	CA live oak, valley oak
* <i>Salix lasiolepis</i>	arroyo willow
* <i>Sambucus mexicana</i>	blue elderberry
* <i>Umbellularia californica</i>	California bay

Structured trees known to be pest and disease resistant

<i>Acacia baileyana</i>	Bailey acacia
<i>Acacia saligna</i>	blue leaf wattle
<i>Acer paxii</i>	evergreen maple
<i>Acrocarpus fraxinifolius</i>	pink cedar
<i>Angophora floribunda</i>	rough-barked apple
<i>Angophora costata</i>	NCN
<i>Arbutus unedo</i>	strawberry tree
<i>Brachychiton acerifolius</i>	flame tree
<i>Brachychiton populneus</i>	bottle tree
<i>Calocedrus decurrens</i>	incense cedar
<i>Calodendrum capense</i>	Cape chestnut
<i>Cassia excelsa</i>	crown of gold tree
<i>Cassia leptophylla</i>	gold medallion tree
<i>Casuarina cunninghamiana</i>	river she-oak
<i>Cedrus deodara</i>	deodar cedar
<i>Chionanthus retusus</i>	Chinese fringe tree
<i>Chitalpa tashketensis</i>	chitalpa
<i>Cinnamomum camphora</i>	camphor
<i>Ceiba insignis, Ceiba speciosa</i>	floss silk tree

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<i>Dombeya cacuminum</i>	NCN
<i>Fraxinus oxycarpa</i>	raywood ash
<i>Geijera parviflora</i>	Australian willow
<i>Ginkgo biloba</i>	maidenhair
<i>Gleditsia tricanthus</i>	honey locust
<i>Harpephyllum caffrum</i>	kaffir plum
<i>Koelreuteria bipinnata</i>	Chinese flame tree
<i>Lagerstroemia indica</i> and hybrids	crape myrtle
<i>Leptospermum scoparium</i>	New Zealand tea
<i>Liquidambar styraciflua</i> and varieties	American sweet gum
<i>Liriodendron tulipifera</i>	tulip tree
<i>Magnolia grandiflora</i>	southern magnolia
<i>Melaleuca linarifolia</i>	flax-leaf paperbark
<i>Melaleuca styphelioides</i>	prickly paperbark
<i>Metasequoia glyptostroboides</i>	dawn redwood
<i>Metrosideros excelsus</i>	New Zealand christmas tree
<i>Morus alba</i>	mulberry
<i>Parkinsonia aculeata</i>	Mexican palo verde
<i>Pinus canarienses</i>	Canary Island pine
<i>Pistacia chinensis</i>	Chinese pistache
<i>Platanus x acerifolia</i> ,	London plane
<i>Podocarpus gracilior</i>	fern pine
<i>Pyrus calleryana</i>	ornamental pear
<i>Quercus ilex</i> , <i>Quercus virginiana</i>	holly oak, southern live oak
<i>Rhodosphaera rhodanthema</i>	yellow wood
<i>Rhus lancea</i>	African sumac
<i>Schinus molle</i>	California pepper
<i>Sapium sebiferum</i>	Chinese tallow tree
<i>Stenocarpus sinuatus</i>	firewheel tree
<i>Taxodium distichum</i>	bald cypress
<i>Taxodium mucronatum</i>	Montezuma cypress
<i>Tipuana tipu</i>	tipu tree
<i>Tristania conferta</i>	Brisbane box
<i>Ulmus parvifolia</i>	Chinese elm
<i>Zelkova serrata</i>	sawleaf zelkova

PALMS

<i>Archonotophoenix cunninghamiana</i>	king palm
<i>Brahea armata</i> , <i>Brahea edulis</i>	Mexican blue palm, Guadalupe
<i>Butia capitata</i>	S. American jelly palm
<i>Jubaea chilensis</i>	Chilean wine palm
<i>Livistona chinensis</i>	Chinese fountain palm
<i>Phoenix canariensis</i>	Canary Island palm
<i>Phoenix dactylifera</i>	date palm
<i>Phoenix reclinata</i>	Senegal date palm
<i>Syagrus romanzoffianum</i>	queen palm
<i>Trithrinax acanthocoma</i>	Buriti palm
<i>Washingtonia filifera</i>	California fan palm
<i>Washingtonia robusta</i>	Mexican fan palm

Washingtonia filifera x robusta

desert fan palm

ADDITIONAL TREES CONSIDERED FOR INLAND GOLF COURSES

Araucaria heterophylla

Cedrus atlantica, Cedrus glauca atlantica

Cedrus deodara, Cedrus libani

Cupaniopsis anacardioides

Eucalyptus leucoxylon

Ficus macrophylla nitida, Ficus rubiginosa

Norfolk Island pine

atlas cedar, blue atlas cedar

deodar cedar, Lebanon cedar

carrotwood

white ironbark

Indian laurel fig, rusty leaf fig

TREE PALETTE FOR COASTAL PARKS AND GOLF COURSES

The ocean influences the Coastal Community climate more than 85% of the time. The community's boundaries correspond with *Sunset Western Garden Book's* climate zones 22, 23, and 24.

