

CITY OF CARMEL-BY-THE-SEA FOREST MANAGEMENT PLAN

By
Michael J. Branson
City Forester



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Reviewed and Approved by the Forest and Beach Commission

Steve Brooks, Chairman

Clayton Anderson

Wayne Kelly

Robert Kohn

Roy Thomas

March 2001

Reviewed and Approved by the City Council of Carmel-By-the-Sea

Sue McCloud, Mayor

Dick Ely

Paula Hazdovac

Barbara Livingston

Gerard Rose

Editorial Assistance by

Margie Perotti

Secretary of the Forest and Beach Commission

Administrative Coordinator Forest, Parks, and Beach Department

TABLE OF CONTENTS

I.	Introduction – A Forest to be Managed	page 1
II.	The Benefit of Trees	page 2
III.	Goals, Objectives, Policies.	
	Preserve and enhance the City’s legacy of an urbanized forest of predominantly Monterey pine, coast live oak and Monterey cypress	page 4
	Maintain and enhance the informality of streetscapes	page 7
	Preserve and acquire open space and parks	page 8
	Conserve water and minimize storm runoff	page 9

Appendices:

- A. ~~Municipal Code~~
 - 1. ~~Chapter 12.28 Trees and Shrubs~~
 - 2. ~~Chapter 2.32 Forest and Beach Commission~~
 - 3. ~~Chapter 12.08 Encroachments~~
 - 4. ~~Title 17 (applicable sections)~~

- B. Tree Pruning Standards
 - 1. Carmel-by-the-Sea and Western Chapter ISA Pruning Standards
 - 2. Policy for Pruning Trees on Public Property by Private Tree Companies

- C. Tree Planting Guidelines.
 - 1. HortScript #10, Planting Landscape Trees

- D. Tree Survey
 - 1. 1999 Tree Survey Segment III

- E. Tree Removal Criteria
 - 1. Criteria/Consideration when reviewing tree removal applications.

Appendices continued:

- F. Policies
 - 1. Emergency Tree Removal Policy C99-01
 - 2. Tree Density per Lot Policy C91-05
 - 3. Firewood Policy C89-35
 - 4. Demolition Permit Review Policy C90-05
 - 5. Policy and Standards for Public Way Designs C97-02
 - 6. Street Resurfacing and Undergrounding of Utility Improvement Projects C90-04

- G. Tree Species List

- H. List of Compatible Plants Under and Around Native Trees

- I. Business District Planting Policy

- J. Pitch Canker Task Force Position Papers

- K. Forest Facts

- L. Monterey pine seed collection guidelines

I. INTRODUCTION – A FOREST TO BE MANAGED

Since the early 1900's the care of Carmel's forest and natural environment has resulted in the adoption of Ordinances, Resolutions, and Policies relating to trees. Taken together, these documents have successfully guided the City's tree program over the years. However, since the measures were adopted at different times to address separate concerns, they lack a sense of overall cohesion.

In order to meld these documents together the first Forest Management Plan for the City of Carmel-by-the-Sea was adopted in 1971. It has served the forest well. Many of its sections remain valid and should be used to provide a historical perspective of changes in the forest as well as its management. Future Commissioners and managers would be wise not to lose sight of the lessons of the past.

The urbanized forest is Carmel-by-the Sea's largest, most visible, and most important natural resource. Both environmentally and aesthetically, the forest makes the City a better place to live and visit. Each tree makes an individual contribution, but in concert with each other the trees become a forest - and a powerful influence on the community.

Carmel's forest is an "urbanized" forest rather than an "urban" forest. "Urban" forests are planted after the urban development and typically consist of single species, regularly spaced trees planted in a row between the sidewalk and the street. An "urbanized" forest existed before the development and is characterized by its diversity in species, age and randomness in tree location resulting in meandering streets of varying width.

To fully understand the importance of public and private trees to Carmel-by-the Sea, it might be helpful to imagine a completely treeless city. Houses would repetitiously line up along straight shadowless streets. The sterile habitat would attract few birds, and without trees, we would have no living clocks to mark the passage of time and no living monuments to the past.

Although some of the streets of Carmel-by-the-Sea, notably Ocean Avenue, were planted with trees, most of the village was tree covered long before there was a Carmel. Robert Louis Stevenson walked through these forests. David Starr Jordan in 1885, or thereabouts, reported forests extending to the white beach of Carmel. There are numerous records by early travelers passing through Carmel-by-the-Sea, which mention a "village in a forest above a white ocean beach" and "a town whose citizens love trees".

A Forest Master Plan seeks to strengthen the connection between trees and residents of the city. The Plan recognizes that an urbanized forest is a combination of trees and people living together for the benefit of both. The Plan provides management guidance by presenting the City's goals and objectives relating to trees and the policies by which they can be implemented. Since the decisions of individuals ultimately determine the quality of the forest, the Plan also seeks to involve individual residents as fully as possible in the preservation and care of the forest.

The new Forest Master Plan begins the millenium with an idealistic tone. However, it must also be a practical document that espouses goals and policies that can be fulfilled. Our vision for the forest should be creative while our feet remain on the pine needles.

II. THE BENEFIT OF TREES

In economic terms, the American Forestry Association (AFA) estimates the amenity value of an urban tree to be twenty-five times greater than the value of a tree grown strictly for lumber. According to the AFA, such a tree is appraised more like real estate than a commodity. Its value derives from the multitude of benefits it bestows on individual residents, the community and the urban forest as a whole.

- Upper canopy trees impart a distinctive ambiance and identity to the City. Carmel-by-the-Sea is known worldwide for its environmental amenities. Living in a pine forest with a mix of upper and lower canopy trees establishes a powerful sense of place.
- Trees establish visual harmony and continuity along City streets. The pleasure of walking, a large part of the Carmel experience is enhanced by the sheltering canopy of trees over meandering streets.
- Trees soften and screen urban development. Combined with good planning and design, trees improve the visual environment, helping to blend diverse structures with a green unity that adds a natural dimension to the City's development over time.
- Trees help diffuse noise. Dense foliage helps break up the sound from traffic and other noises, to make them less intrusive.
- Trees help increase and stabilize property values. Trees increase residential property values from 7 to 20 percent. Surveys in California identify mature trees as the most desired amenity in home sales. The City gains from enhanced property values in the form of increased property and transfer tax revenues.
- Trees enhance people's sense of connection to nature and history. Since trees, like people,

grow and change through time, we identify with them and since they often live longer than we do, they link us to times beyond our own, spanning past and future generations.

- Upper canopy trees protect the environment of native understory trees and vegetation. Locally, coastal fog condenses on the foliage of upper canopy trees and then drips to the ground bringing much needed moisture to the understory trees and vegetation.
- Trees absorb carbon dioxide, counteracting the global greenhouse effect. Photosynthesis “fixes” carbon in a tree where it stays as long as the tree lives. An average tree captures nearly half a ton of carbon dioxide over the first thirty years of its life.
- Trees moderate wind. A grove (screen) of trees will cut a 20-mph wind to 5-mph.
- Trees produce oxygen and help reduce pollution. A tree’s production of oxygen replenishes the atmosphere and dilutes pollutants.
- Trees help reduce soil erosion and surface runoff. Trees protect soil by breaking the fall of raindrops, absorbing water through their roots, covering the ground with protective humus, slowing runoff, and holding soil with their roots.
- Trees provide habitat for birds and other wildlife. A mature tree can provide a home for 300 species of insects, which in turn provide food for many species of birds.

The identification number order of goals, objectives, and policies in the Forest Management Plan is correlated to the numbering order in the adopted Local Coastal Program of Carmel-by-the-Sea and thus may not appear in sequential order in this Plan.

IV. GOALS, OBJECTIVES, POLICIES

G9-13 **Preserve and enhance the City's legacy of an urbanized forest of predominantly Monterey pine, coast live oak and Monterey cypress.**

O9-35 Maintain a Forest and Beach Commission and a Forest, Parks and Beach Department that have specific responsibility and jurisdiction for the health and well-being of the forest, parks and beach.

P9-202 Review periodically all existing tree-related ordinances and policies in the Forest Management Plan/LCP. Propose changes to bring them into alignment with new advances in urbanized forest management practice.

P9-203 Conduct the forest program in accordance with a coherent body of laws, goals, policies and guidelines.

P9-204 Coordinate all functions of the urban forest program through the Forest, Parks and Beach Director.

P9-205 Commit resources necessary to support the forest, parks and beach programs.

O9-36 Maintain a Citywide map and database of trees and landscaped areas to

support tree planting and maintenance programs.

- P9-206 Complete a Citywide survey and database update every 4 years. Compile the data by size of tree and species in an electronic format. Also survey replacement trees required by permit conditions of approval. Report survey information and the status of replacement trees to the Forest and Beach Commission and Planning Commission at the conclusion of each yearly survey. Continue to monitor replacement trees for at least one survey cycle (i.e., 4 years). (Appendix D)
- O9-37 Maintain, restore and enhance the upper and lower tree canopy of Carmel's urbanized forest.
- P9-208 Implement adopted tree density policies for private and public property as appropriate to each site taking into consideration neighborhood characteristics and site constraints. (Appendix A, F)
- P9-209 Establish and implement tree canopy policies for the commercial district. (Appendix A, I)
- P9-210 Maintain a list of tree species which qualify as indigenous upper and lower canopy trees for purposes of meeting tree density, and replacement policies. (Appendix G)
- P9-211 Maintain, restore and enhance a predominantly indigenous forest of native Monterey pines and coast live oaks.
- P9-213 Review all projects involving an increase in lot coverage or tree removal to apply the adopted tree density policy as appropriate for each neighborhood and site conditions. Preserve upper and lower canopy trees classified as significant when planning and implementing residential and commercial development. (Appendix A, F)
- P9-215 Use tree species and sizes well adapted for each planting site.
- P9-216 Manage the tree-planting program to achieve an uneven-aged healthy forest with particular emphasis on native Monterey pines and coast live oaks.
- O9-38 Implement policies, standards and procedures to regulate removal, pruning, and replacement of trees on private property.

- P9-218 Permit the ~~Forest, Parks and Beach Director~~ City Forester to act on requests for the removal and pruning of all trees growing on public and private property.

- P9-220 Permit the ~~Forest, Parks and Beach Director~~ City Forester to apply special procedures for tree removal and pruning during emergencies. (Appendix F)

- P9-221 Record and monitor replacement trees to ensure their establishment and growth to maturity. (Appendix A)

- P9-222 Require ample and appropriate landscaping and tree plantings on all sites. Determine what is appropriate for each site by consulting the recommended tree density as appropriate for each neighborhood. Special emphasis must be paid to construction sites. Required replacement trees shall be of substantial size, caliper and height to produce an immediate visual impact and to reduce the incidence of unauthorized removal. (Appendix A, F)

- P9-223 Require a documented site assessment, or meeting between a planner, City Forester, and the property owner/developer on each proposed construction site to discuss tree preservation and planting. Establish tree protection zones and suitable locations for development through this process. This shall be done before plans have been drawn.

- P9-224 Evaluate, protect and preserve all trees (and their root zones) on sites prior to, during and after construction. Ensure that all building sites abide by appropriate tree protection and preservation standards. (Appendix A)

- O9-39 Perform all tree work and landscaping within the City in accordance with City codes and policies and uniform planting practices that reflect the best current knowledge of tree and plant care.

- P9-225 Maintain close cooperation among all public agencies, tree services, arborists, landscape architects, gardeners, and utility companies affecting the urban forest.

- P9-227 Provide a comprehensive training program for City staff and encourage employees to become Certified Arborists or Certified Tree Workers under the standards of the International Society of

Arboriculture (ISA).

- P9-228 Negotiate with the Public Utilities Commission and utility companies to adopt minimal line clearance standards to give special attention to Carmel's forest.
- P9-19 Promote the undergrounding of utilities where feasible and with minimum detriment to the root systems of trees. (Appendix F)
- O9-40 Maintain a healthy forest.
 - P9-229 Work in concert with the other area foresters and arborists, the Monterey Pine Forest Ecology Cooperative, the Pitch Canker Task Force, Oak Mortality Task Force, and university researchers to address acute concerns to the health of the forest.
 - P9-230 Monitor tree pest and disease problems and take appropriate measures to minimize their impact.
 - P9-231 Foster healthy and disease resistant trees and avoid widespread application of pesticides.
 - P9-232 Investigate ways to discourage large trucks from using streets with low tree limbs.
 - P9-233 Plant native Monterey pine seedlings of different genotypes to maximize resistance to diseases and make these seedlings available to the public. (Appendix L)
 - P9-235 Properly dispose of diseased trees and recycle tree waste. (Appendix F, J)
 - P9-226 Require that all City departments, utility companies, tree service companies, arborists, landscapers, and gardeners adhere to the adopted Tree Maintenance Standards, policies and guidelines. (Appendix A, B, C, J)
- O9-41 Educate and involve the public in tree issues.
 - P9-231 Undertake an active program of community outreach and education. (Appendix A)

- K) P9-240 Publish timely tree care articles in local news media. (Appendix A,
- P9-241 Encourage monetary and other contributions in support of the urban forest program. (Appendix A)
- P9-242 Provide the City Council and Planning Commission with information on an annual basis from the ongoing tree survey regarding projected changes in the composition of the forest and recommendations for policy amendments. (Appendix A)
- P9-243 Involve citizen groups in forestry programs so that forest related subjects are seen as community issues that require broad based involvement and support.

G9-14 Maintain and Enhance the Informality of Streetscapes

- O9-42 Remove or reduce unnecessary or excessive hardscape and other nonconforming encroachments on City parklands and within street rights of way to provide for and promote planting of trees and native vegetation.
- P9-244 Require at the issuance of a building permit, the abatement or retroactive approval of any nonconforming encroachments in the public right of way. (Appendix A)
- P9-245 Look for opportunities to reduce or eliminate hardscape areas Citywide on public and private lands. Identify hardscape in the public right-of-way and on-site that does not meet current policies or codes during preliminary site assessments and/or other design review for all projects in the R-1 District. Require that project landscape plans include the public rights-of-way.
- O9-43 Use mini-parks and islands for planting trees, with an emphasis on native Monterey pine, oaks, and other native vegetation.
- P9-247 Identify opportunities for new trees, removal of invasive plants and landscaping to enhance streetscapes during planning for street reconstruction projects. (Appendix F)
- P9-248 Recognize the City's narrow street paving, roadside vegetation and overarching canopy as important elements contributing the streetscape, to pedestrian circulation, traffic calming, community aesthetics and environmental enhancement. Identify character-

defining features of roadways and retain and enhance these features when planning and implementing street improvement, repairs and reconstruction. (Appendix F)

O9-44 Incorporate adequate landscaping and trees of the urbanized forest in all public construction projects.

P9-249 The City staff member responsible for any public project shall involve the Forest, Parks and Beach Department through the planning and implementation stages of the project.

P9-250 Include funding for the design and installation of landscaping as part of each public project.

G9-15 Preserve and Acquire Open Space and Parks

O9-46 Maximize the amount of open space in the City and sphere of influence by establishing development fees and/or other methods to fund open space acquisition.

P9-251 Resist the transfer of open space to other uses.

P9-252 Encourage rezoning to open space.

P9-253 Actively pursue the preservation of existing open space within the City's sphere of influence.

P9-219 Report sites that are non-conforming with standards for permeable surface lot coverage when applications for tree removal or pruning permits are filed.

O9-46 Restore and maintain open space to its natural state.

P9-254 Establish and implement a procedure for removal of invasive vegetation.

P9-256 Identify and protect environmentally sensitive habitat areas against any significant disruption of habitat values. Only uses dependant upon those resources shall be allowed. For private lots of record within ESHA, establish a transfer of development rights program using credits of water, floor area, density or some other development parameter to relocate development to less sensitive

areas.

P9-260 Provide for public access and passive enjoyment of City parks and open space.

P9-261 Provide and maintain informal trails if there is public demand.

O9-48 Optimize public use of City parks.

P9-258 Implement the recommendations of all existing Master Plans considering prioritized needs and available funding:

- a. Mission Trail Nature Preserve Master Plan
- b. Shoreline Management Plan
- c. Forest Hill Park Master Plan

P9-259 Develop and implement specific plans, master plans or other programs in other areas where needed.

G9-17 Conserve water and minimize storm runoff

O9-49 Maximize retention of surface water on each site through site design and use of best management practices.

P9-262 Where feasible, direct street runoff to open-space areas on public or private property for percolation into the soil.

P9-263 New construction plans should include design features to enhance surface water percolation. Where practical, runoff from roof, driveway and other impervious surfaces shall be collected and directed into pervious areas on the site (landscaped areas) for infiltration in a non-erosive manner, prior to being conveyed off-site.

P9-264 Encourage homeowners to absorb surface water on their own property. Implement development standards that minimize runoff and the amount of area paved with impervious surfaces. Encourage homeowners and commercial property owners to install cisterns for landscaping to decrease water use and to reduce runoff.

O9-49 Landscape with drought tolerant plants, shrubs and trees of the urbanized forest.

- P9-266 Provide to the public an established list of indigenous and non-indigenous drought tolerant plants. (Appendix H)

- P9-267 Require approval of landscape plans for drought tolerance and trees by the Forest and Beach Department on new construction at Final Design Review or before issuing a building permit. Include specifications for location, species, size and planting guidelines for all required replacement trees in this review. (Appendix A)

- O9-50 Minimize the use of potable water for landscape irrigation.

- P9-268 Use low output sprinkler heads and/or drip irrigation for landscape irrigation systems. (Appendix A)

- P9-269 Use on-site water retention devices to capture precipitation or surface runoff for landscape maintenance purposes.

CARMEL-BY-THE-SEA AND WESTERN CHAPTER ISA

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 have led to pruning practices which best preserve and enhance the beauty, structural integrity, and the functional value of trees.

If 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.

