CITY OF SARATOGA

TREE PROTECTION

HANDBOOK

ACKNOWLEDGEMENTS

The Principle author of this document is Landscape Designer and Consultant, Lisa Kurasch. The entire Tree Committee wishes to thank Ms. Kurasch for her generous contribution of time and expense in developing the Handbook.

We would also like to extend our thanks to Assistant Planner, Paul Kermoyan, who assisted the Tree Committee in this project.

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CONTENTS

INTRODUCTION

Saratoga owes much of its unique attractiveness to the wooded hillside and native and ornamental trees found throughout its neighborhoods. In addition to enhancing property values and residents' sense of pride in their community, these trees provide practical benefits by shading homes and streets, buffering temperature extremes and stabilizing soils along creeks and on hillsides. Trees lessen the ill effects of wind, noise and air pollution, while providing wildlife food and habitat in natural areas.

The way trees are accommodated in the City, cared and planned for in all stages of their life, will have a great effect upon their future in the community. Attention to their management- installation, maintenance, removal and replacement - can contribute to sustaining the City's urban forest today and in the future.

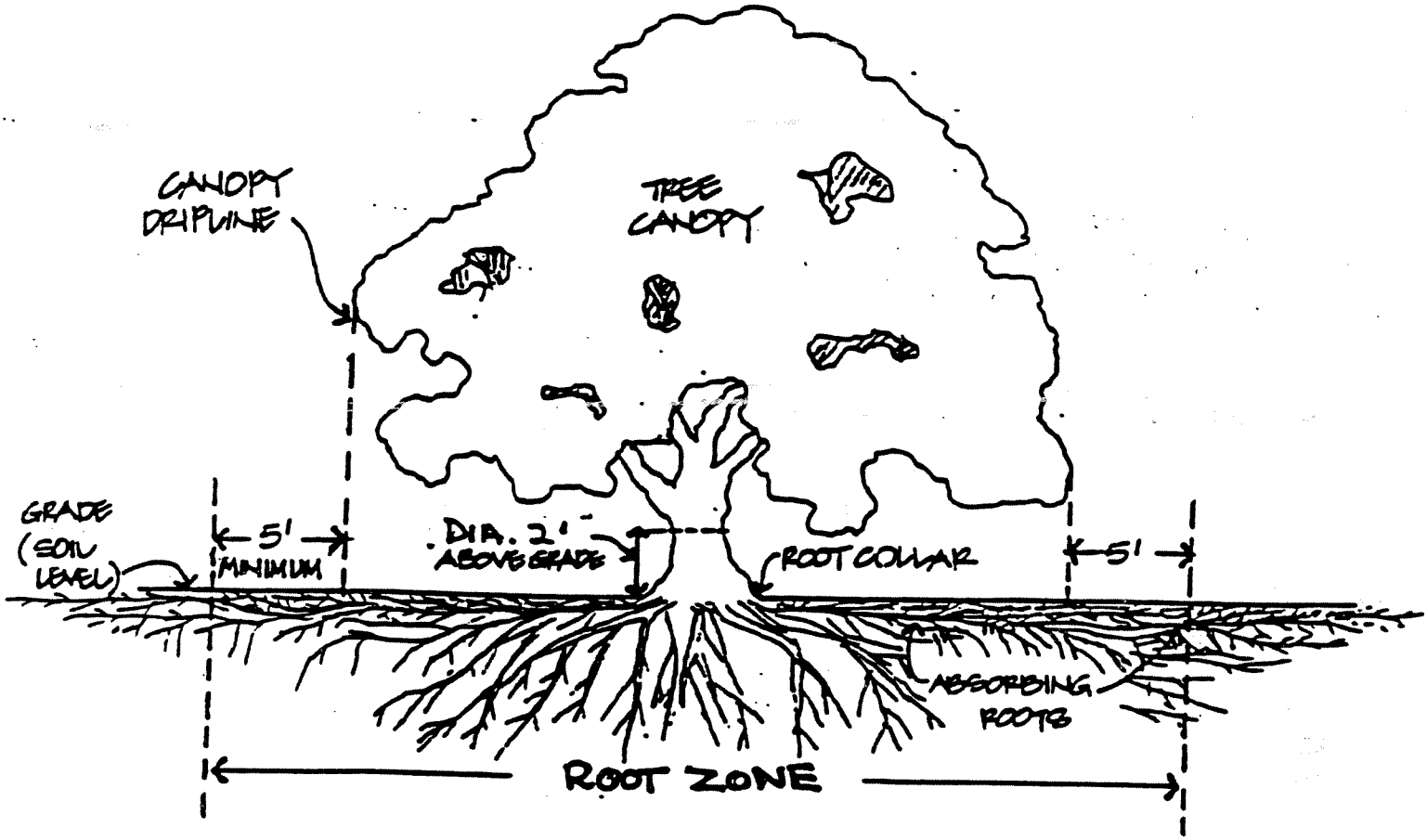
This Tree Protection Handbook, together with Saratoga's Tree Regulations (contained in Article 15-50 of the **Saratoga City Code**), establishes basic standards and recommendations for the protection and preservation of trees in our City. The Handbook is designed to explain and illustrate generally accepted concepts of tree preservation to property owners, developers, designers, tree care professionals and the general public. The goal is to make the process of design, review and development around protected trees easier to understand.

Throughout the Guidelines, special attention is given to **native oak species.** Native oaks are an important part of Saratoga's history. The City's emblem is that of a coast live oak, and its creeks, hillsides, open spaces and neighborhoods are graced by majestic oaks. Throughout California, native oak species have been under intense pressure from human activity and, as a result, their numbers continue to decline. Oak trees are particularly sensitive to disruptions or changes in their growing conditions and are least able to recover from physical injury. For these reasons, the Handbook provides more detailed information about protecting native oaks than for any other species.

Organization of the Handbook

The Handbook starts with a brief description of the way trees grow and what

TREE HEALTH AND CARE



PROVIDE BEST GROWING CONDITIONS TO REDUCE STRESS-RELATED DISEASE AND INJURY:

- MULCH SOIL WITHIN DRIPLINE WITH 2"-4" OF ORGANIC MATERIAL SUCH AS SHREDDED BARK, WOOD CHIPS, LEAVES, ETC. LEAVE NATURAL LEAF LITTER
- KEEP ROOT COLLAR AT NATURAL SOIL LEVEL.
- DEEP WATER INFREQUENTLY (1-2 TIMES PER YEAR) DURING HOT, DRY SUMMERS TO MINIMIZE DROUGHT STRESS; AFTER ROOT LOSS FROM CONSTRUCTION INJURY OR TRANSPLANTING; AFTER FERTILIZING; AND ON MARGINAL SOILS AND SITES SUCH AS STEEP, ROCKY PROPERTIES.
- FOR NATIVE OAKS KEEP PLANTS AND IRRIGATION AT LEAST TEN FEET FROM TRUNKS, OR SEVEN TIMES THE TRUNK DIAMETER (DBH), WHICHEVER IS GREATER.
- DRAIN WATER AWAY FROM TRUNKS.
- PRUNE PROPERLY AND AVOID OVERPRUNING.

figure 9

BASIC REQUIREMENTS FOR TREE GROWTH AND HEALTH

A few basic needs should be considered for all trees and the common functions they perform (see figure 2).

Water. The amounts of water needed by trees depends on the size and type of tree, the soil, depth and spread of roots, stresses on the tree, and the season. ✓ Young trees always need regular, supplemental water until they are established, which usually takes two or more years. ✓ All trees should be watered when showing signs of drought in hot, dry summers, or after a dry winter. Signs of drought in mature trees include: lighter dull leaves, wilting and leaf drop. Infrequent deep watering can benefit all trees during droughts, after root damage or loss, and in paved areas where other sources of water have been eliminated.

Native oaks are adapted to dry summers and are healthier with little of no supplemental water. Buttress roots, at the **root collar**, where the root system meets the trunk, become vulnerable to several fatal root diseases when subjected to frequent summer irrigation. These root diseases are inactive in dry, warm soils but thrive in wet, warm soils. Young oaks do not adapt to frequent irrigation, they just take longer to decline than mature oaks, which will rapidly decline under similar conditions.