Trees native to California

* Indicates that it may be difficult to obtain a large number or at a low price

<i>Acer macrophyllum</i>	big leaf maple
<i>Alnus rhombifolia</i>	white alder
<i>Platanus racemosa</i>	California sycamore
<i>Populus fremontii</i>	Fremont cottonwood
* <i>Quercus agrifolia</i>	coastal live oak
* <i>Salix lasiolepis</i>	arroyo willow
* <i>Sambucus mexicana</i>	blue elderberry
* <i>Umbellularia californica</i>	California bay

Strongly-structured trees known to be pest and disease resistant

<i>Agonis flexuosa</i>	peppermint tree
<i>Chitalpa tashketensis</i>	chitalpa
<i>Cinnamomum camphora</i>	camphor
<i>Bischofia javanica</i>	toog
<i>Erythrina spp.</i>	coral tree species
<i>Fraxinus oxycarpa</i>	raywood ash
<i>Koelreuteria bipinnata</i>	Chinese flame
<i>Lagerstroemia indica</i> and hybrids	crape myrtle
<i>Leptospermum scoparium</i>	New Zealand tea
<i>Liquidambar styraciflua</i> and varieties	American sweetgum
<i>Liriodendron tulipifera</i>	tulip tree
<i>Magnolia grandiflora</i>	southern magnolia
<i>Pinus canarienses</i>	Canary Island pine
<i>Pinus pinea</i>	Italian stone pine
<i>Pistacia chinensis</i>	Chinese pistache
<i>Platanus x acerifolia</i> ,	London plane
<i>Podocarpus gracilior</i>	fern pine
<i>Pyrus calleryana</i> , <i>Pyrus kawakamii</i>	ornamental pear, evergreen pear
<i>Quercus ilex</i> , <i>Q. virginiana</i>	holly oak, southern live oak
<i>Tabebuia impetiginosa</i>	pink trumpet
<i>Tipuana tipu</i>	tipu tree
<i>Tristania conferta</i>	Brisbane box
<i>Ulmus parvifolia</i>	Chinese elm

City of Los Angeles
Recreation and Parks Department

Nursery Specification for Park Trees
for 5 gallon, 15 gallon, and 24 inch box Container-Grown Trees

I. PROPER IDENTIFICATION

All trees shall be true to name as ordered or shown on the planting plans and shall be labeled individually by genus and species and where appropriate, the cultivar.

II. COMPLIANCE

All trees shall comply with federal and state laws and regulations requiring inspection for plant disease, pests, and weeds. Inspection certificates required by law shall accompany each shipment of plants. Clearance from the County Agricultural Commissioner, if required, shall be obtained before planting trees originating outside the county in which they are to be planted. Even though trees may conform to county, state, and federal laws, the buyer may impose additional requirements.

III. TREE CHARACTERISTICS AT THE TIME OF SALE OR DELIVERY

A. TREE HEALTH

As is typical for the species/cultivar, trees shall be healthy and vigorous, as indicated by an inspection for the following:

- foliar crown density
- length of shoot growth (throughout crown)
- size, color, and appearance of leaves
- uniform distribution of roots in the container media
- appearance of roots
- absence of twig and/or branch dieback
- relative freedom from insects and diseases

Note: some of these characteristics cannot be used to determine the health of deciduous trees during the dormant season.

B. CROWN

1. **Form:** Trees shall have a symmetrical form as is typical for the species/cultivar and growth form.
 - a) **Central Leader:** Trees shall have a single, relatively straight central leader and a tapered trunk, free of codominant stems and vigorous, upright branches that compete with the central leader. Ordinarily, the central leader should not have been headed. However, in cases where the original leader has been headed, an upright branch at least $\frac{1}{2}$ (one-half) the diameter of the original leader just below the pruning point shall be present. **Note:** This section applies to single trunk trees, as typically used for street or landscape planting. These specifications do not apply to plants that have been specifically trained in the nursery, e.g., topiary, espalier, multi-stem, clump, etc., or unique selections such as contorted varieties.

b) **Main Branches (Scaffolds):** Branches should be distributed radially around and vertically along the trunk, forming a generally symmetrical crown typical for the species. Minimum vertical spacing may be specified.

- Main branches, for the most part, shall be well-spaced
- Branch diameter shall be no larger than 2/3 (two thirds) the diameter of the trunk, measured 1" (one inch) above the branch.
- The attachment of scaffold branches shall be free of included bark.

c) **Temporary branches:** Unless otherwise specified, small "temporary" branches shall be present along the lower trunk below the lowest main (scaffold) branch, particularly for trees less than 1-1/2" (one and one-half inches) in trunk diameter. Temporary branches should be distributed radially around and vertically along the lower trunk. They should be no greater than 3/8" (three-eighths inch) in diameter and no greater than 1/2 (one-half) the diameter of the trunk at the point of attachment. Heading of temporary branches is usually necessary to limit their growth.

C. TRUNK

1. Trunk diameter and taper shall be sufficient so that the tree will remain vertical without the support of a nursery stake.
2. The trunk shall be free of wounds (except properly-made pruning cuts), sunburned areas, conks (fungal fruiting-bodies), wood cracks, bleeding areas, signs of boring insects, galls, cankers and/or lesions.
3. Trunk diameter at 6" (six inches) above the soil surface shall be within the diameter range shown for each container size below:

Container	Trunk Diameter (in)	Soil Level from Container Top (in)
5 gallon	0.5" TO 0.75"	1.25" to 2"
15 gallon	0.75" to 1.5"	1.75" to 2.75"
24-inch box	1.5" to 2.5"	2.25" to 3"

4. All palm trees shall have minimum 6-foot brown trunk.

D. ROOTS

1. The trunk, root collar (root crown) and large roots shall be free of circling and/or kinked roots. Soil removal near the root collar may be necessary to inspect for circling and/or kinked roots.
2. The tree shall be well rooted in the soil mix. When the trunk is carefully lifted both the trunk and root system shall move as one.
3. The upper-most roots or root collar shall be within 1" (one inch) above or below the soil surface. The soil level within the container below the rim should be within the distance ranges shown in the table above
4. When the container is removed, the root ball shall remain intact.
5. The root ball periphery should be free of large circling and bottom-matted roots. The acceptable diameter of circling peripheral roots depends on species and size of root ball. The maximum acceptable size should be indicated for the species (if necessary).

E. MOISTURE STATUS

At time of inspection and delivery, the root ball shall be moist throughout, and the tree crown shall show no signs of moisture stress, as indicated by wilt, shriveled, dead leaves, or branch dieback. Roots shall show no signs of being subjected to excess soil moisture conditions, as indicated by root discoloration, distortion, death, or foul odor.