Carmel-by-the-Sea's Forest and Beach Commission has adopted these pruning standards with minor amendments. **Licensed tree companies are required to adhere to these standards.** A tree-pruning permit must be obtained if pruning practices that vary from these standards are proposed. Failure to follow these standards shall be grounds for suspension/revocation of a tree company's business license.

1. 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 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 not 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. Trees shall not be topped unless necessary for utility line clearance or under unusual circumstances for which a pruning permit is necessary.

C. Application for Design Approval. Application for design review approval shall be submitted to the Director of the Department of Community Planning and Building on forms provided by the City for that purpose. Such application shall be accompanied by the required fees as set forth by resolution of the City Council. (Ord. 86-3 § 1, 1986; Ord. 85-18 § 5, 1985).

- 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 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 10 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.

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 water sprouts 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.

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.

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 pruning over a number of years.

E. CROWN RAISING

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

When pruning for view, it is preferable to develop "windows" through the foliage of the tree, rather 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 water sprouts and will help to maintain the vitality and structure of the tree.

The maximum size (Base diameter) or live branches that may be removed without a permit is four (4) inches. Dead limbs should always be removed.

IV. MISCELLANEOUS

- A. All motor vehicles and other major equipment of any licensed business used in conducting the licensed business shall be clearly identified with the name of the licensee/business name.
- B. All work must be done safely and in accordance with the American Standard for Tree Care Operation (ANSI Z133.1-1988).
- C. All tree companies must be licensed to work in the City of Carmel-by-the-Sea and in addition must have a contractors license.

V. WHEN TO PRUNE

The timing of any tree pruning operation depends upon the species of tree, its condition and the desired results. Crown thinning and major limb removal should be targeted toward the dormant period for most tree species. In Carmel this period is between mid-October through mid-February. Pruning during these months provides several benefits to the tree:

- Reduced stress
- Less insect activity
- Improved callus formation
- Lessened water sprout production

Other types of pruning can be done year round but the long-term benefit to the tree should be the primary consideration.

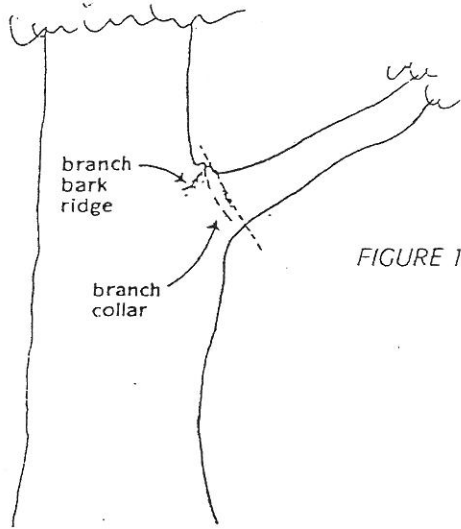


FIGURE 1. When removing a branch, the final cut should be just outside the branch bark ridge and collar.

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.

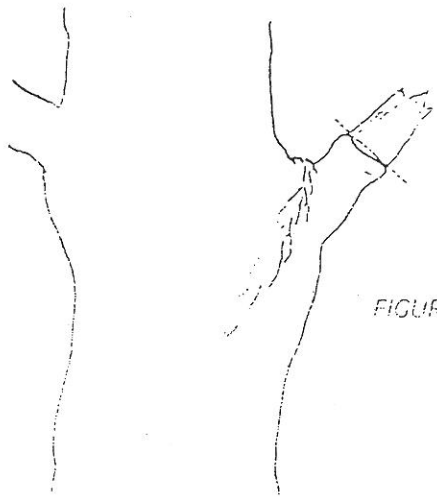
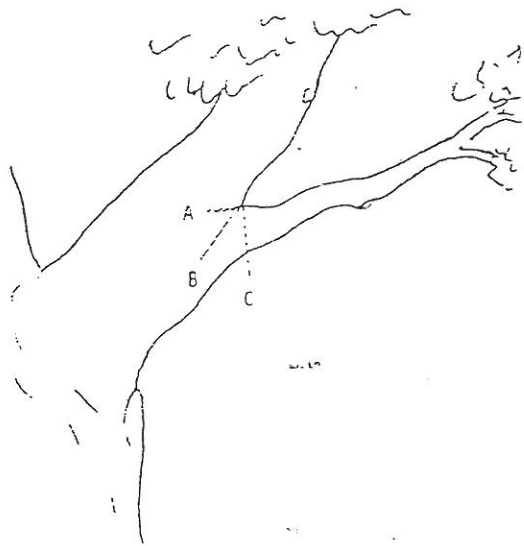


FIGURE 3. When removing a dead branch, cut outside the callus tissue that has begun to form around the branch.

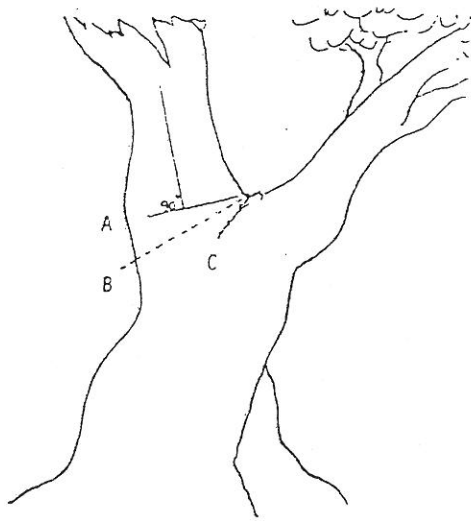
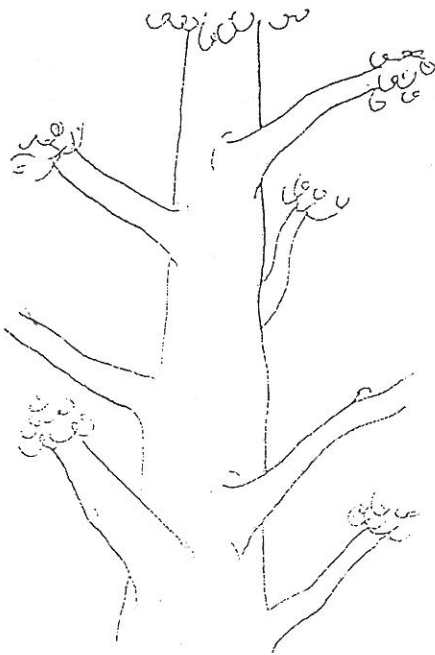


FIGURE 4. In removing the end of a limb to a large lateral branch, the final cut is made along a line that bisects the angle between the branch bark ridge and a line perpendicular to the limb being removed. Angle AB is equal to Angle BC.

FIGURE 5. A tree with limbs tending to be equal-sized, or codominant. Limbs marked B are greater than $\frac{3}{4}$ 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 well spaced both along and around the stem.



POLICY FOR PRUNING TREES ON PUBLIC PROPERTY BY PRIVATE TREE COMPANIES

1. REQUIREMENTS

- A. Valid City of Carmel-by-the-Sea Business License.
- B. Provide proof of liability insurance (\$1,000,000) naming the City, its officers, agents and employees as additionally insured.
- C. Have a California Tree Service Contractors license for any project exceeding \$300.
- D. The project must be supervised by an ISA Certified Arborist.
- E. Attend an annual City sponsored workshop regarding pruning of trees on public property.
- F. Meet with the Forest, Parks and Beach Director prior to the start of a project. The contractor shall arrange for his/her client and job foreman to attend this meeting.
- G. Meet with the Forest, Parks and Beach Director for an after action/project inspection and report.
- H. The Scenic Coastal Overlay District is excluded from this policy and work in this District shall be performed exclusively by the staff of the City of Carmel-by-the-Sea.

2. CONSEQUENCES OF NON-COMPLIANCE

If in the opinion of the Forest, Parks and Beach Director, the method of pruning or the amount of foliage removed is not in keeping with the standards in paragraph four of this policy, the private tree company shall not be allowed to work on public trees for a period of at least one year from the date of violation(s).

3. TREE PRUNING PHILOSOPHY

Pruning should be done only to enhance the health and natural growth characteristics of the individual tree. The use of the word "natural" is important because a tree's structure may be different depending on its age and location. Several unpruned trees in an area should be observed and used as the basis for determining a tree's natural shape and response to environmental conditions prior to the start of a pruning project.

4. TREE TRIMMING STANDARDS

The individual who is directing the operation from the ground, as well as the trimmer in the tree, shall have an understanding of tree pruning concepts and techniques and particularly the attitude or philosophy of cutting trees in the City of Carmel-by-the-Sea. The resident requesting the pruning shall also be informed of this policy.

The finished sculptural result of a pruning should be a light, minimal approach of cutting which results in a tree's silhouette to be visually altered by 1/8 to no more than 1/4 at any one time (unless directed so by the Forest, Parks and Beach Director). It is the intention of the City that a tree can be physically improved by pruning without seeing a drastic change to the silhouette and structure.

Removal of foliage from a tree has two distinct effects on its growth. Removing leaves or needles reduces photosynthesis and may reduce overall growth, which can create a dwarfing effect. At the same time, growth that occurs takes place on fewer shoots. So they tend to grow longer than they would have without pruning. Since each cut has the potential to change the growth of a tree, no branch should be removed without a reason. Leave lower and inside branches evenly distributed along it. Maintain inner lateral branches to achieve even distribution of foliage along the branch. Caution must be taken not to create an effect known as lion-tailing, which is caused by removing all of the inner laterals and foliage. This displaces foliage weight to the ends of the branch and may result in weakened branch structures and breakage.

Each cut should be made carefully at the correct location, leaving a smooth surface with no jagged edges or torn bark. The correct anatomical location is just beyond the branch collar or shoulder. Large or heavy limbs should be removed using three cuts.

This directive is to be strictly adhered to in the two-block zone that is within the influence of the first-exposure-to-seacoast conditions. It is the intent to avoid further dieback of green growing branches, by not removing all of the protective dead branches that baffle the salt laden winds.

These requirements in no way guarantee quality workmanship. They are intended to satisfy the City's legal requirements and demonstrate that the company doing tree work has a basic level of professional capability and commitment to the field of arboriculture.

University of California Cooperative Extension
HortScript #10
November 1994

Planting Landscape Trees

Gary W. Hickman, Environmental Horticulture Advisor, San Joaquin County
Pavel Svihra, Horticulture Advisor, Marin and Sonoma Counties

The performance of a landscape tree depends a great deal on how it is planted.

In order for a tree to grow well as it matures, almost all of its roots will have to grow in the soil of the planting site. Amending the back-fill soil will seldom be beneficial. Also, amending only the back-fill merely creates another artificial container from which the roots must grow to ensure satisfactory tree growth.

If the soil at the planting site will not satisfactorily sustain a tree, extensive conditioning and modification of the entire rooting area would be needed but is seldom practical. Roots grow and develop in moist soil where oxygen is available. Roots grow little or not at all in dry soil, in compacted soil, or in soil that is saturated.

Trees will have shallow roots if planted on shallow soils with impervious layers or an underlaying shallow water table.

DIGGING THE HOLE

Plant a young tree "high", whether it is bareroot, balled or container grown. Dig the hole no deeper than necessary - approximately 2 inches less than the depth of the soil in the container or the depth of the soil ball. Planting the tree deeper or in loose soil may lead to future crown rot problems. Loose soil in the bottom of the hole will settle, causing the tree to be planted deeper than intended.

Soils compacted by construction, vehicular traffic or former agricultural use must be broken up before planting to ensure adequate air and water penetration. After loosening compacted soil by shovel or equipment, irrigate thoroughly and delay planting for two weeks to allow the soil to settle.

In soils of reasonable tilth, the planting hole should be at least twice the diameter of the container or root ball. In more compacted soil, the hole should be 3 to 4 times the diameter of the root ball. In either case, the sides of the hole should be almost vertical and roughened to provide easier root penetration. When planting bare-root trees, make the hole large enough to take the roots without crowding. Backfill the hole with soil dug from the hole or use more friable surface soil if the soil from the hole is mainly hard clods. Take care to not cover the root ball top of container grown trees because the finer-texture backfill can prevent wetting of the rootball.

FERTILIZING

Adding fertilizer, soil amendments or root stimulants to the planting hole or backfill soil is not recommended. Most nursery-grown trees are well fertilized during production and seldom respond to fertilizing at planting except in the most infertile soils.

PRUNING

The less a young tree is pruned the more total growth the tree will make. However, the growth may not be where you want it or where it will develop the most desirable structure. After planting, remove broken, dead, or diseased branches and those interfering with more desirably placed ones. Remove or cut back branches that will compete with the leader (the top-most shoot). Leave small shoots along the trunk below where you want the lowest permanent branch; remove low large branches or cut them back to 2 to 3 buds. These low shoots will protect the trunk and increase its strength. Check the tree every 2 to 3 weeks during the growing season to see how the tree is doing and to direct its growth by pinching back shoots that are too vigorous or you know you will not want later.

STAKING

Staking requirements depend on the ability of a tree to stand upright and the particular landscape situation. The more freedom the top of the tree has to move, the better it is able to develop structure to stand upright and withstand storms. NO STAKES are necessary for the many trees that can stand by themselves and that have branches to the ground or are planted where little or no protection is needed. Most conifers, trees with upright growth habits and trees planted bare root usually do not need support.

Protective Stakes are needed for trees that can stand without support but need protection from equipment, vehicles or animals. To protect trees from equipment and vehicles stakes need only be high enough to be seen so as to not be a tripping hazard. Three taller stakes with wire mesh or other covering may be needed to prevent animal damage.

Anchor Stakes are needed for trees whose trunks can hold them upright but whose roots may not be able to support the trunks upright, particularly in a wind when the soil is muddy. Usually stakes used for protection from equipment are tall enough for ties to the trunk to hold the roots securely and still allow the top to move in the wind.

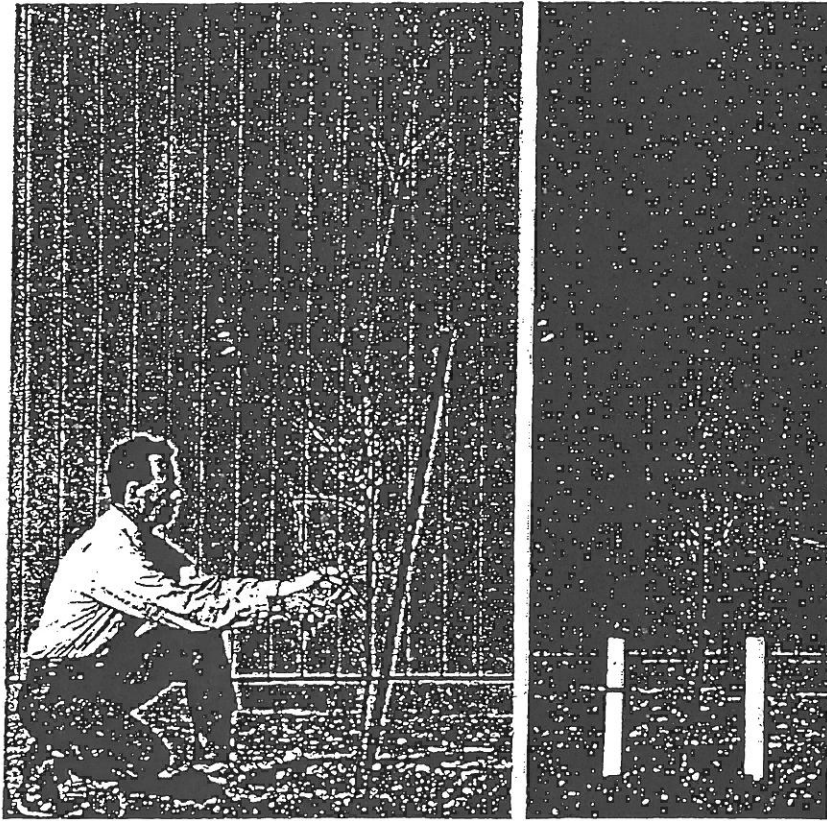
Support Stakes are required for trees unable to stand by themselves. Top support for these trees should be as low on the trunk as possible, but high enough to return the tree upright after deflection. Use 2 to 3 support stakes and if possible, tie the trunk to them at only one height to allow the trunk below the tie to bend in the opposite direction from the top during a wind. Tie material should contact the trunk with a broad smooth surface and elasticity to minimize trunk abrasion and girdling.

COMPETITION FROM TURF AND WEEDS

When trees are planted in a turf area, keep the turf at least 12 inches away from the trunk of young trees the first 2 to 4 years or longer. The growth of young trees may be retarded by turf growing to close to their trunks, even though additional water and fertilizer are applied. A 24 inch diameter of bare soil about the tree trunk will also reduce damage to young trees by lawnmowers. Mechanical damage to the trunk of young trees can have a severe dwarfing effect.