✓ Oaks can be given one or two deep soakings at the beginning of spring and at the end of summer. Water should be applied using soaker hoses, drip emitters or a slow drip from a conventional hose to reach the entire root area. Water should only be applied in the area from the middle to the outside of the dripline, never close to the trunk.

Soils. All soils are made up of mineral particle, organic matter, water, air and soil organisms. The best soils for root health allow for water and air movement while holding water and mineral nutrients. These well aerated soils have spaces between particles which allow a free exchange of gases with absorbing roots. Oxygen is critical for the uptake of water and minerals, without which trees cannot survive. Soils should be deep enough to drain water and to allow roots

to grow unrestricted.

✓ To improve soils for young or new trees, **organic amendments** (peat moss, compost, nitrolized redwood conditioners, etc.) can be added to benefit any type of soil. Organic amendments help hold water and nutrients in sandy soils, and improve drainage and aeration in heavy, clay soils.

Although nitrogen is the most important mineral for young trees, mature trees that are growing well may not need supplemental nitrogen, except those growing in very poor soils. Too much nitrogen can cause excessive leaf growth, overly dense canopies and excessive shading inside the canopy, all of which lead to poor growth.

✓ Commercially available soil tests can help analyze soil conditions and provide recommendations to correct deficiencies.

✓ Young and mature trees alike benefit greatly from **mulching** with organic materials, such as shredded bark or leaves, compost, etc. A layer of organic mulch covering the soil is one of the easiest and most important steps in tree care as it provides ideal conditions for tree roots.

Mulch maintains a slow, long lasting supply of nutrients, improves aeration, retains moisture, reduces evaporation and runoff, and buffers soil temperature in the summer when it can be hot enough to kill tree roots. ✓ To mulch properly, place four inches of organic material within the dripline at least six inches away from the truck, replenishing as needed.

✓ Existing **leaf litter** (the natural built up layer of leaves and debris dropped by the tree itself) is similarly beneficial and should always be left under the canopy.

ENCROACHMENT IMPACTS

A mature tree is adapted to a specific balance of moisture, air, soil conditions and nutrients. Its ability to tolerate change from these vary according to the trees health, age, species, location and other factors. A tree's natural aging and decline can be accelerated by stress such as root loss, soil changes and resulting diseases. Many of the greatest injuries to trees are caused by development activities that take place too extensively or too close to a tree's root area. By identifying

impacts from common activities around protected trees, some damage can be lessened or avoided by using alternatives to the most harmful of them.

✓ The best strategy for protecting trees, especially native oaks, is to keep their **root zones** as undisturbed as possible. A tree's long term survival can be enhanced by providing the conditions to which trees are naturally adapted and by minimizing environmental changes.

Compaction. **Soil compaction** compresses the spaces between soil particles, eliminating much of the air spaces and essential oxygen available to roots. ✓ Keep vehicles and heavy equipment outside the root zone.

Impervious Paving Asphalt, concrete and similar surfaces prevent water percolation and the exchange of air and gases between roots soil and atmosphere. In addition, preparation for paving often compacts soils and removes or damages tree's roots during excavation.

✓ Porous materials which allow for permeability are attractive alternates. Brick, stone on sand, with sand joints, gravel, bark or similar materials are good substitutes for **impervious paving**. Aeration devices set in gravel are needed with impervious paving located in a root zone.

Trenching. Trenching in a tree's root area is a commonly overlooked cause of tree mortality. When utility trenches are dug into the root zone, or area where the majority of the roots are found, major portions of the tree's roots may be cut. The ability of a tree to withstand root loss depends upon its age, health, species and the soil type. Root loss may stress a tree, leading to other secondary health problems, its decline or death. ✓ Alternative to trenching include boring or drilling for utilities and installing conduit for several bundled lines; excavating by hand when digging is unavoidable and designing utility pathways so they are outside of the root zone.

Other Soil Disturbances Changing natural soil levels through grading or terracing can reduce soil permeability and trap excessive moisture in soils causing root and drown rot. Building retaining walls near trees can cut roots or mound soil up onto root collars and lead to root decay. Poorly designed drainage can divert water into root zones, where wet soils may eliminate oxygen and be detrimental to trees. ✓ Natural drainage patterns around trees should be retained, and

drainage devises used. Significant grade changes should occur only outside root zones.

✓ For areas which will have landscaping restored or added, stockpile any topsoil that must be removed before construction and redistribute afterwards. This saves some of the sites's original fertility and organic material at little added cost.

Pruning. Pruning can be a detriment or an asset to a tree's health depending on the type of pruning done. Extensive, severe pruning such as "**topping**" should never be done to any valued tree. Topping cuts back all large branches of a mature tree indiscriminately, to stubs. This eliminates the tree's ability to produce and store food. Topping exposes the trunk and limbs to sun, which scalds the tree. The pruning wounds cannot close and are left open to disease and insect attack. The branches or "water sprouts" that grow back produce many vigorous, upright shoots that emerge just below the stubbed cuts, like a hedge. These prolific water sprouts are weak and hazardous because they are neither attached deeply nor supported by the natural structure of the tree.

Overthinning the interior of a tree is just as detrimental as topping. This common practice removes most of the interior branches to produce long limbs with growth only at the ends. A few years after the overthinning, the long branches break because they cannot support the weight of their relatively heavy foliage.

✓ Use the kind of cuts recommended in the **ISA Pruning Standards** (see appendix I). Selective pruning, such as a light thinning, opens the canopy to light and lightens heavy branches. This reduces the size of the tree without unnecessary stress. ✓ Instead of cutting to stubs, follow the branch back to its origin on another limb or trunk, and remove the whole branch, or cut back to a smaller branch, which will take over the lead. Follow the natural shape of the tree and cut only dead, weak, diseased or crossing branches. For native oaks, limit the amount cut to 10% to 20% of the tree and less for older or declining trees. ✓ Instead of forcing a tree into a size or space to which it may never conform, consider replacing the tree with one or more that are appropriate.

Landscaping. Landscaping, like pruning, can also be harmful or beneficial to trees. Native oaks are especially sensitive to changes in their living environment. Since oaks do not tolerate summer irrigation, plants that need regular year round

irrigation should not be planted close to native oaks. Thick ground covers such as ivy, ornamental covers, exotic ferns, lawns, etc., develop thick mats of roots and foliage which inhibit the air and water that a mature oak requires. These ground covers also disturb and compete with a tree's root system.

Native oaks have evolved in a "community" or as part of a relationship with other plants, animals, insects and organisms. Oak habitats support and incredibly diverse amount of wildlife which use oaks as nesting sites, shelter and food.

✓ Preserving some oak habitats can provide many landscape benefits for property owners. They help control soil erosion, promote ground water recharge and water percolation, reduce stream siltation, stabilize soil, control insects and lower maintenance costs. These undisturbed habitats also assure that some oak seedlings survive to establish future generations.

✓ Do not remove any natural litter or built up layer of leaves and debris beneath the canopies of trees. Many native plants that tolerate dry soil and partial shade are well suited to the oak's environment and can provide an attractive, low maintenance, drought tolerant landscape that will attract wildlife, such as birds, to the garden. ✓ Install compatible plants or irrigation no closer than ten feet from any native oak trunk or seven time the trunk diameter, whichever is larger. This leaves a minimum area that is consistently dry near the sensitive roots. Use drip or soaker irrigation until plants are established, then irrigate sparingly or not at all after that. An excellent guide is Compatible Plants Under and Around Oaks, published by the California Oak Foundation, Oakland, CA and the Saratoga City Xeriscape Guidelines.