IV. INSPECTION

The City reserves the right to reject trees that do not meet specifications as set forth in these guidelines or as adopted by the buyer. If a particular defect or sub-standard element or characteristic can be easily corrected, appropriate remedies shall be required. If destructive inspection of root balls is to be done, the buyer and seller should have a prior agreement as to the time and place of inspection; minimum number of trees to be inspected, or percentage of a species (or cultivar), and financial responsibility for the inspected trees.

GLOSSARY:

Codominant – stems: two or more vigorous and upright branches of relatively equal size that originate from a common point, usually where the leader has been lost or removed.

Crown – The portion of a tree above the lowest main (scaffold) branch, including the trunk, branches and foliage.

Cultivar – A named plant selection from which identical or nearly identical plants can be produced, usually by vegetative propagation or cloning.

Girdling root – A root that partially or entirely encircles the trunk and/or large buttress roots, which could restrict growth and downward movement of photosynthate.

Included bark – Bark embedded within the crotch between a branch and the trunk or between two or more stems that prevents the formation of a normal branch bark ridge. This often occurs in branches with narrow-angled attachments or branches resulting from the loss of the leader. Such attachments are weakly attached and subject to splitting out.

Kinked root – A primary root(s), which is sharply bent and causes a restriction to water, nutrient, and photosynthate movement. Kinked roots may compromise the structural stability of roots systems.

Leader – The dominant stem that usually develops into the main trunk.

Photosynthate – pertains to sugar and other carbohydrates that are produced by the foliage during photosynthesis, an energy trapping process.

Root collar – The flared area at the base of a tree where the roots and trunk merge. Also referred to as the "root crown" or "root flare."

Shall – used to denote a practice that is mandatory.

Should – used to denote a practice that is highly recommended.

Scaffold branches – large, main branches that form the main structure of the crown.

Temporary branch – A small branch that is retained temporarily along the lower trunk of young trees. Temporary branches provide photosynthate to increase trunk caliper and taper help protect it from sunburn damage and mechanical injury. Such branches should be kept small and gradually removed as the trunk develops.

Trunk – The main stem or axis of a tree that is supported and nourished by the roots and to which branches are attached.

Guarantee:

The Successful bidder shall guarantee that the trees meet all of the specifications included in this contract. If a particular defect or sub-standard element or characteristic can be easily corrected, appropriate remedies shall be required. If destructive inspection of root balls is to be done, the City and seller should have a prior agreement as to the time and place of inspection; minimum number of trees to be inspected, or percentage of a species (or cultivar), and financial responsibility for the inspected trees.

Rejection:

The City reserves the right to reject trees that do not meet specifications as set forth in this contract or as adopted by the buyer at the time of delivery. The successful vendor shall be responsible for picking up the rejected trees at no cost to the City.

Training Leaflets

- Leaflet 1 – *Understanding the Oak Tree Ordinance* page 40
- Leaflet 2 - *Tree Wounds* page 41
- Leaflet 3–*Tree and Turf Association* page 42-43
- Leaflet 4 – *Watering Practices* page 44
- Leaflet 5 – *Mulch and It's Benefits* page 45
- Leaflet 6 - *Tree Staking* page 46
- Leaflet 7 – *Maintaining Young Trees* page 47-48
- Tree Care PowerPoint Presentation Outline page 49
- Video Guide –*Tunneling and Trenching*. Call the Forestry Division for more information.
- *The Green in Your City* series are public outreach brochures on various topics related to trees and nature. Call the Forestry Division for more information.

The Forestry Division also offers a 2.5-hour presentation on tree care. The presentation includes PowerPoint visuals and hands-on discussions using wood samples. Below is the training outline.

To arrange the presentation, call the Forestry office at 213-485-6547 at least two weeks prior to desired date. A room with projection wall and electrical outlet is necessary for the training.

UNDERSTANDING THE OAK TREE ORDINANCE

What governmental organizations have Oak Tree Ordinances?

- The State of California has no Ordinance that covers Oak Trees
- The County of Los Angeles has an Oak Tree Ordinance that is enforced by the Los Angeles County Fire Department
- The City of Los Angeles also has an Oak Tree Ordinance that is enforced by the Department of Public Works, Street Tree Division
- The City and County work together to save and protect oaks in our area, taking equal responsibility for enforcement and preservation of the existing indigenous oaks

What does the City of Los Angeles Ordinance do?

The Ordinance states that you cannot do anything to cause damage to, relocate, or remove, an Oak Tree on over an acre of private or public property, without the permission of the Board of Public Works. The Ordinance also identifies the type of oaks that are protected such as coast live oak (*Quercus agrifolia*), valley oak (*Quercus lobata*), and any indigenous oak tree except the scrub oak (*Quercus dumosa*).

What size Oak Tree is protected?

Oak trees with a diameter at breast height (DBH) of less than 8 inches are exempt from the Ordinance. Oaks that have a DBH of greater than 8 inches fall under the auspices of the Oak Tree Ordinance.

What type of work can you do to Oak Trees?

Once you have obtained a permit from the Department of Public Works Street Tree Division, you can trim an Oak Tree as long as you do not remove any limbs over 2 inches in diameter, or permanently damage the tree. You can remove dead wood and damaged limbs due to limb failure or physical damage to eliminate potential hazards. A Certified Arborist shall inspect any trimming requests of Oak Trees and an Oak Tree Report must then be submitted to the Street Tree Division for approval. Any trimming shall be done in compliance with the Oak Tree Pruning Standards of the Western Chapter of the International Society of Arboriculture.

Penalties for illegal trimming or removal

Failure to comply with, or willful violation of, any condition or requirement imposed is a misdemeanor. The illegal removal of a protected Oak Tree can result in a \$10,000 fine and/or 6 months in jail. The illegal trimming or willful damage to any protected Oak Tree can result in a \$10,000 fine and/or 6 months in jail.