WATERING

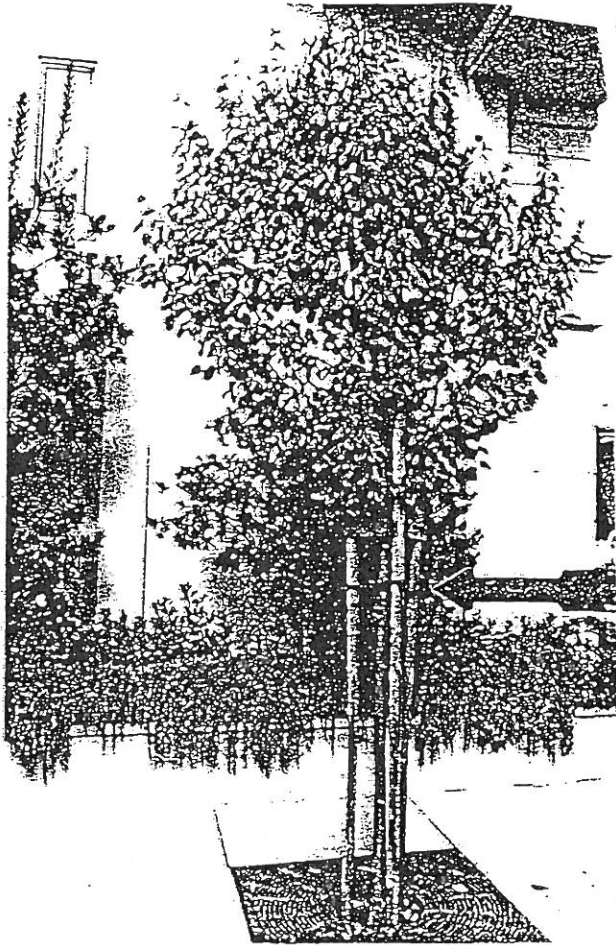
The basin for watering the newly planted tree should be so constructed that the water will drain away from the trunk. Even though the soil is moist at the time of planting, thoroughly irrigate the tree to settle the soil around the root system. Remember that most of the root volume occupies a rather limited area, particularly through the first growing season. Lighter and more frequent watering may be needed until the roots become established in the parent soil. If the parent soil is poorly drained be careful not to overwater the tree. Once established thorough infrequent irrigation around the "dripline" (ends of branches) is most beneficial for good tree growth.



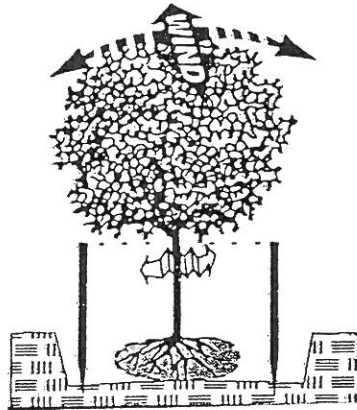
After planting, some of the laterals are removed and others headed to reduce wind resistance, balance the tree, and prevent the laterals from outgrowing the leader (left). Two stakes protect the trunk from equipment damage and allow the tree to develop proper caliper (right).

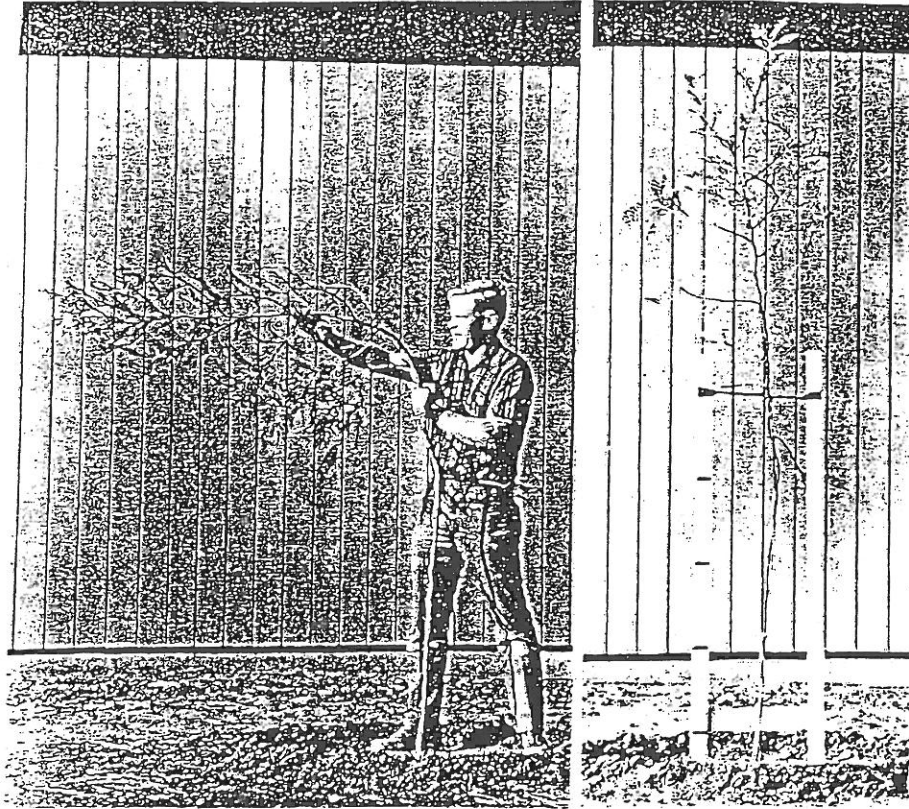


Maintaining an area of bare soil around young trees prevents competition for water and nutrients by other vegetation. Growth rate of oak tree at left, planted in a 9-square-foot area of bare soil (with resprouting weeds controlled by glyphosate), surpassed growth of tree grown in turf. Both trees were planted as one-year-old liners in tree shelters.

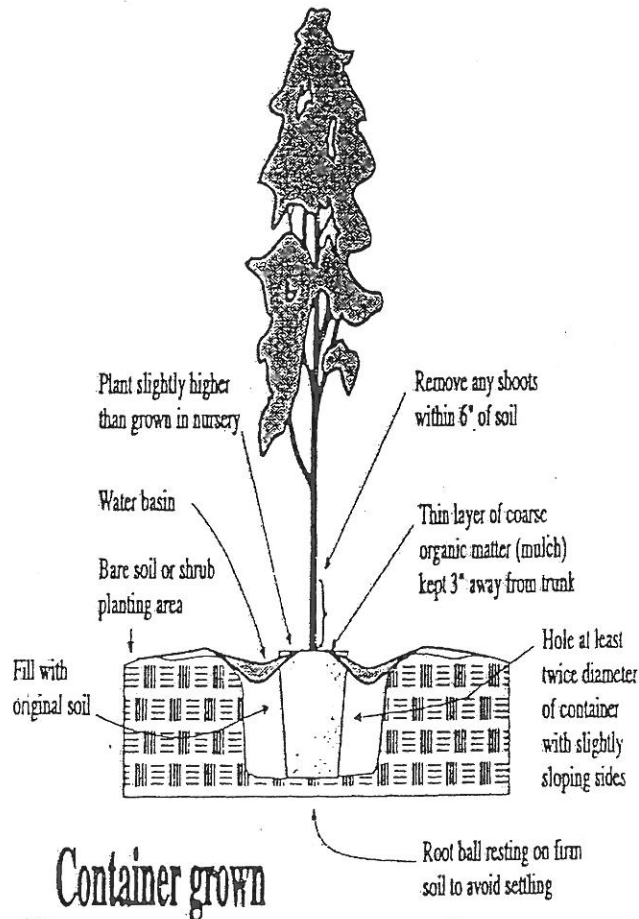


Stakes extend too high into this tree and will rub the laterals, causing injuries that encourage infestation by insects and pathogens. The tree was tied at the correct height (arrow), but support boards should be at the same height as the ties, and the stakes cut flush with boards.





Stakes should be no higher than necessary to hold the tree upright, while allowing the top freedom to move in the wind. To find the correct height, grasp the trunk with one hand and bend the top (left). If the top returns to its upright position when released, tie the trunk to stakes at the height (right).



City Trees Segment IV, 2000

	Pine	Oak	Acacia	Cypress	Redwood	Other	Total	Percent
<1"	11	40	15	1	2	4	73	3%
1-6"	187	398	151	105	35	262	1138	49%
7-12"	103	211	16	18	6	38	392	17%
13-18"	223	65	15	12	5	12	332	14%
19-24"	131	10	6	3	2	5	157	7%
25-30"	111	0	2	2	0	2	117	5%
31-36"	55	0	0	6	0	0	61	3%
37-42"	24	0	0	3	0	0	27	1%
43+"	9	0	0	6	1	9	25	1%
Total	854	724	205	156	51	332	2322	
Percent	37%	31%	9%	7%	2%	14%		100%

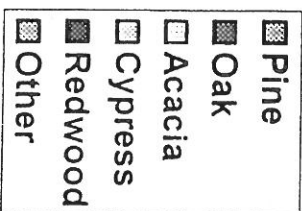
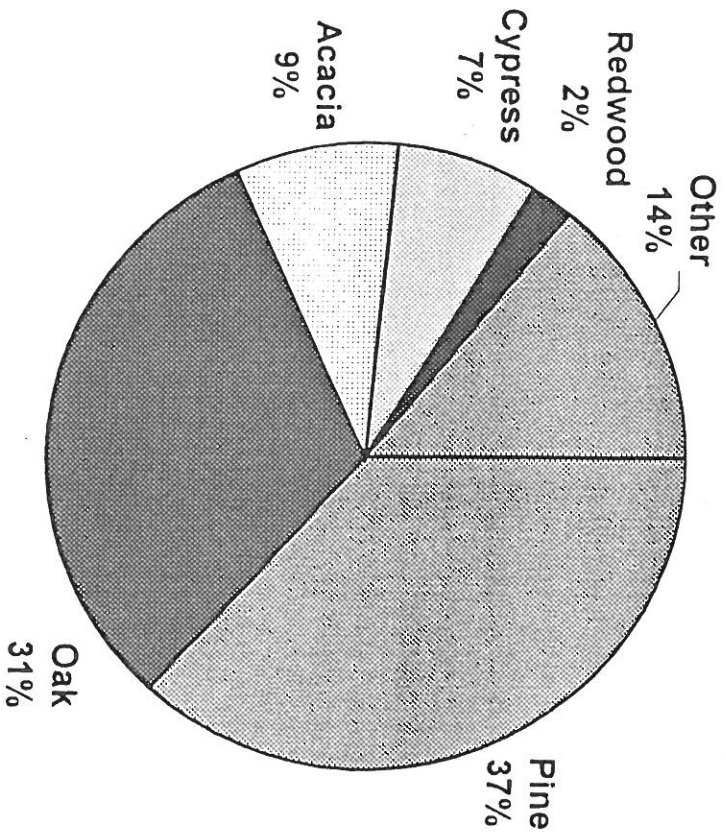
Private Trees Segment IV, 2000

	Pine	oaks	Acacia	Cypress	Redwood	Other	Total	Percent
<1"	14	102	11	13	0	0	140	3%
1-6"	96	871	224	65	22	389	1667	37%
7-12"	123	771	70	31	15	565	1575	35%
13-18"	212	400	35	21	29	22	719	16%
19-24"	132	34	3	10	10	2	191	4%
25-30"	114	5	0	5	10	0	134	3%
31-36"	51	4	2	1	6	3	67	1%
37-42"	17	0	0	2	0	0	19	0%
43+"	6	0	0	2	3	1	12	0%
Total	765	2187	345	150	95	982	4524	
Percent	17%	48%	8%	3%	2%	22%		100%

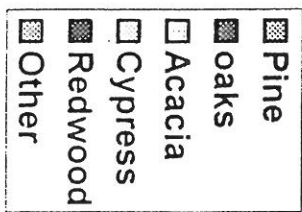
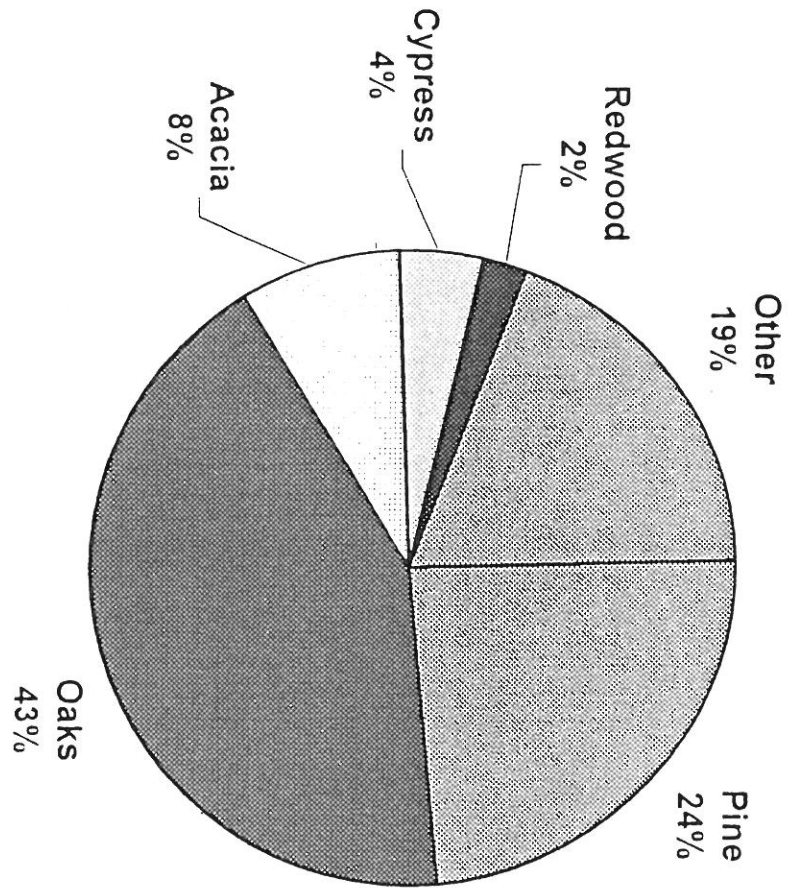
Total Trees Segment IV, 2000

	Pine	oaks	Acacia	Cypress	Redwood	Other	Total	Percent
<1"	25	142	26	14	2	4	213	3%
1-6"	283	1269	375	170	57	651	2805	41%
7-12"	226	982	86	49	21	603	1967	29%
13-18"	435	465	50	33	34	34	1051	15%
19-24"	263	44	9	13	12	7	348	5%
25-30"	225	5	2	7	10	2	251	4%
31-36"	106	4	2	7	6	3	128	2%
37-42"	41	0	0	5	0	0	46	1%
43+"	15	0	0	8	4	10	37	1%
Total	1619	2911	550	306	146	1314	6846	
Percent	24%	43%	8%	4%	2%	19%		100%

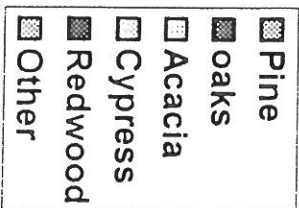
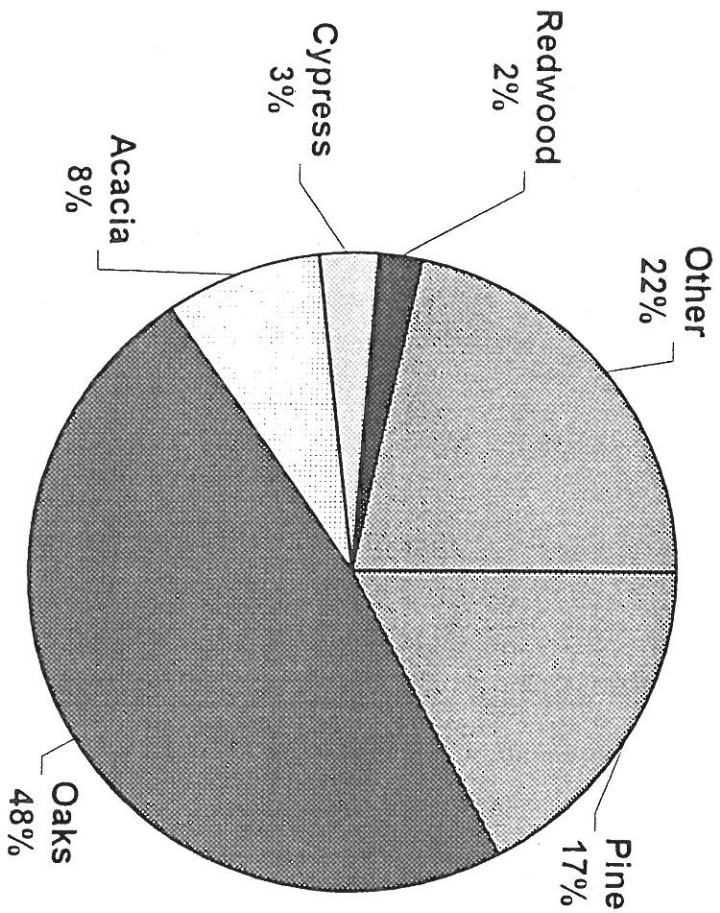
Percentages of City Trees
Segment IV - 2000



Percentages of Total Trees
Segment IV - 2000



Percentages of Private Trees
Segment IV - 2000



The City of Carmel-by-the-Sea exists as a “Village in a Forest”, and takes a great deal of pride in this fact. In order to maintain and perpetuate the forest, the City has established an application/permit process regarding tree removal and tree pruning on public and private property. Upon receipt of a completed application, Forest, Parks, and Beach Dept. staff and the Forest and Beach Commission use the following criteria to assess and render a decision:

CRITERIA/CONSIDERATION FOR REVIEW OF TREE REMOVAL/PRUNING APPLICATIONS

SAFETY: Does the tree have any structural impairment that is likely to cause tree failure?

HEALTH: Are insects or disease present that indicate the tree is declining and has a very limited life expectancy?

SPECIES: Is this tree an indigenous species? Is it included on the Commission’s recommended tree list? Is the tree compatible with the forest character of the neighborhood?

CONSTRUCTION IMPACTS: Is the tree likely to survive the impacts of construction activities? Are any special protection measures appropriate?

TREE DENSITY: Will the number and mix of trees on this site and/or the neighborhood be consistent with the City’s recommended tree density if this tree is removed? If not, are there planting opportunities to mitigate the tree’s loss and will the recommendation be met on the site?

OTHER TREE AFFECTS: Will the removal of this tree adversely or positively affect other trees on this property or neighboring properties? Consider crowding, competition, wind buffeting, light and privacy screening.

SIGNIFICANCE: Is there some characteristic or combination of characteristics that cause a tree to be of such value that its loss will have a detrimental effect on the forest and residents will be denied the amenities this tree affords them? Are there other significant trees on the site?