SARATOGA'S TREE PERMIT PROCESS

A **Tree Removal Permit** is required for the lawful removal of any **protected tree** except in the case of emergencies, removals by public utilities and removals expressly allowed by the City through project approval. Before a tree permit may by granted, the City inspects the tree involved and evaluates the application based on relevant information, including: 1) the condition of the tree; 2) the necessity to remove the tree because of physical damage or threatened damage to the property; 3) the topography of the land and the effect of the tree removal on erosion, soil retention and the diversion of increased flow of surface waters, particularly on steep slopes; 4) the number, species, size and location of existing

trees in the area and the effect the removal would have upon shade, privacy impact, scenic beauty, property values, erosion control and the general welfare of the residents in the area; and 5) the age and number of healthy trees the property is able to support according to good forestry practices.

THE DEVELOPMENT PROCESS

This section of the Handbook deals with development related activities around protected trees and the recommended or required measures for retaining trees. Information is presented according to the times or phases when various construction activities take place, and the required steps in the building process when protected trees are involved. This section contains some of the most important recommendations in the Handbook because they are intended to minimize the injury and loss of trees during property development when the majority of damage and removal occurs.

The basic process of design, review and development that any project follows where protected trees may be affected is summarized in figure 3.

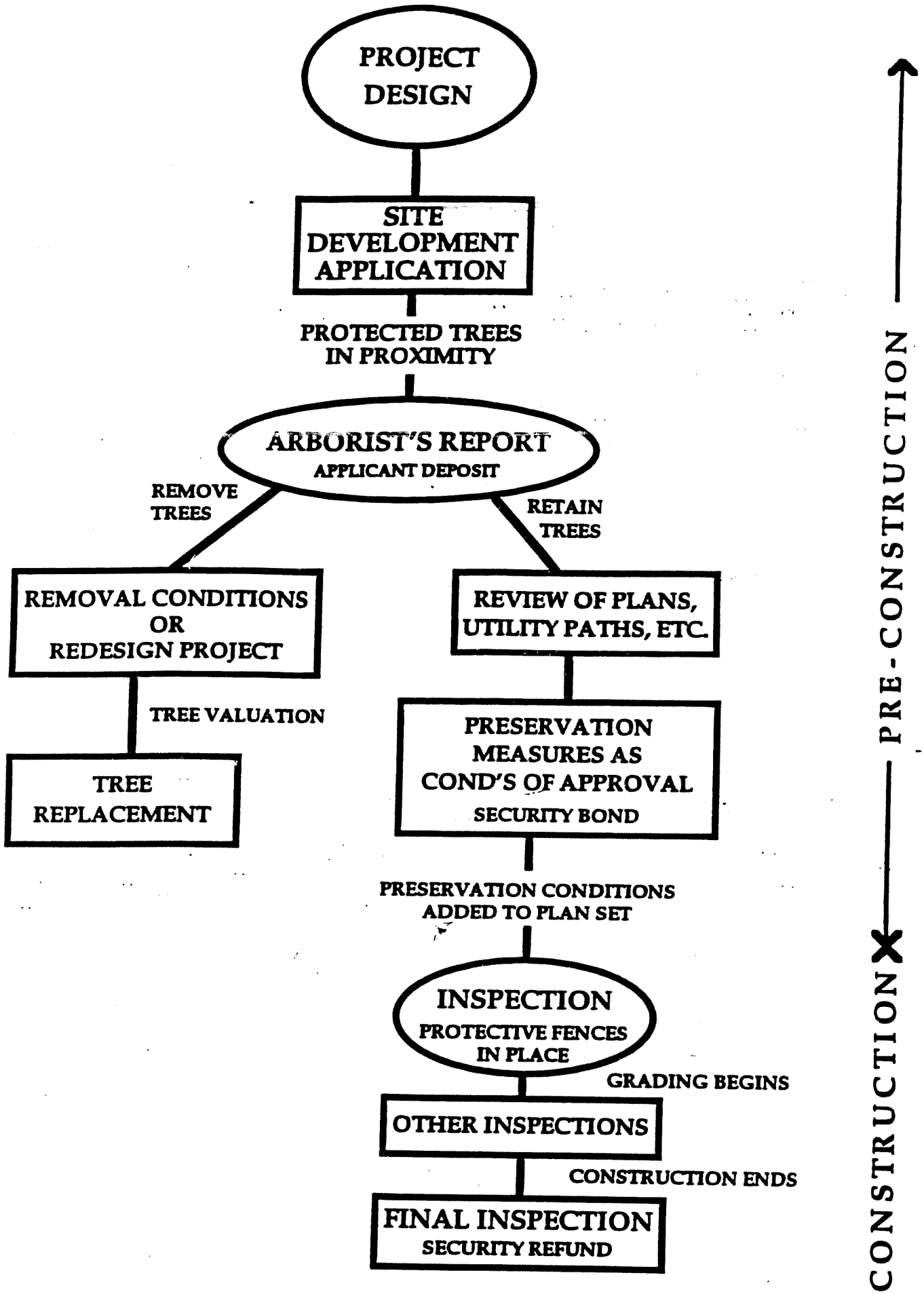
When an application for development is submitted to the City, it is first reviewed to determine whether protected trees are involved. If protected trees are in proximity to the proposed development, a deposit is then made to the City to fund the City Arborist's assessment of trees that may be affected. The project design and plans can then be evaluated to try to minimize tree removal or impact given the constraints of the property.

Design Evaluation

✓ A number of specific standards are recommended to reduce construction practices which can cause harm if undertaken within a tree's root zone (see figure 4):

New construction **setbacks**. Structures, excavations and **impervious hardscape** surfaces should not be constructed within the root zone of a tree.

Within a tree's root zone, avoid or keep to an absolute minimum: Change of grade, excavation, cut and/or fill, or retaining walls. Change in drainage


PROJECT DESIGN
SITE DEVELOPMENT APPLICATION
PROTECTED TREES IN PROXIMITY
ARBORIST'S REPORT
APPLICANT DEPOSIT
REMOVE TREES
RETAIN TREES
REMOVAL CONDITIONS OR REDESIGN PROJECT
TREE VALUATION
TREE REPLACEMENT
REVIEW OF PLANS, UTILITY PATHS, ETC.
PRESERVATION MEASURES AS COND'S OF APPROVAL
SECURITY BOND
PRESERVATION CONDITIONS ADDED TO PLAN SET
INSPECTION
PROTECTIVE FENCES IN PLACE
GRADING BEGINS
OTHER INSPECTIONS
CONSTRUCTION ENDS
FINAL INSPECTION
SECURITY REFUND
PRE-CONSTRUCTION
CONSTRUCTION

patterns, trenching, compaction or impervious paving.

Avoid paving inside the root zone wherever possible. Where paving must occur, install pervious paving such as brick on sand, rock, gravel or similar materials. Where impervious materials are used, install aeration devices on gravel beds at original grade (soil level). Portions of structures under tree driplines should have pier and grade beam foundations with beams poured at original grade. Drain away from trunks by paved areas to avoid the root zone using surface and/or subsurface devices.

✓ For appropriate landscape material see Encroachment Impacts and the City **Xeriscape Guidelines.** For **native oaks trees,** the following steps are recommended:

Keep the area within the **dripline** of mature or established oaks as undisturbed as possible.

Do not install plants, lawn etc., that need summer irrigation within oak tree **driplines.**

If plants must be installed within driplines, select plants that are shade and drought tolerant (plants that require no supplemental water once established). Use plants sparingly as accents.

Install plants or irrigation no closer than ten feet from trunks or seven times the trunk distance, whichever is larger.