TREE WOUNDS

What is a tree wound? A wound is a cut or breach in living tissue due to external intrusion. Wounds destroy the *cambium* layer, which is responsible for tree growth. *Cambium*, by division, forms new cells on both sides. These new cells are the duct system of trees. *Xylem*, the inside cells, conduct water and nutrients from the soil up the stems and *phloem*, the outside cells near the bark, conduct organic substances responsible for physiological process of trees from regions of higher to lower concentration in the tree. Wounds often close but do not heal. When wounds close and do not heal, the wood inside the tree will decay in what appears on the outside a sound tree trunk. Decayed wood loses conductive and storage capabilities.

Why do trees die from starvation and not a wound? Trees, like other living things, starve when water, nutrients, and organic substances (food) become limited. Trees also starve when space for storing energy reserves begins to decrease. Decayed wood means no storage.

How many times can you wound a tree before it dies? Trees have a defense system that is called CODIT (Compartmentalization of Decay in Trees). This system develops “internal barriers” limiting the spread of pathogens in trees vertically and horizontally. Trees do not heal, they compartmentalize. Any treatment that breaks the internal boundaries will destroy the tree’s defense system, and the pathogens will spread rapidly. Trees survive as long as they can form new parts in new positions faster than old parts are breaking down. Many wounds create many entries for pathogens; additional strains mean less vigor in developing the defense system. Trees will die if the CODIT does not develop in only one wound thus multiple wounds dramatically increase the potential of trees to die.

What are the pathogens? Pathogens are microorganisms that cause diseases. Fungi, bacteria, viruses and nematodes are the most common pathogens

What causes stress and strain? Injuries, cuts, burn, soil compaction around roots, over-watering, under-watering, or insect damage are factors that cause stress. Stress is a *reversible* process. Stress is a condition resulting from disruption, breakage, drain, or shunt of energy. When the condition of stress remains, the tissues become strained. Strain is an *irreversible* condition resulting from excessive stress.

How do wounds occur? Wounds may occur naturally through self-pruning or can be made inadvertently in the course of normal tree care. The bark of the trunk is the tissue of trees most often subject to mechanical damage, especially in spring and early summer when the *cambium* is active and the bark is “slipping”. Mowers, string trimmers, rubbing tree stakes and ties, aerating and other equipment bumping into trees, and intentional knife carving debarks trees at any season. Hot coals, chains, and even ropes left tied on tree trunks over time will injure trees.

How to prevent wounds? The best way to prevent injuries is to place mulch around tree basins to provide distance between operating machinery and tree trunks. Stakes and ties need to be removed before they rub against the bark and girdle the tree. For surfacing roots, place soil over exposed areas.

TREE AND TURF ASSOCIATIONS

The common association of trees and turf in landscaped areas is a complex competition for resources such as water, nutrients, and sunlight. Trees and turf grass are commonly grown together in man-made landscapes because of the desire to have both lush, green lawns and the shelter of large shade trees. Grassy lawns with trees are an unnatural ecosystem.

Tree habitat: Trees are native to forests that provide dense shade that prevents grasses and under-story plants from becoming established and competing for available nutrients. Forest topsoil's are moist and fertile from the constant decomposition of leaf litter and other organic matter. The soil is porous and loose; conditions are highly favorable for tree root growth. Water and nutrient absorbing roots occupy the top 12 to 18-inches of topsoil.

Turf habitat: Grasses are native to dry and arid prairie settings. They adapt to low water availability by developing dense, aggressive root systems and have the ability to go dormant in periods of drought. The absence of an over-story allows grasses to capture plenty of light to fuel their aggressive growth. Healthy turf requires morning sunlight to optimize growth, health, and stand density. Roots occupy the top 12-inches of topsoil.

Competition Problems and Maintenance Conflicts:

Trees block sun exposure from turf. Therefore, in areas where trees are already well established, grass is often sparse and unhealthy due to lack of sunlight. Some shade-tolerant types are able to get by with less light than others; however, all perform poorly in the heavy shade of a densely canopied tree. Heavy shade conditions can also create temperature and moist conditions that are favorable to turf disease organisms. Some grasses have the ability to produce chemicals that can retard the growth of tree roots, stunting the growth and development of young trees.

Trees that have grass growing up to their trunks will invariably have wounds at the base of the trunk caused by lawnmowers and string-line trimmers. Exposed tree roots that run along the surface of the ground also fall victim to scalping by these machines. Mechanical wounds make a tree more susceptible to decay and insects, which can eventually compromise its health and structural integrity. Wounds to the trunk remove not only the bark but also tissue just inside of the bark, which is responsible for diameter growth and food transport. When wounds destroy enough of the trunk, the tree is girdled -- cut off from its food supply and the tree dies.

Frequent irrigation required to maintain turf in the hot summer months is detrimental to some trees. Water that strikes the tree trunk and collects at the base can cause root and stem rot. High-pressure sprinklers set too close to the trunk will peel off the bark and create wounds that never close.

Finding Solutions:

Instead of struggling to keep your competing trees and turfgrass healthy with heavy inputs of water and fertilizer, the best approach is to eliminate or reduce the competition and conflicts by mimicking the conditions under which these plants grow best in nature. The result will be fewer insect and disease problems, less time and expense in maintenance, and a more attractive, longer-lasting landscape. Here are a few of the ways to accomplish these objectives:

- Designate turf-free areas under the canopies of trees. Turf outside of the tree's canopy area will have ample sunlight and competition for rooting space within a major portion of the tree's root zone will be eliminated. Remember to establish boundaries according to the ultimate size of the tree or plan to enlarge the turf-free zone, as the young tree gets larger.
- Mulch with wood chips, bark or pine straw within the turf-free zone surrounding the trees. The larger the mulched area, the better for the tree. Apply mulch up to six inches deep but avoid piling it directly against tree trunk, which can create moist conditions that can lead to rot or insect invasion of the tree trunk.
- Before mulching, use herbicides cautiously around trees to kill any dense patches of grass. If grass growth is already suppressed by shade conditions, then mulching alone will most likely eliminate it, much like a tree would in its native environment. Many herbicides used to control weeds in turf are absorbed by tree roots and can severely injure or kill trees.
- Plant shade tolerant shrubs and ground covers in mulched areas if more "green" is desired under tree canopies. Although these plants also compete with the tree, their root systems are much less aggressive than that of turfgrass. They also are better adapted to living within the shade of trees. Ideally, these plantings should be done while a tree is young. However, if you must plant around mature trees, be careful not to cut large roots or disturb any of the finer feeder roots in the top 4 to 6 inches of the soil. Tilling the planting area is not recommended, as it will sever a large portion of those finer roots. Instead, dig individual planting holes using hand tools.
- Supplement water and nutrients to reduce the effects of competition in areas where trees and turfgrass must grow together. You may irrigate turf with sprinklers during dry periods, but avoid wetting the base of tree trunks. Young trees will respond better to occasional deep soakings rather than to the more frequent light watering for turf.