PROPERTY DAMAGE: Are damage alleviation measures (notch the eaves, repair the deck or driveway, foundation repair, etc.) available to repair the damage and retain the tree? Damage to patios, walkways, driveways, decks, eaves and outbuildings is not always considered to be significant for tree removal alone. Leaf litter or being messy is not considered significant cause for removal.

NEW CONSTRUCTION: Is there a compelling reason to impact the significant tree(s)?
(During evaluation of Design Guidelines Track 2 and Track 3 projects)

CITY OF CARMEL-BY-THE-SEA

POLICY AND PROCEDURE DATA SHEET

Policy/Procedure No.: C99-01
Effective Date: 12 January 1999

Department of Origin: City Council
Authority: Resolution No. 99-07

Revision Date(s):

SUBJECT: Emergency Tree Removal

RESPONSIBLE PARTY: Department of Forest, Parks and Beach

PURPOSE: To establish a protocol for City staff to administer requests for tree trimming and/or removals during emergency situations

POLICY/PROCEDURE:

It is recognized that public safety is the first priority during any hazardous event and those trees growing on both public and private property may threaten the public safety and may need immediate emergency attention during such events. In the event that the staff of the City's Forest, Parks and Beach Department, whose first charge during such situations is to tend to public trees, is unable to respond in a timely manner to a resident's call for assistance pertaining to a private tree, the following procedure shall be followed:

1. A resident's call to the Forest, Parks and Beach Department will be received by the staff on duty or forwarded to the City's Emergency Operations Center. The matter will be scheduled for staff attention or the resident will be referred to a tree service from an official City list of those tree services with a valid City business license that employ a Certified Arborist.
2. After examining the tree(s) in question, the Certified Arborist must contact the Director of the Department of Forest, Parks and Beach or her/his designee for authorization before action is taken.
3. If the tree is removed, an after-action report (submitted on a form supplied by the City) must be submitted to the City by the Certified Arborist who has approved the removal. The report will include the following information: a) tree location; b) species; c) diameter at breast height; d) description of the health and condition of the tree; and e) reason for removal.
4. The property owner/resident from whose property the tree was removed will be responsible for the planting and maintenance of a replacement tree(s), the size, species, and location of which will be determined by the Director of the Department of Forest, Parks and Beach or her/his designee.

RESCINDED: (Date)

CITY ADMINISTRATOR APPROVAL OF
DEPARTMENTAL POLICIES:

Date:

Initial:

CITY OF CARMEL-BY-THE-SEA

POLICY AND PROCEDURE DATA SHEET

Policy/Procedure No.: C91-05 Department of Origin: Forest and Beach

Effective Date: 5 February 1991 Authority: Resolution No. 91-27

Revision Date(s): 10 December 1996 (Resolution No. 96-159)

SUBJECT: Recommended replacement trees and planting requirements for new houses/substantial alterations/tree removals

RESPONSIBLE PARTY: As fully set forth in the policy document, attached.

PURPOSE: As fully set forth in the policy document, attached.

POLICY/PROCEDURE: As fully set forth in the policy document, attached.

RESCINDED: (Date)

CITY ADMINISTRATOR APPROVAL OF
DEPARTMENTAL POLICIES:

Date: _____ Initial: _____

**CARMEL-BY-THE-SEA
POLICY C91-05
TREE DENSITY PER LOT**

RESPONSIBLE PARTY:

This policy will be utilized by the Forest and Beach Commission to determine replacement plantings when a tree is proposed for removal. Planning staff and Forest, Parks and Beach staff shall utilize the policy to determine new plantings in conjunction with new houses and substantial alterations. Staff shall forward a recommendation to the Planning Commission based on this policy.

PURPOSE:

To protect, conserve and enhance the unique natural beauty and irreplaceable natural resources of Carmel-by-the-Sea. To ensure the future of our urban forest by the preservation and planting of native/indigenous trees on private property while considering the diverse vegetation existing within the community. The City recognizes these differences and will consider them when applying this policy. The City also recognizes that this policy is a recommended tree density per lot intended to achieve a mixed, healthy forest, taking into consideration individual site constraints and opportunities.

POLICY/PROCEDURE:

To implement General Plan Goal 6-1, "To protect, conserve, and enhance the unique natural beauty and irreplaceable natural resources of Carmel and its sphere of influence; to conserve Carmel's available water sources; and to protect scenic routes and corridors." The recommended replacement trees and plantings are:

<u>LOT SIZE (SQUARE FEET)</u>	<u>UPPER CANOPY TREES</u>	<u>LOWER CANOPY TREES</u>
Up to 4,000	3	1
4,001—6,000	4	3
6,001—8,000	5	4
Over 8,000	As determined by the Forest and Beach Commission	As determined by the Forest and Beach Commission

Upper Canopy Trees: Monterey pine, Monterey cypress, coast redwood, Douglas fir, Bishop pine
Lower Canopy Trees: Coast live oak, liquidamber, London plane, sycamore, fernleaf, Catalina ironwood (Also see "Approved Tree List for Urban Forest.")

CITY OF CARMEL-BY-THE-SEA
POLICY AND PROCEDURE DATA SHEET

Policy/Procedure No.: C89-35

Department of Origin: Forest and Beach

Effective Date: 24 February 1984

Authority: Administrative memo

Revision Date(s): _____

SUBJECT: Firewood - distribution of surplus wood

RESPONSIBLE PARTY: City Forester

PURPOSE: To implement a firewood policy that will both serve municipal facilities and Carmel residents and be workable within City resources.

POLICY/PROCEDURE: As set forth fully in the policy document, attached.

RESCINDED: (Date)

CITY ADMINISTRATOR APPROVAL OF
DEPARTMENTAL POLICIES:

Date: _____ Initial: _____

MEMORANDUM

TO: Doug Schmitz, City Administrator

FROM: Gary Kelly, City Forester

SUBJECT: Firewood Policy

DATE: 24 February 1984

With the hope of implementing a firewood policy that will both serve municipal facilities, Carmel residents and be workable with our resources, I have given considerable thought to this matter. There are a few changes to the draft policy of 31 October 1983. I will explain the reasons for these changes and hope that you will agree with them.

1. Wherever practical, wood will remain on the site it is cut for use by residents adjacent to the tree that is being pruned or removed.
2. Wood that cannot be left at the site will be delivered to Carmel-by-the-Sea residents. City residents, who need firewood, may call the Department of Public Works to have their name placed on a list. They will be phoned in the order that their name is listed, notifying them when wood will be delivered. If they cannot be contacted, the next person on the list will be phoned. Only wood that can be handled by residents, 18" in diameter or less, will be delivered. (Delivering wood is preferred to allowing people to pick it up for two reasons; we do not have a storage area that could be managed for this type activity and the liability created by people loading wood on City property is eliminated.)
3. Wood that is infected by insects will be condemned by the City Forester. This wood must be hauled to an appropriate site and disposed.
4. Wood that is not usable by municipal facilities or residents because of size or species may be taken by City employees after Public Works close of business. (Since this wood is not usable by members of the City it is in the City's best interest to have it hauled away on a daily basis. We do not have a facility to store any firewood.)

I would like to announce this Policy in the Pine Cone so that we may compile a list of people needing wood. I will also note that amounts and species of wood will vary.

**City of Carmel-by-the-Sea
Policy and Procedure Data Sheet**

Policy/Procedure No. C90-05

Department of Origin: Forest and Beach

Effective Date: 10 July 1990

Authority: Resolution No. 90-83

Revision Dates:

SUBJECT: DEMOLITION PERMIT REVIEW POLICY

RESPONSIBLE PARTY: City Forester

PURPOSE: To ensure the protection and preservation of trees on sites where an existing structure or part thereof is to be demolished.

POLICY/PROCEDURE:

Prior to the issuance of a demolition permit:

1. The applicant shall submit to the Building Official a plot plan with a complete tree inventory of the site, to include species and size.
2. The City Forester shall inspect the site to verify that proper tree protection is in place.

RESCINDED: (Date):

**CITY ADMINISTRATOR APPROVAL OF
DEPARTMENTAL POLICIES:**

Date: _____ Initial: _____

-- 159--

CITY OF CARMEL-BY-THE-SEA

POLICY AND PROCEDURE DATA SHEET

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Policy/Procedure No. C97-02 : Department of Origin: Administration

Effective Date: 12/9/97 Authority: Resolution No. 97-143

Revision Date(s):

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SUBJECT: Policy and Standards for Public Way Design

RESPONSIBLE PARTY: City Administrator/Planning Commission

PURPOSE: To establish guidelines for design of public way.

POLICY/PROCEDURE: As fully set forth in the Policy document attached.

RESCINDED: (Date)

**CITY ADMINISTRATOR APPROVAL
OF DEPARTMENT POLICIES:**

Date:----- Initial-----

**CITY OF CARMEL-BY-THE-SEA
POLICY AND STANDARDS
FOR
PUBLIC WAY DESIGN**

STATEMENT OF PURPOSE

The purpose of this policy is to identify objectives and to set forth guidelines and standards for review of design (including placement), construction or reconstruction of projects that include sidewalks, pathways, handicapped ramps, curbs, gutters, tree planters, mini-parks, landscaping, utilities, street signs and other amenities located on public ways within the City of Carmel-by-the-Sea. It is the intent of the following policies and guidelines to provide direction in using safe, varied and diverse materials, colors and design approaches that implement the General Plan.

DESIGN REVIEW PROCESS:

For public and private projects requiring Planning Commission review, each municipal department responsible for elements of project design shall review proposed plans and provide comments and recommendations to the applicant or to the Department sponsoring the project. These recommendations shall be forwarded to the Planning Commission at the time of its review. For those projects not requiring Planning Commission review, these policies, standards and guidelines shall be used by the City Administrator and appropriate staff as a basis for design and review of public or private projects.

The City Administrator may give final approval for public projects valued at less than the administrative approval authority limits established by policy of the City Council and/or the California Public Resources Code if they are consistent with the standards in this policy. The Planning Director and any other Municipal Department appropriate to the project shall be advisory to the City Administrator on such projects.

The City Council shall give final approval for all public projects valued greater than the administrative approval authority limit and/or the limits established by the California Public Resources Code. The Planning Commission shall be advisory to the City Council on such projects when they will be visible to the public, located in the public way and represent a change from existing design conditions.

When the City Administrator believes that the project may (1) conflict with these standards, (2) raise issues warranting a policy discussion or (3) would result in a significant change in design character or material, the matter shall be referred to the Planning Commission for review and comment regardless of project cost.

DESIGN GUIDELINES

A. Sidewalk:

Sidewalks shall be constructed of safe, durable materials that are not slippery when dry, wet or worn and shall be selected to promote a limited variety of different sidewalk treatments. Materials for sidewalk surfaces should enhance the village character for the pedestrian and allow for percolation of water into the soil to enhance the urban forest. Standard urban sidewalk treatments such as exposed aggregate (unsafe), blacktop and plain concrete (unattractive) should be avoided.

Sidewalks should not appear excessively uniform. Some variety, or break in paving shapes or colors can help in preserving an informal, unplanned visual appearance. To achieve a balance between excessive monotony and excessive variety, sidewalks should incorporate occasional changes in materials or color at intervals between 200 and 300 feet in length. Changes should occur at natural breaks such as intersections, driveways and similar features. Materials and colors selected should play a subtle, background role and should not compete with adjacent buildings by calling attention to them. To achieve this, sidewalks should:

- Be constructed from sand-set pavers that facilitate percolation using square, rectangular, hexagonal, cobble or creased-keystone shapes. Non-creased keystone and wave edged pavers should be avoided. (See Figure #1)
- Use earthen, warm hues (tan, brown, warm gray). Saturated colors (solid brick red, etc.) and cool hues (green, blue, cold gray) should be avoided.
- Use a single hue or a mix of not more than two similar hues in paving areas.
- Avoid the creation of patterns through the arrangement of pavers. Changes to colors or patterns shall not be used to identify the entrances to driveways, doorways or courtyards.
- Use colored concrete, or driveway pavers, for commercial driveways where the use of standard sand-set pavers is impractical. Driveway colors and/or materials should match at least one of the adjacent sidewalk designs.
- Remain the same bordering large areas (e.g. Devendorf Park, Sunset Center) where there are no storefronts.

Policy and Standards
Design Improvements to Public Ways
Page Three

B. Pathways and Footpaths:

Informal pathways and footpaths of decomposed granite should be considered the preferred design in all areas that form a transition between the commercial and residential (R-1) districts. Asphalt may be used in specific areas where drainage or erosion-control problems make decomposed granite impractical. The width of pathways and footpaths should not exceed four to five feet of available public ways. Randomly placed landscaping and trees should predominate in these areas to emphasize the transition from the urban to the residential.

C. Sidewalk Ramps:

Access to sidewalks at every intersection must be handicap accessible ramps to meet Title 24 California State Accessibility Standards for the physically impaired as depicted in Title 24 Standards Diagram (See Figure 2). Ramps should be constructed with materials and in colors that blend harmoniously with adjacent sidewalk materials.

D. Furniture in the Public Way:

The Planning Commission shall review the design and siting of furniture in the public way (e.g. benches, newspaper racks, cigarette butt containers, fountains, drinking fountains and tables). The Commission will determine whether a location or placement is appropriate based on demonstrated need, public safety, pedestrian flow, access to parked vehicles, existing structures located in the sidewalk area, the architecture of the area, location of underground utilities and the type of business that the furniture will impact.

Furniture shall be purchased, installed and maintained by the party making the request. The construction material shall be appropriate to the area, and natural appearing using wood, metal or recycled products. All street furniture shall require the property owner to obtain an encroachment permit and maintain insurance coverage acceptable to the City consistent with all City policies.

The City Administrator, following review and comment by the Director of Community Planning and Building and the City Forester, may approve installations of the City's standard wood-enclosed trashcans. The Planning Commission must approve the location of new standard light fixtures.

Policy and Standards
Design Improvements to Public Ways
Page Four

E. Curbs and Street Gutters:

Throughout most of the Residential District, rolled blacktop berms are the preferred design for street gutters. Concrete and cobblestone curbs should be restricted normally to the Commercial District except when required for safety or drainage. (See Figures #3 and #4, Stone and Concrete Curb and Gutter and Blacktop Rolled Berm).

F. Sidewalk Street Trees:

Sidewalk street trees are those planted in spaces on existing sidewalks. Sidewalk street trees are encouraged. The exact number of trees, their species, and location shall be determined by the City Forester depending on site conditions. Sidewalk street trees should be located near the head of, and adjacent to, parallel parking spaces with the trunk of the tree located 4 1/2 feet back from the head of the parking space. (See Figure #5, typical parking stall with planter). These specifications have been designed so that these sidewalk street trees will not be injured by cars maneuvering in parking stalls and not block car doors being opened on the sidewalk side. For trees at the curb line there should be at least 4-feet between the trunk and the facing building or planters in front of the building.

All tree planters should be made as large as practicable so that additional landscaping can be incorporated into the planters. There should also be no contrasting edging around the planter, rather the sidewalk material should frame and be flush with the exposed earth around the tree. Root barriers to prevent root damage to streets, gutters and sidewalks will be installed as directed by the City Forester.

G. Mini-Parks:

A mini-park protrudes into the street from the curb line or is in the Street. Landscaping in mini-parks should include native, drought resistant plants and/or trees. If trees or large shrubs are included, they should not be used at the corner of a street where they could cause a safety hazard by blocking views of cross traffic. The design of mini-parks shall be consistent with the standards in the Forest and Beach Management Plan (See Figure #6). All new mini-park installations shall be reviewed for recommendations by the Staff Traffic Committee and approved by the Planning Commission with consideration of:

Policy and Standards
Design Improvements to Public Ways
Page Five

- Appropriateness of location
- Impact on parking resources
- Impact on traffic and pedestrian safety
- Drainage and maintenance issues including street-sweeper access

H. Street Drainage:

Whenever possible, open drain channels for curbside drainage should be used through planter areas rather than using subsurface pipes. This avoids pipes being clogged with debris and is easier to maintain. See Figure #7.

I. Irrigation:

1. **Drip and Low-Flow Systems**--All landscaping, sidewalk street trees and mini-parks will have drip or low-flow irrigation to help keep vegetation alive and cut down on maintenance requirements by City personnel.

2. **Cistern Recycling Systems**--When feasible, public projects should provide cistern system drainage to capture storm water runoff for irrigation of on-site and public way landscaping area. These systems will:

- Reduce demands on the City's public potable water resources
- Protect municipal water allocations during periods of drought
- Reduce impacts on the City's overtaxed storm drain systems.

3. **Gutter/Downspout Gravity Irrigation for Street Tree Planters**--When feasible, storm water runoff from roofs into roof gutters, downspouts, under sidewalks and exiting at curb gutters should be intercepted and used to irrigate trees in sidewalk planters. Storm water runoff redirected for irrigation purposes reduces the total volume of water entering the municipal storm drain system from a commercial project. (Refer to Figure #8, Detail A, and Figure #9, Cross-sectional Layout Plans for Gutter/Downspout Gravity Irrigation.)