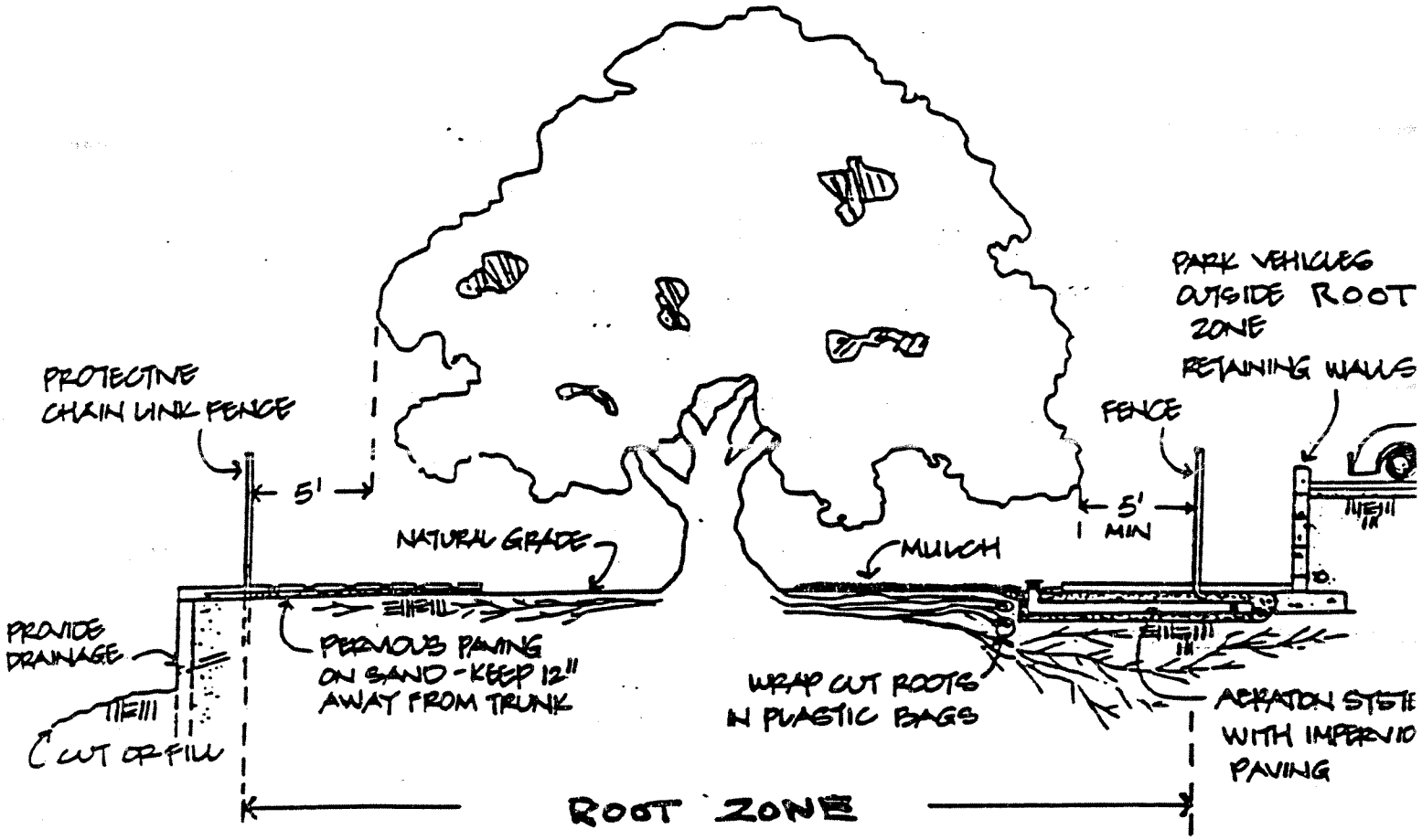
Irrigation systems for these plantings should be bubbler, drip or soaker types only, with no sprinkler spray systems within the oaks' **driplines.**

If landscape stones are installed, set on existing soil or water permeable landscape fabric and keep at least six inches from trunks. Never use non-permeable plastic tarping within **driplines.**

Do not remove natural leaf litter within oak **driplines.**

Replace any removed leaf litter with two to four inches of organic material within **dripline,** six inches away from trunks. Nitrogen should be added

MANAGEMENT OF ACTIVITIES IN THE ROOT ZONE



A NUMBER OF ALTERNATIVES CAN BE USED FOR COMMON CONSTRUCTION ACTIVITIES IN ORDER TO MINIMIZE TREE INJURY WITHIN THE **ROOT ZONE**.

DO NOT:

- COMPACT SOIL WITH HEAVY MACHINERY, PARKED VEHICLES, EQUIPMENT, MATERIALS
- CHANGE SOIL LEVEL, SUCH AS RAISE OR LOWER WITH CUT AND/OR FILL
- MACHINE TRENCH OR EXCAVATE
- ROTOTILL OR MECHANICALLY TILL
- CHANGE DRAINAGE PATTERNS
- INSTALL IMPERVIOUS (SOLID) PAVING SUCH AS CONCRETE OR ASPHALT
- REMOVE NATURAL LEAF MULCH
- USE SPRAY IRRIGATION OR SUMMER WATER DEPENDENT PLANTS WITH NATIVE OAKS

DO:

- PARK AND STORE MATERIALS OUTSIDE PROTECTIVE FENCES
- DESIGN RETAINING WALLS OR MAJOR GRADE CHANGES OUTSIDE **ROOT ZONE**.
- LOCATE PATHWAYS FOR UTILITIES, DRAINS AND OTHER LINES TO AVOID **ROOT ZONE**
- BORE OR TUNNEL THROUGH SOIL AND BUNDLE SEVERAL LINES IN CONDUIT TO INSTA
- EXCAVATE BY HAND AND CUT ROOTS CLEANLY WITH SHARP SAW OR SHEARS
- USE POROUS PAVING SUCH AS BRICK OR STONE ON SAND, GRAVEL, ETC. USE DECK MATERIAL ON POST AND PIER FOUNDATION
- IF IMPERVIOUS PAVING CANNOT BE AVOIDED INSTALL AERATION DEVICES WHERE LOCATED IN **ROOT ZONE**

to woody material(shredded bark, sawdust, etc.) using a formula of three pounds actual nitrogen per cubic yard of material.

PRIOR TO CONSTRUCTION

Before a grading permit is issued or any construction activity begins, an Arborist's report, protective fencing or other measures may be required by the City.

Arborist's Report. The City Arborist's report is required when a development proposal is in close proximity to one or more **protected trees.** Is describes and evaluates the physical health and condition of protected trees on a development site, showing their location, canopy spread, trunk diameter and species name. The report also evaluates the impacts of proposed activities (including utility pathways, landscaping and construction). Mitigation or changes to reduce impacts may also be recommended.

Protective Fencing. A temporary chain link fence for trees to be protected must be installed at the edge of a tree's protected zone prior to any grading operations. The fences are an important way to minimize direct damage to tree roots, trunks and branches. Fencing must remain in place until all work is completed and may not be removed until authorized by the City. Scheduled property inspections will be made by the City before any grading or construction activities begin to verify that all appropriate protective measures, including protective fencing, are in place.

CONSTRUCTION PHASES

The construction phases begin with grading and include the construction of all building improvements.

Grading Operations

After grading operations have begun and before building improvements have started, the following measures will be required for protected trees:

1) A copy of the approved plan and related documents must be kept at the

project site.

2) City inspection and approval of rough grading, including compaction, cut and fill, drainage and trenching.

3) Installation of all tree preservation devices. Devices such as aeration systems (see figure 5), tree wells, drains, special paving and cabling may be required to be installed before grading operations are complete.

All building improvements are completed at this time, including landscaping and irrigation.

POST CONSTRUCTION PHASE

Following completion of all building improvements, certain conditions may be required before a final inspection may be requested. The City will certify all tree work. On all sites containing protected trees, the City will ensure that all tree work specified in the City approvals has been completed. This will include landscape materials and irrigation installed around protected trees.

TREE PLANTING AND MAINTENANCE

Along with the attention given the needs of established trees, another important area to be considered is the way new trees are planted and maintained. By providing the best possible conditions for them to grow from the beginning, proper planting can go along way to assure trees' long term health. ✓ One of most important steps to proper planting is to choose an appropriate tree species.

Trees can be selected that are adapted to the particular set of conditions under which they may grow, conditions which may not by affected by any other planting practice. For example, within the general climate zone of Saratoga, one species may need full sun in order to perform well, where another would only thrive in part shade. Tolerance to heat, wind, smog or alkaline soils, as well as requirements for water vary greatly between species of trees. A tree which is well adapted to its environment will generally be healthier, more attractive, have less disease problems, and need less maintenance.