WATERING PRACTICES

Poor water management is probably the biggest problem suffered by landscape trees. Each species has a different range of maximum and minimum water necessary for survival. An optimal watering should simulate natural climatic patterns of the tree's origin and should follow seasonal changes. Unfortunately the park trees grow in conflicting environments. Trees and turf are mutually exclusive in nature.

It is rare to see trees growing in grasslands, and grass is not common on the forest floor. Grassy lawns with trees are an unnatural ecosystem; they compete for water and nutrients. They also compete for sunlight and root space underground. However, watering brings the biggest challenge in maintaining a healthy environment for both. This leaflet will provide tree facts and watering do's and don'ts, which should help to apply attractive and accommodating alternatives in our parks.

Tree Facts. Healthy roots are vital to a tree's survival. Trees absorb water, nutrients, and oxygen through root tips (also called fine roots), of which 85 percent are in the top 18 inches of soil surrounding trees. Roots typically extend beyond the tree canopy dripline and the majority of trees have a root system extending twice the tree height. Roots eliminate waste carbon dioxide, store food, reduce erosion, produce compounds essential to the plant, and support the above ground structure.

Damage appearing on aboveground often occurs because roots have been improperly cared for. Roots are often neglected because they grow underground and are not seen. Most healthy trees have beneficial fungi (mycorrhizae or mycorrhizal root tips) growing in or on their roots. Trees need more water in the growing season and warm/hot months when evapotranspiration is increased. Trees "transpire" water through stomates, small openings mostly occurring in leaves. One isolated tree with a canopy spread of 36 feet may transpire 525 gallons of water per summer day.

Water stress symptoms exhibited by broadleaf trees include wilting of leaves and normally shiny green foliage that becomes faded, dull, or grayish. Growing tips may wilt in the afternoon and recover as evening approaches. Stress is a reversible condition; the sooner the condition is eliminated the better chance for total recovery. Native and drought tolerant trees benefit from deep, supplemental water at 1 or 2 month intervals during summer.

Tree Watering Do's. Water trees around and beyond the dripline, not near the trunk. Water infrequently and deep to encourage a deep root system. Examine trees regularly for symptoms of water stress. For young trees and mature trees showing drought stress, form a basin by creating a berm of soil several inches high that encompasses the dripline of the tree; fill basin with water. Probe the soil to a depth of three feet to monitor soil moisture within dripline; daily and weekly for young trees and monthly to bimonthly for the mature trees. Irrigate trees early morning or just before dawn. Install sprinklers outside the dripline and direct sprinklers away from trunks and canopy.

Tree Watering Don'ts. Don't underwater which leads to drought stress. Do not overwater, which is a more common problem in our parks due to trees growing in turf. Excess water excludes oxygen from soil, a vital factor for healthy roots. Excessive water increases probability of soil compaction by closing soil pores essential for root survival. Excessive water in the root zone, especially near the root collar, is a primary cause of root and crown diseases such as *Armillaria*, *Phytophthora* and *Dematophora*. These fungi-causing diseases are present in many soils but activate damaging effects in moist and/or warm conditions. Do not install sprinklers within the dripline. Avoid sprinklers wetting tree trunks and canopies, especially trees susceptible to fungal diseases.

Finding an Attractive and Accommodating Alternative. Plant shrubs near trees that have the same water requirements. Mulch trees in groups and individually as far from tree trunks as possible.

Mulch within the tree's dripline is perhaps the most important maintenance recommendation. It will minimize competition with turf, improve moisture content in the soil and enhance tree health. Learn how to properly apply mulch in the next training leaflet 5 – **Mulch and Its Benefits.**

MULCH AND ITS BENEFITS

Mulching enriches and protects soil, helping to provide a better growing environment for trees. Mulch is simply a protective layer of a material that is spread on top of the soil. Mulches can either be organic, such as grass clippings, straw, shredded wood, bark chips and similar materials or inorganic, such as stones, brick chips, gravel and plastic. Properly applied mulches, both organic and inorganic have numerous benefits and they:

- protect the soil from erosion
- reduce compaction from the impact of heavy rains
- conserve moisture, reducing the need for frequent watering
- maintain a more even soil temperature
- prevent weed growth
- provide a protection zone for trees against accidental equipment damage

Organic mulches also improve the condition of the soil. As these mulches slowly decompose, they provide organic matter which helps keep the soil loose. This improves root growth, increases the infiltration of water and also improves the water-holding capacity of the soil. Organic matter is a source of plant nutrients and provides an ideal environment for earthworms and other beneficial soil organisms. In poor soils, organic mulch may cause a nitrogen deficiency caused by wood decomposing bacteria. In that case apply nitrogen fertilizer at the minimized rate.

Inorganic mulches have their place in certain landscapes; however they lack the soil-improving properties of organic mulches. Inorganic mulches, because of their permanence, may be difficult to remove if you decide to change your garden plans at a later date.

When to apply mulch? Mulch may be applied at any time in our Southern California climate. Mulches moderate the soil temperature by providing an insulating barrier between the soil and the air. This means that a mulched soil in the summer will be cooler than the adjacent unmulched soil; while in the winter, the mulched soil may not cool off as deeply. Since mulches slowly decompose, they need to be replenished every two to three years to maintain an effective layer.