J. Utilities

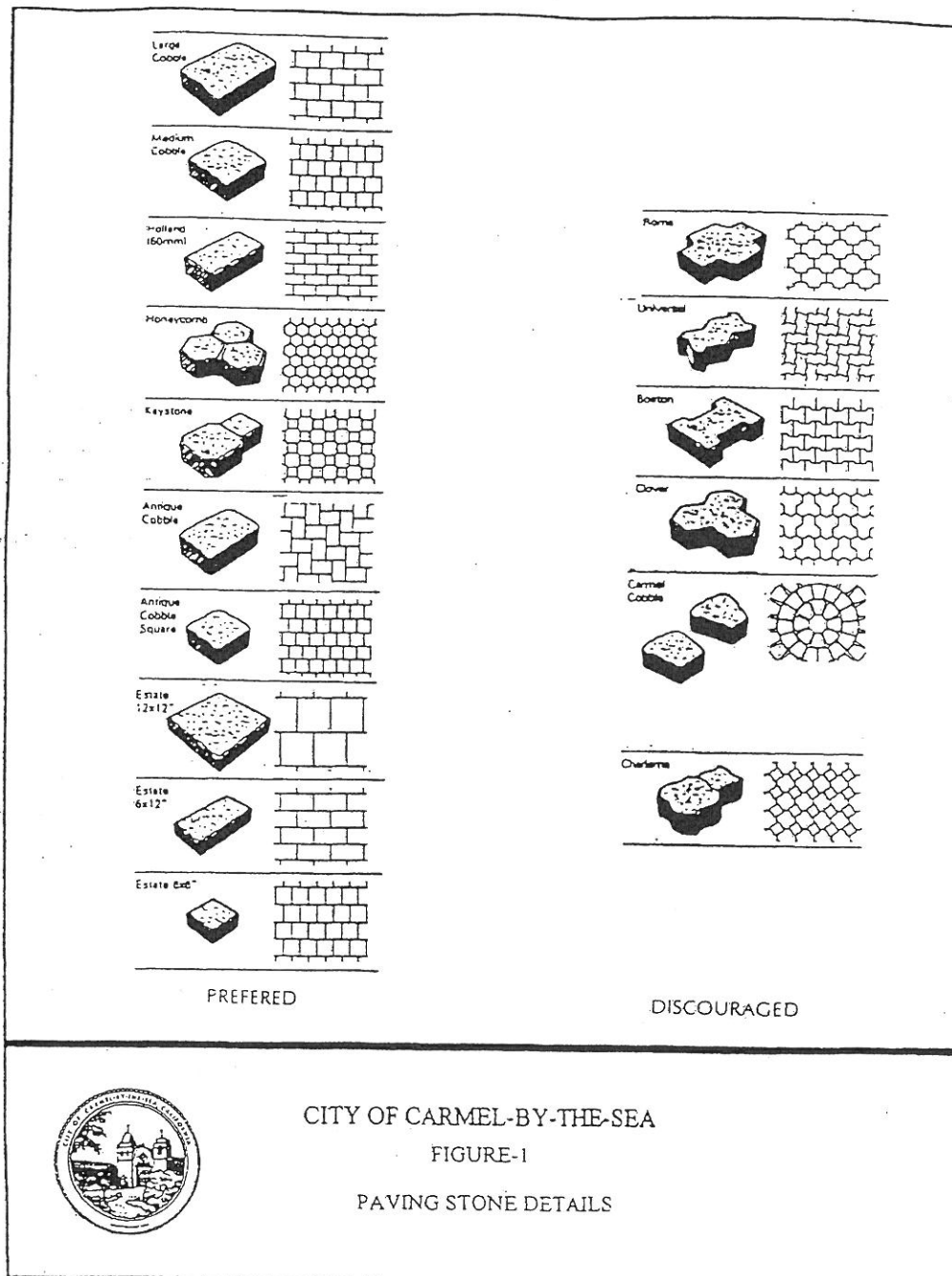
Utility boxes shall be located in garages, driveways or in planter areas on private property except where this is impractical. Utility boxes located in the public right of way shall be incorporated into sidewalk planters with sufficient additional space to establish screening-vegetation such as ground cover and shrubs when practical. If neither of these alternatives is feasible, utility boxes may be located in a paved area of the street or the sidewalk as close to the curbline as possible and may use standard nonskid utility covers.

K. Street Signs

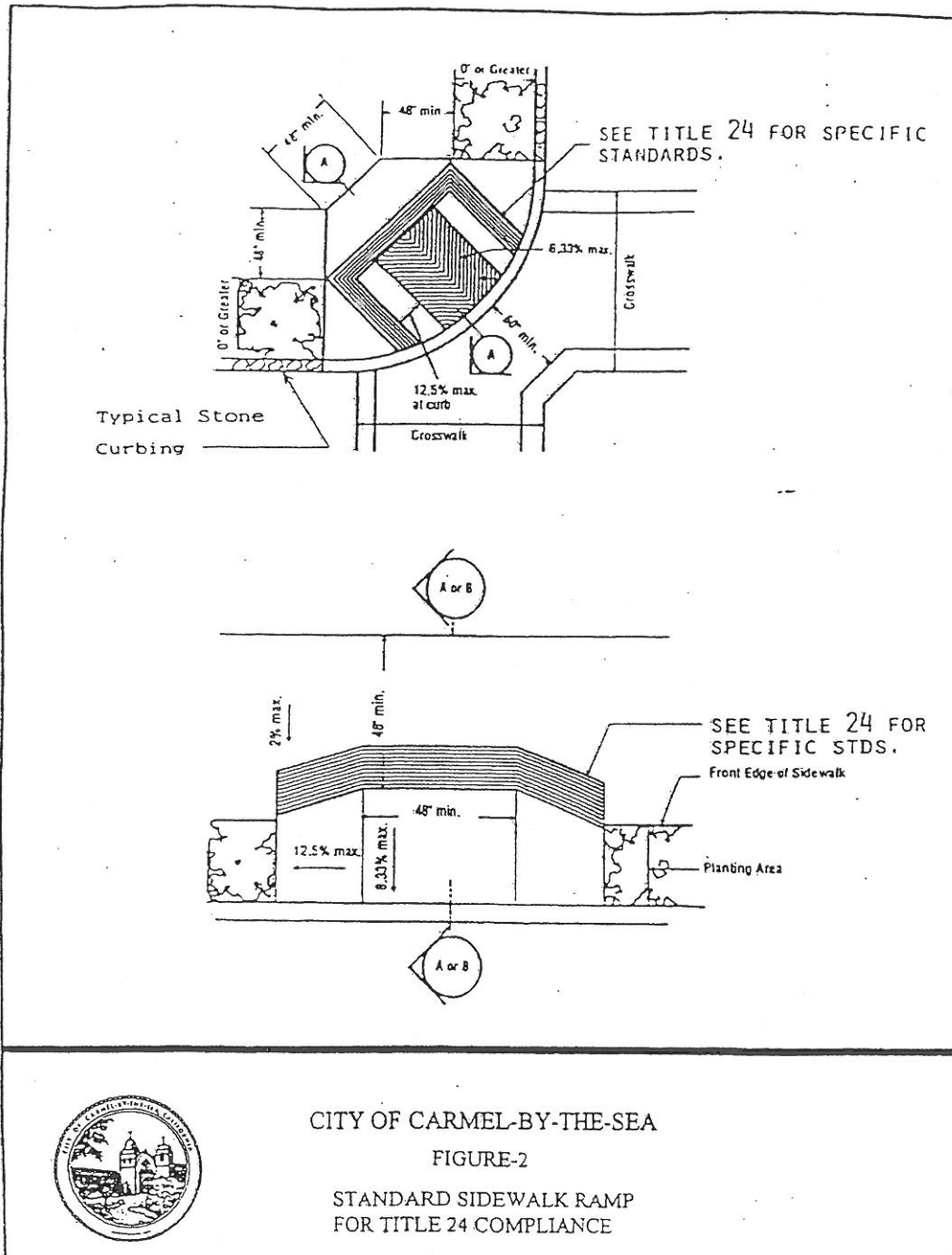
1. **Traffic Control Signs**--The historic and traditional design for stop signs in Carmel uses a 2" diameter, non-reflective, white-painted, metal pole with a four-sided-box, street-name sign mounted mid-way on the pole. Traffic control signs (e.g. stop signs, speed limit signs, warning signs) shall also conform to the design, color and shape requirements of the California Vehicle code.
2. **Stop Signs Combined with Street Name Signs**--Metal pole mounted stop signs combined with street name signs is the preferred method of identifying streets. A four-sided wood box shall be constructed around the steel pole consistent with Figure #10. The wood panels and metal pole shall be painted with a non-reflective white background and lettered with the street name using non-reflective forest green paint and vertical block-stencil lettering. The metal stop sign shall have no wood backing and no wood frame or other appurtenances. .
3. **Stand-alone Post Signs**--Stand-alone street name sign posts (not combined with a stop sign) may be used when there is no stop sign at the intersection or the stop sign location is not suitable for identifying the street names. Stand-alone posts also are the appropriate design to use for No Parking signs.

Stand-alone Street Name or No Parking signposts shall be constructed of 4" X 4" solid lumber of sufficient length to project 4 feet in height from grade. The top of each post shall be cut to a 4-facet taper (see Figure #11). Posts shall be painted non-reflective white except for a 4-inch cap and a 7-inch pine tree emblem at the base, that shall be painted forest green. Each vertical face of the post shall be painted with the corresponding street name (or "no parking" text) using non-reflective, forest green paint and vertical block-stencil lettering.

Appendix F-5



Appendix F-5



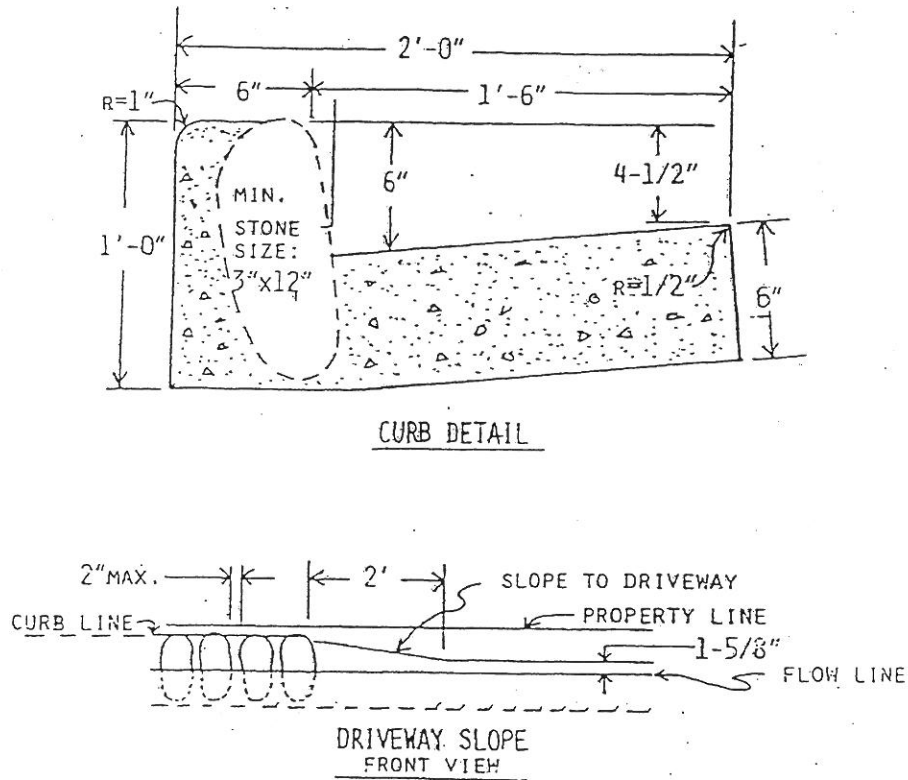
CITY OF CARMEL-BY-THE-SEA

FIGURE-2

STANDARD SIDEWALK RAMP
FOR TITLE 24 COMPLIANCE

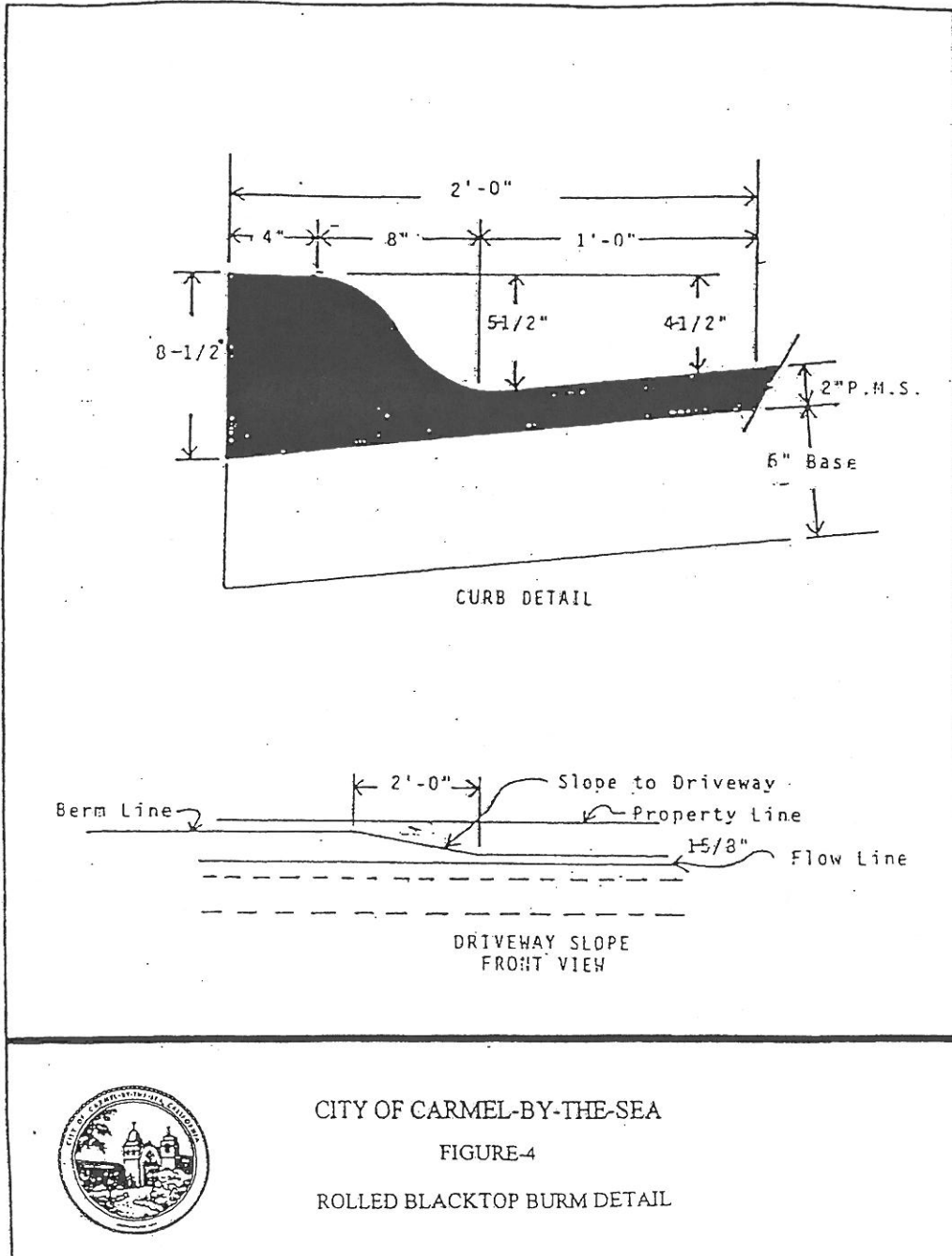
Appendix F-5

NOTE: USE CLASS A CONCRETE.