Knowing existing trees in an area and their success or problems can help in

selecting new trees. ✓ Native trees have the advantage of being well suited to their area's climate and natural conditions, while many other disease resistant tree varieties are also widely available. ✓ Planting a diversity of trees species and ages can help limit the spread of pest infestations by eliminating continuous stands of trees which all have the same vulnerability. Pine beetles and borers, for example, are a large problem in northern California where one type and age of pine has been used extensively.

In the same way, the appropriateness of a site itself should be considered when selecting trees. The proximity of building, walks, sewers or other lines, and soil type and condition should be addressed. The growth rate, life span and ultimate size of a tree and its root system should also be considered to prevent property damage. The cooling shade cast by a new tree may be welcome for a building but not for existing landscaping or trees which may need more light. Similarly, building may interfere with a tree's own need for light or air.

Many factors should be considered in order to make compatible choices between trees and their placement in the landscape. ✓ An ideal tree would have a straight, tapered trunk, able to stand upright without staking, with branches evenly spaced, and along the length of its trunk. Trees which have been "topped" and have so many branches growing close together near the top of the tree may develop a poor structure and need corrective pruning later on. An ideal tree has a good balance between the size of its roots and its top or crown. Its roots are able to supply the size of the crown with water and nutrients as it grows.

An overly large tree in the same size container may likely be root bound and not have enough roots to support vigorous top growth, or may have to be pruned later to reduce the crown to a size the roots can support. Avoid trees with circling or kinked roots as they can lead to poor root support and growth. Bark should be free of obvious wounds or cracking from injuries or sunscald.

✓ After selecting an appropriate tree and size, several steps can be followed for planting:

1) Thoroughly water plants in containers the evening before planting.

2) Dig planting holes two time the width and as deep as the nursery plant container. Gouge side of holes to loosen; loosen 3-4" of soil under plant hole.

3) Add appropriate amendments to native soil for the planting (backfill) mix. In general, backfill can be 70% native soil and 30% added amendment such as redwood conditioner or any other humus containing organic material. This basically helps aerate and loosen soil. A slow release granular fertilizer, one pound per cubic yard (Osmocote 18-6-12) can be added if a nutrient deficiency is suspected. For best results, use a soils analysis to determine recommended amendments and fertilizer rates for planting and maintenance.

4) Remove the entire root ball intact from the container by supporting it from below. Cut any visibly circling roots (3/16" diameter or larger) with sharp shears or a knife. This will encourage new roots to form. Do not pull the root ball apart.

5) Set plant in hole and adjust height of rootball so that plant soil level (root crown) is even with the finish grade, or slightly higher. For trees in lawns, set root crown 1" above finish grade to drain. Fill around rootball with backfill, packing soil to firm. Disturb the rootball as little as possible. Make sure to keep the same level of soil around the planter as it was in the original nursery container.

6) Form basin around tree root ball with remaining native soil to retain water.

7) Fill basin with water, allow to drain and fill and drain two more times. New trees will need regular, frequent watering during the first year or until established. Generally after two years, infrequent, thorough soaking will encourage deep roots and a healthy root system.

8) Install stakes as illustrated in figure 5. Brace if needed with 1/4' board nailed between stakes to keep stakes from leaning together. Make sure neither brace for stakes touch tree trunks.

Maintenance for young or new trees should involve good planting and staking techniques such as these. ✓ Staking should be checked periodically and removed when a tree can hold its shape and trunk straight. Staking should be considered at best a needed but temporary measure, as staking after two years of growth creates weaker trees and less developed supporting roots. Protect the trunks of young trees from mechanical injury by surrounding them with short stakes, especially in lawns, just outside the rootball. ✓ Keep lawns and weeds at least

thirty inches away from trunks until established.

✓ Proper pruning which follows the natural form of a tree is an important part of good maintenance, especially for young trees. Selective pruning helps to develop a strong framework, space branches evenly and remove dead, diseased or crossing branches. This helps maintain a tree's natural shape and safe structure.
✓ When hiring tree workers, ask that the work follows the Western Chapter ISA Pruning Standards for amounts and types of pruning done. This may prevent hazardous conditions or injuries to a tree that topping or other severe pruning method create.

Regular observation is an essential step in good tree maintenance. By noting changes in their appearance and size, clues to a tree's overall health can be found.

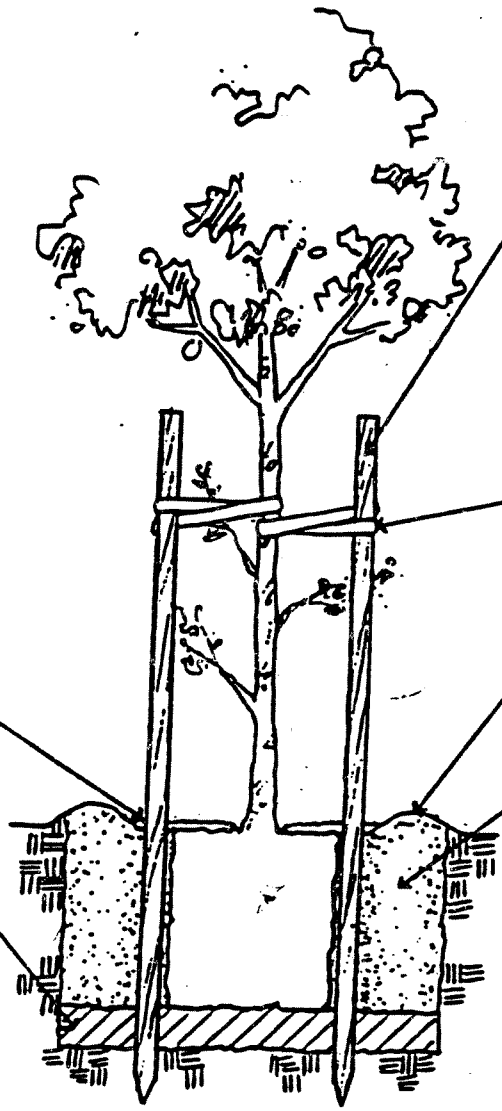
✓ Note the general vigor of a tree, the amount of yearly growth, and watch for changes. A decline in growth rate can be a first sigh of many problems, from root disease, mineral deficiency or compacted soil. Changes in leaf color or size can also alert a homeowner of potential concerns. If changes happen after periods of stress, such as an injury, drought, transplanting, etc., they may signal a need for care.

✓ Proper irrigation, nutrition and growing conditions can go a long way in preventing the stresses that impair tree health. Trees, like many living things, are better able to resist diseases or infections when they are vigorous and healthy. Providing conditions as close to those that trees naturally thrive under is one of the fundamental goals in the care of urban trees.

Poor soil, bark and root injury, air pollution and bad pruning can stress trees and leave them open to the injury from pest attacks. A number of strategies have been developed by horticultural professionals to emphasize the least toxic solutions to pest control.

✓ **Integrated Pest Management (IPM)** is an approach which considers the plant, pest and their environment as parts of a total system. A variety of techniques are combined to keep pest damage down to an acceptable level. Established knowledge of physical, biological, cultural and chemical methods can be utilized to the find the least toxic solution to pest control problems. The contamination of surface and groundwater supplies from pesticides, herbicides and other

TREE PLANTING AND STAKING



FOR SHRUBS: DELETE STAKES.
FOR NATIVE PLANTS: PLANT WITH ROOTCROWNS SLIGHTLY ABOVE GRADE

SLOPE SOIL TO DRAIN AWAY FROM TRUNKS

FOR TREES IN LAWNS: CLEAR TURF IN 30" DIAM. CIRCLE AROUND TREES FOR FIRST (3) GROWING SEASONS.

2" - ORGANIC MULCH: SHREDDED BARK, OR EQUIV.