How much mulch to apply? Mulch groups of trees, mulch trees in planters, mulch individual trees and mulch all young trees for at least 3-5 years after planting. Mulch is measured in cubic feet. As an example, if you have an area 10 feet by 10 feet and you wish to apply 6 inches of mulch, you would need 50 cubic feet.

How to apply mulch? Do not apply mulch directly in contact with plants and especially tree trunks. Leave an inch or so of space next to plants and six inches away from tree trunks to help prevent diseases from flourishing from excessive humidity. Remove weeds before spreading mulch. Spread mulch evenly at a six-inch thickness.

Griffith Park's Green Waste Facility produces shredded tree trimming mulch continually, which is always available for distribution throughout City parks. Call (213) 485-4826 to request a mulch delivery to your park.

TREE STAKING

Newly planted trees may need artificial support to prevent excessive swaying in the wind, to promote upright growth, or to guard against mechanical damage.

Why to Stake Park Trees?

Staking is not always necessary for many trees and can have negative effects on the young trees being planted. Research has shown that staked trees develop smaller root systems and decreased trunk taper. The young trees are often injured by leaving the tree ties on too long or by using metal wire and other unsuitable material for securing the tree to the stake. The decision to stake or not should be determined by the strength of the trunk of the tree being planted, wind conditions, traffic patterns and maintenance requirements. The proper use of stakes on young trees can lessen or prevent problems that may occur as the tree matures.

Trees with strong trunks may need stakes only to prevent mechanical damage such as Weed Eater line girdling, being run into by lawnmowers, and park patron vandalism. The stakes are there to provide stability for the young tree until its roots can expand and grow into the surrounding soil, anchoring it securely.

How to Stake Park Trees?

The Forestry Division recommends that at least three stakes be used when staking a tree. Stakes should be at least 9-12 inches from the trunk of the tree. Stake ties should be loose enough to allow the tree to sway with the wind to help develop trunk strength. If the ties are too tight, they will cause weak spots in the trunk that will eventually lead to trunk failure.

The materials used during staking can be either metal or wood, metal stakes can be used if they are easily removable and are removed before the tree grows around the stake. The DRP recommends wooden peeler poles that are biodegradable and easily removed when needed. The material used for tying the trees to the stakes should never be metal or wire.

There are many new products on the market that do not damage the tree's bark and can expand with the developing trunk structure. The ties should make a "figure-eight" pattern around the trunk and back to the stake, and then nailed to the stake. The ties should be spaced along the trunk of the tree at different heights, not all at one height at the same place on the trunk of the tree.

How Long to Keep Tree Stakes?

Trees should be staked no longer than two to three years. If the tree is unable to support itself after that time it should be evaluated for removal and replacement. Tree stakes are for protection—not for support of the tree.

MAINTAINING YOUNG TREES

Mulching, pruning, watering, staking, and fertilizing affect the growth and development of young trees.

Why Mulching is Important?

Mulching is the most important post-planting practice that you can do to improve the health and vitality of your landscape plant. Research has shown that wood chip mulch can nearly double plant growth in the first few years after planting. Mulching conserves moisture and insulates roots from heat and cold extremes. Proper mulching provides a well-groomed appearance, eliminates grass or weed competition, and prevents mechanical damage from mowers and weed trimmers. Mechanical damage is one of the leading causes of injury and death to landscape plants.

Mulch groups of trees, mulch trees in planters, mulch young trees for at least 3-5 years after planting. Mulch is measured in cubic feet. As an example, if you have an area 10 feet by 10 feet and you wish to apply 6 inches of mulch, you would need 50 cubic feet. Do not apply mulch directly in contact with plants and especially tree trunks. Leave six inches away from tree trunks to help prevent diseases flourishing from excessive humidity. Remove weeds before spreading mulch. Spread mulch evenly at 6-inch thickness.

Caution must be used when applying mulch since a heavy mulching can also be a problem in poorly drained or wet sites where moisture can remain at high levels for extended periods and cause root dieback. In addition, heavy mulch layers encourage tree roots to grow up into the mulch material, which may dry out during long dry periods and cause these roots to die.

How Much to Prune?

Trees and shrubs should be pruned at planting time to remove branches damaged during handling and transplanting. The main leader on a single-stemmed tree should not be pruned unless it has been damaged. Lower branches should not be removed because they manufacture critically needed food and help to develop a strong trunk caliper. All planted and transplanted trees should be inspected during the first fall and winter after planting and pruned to remove any dead or crossing branches or to improve structure. This pruning period is also an excellent time to inspect the trees for other problems.

How to Water Young Trees?

Water is critical to the success of any tree or shrub planting. Tree roots, especially the small, water-absorbing roots, are easily damaged during original planting and transplanting. For sufficient water uptake to occur, the root ball of a newly planted tree must be kept moist, but not saturated. Monitor the moisture in the root ball daily, and water as needed so that the root ball does not dry out. The area outside of the root ball also should be watered to encourage root growth into the surrounding soil. Avoid over-watering, which is a major cause of tree failure. Heavy clay soils that have been compacted during construction activities severely restrict the movement of water and commonly lead to saturated conditions.

In areas with fine textured soils, such as those containing high levels of clay or silt, newly planted trees should receive no more than an inch of surface water per week during the growing season. Supplemental watering may not be necessary during periods of adequate rainfall. Water no more than two or three times per week for a total of one inch. Operating automatic lawn irrigation systems for 20 to 30 minutes per day often results in a continuously saturated soil condition, which in turn causes severe root damage and tree death.

In sandy soils, water drains more easily, and up to 2 inches of water per week may be necessary to keep the soil moist. Carefully monitor the moisture level in the root ball of container trees planted in sandy soils. Water does not drain easily from the fine textured soil of the root ball into the surrounding sandy soil, and saturated conditions in the root ball may develop. Use a typical two-foot soil probe to monitor soil moisture in no more than 7-day intervals.

How to Stake, Tie, and Why to Install Tree Guards?