CITY OF CARMEL-BY-THE-SEA
FIGURE-3
STONE CURB AND GUTTER DETAIL

Appendix F-5

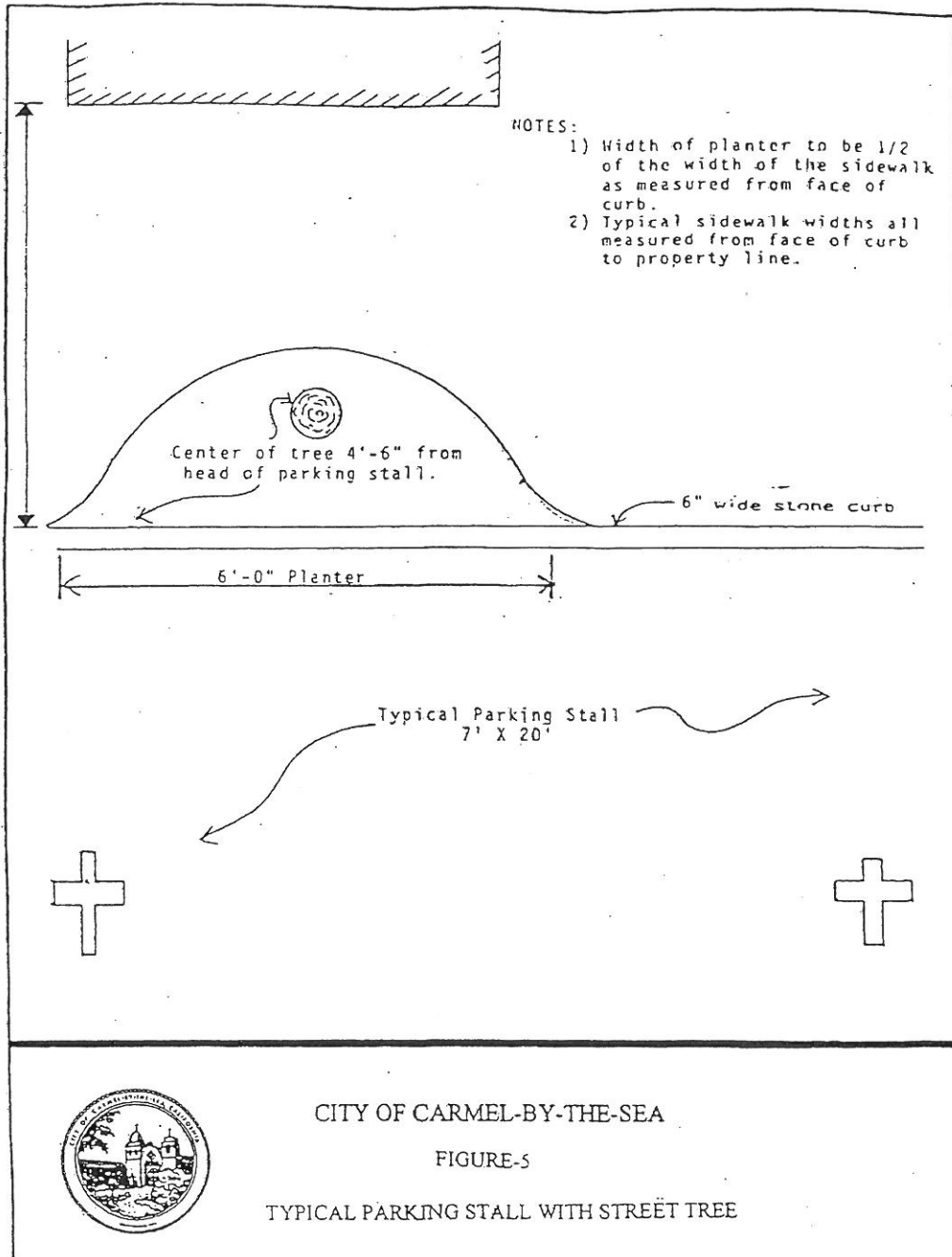


CITY OF CARMEL-BY-THE-SEA

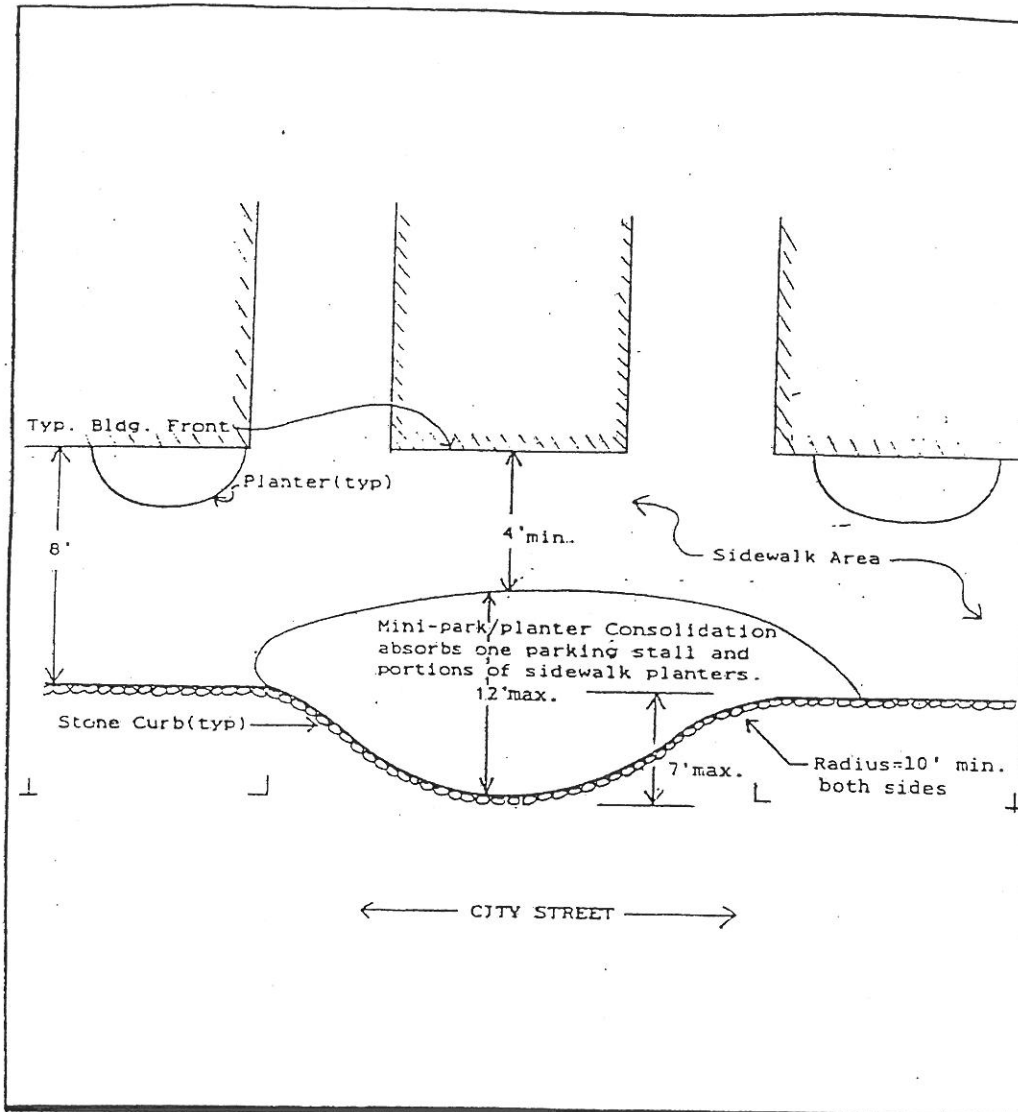
FIGURE-4

ROLLED BLACKTOP BURM DETAIL

Appendix F-5



Appendix F-5

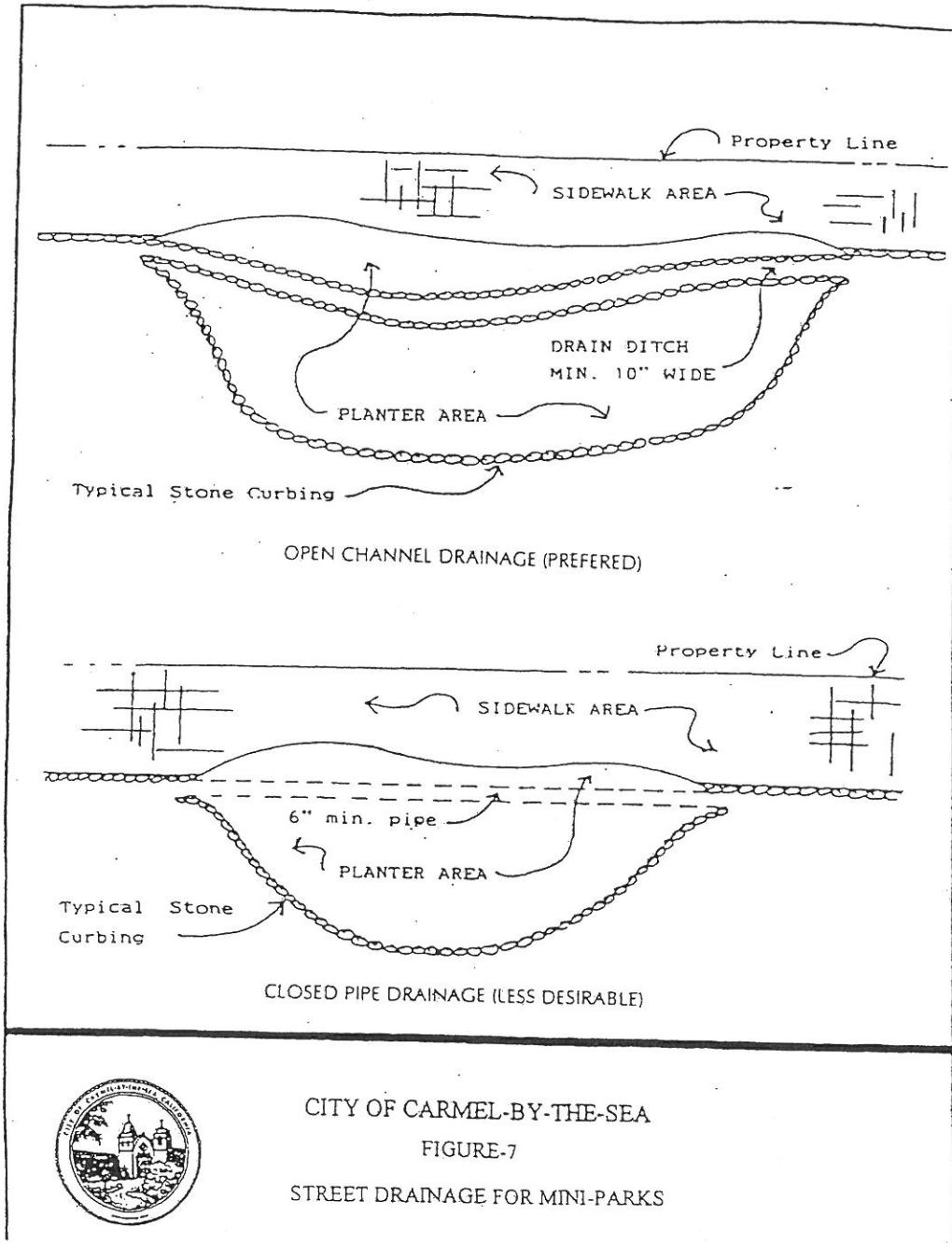


CITY OF CARMEL-BY-THE-SEA

FIGURE-6

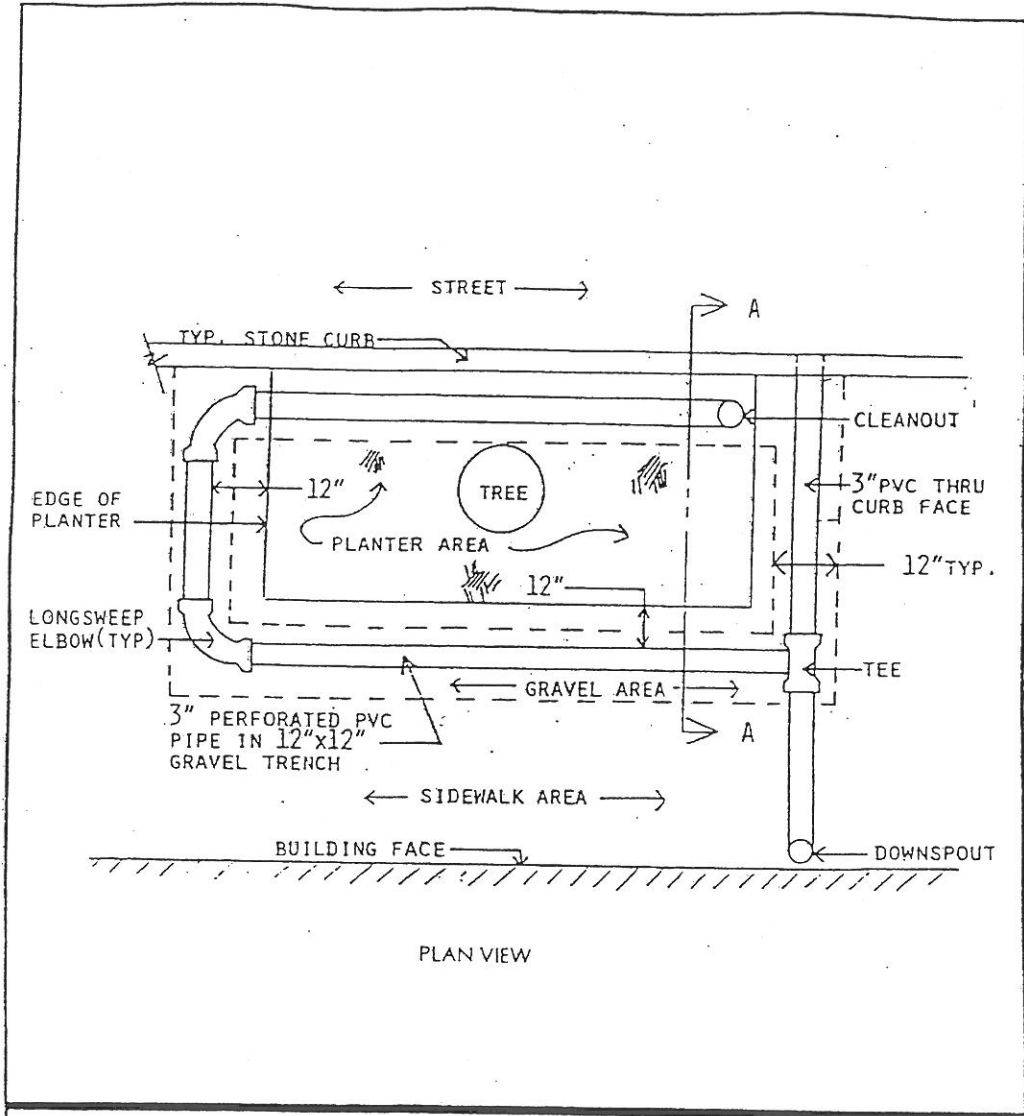
MINI-PARK LAYOUT

Appendix F-5



CITY OF CARMEL-BY-THE-SEA
FIGURE-7
STREET DRAINAGE FOR MINI-PARKS

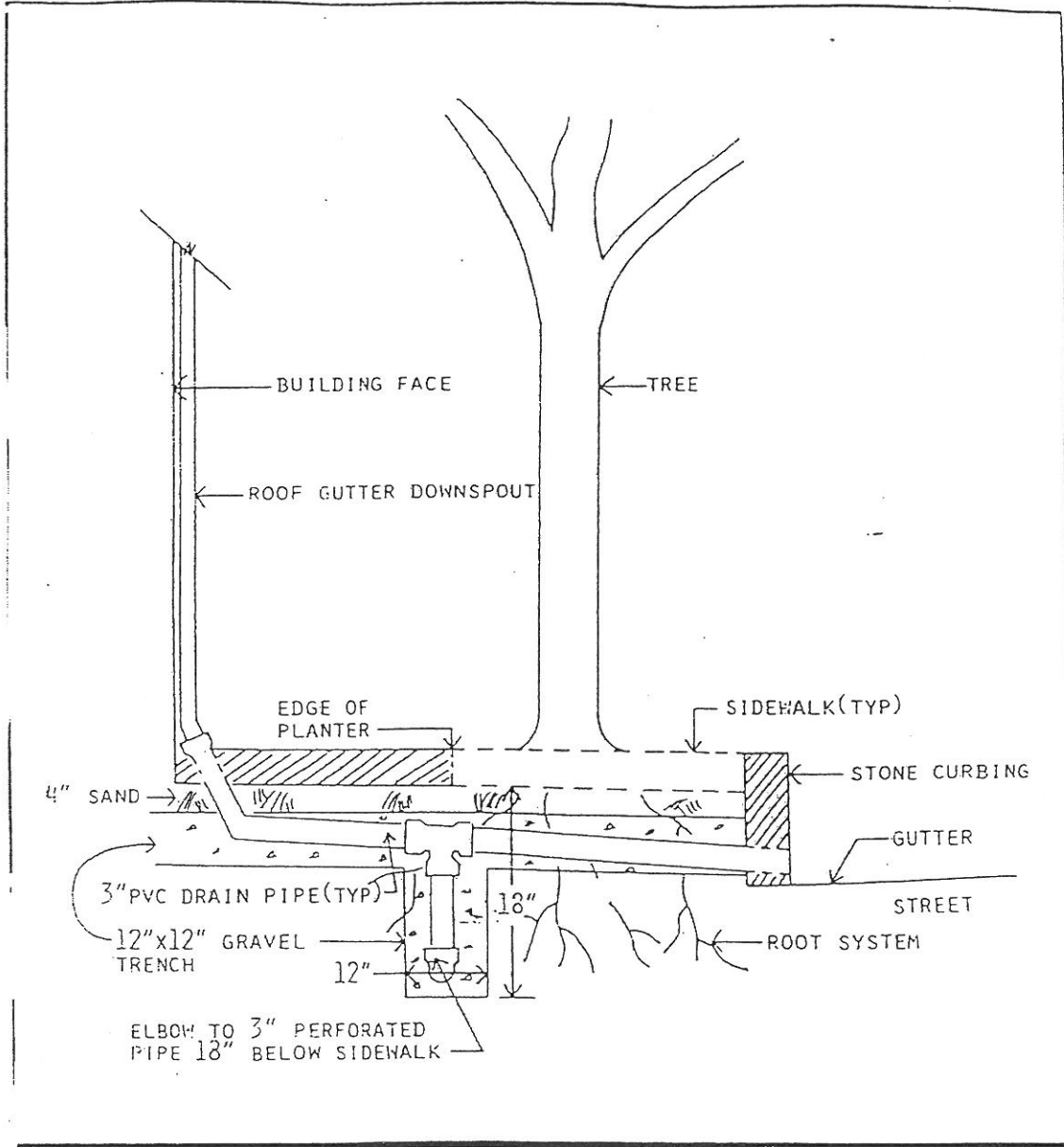
Appendix F-5



CITY OF CARMEL-BY-THE-SEA

FIGURE-8

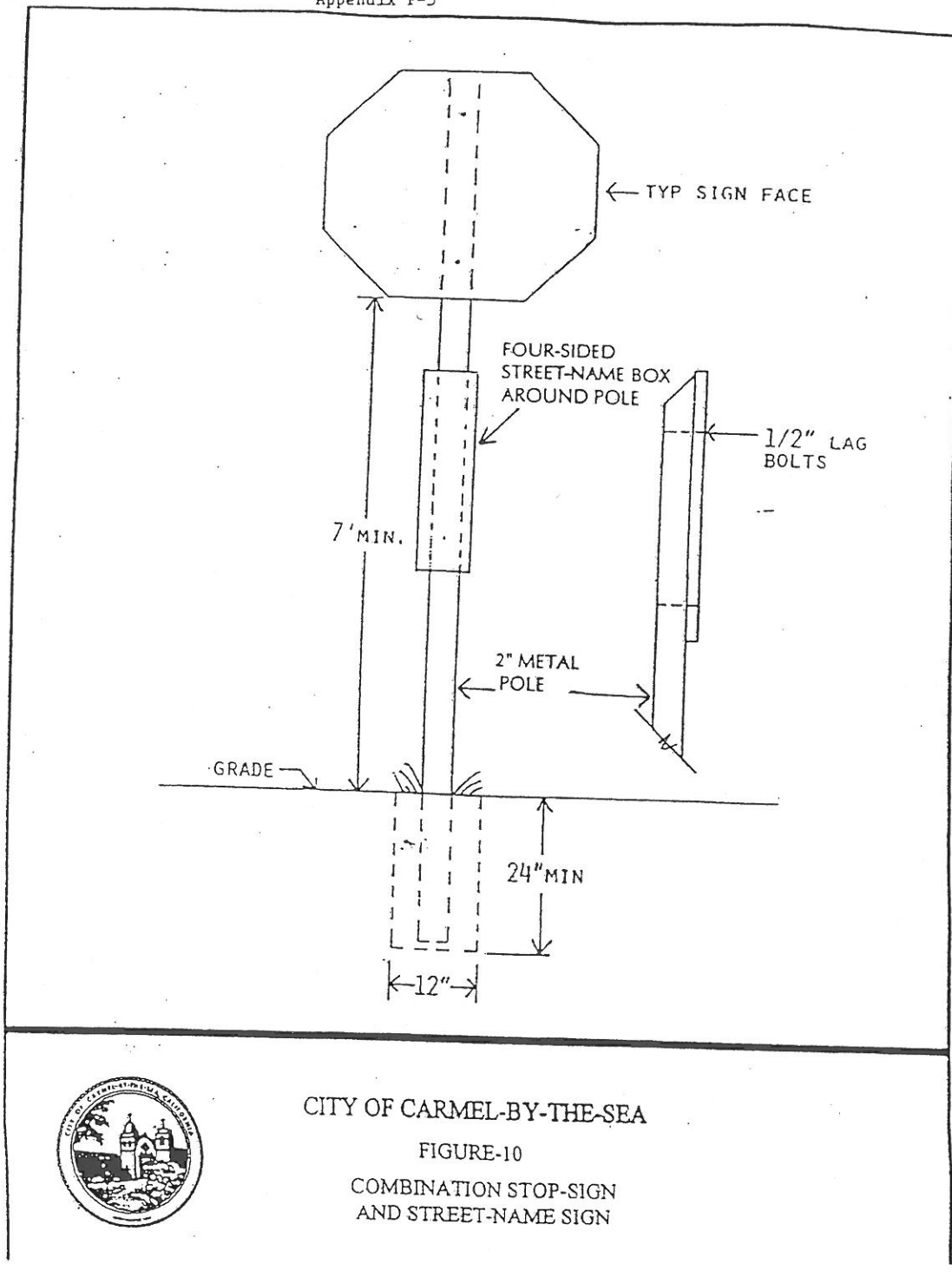
DOWNSPOUT GRAVITY-IRRIGATION
LAYOUT FOR STREET TREES



CITY OF CARMEL-BY-THE-SEA
FIGURE-9
CROSS-SECTION FOR STREET TREE
DOWNSPOUT GRAVITY IRRIGATION

Map 2

Appendix F-5



CITY OF CARMEL-BY-THE-SEA

POLICY AND PROCEDURE DATA SHEET

Policy/Procedure No.: C90-04

Department of Origin: Forest & Beach

Effective Date: 10 July 1990

Authority: Resolution 90-83

Revision Date(s): _____

SUBJECT: REVIEW OF STREET RESURFACING AND UNDERGROUND
UTILITY IMPROVEMENT PROJECTS BY THE FOREST AND
BEACH COMMISSION

REPOSIBLE PARTY: City Forester

PURPOSE: The greenbelt areas of the City are vitally important to the
ambiance of our community. This policy is to establish a process whereby the Forest
and Beach Commission will review street resurfacing and underground improvement
projects from the concept stage through their completion to ensure that this greenbelt is
preserved, protected and enhanced.

POLICY/PROCEDURE: The Forest and Beach Commission shall be informed by the
Director of Public Works of any proposed street resurfacing or underground utility
improvement project in a timely manner, so as to allow for Commission input while the
project is in the concept phase.

The Commission shall also review working drawings and final plans and specifications
before the project goes to bid or, if no bid process is involved, before construction
begins.

The Commission may also conduct a post-implementation tour of the project site and
prepare an after-action report identifying ways future projects may be improved.

RECINDED (Date)

CITY ADMINISTRATOR APPROVAL OF
DEPARTMENTAL POLICIES:

Date: _____ Initial: _____

TREE SPECIES LIST

An urban forest is an ecosystem that operate as a result of multiple interactions among vegetation, soils, water, insects, wildlife, climate, anthropogenic surfaces, and people. The goal of the Forest and Beach is to manage that operation for the improvement of the urban forest and the quality of life of the City's residents.

Our forest is based on the concept of a two-story canopy consisting of native and indigenous trees and is one, which the Commission feels is essential for the continuation of Carmel's forest. Monterey pines (*Pinus radita*) and cypresses (*Cupressus macrocarpa*) are the primary upper canopy trees of the forest and the planting of these species shall receive the greatest priority in appropriate situations. Coast live oak (*Quercus agrifolia*) is the preferred lower canopy tree. In general, the native indigenous trees (pine, cypress, and oaks) will do well planted at any location throughout the City.

Pinus radita - "Monterey Pine"

An attractive pine that creates the forested character of our village. A fast growing native species, which naturally occurs along the coast of central California, and can rapidly attain 70-100 feet. It is best suited to coastal landscapes where it becomes drought tolerant. Monterey pine has the form of a pyramid, but at maturity develops a rounded or flatish crown. Accepts lots of water, but can overgrown and die at early ages, therefore, watering should be limited to the first few years after planting. (Native upper canopy tree).

Cupressus macrocarpa - "Monterey Cypress"

Stately and conical when young. At maturity attains heights of 40 feet and more, and as wide. With supplemental water, it produces amazing growth. Planted away from the coast, it is susceptible to canker fungus. Fog and wind conditions will allow proper development and freedom from canker (Native upper canopy tree).

Tree Species List

Quercus agrifolia – “Coast Live Oak”

Evergreen tree, developing a broad round dome from 30-60 feet high, 35-80 feet wide. Fast growing when young, especially with ample water. Supplemental watering of mature trees is not recommended. Native to coast ranges from Mendocino to San Diego counties, but will do well inland on not-to-dry-slopes. Has greedy roots and drops almost all of its old leaves in early spring. It is a magnificent year-round cover for small gardens (Native lower canopy tree).

A healthy forest requires a variety of tree species to preclude a single disease from causing irreversible damage. Therefore, the following list of tree species, including growth characteristics, is provided for those circumstances where one of the preferred tree species is not appropriate. Native species are favored. The following trees have proved successful in our community given the proper growing conditions.

EVERGREENS

Pinus muricata – “Bishop Pine”

Native to the northern coast. Rapid growth to 40 – 50 feet. Tolerates wind and salt air. Disease resistant, can grow in pure sand (Native upper canopy tree).

Pinus torreyana – “Torrey Pine”

Native to the warm southern coast. Is a rugged tree that grows to 30-50 feet. Drought tolerant and long-lived, does well in gardens or naturalized landscapes. Does not require pruning, only the removal of dead branches. (Native upper canopy tree).

Tree Species List

Cedrus deodara - "Deodar Cedar"

Moderate growth to 50-60 feet with 30 foot spread at ground level. Very graceful tree with a light texture. Needs infrequent but deep watering and regular fertilization. Prefers sunny warm locations. (Upper canopy tree).

Lyonothamnus floribunda asplenifolius - "Catalina Ironwood"

Moderate growth rate, 30-40 feet in height. Considered drought tolerant, however, will look much better if watered during the summer. Notable feature is its redwood colored bark that peels off in long thin strips. Grows near the coast and is very handsome when planted in groves. Needs excellent drainage (Native lower canopy tree).

Arbutus menziesii - "Madrone"

Slow growing evergreen. Mature height varies with growing conditions and site. Rarely exceeds 25 feet in our area. Main feature is smooth reddish-brown bark that peels in thin flakes. Needs well-drained soil and ample water to become established. (Native lower canopy tree).

Schinus molle - "California Pepper Tree"

Fast growing to 25-40 feet. Distinctive light brown, scaly bark on gnarled trunks. Evergreen tree with pale foliage. Will tolerate poor soil and drainage, wind, dust and limited water. It has a voracious root system and generates large amounts of litter. Avoid summer water. (Lower canopy tree).

Heteromeles arbutifolia - "Toyon"

Dense evergreen shrub or small tree that can grow to 15-25 feet in height. Has large groups of showy red berries during December - February. Tolerant of heat, smog, wind, and poor soil. Very drought tolerant. (Native lower canopy tree).

Tree Species List

Umbellularia californica - "California Bay"

Needs deep moist soil to attain a height of 25-40 feet. Dry or windswept sites cause a more shrub like appearance, which make it a good screen. Aromatic leaves used in cooking (Native lower canopy tree).

Calocedrus decurrens - "Incense Cedar"

Slow growing pyramidal conifer. Can grow to 80 feet, but in our coastal environment 20 feet is the norm. Tolerates poor soil, full sun and high winds. (Native lower canopy in this area).

Sequoia sempervirens - "Coast Redwood"

Fast growing with ample water and good drainage. One of the best upper canopy trees planted next to a lawn. Will grow to 50-60 feet in our area, tops usually die as a result of coastal wind. Relatively pest-free. (Native upper canopy tree).

Schinus terebinthifolius - "Brazilian Pepper Tree"

Evergreen shrub to small dome-shaped tree that grows at a moderate rate to 15-30 feet. Darker green and coarser leaf than California Pepper. It does not develop the same problems with roots and litter as the Schinus molle. Frequently used for lawn and courtyard accents. It responds well to pruning and can become a clipped screen. (Lower canopy tree).

Olea europaea - "Olive"

A medium sized evergreen tree (25-30 feet). Willow like foliage is a soft gray-green that combines well with most colors. With time, these trees develop into a round dome shape and have interesting gnarled trunks. Needs full sun and are tolerant of most soils. Plant fruitless variety to avoid messy litter. (Lower canopy tree).

Tree Species List

Eucalyptus ficifolia - "Red Flowering Eucalyptus"