BREAK UP NATIVE SUBSOIL BENEATH PLANTING HOLE

SET ROOTBALL CROWN AT SAME LEVEL AS FINISH GRADE OR SLIGHTLY HIGHER
IN LAWNS SET ROOTCROWN 1" ABOVE GRADE TO DRAIN

KEEP SHORT BRANCHES ALONG LENGTH OF TRUNK

8' LONG x 2" DIAMETER LODGE-POLE STAKES (2 PER TREE) ON WINDWARD SIDE OF TREE SET 2' IN GROUND
KEEP 6" BETWEEN STAKES AND TREE (MINIMUM)
PLACE STAKES OUTSIDE ROOT-BALL WHERE POSSIBLE.

(2) FIGURE 8 TWIST RUBBER HOSE TREE TIES

4" HIGH TEMPORARY BERM FOR WATER BASIN

BACKFILL MIX OF AMENDED AND FERTILIZED NATIVE SOIL
EXCAVATE PLANTING HOLE TO TWO TIMES WIDTH OF ROOT-BALL AND EQUAL TO ITS DEPTH

KEEP ROOTBALL INTACT WHILE PLANTING AND FILLING HOLE.

WATER TREES THOROUGHLY AND FREQUENTLY THROUGH FIRST YEAR THEN REGULARLY UNTIL ESTABLISHED

Figure 5

chemicals is a growing concern all over the country. The indiscriminate use of pesticides also kills beneficial insects, as well as birds and other organisms, which work to keep unwanted pests in check. A horticultural consultant familiar with IPM can set up a management program.

✓ An excellent IPM guide is Pests of Landscape Tree and Shrubs: An Integrated Pest Management Guide, by Dr. Steve Dreistadt. This guide is available from the U.C. Statewide IPM Project, IPM Education and publications, University of California, Davis (916/752-7691), publication number 3359.

MANAGING TREES YOURSELF

Many steps can be taken by homeowners themselves to manage their own properties and help trees resist insect and disease attacks. ✓ For new trees, planting disease resistant types can help by preventing some types of damage. Planting a diversity of types and age of trees can also help limit pest outbreaks.

Beside direct pest damage, disease can also be spread by insects and by contact with diseased plant material, through the air water or soil. ✓ Good hygiene can help lessen their spread by restricting disease sources. Remove any infected cuttings or leaves of plants from the property and do not compost. Piles of debris left near trees may allow unwanted pests to overwinter and appear the next year and should be removed regularly. These can be composted and reapplied the following spring.

✓ Protect tree bark and limbs from pruning or other injuries such as tears, rips or stubs which can allow infections to enter. Clean cuts should always be made outside the branch collar, the thickening where the branch being cut meets the trunk or a larger branch, which is a natural barrier to decay.

Wise use of water has many advantages. ✓ Watering with drip or soaker irrigation instead of sprinklers can help reduce the spread of fungal diseases, put water directly into the root zones where it is needed and save water too. Summer wet conditions, that allow root fungi to thrive can be avoided by planting drought tolerant and native plants around susceptible trees such as native oaks.

✓ If sprays are necessary, try to use them effectively, timing their application to when the pests are most vulnerable. Eggs are more protected by their armor

than the soft bodied larvae that hatch later. Insecticidal soaps mixed with water, available at most nurseries, are fatty acids which desiccate a wide range of soft bodied insects such as aphids. Dormant oil sprays are very effective for deciduous trees, fruits, etc., by smothering many overwintering pests on the bark when the tree is dormant.

✓ Mulching soil surfaces around trees and shrubs with organic matter helps prevent soil disease spores from splashing up onto leaves and improves soils by adding nutrients, conserving moisture, increasing aeration and buffering soil temperatures.

PRUNING STANDARDS

The Western Chapter of the International Society of Arboriculture Pruning Standards are the recommended guideline for structural pruning of protected trees (see appendix I). While pruning in excess of ISA Pruning Standards (which provides that no more than 25% of a tree canopy should be removed), is not encouraged or recommended, it is possible that larger amounts of pruning can be justified in some cases where a large imbalance exists, or where disease or injury has caused unsafe or undesirable situations.

"Topping" or other destructive heading cuts on otherwise healthy trees is not encouraged for any tree.

WHY DO I NEED A CERTIFIED ARBORIST?

Certified arborist are widely recognized plant care professionals. They are educated and trained in:

Diagnosis and treatment of landscape problems.
Proper pruning and management techniques for trees.
Tree biology and structure.
Selection and installation of appropriate trees and other plants.
Soil, Water and nutritional requirements to keep plants in peak form.
Recognizing tree hazards and construction damage.

To qualify as a certified arborist, these professionals must pass an examination on technical competency and knowledge developed by the International Society of

Arboriculture. To maintain certification, arborists must update their knowledge through continuing education programs.

GLOSSARY

Absorbing Roots - The roots produced in the upper two to three feet of soil which absorb water minerals and oxygen. The most effective ones are found in the top two inches if a mulch is maintained on the soil surface. See figure 1.

Arborist Report - A report prepared by a certified arborist containing specific information on the location, species, condition, structure, potential impacts of development and recommended actions and mitigation measures for one or more protected trees on a project site.

Buttress Roots - The major roots which join the trunk at the ground level. The buttress roots support the above ground tree structure. Soil levels raised above original grade around buttress roots provide an ideal environment for disease. See Figure 1.

Canopy, Tree Canopy - All portions of the tree with foliage. Also defined as the area inside the dripline. See figure 2.

City Arborist - The ISA Certified tree care professional contracted by the City to review development applications involving trees.

City Xeriscape Guidelines - A set of documents available at City Hall which lists plant materials recommended for drought tolerant landscapes.

Deadwood - Limbs, branches or a portion of a tree that contains no green leaves during a period of the year when they should be present.

Dripline - The outermost edge of a tree's canopy. Also the irregularly shaped circle that follows the contour of the tree's branches as seen from overhead. See Figure 2.

Encroachment - Any intrusion or human activity into the root zone of a tree.

Handbook - The Tree Protection Handbook (this document).

Impervious Paving or Hardscape - Asphalt, concrete and similar surfaces that prevent water percolation and the exchange of air and gases between roots, soil and atmosphere.

Integrated Pest Management (IPM) - Use of a combination of pest control methods, emphasizing the least environmentally damaging solutions. IPM considers plants and pests as part of a system.

ISA Certified Arborist- Professional tree care specialist certified for technical competency and knowledge by the International Society of Arboriculture.

ISA Pruning Standards or Pruning Standards - The pruning standards established by the Western Chapter of the International Society of Arboriculture as revised from time to time. See appendix I.

Leaf Litter - The natural built up layer of leaves and debris under the canopies dropped by the tree itself.

Mulch - Any organic material, such as shredded bark or leaves, compost, etc., which covers and enriches the soil, providing ideal conditions for tree roots.

Native Oak Species - The most common native oak species in the Saratoga area are: Quercus agrifolia(Coast Live Oak), Quercus lobata(Valley Oak), Quercus Kellogi(Black Oak), Quercus douglasi(Blue Oak) and Quercus dumosa(Scrub Oak).

Oak Tree or Oak - Any native oak tree of the genus Quercus.

Organic Amendments - Any soil conditioner, such as compost, peat moss and nitrolized redwood which adds humus to soil, improving its drainage, aeration and fertility.

Protected Tree - Any tree so defined by Section 15-50.020(m) of the City Code.

Root Zone - An area totally encompassing a protected tree where activities are strictly controlled. When shown on a map or plan, the root zone appears as an irregularly shaped circle that follows the contour of the tree canopy and extends from the trunk to at least five feet beyond the dripline.

Protective Fencing - Temporary fencing installed before construction to prevent direct damage to trees.

Pruning - Any work performed on the roots, branches or limbs of a protected tree.

Root Collar - Where the root system meets the trunk at natural ground level.

Root System, Root Zone- The portion of the tree which supplies water and minerals to the foliage (absorbing roots) and which provide structural support for the trunk (buttress roots).

Saratoga City Code The codified laws of the City of Saratoga. The City Code is available for review or purchase from the City Clerk's office.

Soil Compaction - Compression of soil particles by heavy machinery, construction, materials, structures, paving, etc., which eliminate air spaces between particles. This damages roots and prevents their growth.

Terminal Buds - The tips of tree stems from which growth in the canopy takes place.