The purpose of most staking and tying is to prevent the newly planted tree from tipping over in the wind. If at all possible, staking and guying systems should not be used, but in windy, exposed areas this practice is sometimes appropriate. Excessive movement will dislodge the small, fibrous roots from their new footing in the soil before they are firmly established. However, many trees are girdled and killed because guying materials are not removed or are improperly installed.

Staking and guying materials should be strong enough to provide support but flexible enough to allow some movement. Ties should have a broad surface to prevent damage from rubbing. Do not use a wire in a hose. All guying materials should be loosened or removed at the end of the first growing season to prevent trunk girdling. Trees with strong trunks need stakes only to prevent mechanical damage such as Weed Eater line girdling, being run into by lawnmowers, and park patron vandalism.

The Forestry Division recommends that at least three stakes be used when staking a tree. They should be at least 9"-12" inches from the trunk of the tree. Staked should be removed after two to three years. If the tree is unable to support it self after that time, it should be evaluated for removal and replacement. Plastic tree guards can prevent trunk damage from rodents, mowers and weed trimmers. They should be monitored regularly and removed before rubbing or girdling problems occur.

Should the Young Trees be Fertilized?

Fertilizers are generally not recommended at planting time since most soils contain sufficient levels of available nutrients to supply the requirements of newly planted landscape trees. Nitrogen fertilizers, in particular, should be avoided because the nitrogen promotes shoot growth over root growth, and re-establishment of the root system is required before a newly planted tree can adequately support new top growth.

Sites with very poor soil, or where construction activities have altered the soil composition, may be deficient in certain nutrients and especially mycorrhizae, which are fungal organisms that have beneficial association with tree roots. They are present in all native soils. Although they do not directly provide nutrients, they greatly increase effective surface area for root absorption of nutrients and water from the soil.

If a tree grows in poor disturbed urban soil, shows stress symptoms, and all other tree's requirements are met, most likely this is an indicator of a fungi-sterile soil. Analysis of existing tree roots for the presence of native mycorrhizae fungi may be advisable prior to deciding about the application of mycorrhizal fungal inoculants. If fertilizing applications are needed fertilizing formula should be slow release, complete fertilizing with chelate trace of elements and mix at label rates not to exceed 4-pounds nitrogen per 100 gallons of water.

Tree Care PowerPoint Presentation Outline

To arrange the presentation, call the Forestry office at 213-485-6547 at least two weeks prior to the desired date. A room with projection wall and electrical outlet is necessary for the training.

1. Welcome to the Forestry Division
2. Our Mission
3. Department's Responsibility
4. Park Trees
5. Forestry Division's Responsibility
 - Preserve the urban forest
 - Provide a safe environment
 - Inspect trees for hazards
 - Evaluate needs
 - Prune selectively
 - Remove hazardous trees
6. Tree Selection
 - Choose the right tree for the environment
 - Avoid root bound trees
 - Avoid very old trees
7. Favor trees with branches along the trunk
8. Tree Planting Considerations
9. Planting Depth
10. Development of Trunk Caliper Is Essential
11. Comparison of Trees Planted at the Same Time
12. Proper Reduction of Lower Branches
 - The lowest branches and leaves on young trees are essential for development of trunk caliper to hold mass when trees mature
 - If you must, cut lower branches to 6 inches in length - but DO NOT cut them all the way to the trunk
 - Do not remove these branches until tree is 5-6 years old
13. Proper Reduction of Lower Branches
14. Basic Principles of Pruning
15. Stake Trees Only When Necessary
 - Tree trunks kept from moving by guying or staking grow taller, exhibit less caliper growth, and develop less taper
 - Staking makes a tree less able to stand without support and more subject to injury
16. Benefits of Staking
 - Trees need support to stand against the wind or grow upright
 - Stakes protect young trees from vehicles, equipment, animals, and vandalism
17. Proper Staking Practices
 - Remove nursery stake
 - Use one, two, or three stakes
 - Place single stakes on the upwind side
18. Staking always requires follow-up maintenance
19. Stake Strap Tying Practices
 - Tie tree to stakes with a figure eight loop
 - Place ties near the top of stake
 - Use broad, smooth and somewhat flexible straps

20. Avoid Tree Girdling
 - Check staking within one year to prevent injury to tree
 - Stakes should generally be removed after one growing season
21. Girdling Damage
22. Benefits of Mulch
 - Protects soil from erosion caused by wind and rain
 - Reduces compaction caused by short, heavy rains
 - Retains moisture
 - Maintains an even soil temperature
 - Prevents weed growth that competes with desired plants for water and nutrients
 - Helps keep feet clean, allowing access to parks even when damp
 - Provides an aesthetically pleasing "finished" look to parks and gardens
23. Use Mulch To Protect Tree Trunks
 - Avoid turf from touching tree trunk
 - Maintain turf a minimum of three feet away from trunk
 - Use a thin blanket of mulch to maintain machinery away from trunk
 - Maintain mulch away from the trunk
24. Avoid Compost Mounds
25. Follow-Up Maintenance is Necessary
 - Maintain lawn away from tree
 - Monitor tree guards constantly
26. Maintenance Practices to Avoid
 - Eliminate soil compaction and lack of oxygen in tree root zone through soil aeration
 - Avoid planting and deep cultivation within trees' drip lines, which may cause root disturbance and nutrient deficiency
 - Do not scalp tree roots or grade down to the soil level within the dripline; consider adding soil to protect roots
 - Use alternative layout for utilities to stay away from trees
 - If necessary, make sharp cuts and do not rip roots
 - Remove all volunteer tree seedlings before they mature into trees
 - Control rodents out of the roots zone
 - Do not chain objects to tree trunks
 - Maintain crown above the grade
 - Avoid any trunk damage
27. All Projects Affect Trees
28. Improvement projects in our parks affect the trees.
29. Capital Improvement Projects
30. Tree Protection During Construction
 - **FENCES:** Construction fences should be erected around trees that are to be retained. The fences should be placed as far from the trunk as possible with the intent to protect the above ground portion of the trees as well as the root zone
 - **STORING AND PILING:** Leaning objects against the tree trunks and piling soil over the root zone is prohibited
 - **PRUNING:** Pruning for vertical clearance of buildings, traffic, and construction equipment should be performed only by an arborist and not by construction personnel