Round headed evergreen tree that grows to about 30 feet. Spectacular 1-foot clusters, can have variable colored flowers (cream, light pink, orange and red). Flowers during summer months. Good coastal tree but should not be used in lawns. (Lower canopy tree).

Eucalyptus nicholii - "Peppermint Gum"

Graceful, weeping, vertical evergreen tree that is fast growing to 40 feet. A garden tree with fine textured foliage. Crushed leaves smell like peppermint. (Upper canopy tree).

Eriobotrya japonica - "Loquat"

Grows to 15-30 feet tall and equally broad. Large, leathery and heavily veined leaves. Needs well-drained soil and is drought tolerant once established. May produce edible fruit, but is mainly used as an ornamental. (Lower canopy tree).

Ceratonia siliqua - "Carob"

Evergreen shrub or tree. If pruned to grow as a tree can attain a height of 30 feet and as wide. Male trees have flowers; females produce abundant one-foot leathery pods that create litter beneath the tree. Water deeply and infrequently as this tree is subject to root crown rot. (Lower canopy tree).

Grevilla robusta - "Silk Oak"

Large, fast growing, narrow tree that attains 50-60 feet. Branches are very brittle and subject to break in winter storms. Generates lots of litter and has a shallow, invasive root system. Needs full sun. Grows in poor, compacted soils if not over watered. Use for quick, tall screening while slower growing, tougher-wooded trees grow up. (Lower canopy tree)

Tree Species List

DECIDUOUS

Platanus racemosa - "California Sycamore"

Native to stream banks. Fast growing to 40 feet. Attractive patchy, buff colored bark. Deciduous with leaves remaining on until new growth starts. Generally used in informal gardens (Native lower canopy tree in coastal environments).

Aesculus californica - "California Buckeye"

Small single or multi-trunked tree that will grow to 15 to 20 feet. Native to dry slopes but will grow in a variety of cultural situations. Usually drop their leaves in early summer exposing its silver-gray bark and artistic structure. (Native lower canopy tree).

Liquidamber styraciflua - "Sweet Gum"

Moderate growth rate with cone shape form at maturity. Deciduous trees with brilliant fall foliage. Grows to 40-feet in coastal climate, needs well-drained soil (Lower canopy tree).

Platanus acerifolia "London Plane"

Fast growing to 40-50 feet. Tolerant of most soils, smog, dust, and reflective heat. Deciduous tree that is fairly insect free, but subject to anthracnose, which causes early, continued leaf fall. Interesting bark texture and color. (Lower canopy tree).

Acer macrophyllum - "Big Leaf Maple"

Deciduous tree, native to stream banks and moist canyons. Broad topped, dense shade tree that grows to 30 feet tall in our coastal area. Golden fall color. Tree produces fruit with twin wings that persist for a long time providing the tree with an interesting decorative feature. (Native lower canopy tree).

TREE NOTES

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

Pete Wilson, Governor

Richard A. Wilson, Director

Douglas Wheeler, State of California Secretary for Resources, The Resources Agency

NUMBER: 1

APRIL 1989

Protecting Trees From Construction Impacts

Sherburn R. Sanborn

Forester, CDF Resource Management, P.O. Box 670, Santa Rosa, CA 95402-0670

Why Should We Protect Trees

An important benefit of trees to society is their aesthetic value. Our parks, streets, homes and businesses would seem sterile without them. Trees also have monetary value. Residential and commercial properties with established trees have a greater market value than those without them. Trees provide other benefits which include: shade, noise abatement, wind breaks, erosion control and air pollution reduction. Like all green plants, trees convert carbon dioxide into oxygen during photosynthesis. This process contributes significantly to the recycling of the atmospheric gases we breath. Unfortunately trees are often irreversibly damaged or killed during construction and/or landscaping.

Understanding a Tree's Root System

The primary impact of construction around a tree is to the unseen portion, the root system. Activities which disturb or alter the soil in which roots grow can injure or kill a tree. To reduce or prevent adverse impacts, we must understand how roots function and how they develop in the soil.

The greatest proportion (90%) of tree roots is found within the first three feet of soil. Roots function to support and anchor the tree. In addition, specialized (absorbing) roots function to exchange gases and to absorb water and minerals. Most absorbing roots are found in the first 8-12 inches of soil where water and oxygen can readily penetrate. Roots require both water and oxygen to grow and function. A network of supporting roots and absorbing roots grows well beyond the trunk. Depending on soil conditions they may extend two to three times the radius of the crown. The roots of most tree species are associated with beneficial fungi called mycorrhizae. These fungi increase the roots ability to absorb water and minerals. Soil disturbance during construction can permanently disrupt this association.

VINES

Clematis spp. -- (CN)

deciduous, prefers cool root area, full sun or light shade, showy flowers

Hardenbergia violacea -- Happy Wanderer

Australian native to 10', purplish flowers, needs good drainage, hardy

Lonicera japonica 'Halliana' -- Hall's Honeysuckle

15' long, cut back to control, white-yellow flowers liked by bees and birds

Polygonum aubertii -- Silver Lace Vine

rapid growing evergreen, useful as a screen, white flowers, full sun

Vitis californica -- California Grape (CN)

deciduous vine

FERNS

Dryopteris arguta -- Coastal Wood Fern (CN)

dark green, finely cut fronds, 2'-3' tall, avoid overwatering

Nephrolepis cordifolia -- Southern Sword Fern

bright green upright fronds to 3', spreads by runners, very adaptable

Polystichum munitum -- Western Sword Fern (CN)

leathery dark green fronds to 4', good in shade, best in rich soil

PERENNIALS (cont.)

Myosotis scorpiodes -- Forget-Me-Not (D)

bright green leaves, blue and yellow flowers, spreads by creeping roots

Oenothera berlandieri -- Mexican Evening Primrose

profuse summer bloom of rose-pink flowers, tough sites, invasive

Penstemon heterophyllus purdyi -- Beard Tongue (D, CN)

upright 2' stems, spikes of lavender-blue flowers in spring, full sun

Romneya coulteri -- Matilija Poppy (D, CN)

8' stems, gray-green leaves, fragrant white 9" flowers, invasive rhizomes

Salvia leucantha -- Mexican Bush Sage (D)

3' stems from roots, purple and white flowers enjoyed by hummingbirds

Sedum spp. -- Stonecrop

succulents, fleshy leaves in many shapes and sizes, star-like flowers

Sisyrinchium bellum -- Blue-eyed Grass (CN)

narrow grass-like leaves, 4" to 16" tall, bluish purple flowers in spring

Thymus vulgaris -- Common Thyme

erect shrubby plant, aromatic foliage, tiny lavender flowers

Tulbaghia violaceae -- Society Garlic

broad clump of blue-green leaves, 1' to 2' stems of rosy-lavender flowers

Viola odorata -- Sweet Violet

fragrant blue and yellow flowers, 2" to 10" tall, runners root at joints

Zauchneria californica -- California Fuchsia (D, CN)

upright 1' to 2' stems, gray-green foliage, scarlet trumpet shaped flowers

PERENNIALS

Acanthus mollis -- Bear's Breech (D)

fast growing, 2' long dark green leaves, 18" spikes of tubular flowers

Achillea tomentosa -- Woolly Yarrow (D)

spreading mat of fernlike hairy leaves, golden flowers in summer

Aloe spp. -- Aloe (D)

many varieties, clumps of fleshy pointed leaves, showy flowers

Artemesia pycnocephala -- Sandhill Sage (D, CN)

round spreading to 2' tall, soft gray leaves, very small yellow flowers

Bergenia crassifolia -- Winter Blooming Bergenia

dark green 8" wavy leaves, 20" tall, dense clusters of rose-purple flowers

Centranthus rubra -- Red Valerian

3' tall bush, clusters of red-pink flowers, naturalizes, can be invasive

Dudleya spp. -- (D, CN)

succulents, full sun, some native to coastal cliffs

Erigeron karvinskianus -- Fleabane, Mexican Daisy

trailing growth to 20" tall, numerous white-pink flowers, naturalizes

Hemerocallis hybrids -- Daylily

Deciduous or evergreen, 1' to 6' tall, many colors of 3" - 8" flowers

Heuchera spp. -- Coral Bells (CN)

several varieties, clumps of round leaves, reddish flowers on tall stems

Iris douglasiana and hybrids -- Douglas Iris (D, CN)

dark green leaves, 1' to 2' stems with lavender-white-yellow flowers

Kniphofia uvaria -- Red-Hot Poker (D)

coarse clumps of grass-like leaves, tall spikes of red tubular flowers

Limonium perezii -- Sea Lavender

leathery green leaves, clusters of purple and white flowers, beach areas

GROUND COVERS (cont.)