Topping - Indiscriminate pruning which cuts all limbs back to stubs and produces hazardous new growth.

Tree Ordinance - Article 15-50 of the City Code which deals with the protection of trees in Saratoga.

Tree Removal Permit - A permit issued by the City for removal of one or more protected trees pursuant to City Code Section 15-50.

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WESTERN CHAPTER

PRUNING STANDARDS

Purpose:

Trees and other woody plants respond in specific and predictable ways to pruning and other maintenance practices. Careful study of these responses has led to pruning practices which best preserve and enhance the beauty, structural integrity, and functional value of trees.

In an effort to promote practices which encourage the preservation of tree structure and health, the W.C. ISA Certification Committee has established the following Standards of Pruning for Certified Arborists. The Standards are presented as working guidelines, recognizing that trees are individually unique in form and structure, and that their pruning needs may not always fit strict rules. The Certified Arborist must take responsibility for special pruning practices that vary greatly from these Standards.

I. Pruning Techniques

A. A thinning cut removes a branch at its point of attachment or shortens it to a lateral large enough to assume the terminal role. Thinning opens up a tree, reduces weight on heavy limbs, can reduce a tree's height, distributes ensuing invigoration throughout a tree and helps retain the tree's natural shape. Thinning cuts are therefore preferred in tree pruning.

When shortening a branch or leader, the lateral to which it is cut should be at least one-half the diameter of the cut being made. Removal of a branch or leader back to a sufficiently large lateral is often called "drop crotching."

B. A heading cut removes a branch to a stub, a bud or a lateral branch not large enough to assume the terminal role. Heading cuts should seldom be used because vigorous, weakly attached upright sprouts are forced just below such cuts, and the tree's natural form is altered. In some situations, branch stubs die or produce only weak sprouts.

C. When removing a live branch, pruning cuts should be made in branch tissue just outside the branch bark ridge and collar, which are trunk tissue. *(Figure 1)* If no collar is visible, the angle of the cut should approximate the angle formed by the branch bark ridge and the trunk. *(Figure 2)*

D. When removing a dead branch, the final cut should be made outside the collar of live callus tissue. If the collar has grown out along the branch stub, only the dead stub should be removed, the live collar should remain intact, and uninjured. *(Figure 3)*

E. When reducing the length of a branch or the height of a leader, the final cut should be made just beyond (without violating) the branch bark ridge of the branch being cut to. The cut should approximately bisect the angle formed by the branch bark ridge and an imaginary line perpendicular to the trunk or branch cut. *(Figure 4)*

F. A goal of structural pruning is to maintain the size of lateral branches to less than three-fourths the diameter of the parent branch or trunk. If the branch is codominant or close to the size of the parent branch, thin the branch's foliage by 15% to 25%, particularly near the terminal. Thin the parent branch less, if at all. This will allow the parent branch to grow at a faster rate, will reduce the weight of the lateral branch, slow its total growth, and develop a stronger branch attachment. If this does not appear appropriate, the branch should be completely removed or shortened to a large lateral. *(Figure 5)*

G. On large-growing trees, except whorl-branching conifers, branches that are more than one-third the diameter of the trunk should be spaced along the trunk at least 18 inches apart, on center. If this is not possible because of the present size of the tree, such branches should have their foliage thinned 15% to 25%, particularly near their terminals. *(Figure 6)*

H. Pruning cuts should be clean and smooth with the bark at the edge of the cut firmly attached to the wood.

I. Large or heavy branches that cannot be thrown clear, should be lowered on ropes to prevent injury to the tree or other property.

J. Wound dressings and tree paints have not been shown to be effective in preventing or reducing decay. They are therefore not recommended for routine use when pruning.

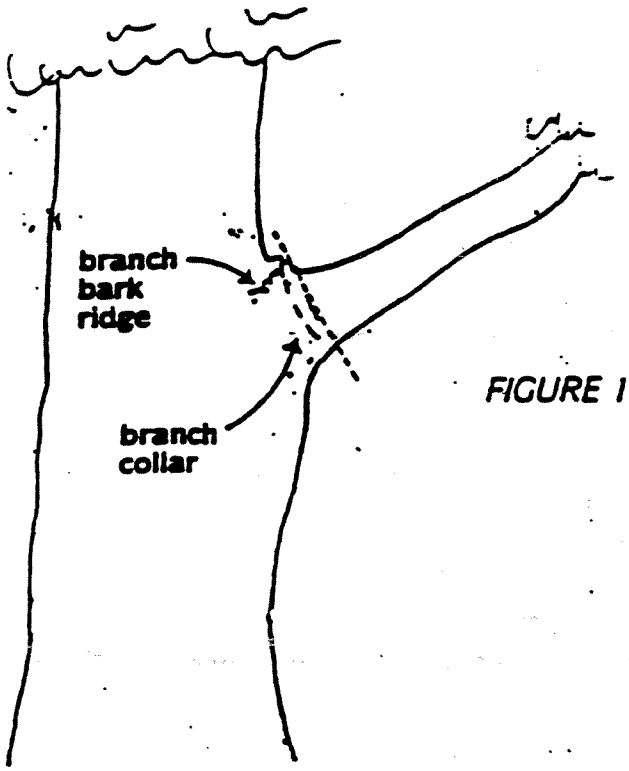

FIGURE 1. When removing a branch, the final cut should be just outside the branch bark ridge and collar.

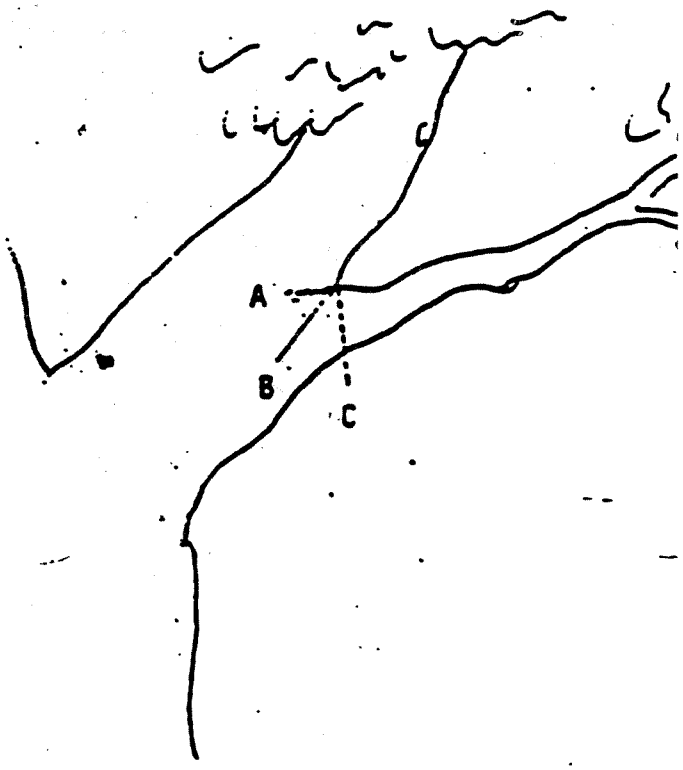

FIGURE 2. In removing a limb without a branch collar, the angle of the final cut to the branch bark ridge should approximate the angle the branch bark ridge forms with the limb. Angle AB should equal Angle BC.

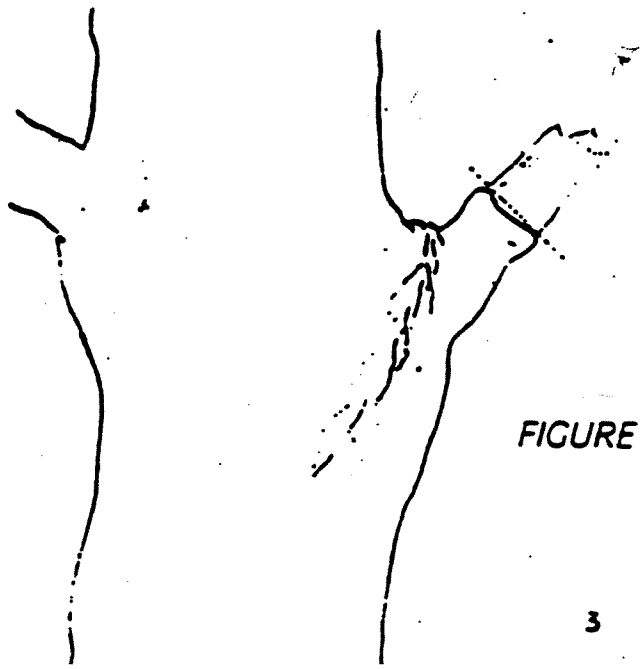

FIGURE 3. When removing a dead branch, cut outside the callus tissue that has begun to form around the branch.