- **COMPACTION:** Driving equipment and walking within the drip line zone causes soil compaction and is a serious cause of tree decline and death long after construction is over. Fences around trees reduce unnecessary traffic. If traffic cannot be avoided, it is recommended to spread a 6-12 inch thick layer of mulch to reduce the compaction. Additionally, placing large plywood sheets over the mulch can disperse weight.
- **EXCAVATION:** Excavation causes major damage to trees. Digging and trenching should be planned ahead and all alternatives should be explored to minimize the root loss. When roots must be severed, clean cuts shall be made by an arborist. The soil shall then be backfilled immediately to minimize drying of the roots.

TREE MAINTENANCE. Abruptly cutting off regular tree maintenance is another cause of tree decline.

- Provide supplemental irrigation in similar volumes to replicate seasonal distribution
31. Alternatives For Healthy Trees
 32. Successful Story
 33. Principles Of Urban Forest
 - The propagation, design, installation, and maintenance of landscape trees and plants, and long-term management of trees should conform to reasonable standards.
 - The standards should be based on professional knowledge of tree biology, tree ecology, experience, and on research of a tree's response system.
 34. Trees Are the Foundation of RAP!

9.0 Assumptions

The City of Los Angeles Recreation and Parks Department assumes no responsibility for matters legal in character regarding the *Tree Care Manual*. The *Manual* was created to conform to current standards of care, best management practices, established technical specifications, evaluation and appraisal procedures, and sound arboricultural practices as recommended by the sources listed in the References section.

10.0 References

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ANSI Z133.1-2000. *American National Standard for Arboricultural Operations – Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush - Safety Requirements*. International Society of Arboriculture. Champaign, IL.

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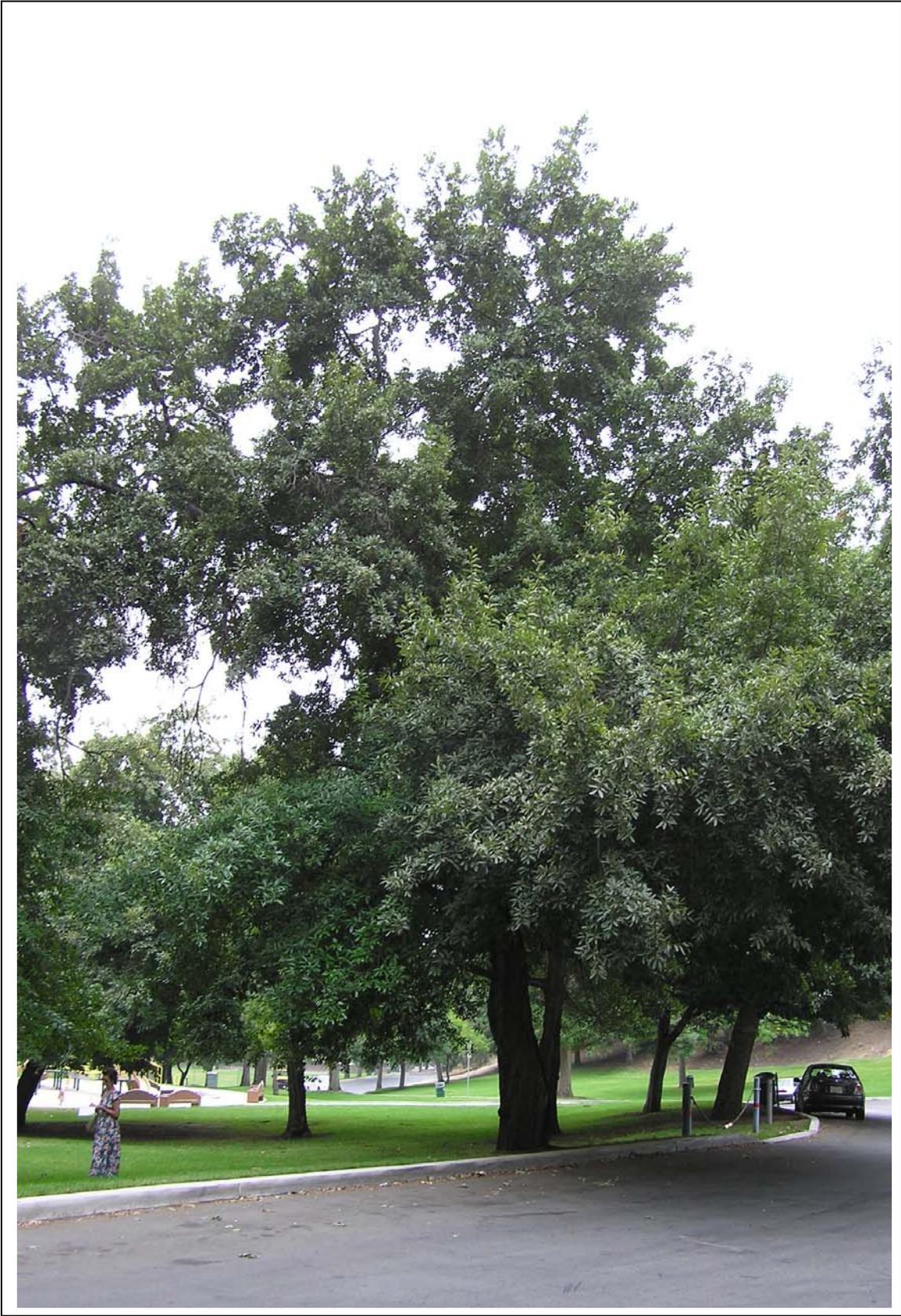
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Quercus laurifolia
Solano Canyon in Elysian Park