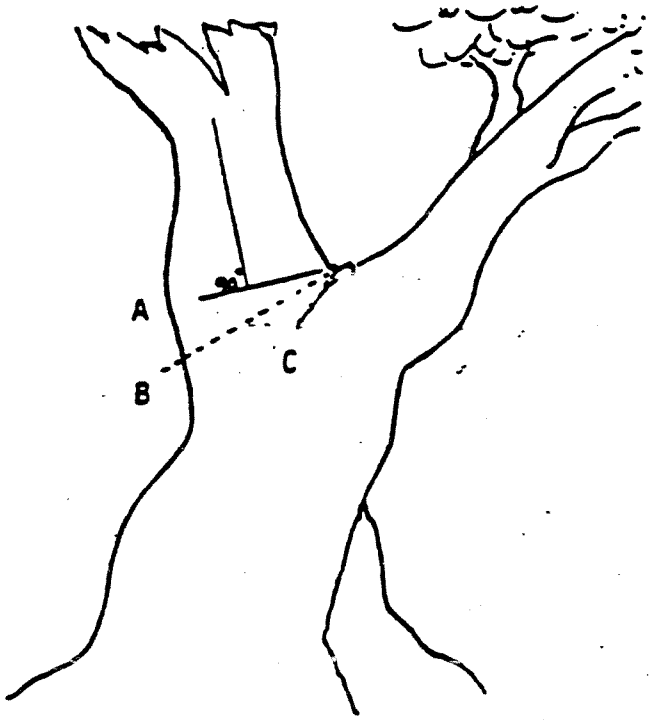

FIGURE 4. *In removing the end of a limb t large lateral branch, the final is made along a line that bise the angle between the branch b ridge and a line perpendicula the limb being removed. Angle is equal to Angle BC.*

FIGURE 5. *A tree with limbs tending to be equal-sized, or codominant. Limbs marked B are greater than ¾ the size of the parent limb A. Thin the foliage of branch B more than branch A to slow its growth and develop a stronger branch attachment.*

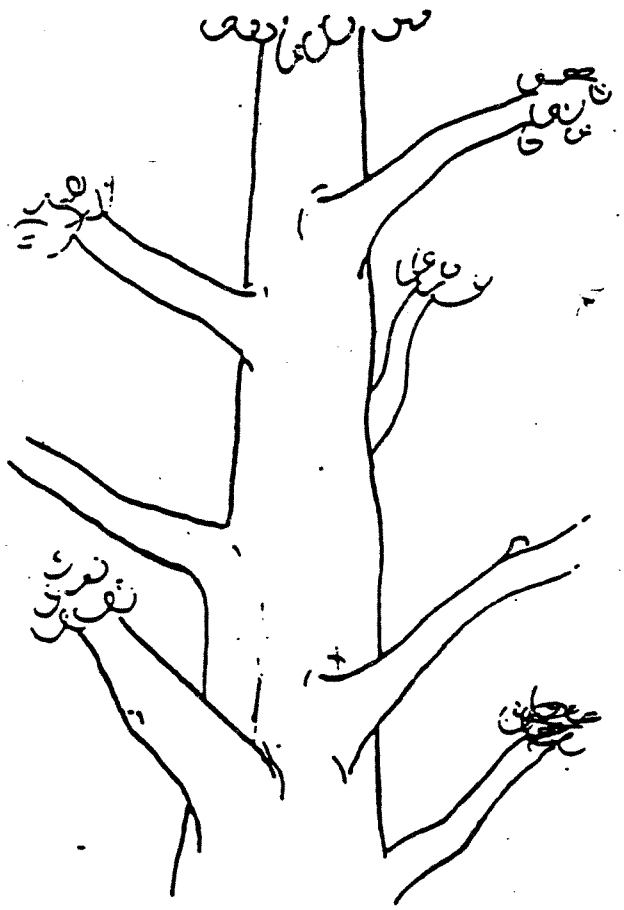

FIGURE 6. *Major branches should be spaced both along and arc the stem.*

II. Types of Pruning — Mature Trees

A. CROWN CLEANING

Crown cleaning or cleaning out is the removal of dead, dying, diseased, crowded, weakly attached, and low-vigor branches and watersprouts from a tree crown.

B. CROWN THINNING

Crown thinning includes crown cleaning and the selective removal of branches to increase light penetration and air movement into the crown. Increased light and air stimulates and maintains interior foliage, which in turn improves branch taper and strength. Thinning reduces the wind-sail effect of the crown and the weight of heavy limbs. Thinning the crown can emphasize the structural beauty of trunk and branches as well as improve the growth of plants beneath the tree by increasing light penetration. When thinning the crown of mature trees, seldom should more than one-third of the live foliage be removed.

At least one-half of the foliage should be on branches that arise in the lower two-thirds of the trees. Likewise, when thinning laterals from a limb, an effort should be made to retain inner lateral branches and leave the same distribution of foliage along the branch. Trees and branches so pruned will have stress more evenly distributed throughout the tree or along a branch.

An effect known as "lion's-tailing" results from pruning out the inside lateral branches. Lion's-tailing, by removing all the inner foliage, displaces the weight to the ends of the branches and may result in sunburned branches, water-sprouts, weakened branch structure and limb breakage.

C. CROWN REDUCTION

Crown reduction is used to reduce the height and/or spread of a tree. Thinning cuts are most effective in maintaining the structural integrity and natural form of a tree and in delaying the time when it will need to be pruned again. The lateral to which a branch or trunk is cut should be at least one-half the diameter of the cut being made.

D. CROWN RESTORATION

Crown restoration can improve the structure and appearance of trees that have been topped or severely pruned using heading cuts. One to three sprouts on main branch stubs should be selected to reform a more natural appearing crown. Selected vigorous sprouts may need to be thinned to a lateral, or even headed, to control length growth in order to ensure adequate attachment for the size of the sprout. Restoration may require several prunings over a number of years.

II. Types of Pruning — Mature Trees *(continued)*

E. CROWN RAISING

Crown raising removes the lower branches of a tree in order to provid clearance for buildings, vehicles, pedestrians, and vistas. It is important that tree have at least one-half of its foliage on branches that originate in the lowe two-thirds of its crown to ensure a well-formed, tapered structure and t uniformly distribute stress within a tree.

When pruning for view, it is preferable to develop "windows" through the foliage of the tree, rather than to severely raise or reduce the crown.

III. Size of Pruning Cuts

Each of the Pruning Techniques (Section I) and Types of Pruning (Section II) can be done to different levels of detail or refinement. The removal of many small branches rather than a few large branches will require more time, but will produce a less-pruned appearance, will force fewer watersprouts and will help to maintain the vitality and structure of the tree. Designating the maximum size (base diameter) that any occasional undesirable branch may be left within the tree crown, such as ½", 1" or 2" branch diameter, will establish the degree of pruning desired.

IV. Climbing Techniques

A. Climbing and pruning practices should not injure the tree except for the pruning cuts.

B. Climbing spurs or gaffs should not be used when pruning a tree, unless the branches are more than throw-line distance apart. In such cases, the spurs should be removed once the climber is tied in.

C. Spurs may be used to reach an injured climber and when removing a tree.

D. Rope injury to thin barked trees from loading out heavy limbs should be avoided by installing a block in the tree to carry the load. This technique may also be used to reduce injury to a crotch from the climber's line.