Ceratostigma plumbaginoides -- Dwarf Plumbago

6"-12" tall, spreads by underground stems, intense blue flower

Cistus salviifolius -- Sageleaf Rockrose

2' tall x 6' wide, gray-green leaves, white and yellow flowers, rough areas

Coprosma kirkii -- Creeping Coprosma (D)

spreading, prostrate to 3' tall, small light green leaves, tough

Correa pulchella -- Australian Fuchsia (D)

low growing broad plant to 2' tall, deep red tubular flowers in winter

Cotoneaster spp. -- Cotoneaster (D)

many varieties, tolerates poor soil, red berries attract birds

Fragaria chiloensis -- Wild Strawberry (CN)

low compact mats, dark green leaves, 1" white flowers, small red fruit

Juniperus spp. -- Juniper (D)

variety of forms and colors, scale-like or needle-like foliage, wide range soils

Mahonia repens -- Creeping Mahonia (D, CN)

spreading, 3' tall, spiny blue-green leaves, yellow flowers, blue fruit

Polygonum capitatum -- Pink Knotweed

rugged, 6" x 20" , stems and flowers are pink, confined or waste areas

Ribes viburnifolium -- Evergreen Currant (CN)

spreading evergreen to 3' tall x 12' wide, fragrant foliage, pink flowers

Rosmarinus officinalis cultivars -- Rosemary (D)

several varieties, aromatic leaves, light blue flowers, good drainage

Sollya heterophylla -- Australian Bluebell Creeper

evergreen, loose spreading to 3' tall x 8' wide, blue bell shaped flowers

Symphoricarpos mollis -- Creeping Snowberry (D, CN)

spreading, to 18" tall, pink flowers, white fruit, takes neglect, partial shade

BULBS

Alstroemeria 'Ligtu' hybrids -- Peruvian Lily

leafy 3'-5' stems, many colors, spread by seed or roots, sow in fall

Amaryllis belladonna -- Naked Lady

2'-3' clumps in fall / winter, fragrant pink flowers during dormancy

Anemone blanda -- Windflower Anemone

tuberous roots with 2"-8" stems, blue flowers in spring, good drainage

Crocsmia crocosmiiflora -- Montbretia

corms with 3' stems, orange flowers on 4' stalks, full sun, spreads freely

Cyclamen hederifolium -- Cyclamen

plant tubers June-August, pink flowers on 3" to 4" stems, easy to grow

Freesia 'Tecolote' hybrids -- Freesia

fragrant flowers to 2' tall, many colors, will naturalize, good drainage

Muscari spp. -- Grape Hyacinth

4" to 8" stems with blue-white flowers in early spring, long lived

Narcissus -- Daffodil

many kinds and colors, plant bulbs in fall, full sun, divide infrequently

Any Native Bulbs

adapted to a wide variety of landscape situations, not readily available

GROUND COVERS

Arctostaphylos hookeri -- Monterey Manzanita (D, CN)

dense mounds to 4' tall x 6' wide, 'Monterey Carpet - 1' x 12', slow

Baccharis pilularis ' Twin Peaks ' -- Coyote Brush (D, CN)

very adaptable, low mounds 2' tall x 6' wide, moderate growth rate

Ceanothus griseus horizontalis -- Carmel Creeper (CN)

several varieties, up to 5' tall x 15' wide, blue flowers, dark green leaves

ANNUALS (cont.)

Eschscholzia californica -- California Poppy (CN)

2' tall with orange-yellow flowers, good to naturalize, sow in fall or winter

Linaria spp. -- Toadflax

multi-colored flowers to 2', full sun or light shade, sow in winter or spring

Lupinus spp. -- Lupine (CN)

many varieties, sow in fall or winter, all need good drainage

Nemophila menziesii -- Baby Blue Eyes (CN)

sow in fall or winter, to 1' tall, blue flowers with white centers 1" across

Scabiosa atropurpurea -- Pincushion Flower

sow in winter or spring, prefers sun, 2" red-rose-purple-white flowers

GRASSES

Deschampsia caespitosa -- Tufted Hairgrass (CN)

Elymus glaucus -- Blue Wild Rye (CN)

Festuca californica -- California Fescue (CN)

Festuca rubra -- Red Fescue (CN)

used in lawn blends, shade tolerant, tolerates drought and many soils

Helictotrichon sempervirens -- Blue Oat Grass

2'-3' fountains of blue-gray leaves, full sun, good drainage

Koeleria cristata -- Prairie Junegrass (CN)

Melica imperfecta -- Melic Grass (CN)

Muhlenbergia rigens -- Deergrass (CN)

Pennisetum setaceum -- Fountain Grass

perennial clump to 4', summer 3'-4' flower spikes, winter dormant

Stipa pulchra -- Purple Needlegrass (CN)

SHRUBS (cont.)

Rhamnus californica -- Coffeeberry (D, CN)
evergreen to 15', low varieties also, sun or half shade, red-black berries

Rhus integrifolia -- Lemonade Berry (D, CN)
evergreen to 15', clusters of pink flowers in the spring

Ribes sanguineum -- Red Flowering Current (D, CN)
deciduous shrub to 10', maple-like leaves, clusters of red-pink flowers

Ribes speciosum -- Fuchsia-Flowering Gooseberry (D, CN)
very spiny stems, drooping fuchsia-like red flowers in early spring

Rosa californica -- California Wild Rose (CN)
Deciduous spiny shrub, pink flowers followed by crimson hips

Salvia clevelandii -- Cleveland Sage (CN)
4' rounded shrub, aromatic foliage and blue flowers, good drainage

Salvia greggii -- Autumn Sage (CN)
4' shrub, full sun to light shade, red flowers in spikelike clusters

Teucrium fruticans -- Bush Germander (D)
loose gray-green shrub 4' to 8', lavender flowers all year, good drainage

Viburnum suspensum -- Sandankwa Viburnum
evergreen, clusters of white flowers in spring, sun to nearly full shade

Xylosma congestum -- Xylosma
loose spreading growth to 10', yellow-green leaves, bronzy new foliage

ANNUALS

Centaurea cyanus -- Cornflower, Bachelors' Button (D)
to 3', gray foliage, blue-pink-red-white flowers, sow all year with water

Clarkia amoena -- Farewell - to - Spring (D , CN)
sow in fall or spring, 2" pinkish flowers, full sun, good with other annuals

Tree Species List

Robinia pseudoacacia – “Black Locust”

Deciduous tree. Fast growth to 40-70 feet with rather open, sparse-branching habit. Thorny branchlets and showy flowers form grape-like clusters. A very aggressive tree which tolerates the most adverse conditions. (Lower canopy tree).

Ulmus parvifolia – “Chinese Elm”

Evergreen or deciduous according to the trees individual heredity. Very fast growth to 40 feet. Older trees have bark that sheds similar to sycamores. Makes a good patio tree, but has aggressive root system. (Lower canopy tree).

Quercus palustris – “Pin Oak”

Moderate growth to 40-50 feet. Slender and pyramidal form when young, open and round headed at maturity. Lower branches tend to droop almost to the ground. Intolerant of drought. Develops chlorosis in alkaline soils. Needs ample water and good drainage. A good tree for lawns. Displays fall color. (Lower canopy tree).

City of Carmel-by-the-Sea

List of Compatible Plants

Under and Around

Native Trees



June 2000

How Construction Affects Roots

By understanding where roots grow and how they function, we can begin to see how construction activities such as trenching, slope cuts, soil compaction, soil grade changes and paving can affect roots.

When trenching for utilities and foundations or where grade lowering is done close to a tree, there is a likelihood that roots will be cut. The closer the trench is to the trunk the greater the damage. Each root that is cut reduces the tree's capacity to supply water and nutrients to the leaves. Trenching within just a few feet of a trunk can reduce the functional root system by as much as 50%.

Soil is compacted during construction by heavy equipment which squeezes out the air spaces making it more dense and stable. Unfortunately, this process greatly reduces the infiltration of water and oxygen into the soil. As a result roots cease to function and eventually die. In addition, root penetration is decreased.

Soil grade changes alter the natural soil level around a tree. The addition of fill soil in particular, can have an effect similar to soil compaction. The depth and porosity of the fill soil are the most important factors affecting the tree. If the depth is significant or the porosity is low, root death can occur. For some tree species, a grade change of two inches can be significant. Soil fill that is compacted or has lower porosity than the native soil will restrict root activity. If roots cannot develop or grow into the fill, recovery by the tree after construction may be impaired or prevented.

Fill soil around the root collar (the flared part of the trunk at or just above soil grade) and trunk will result in death and decay of the bark tissue. This can cause the death of all or part of the root system including the supporting roots. Often this results in a "Hazardous" tree.

Grade changes that require the removal of soil often remove absorbing roots and expose and injure other roots.

Concrete or asphalt paved over soil where roots are present will seal the surface, reducing water availability and gas exchange to the roots beneath. Usually soils are compacted prior to installing pavement which compounds these problems.

Symptoms Of Construction Impacts

An injured tree may take several months to many years to exhibit symptoms of construction impacts. These can include: slow decline, insect or disease attack, sparse foliage, significant branch dieback and wilting or yellowing of leaves.

Reducing Construction Impacts

The following techniques can be used during construction to prevent or reduce tree injury:

- Fence around the area within the dripline to protect it from construction activities. Because roots often grow beyond the dripline, enclosing a larger area is desirable.
- Place six inches of mulch over the root zone to reduce soil compaction where vehicular access is required.
- Dig trenches by hand or tunnel under the tree if underground utilities must be installed within the tree's drip line.
- Prune roots that must be removed, do not rip them out with a trencher or back hoe.
- Bridge over roots when trenches for new foundations will damage them.
- Construct wells around trunks and root collars to keep soil away and install aeration systems when the soil grade must be raised. Use a coarser fill soil than the soil being covered and do not compact. Add fill in the late fall or winter when roots are less active. Avoid working on wet soils.

What To Do After The Damage Is Done

- Soil aeration (vertical or hydrojet mulching) can be effective where soils have been compacted.
- Only remove dead, hazardous or obstructive branches. Never remove more than 20% of the foliage during a single year. Leaves produce carbohydrates and buds produce hormones - both are necessary for root growth.
- Where appropriate, apply pesticides to reduce attacks by insects or other pests until the tree's vigor is restored.

- Place organic mulch over bare soil.
- Restore soil grade by removing fill.
- Restore irrigation regime that existed before construction took place.

Summary

Construction around trees can be done successfully. However, this requires planning before construction or landscaping. Not all trees on a site are worth saving. Each tree should be evaluated by a consulting arborist to determine its condition and value in the landscape. It may be more desirable in the long run to plant new trees after construction is completed. The value of a tree should be used as a guide to determining the measures used to save it from construction impacts. Where trees of high value are present the effort and expense to save them is worthwhile. Mature trees take years to grow and their beauty and aesthetics are irreplaceable.

Further Reading

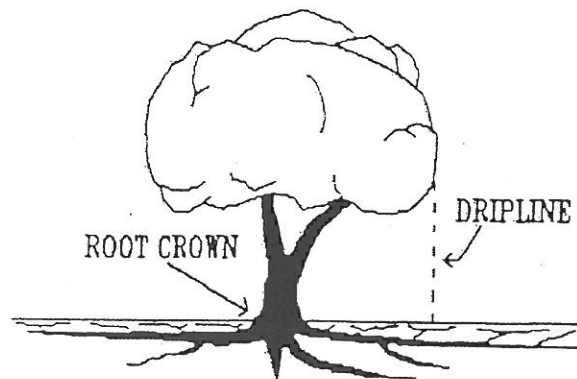
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Revised 12/13/90



Tree Notes

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

Pete Wilson, Governor, State of California

Harold R. Walt, Director

Douglas Wheeler, Secretary for Resources, The Resources Agency

NUMBER: 2

APRIL 1989

Tree Roots – Major Considerations For The Developer

Bruce W. Hagen

Forester, Pest Management Program, P.O. Box 820, Santa Rosa, CA 95402-0820

Roots support and anchor, absorb water and minerals, store energy and produce important compounds.

Roots grow where there is sufficient oxygen, water, minerals, and where the soil is not too hard to penetrate. 90% or more of tree roots grow in the upper three feet of soil. Up to 70% are in the top one foot. The surface layer of undisturbed soils is generally quite porous, allowing oxygen, water and roots to penetrate. Minerals are also concentrated there. Soil becomes less porous and more difficult to penetrate as depth increases.

Oxygen availability affects mineral absorption, growth, health and root depth. Poor oxygen availability is associated with compacted, waterlogged, heavy clay, paved over and filled (raised) soils. The mixing of soil or the addition of off-site soil, greatly reduces oxygen availability and water drainage. Waterlogging of the surface layer and excessive dryness may result.

Roots do not normally grow deeper than three or four feet. Most grow radially outward and largely horizontal to the surface. Vertical growing roots are common close to and under trees. They may go down to five feet or more in sandy soil. These roots take up water during dry periods and provide support, especially if lateral roots are cut.

The large buttress roots which originate at a tree's base, rapidly decrease in diameter, one to three meters from the trunk to form a network of long, thin, rope-like roots, 8 – 12 inches below the surface. These roots branch and rebranch to form an extensive network of absorbing roots, extending outward one to two times the height of the tree.

The greatest concentration of active roots is directly beneath the leaf canopy (drip zone).

Cutting large roots near the trunk is much more injurious than cutting smaller roots beyond the area of rapid taper. Few large roots are found beyond 10 feet of the trunk. Much of a tree's water absorbing roots are under and close to the tree's base. Because of their depth and location, These roots are less likely to be damaged by construction.

Root loss due to root pruning, trenching or grade changes, reduces tree growth, health, aesthetics and stability. The destruction of roots just outside the drip zone on one side of a tree represents about a 15% loss. If the roots are cut midway between the drip zone and the trunk on one side, about 40% of the roots will be lost. Severe root loss (50%) or more) usually causes immediate water stress and reduces photosynthesis (food production). Growth is reduced, dieback and even death may result.

Young healthy, vigorous trees can survive severe root loss while large, old, or declining trees may not. Recovery following the shock of severe root loss depends on rapid root replacement.

The recovery of a tree sustaining severe root loss is influenced by:

- **Species, age, vigor and size**
- **Growing conditions**
- **Date of injury (season)**
- **Percent of root loss and distance from the trunk**
- **Other soil disturbances**
- **Treatment given**

Root growth requires adequate food reserves, growth stimulating hormones, water and minerals. If these are available, and there are no other restrictive influences or construction impacts, root growth and replacement will generally proceed rapidly. Low or depleted food reserves will delay root replacement. If the soil conditions have been seriously altered by construction, root development will be slowed or stopped. **A DELAY IN RECOVERY FROM ROOT LOSS WILL RESULT IN GROWTH LOSS, DIEBACK OR TREE DEATH.**

The worst time to cut roots is just prior to bud break in the spring because growth hormones are not present in the roots to stimulate root growth. Avoid cutting roots later in the spring when food reserves have been nearly depleted by leaf growth. Root growth proceeds most rapidly in the summer and fall when top growth has slowed, food reserves are high and growth hormones are present in the roots.

Top pruning to reduce demands on the damaged root system reduces the amount of food available to the roots, thus slowing recovery.

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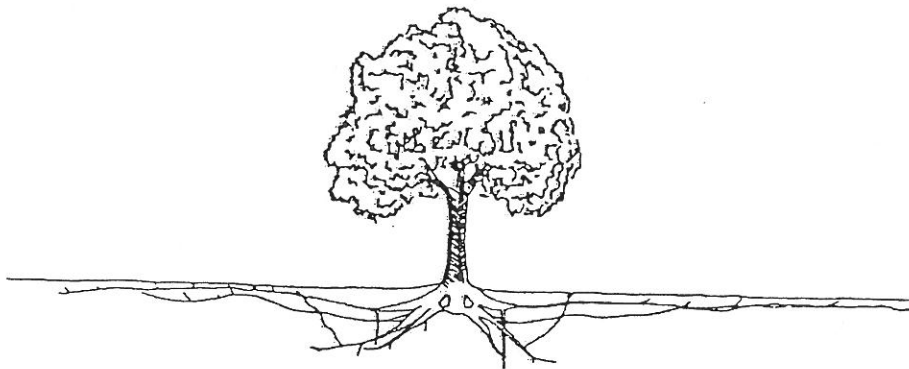
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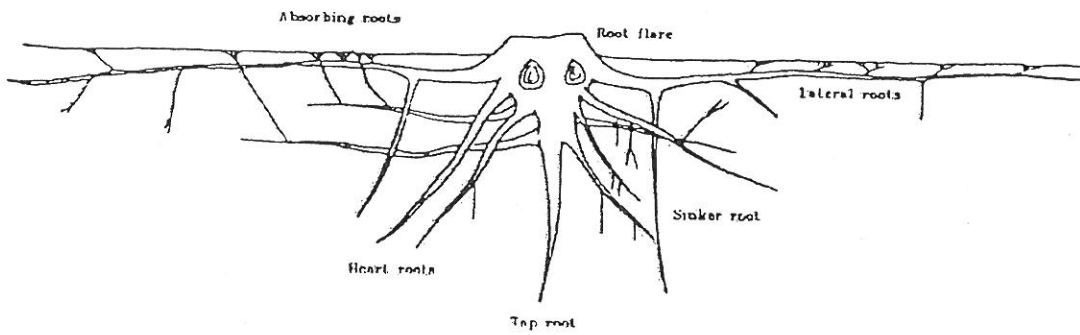
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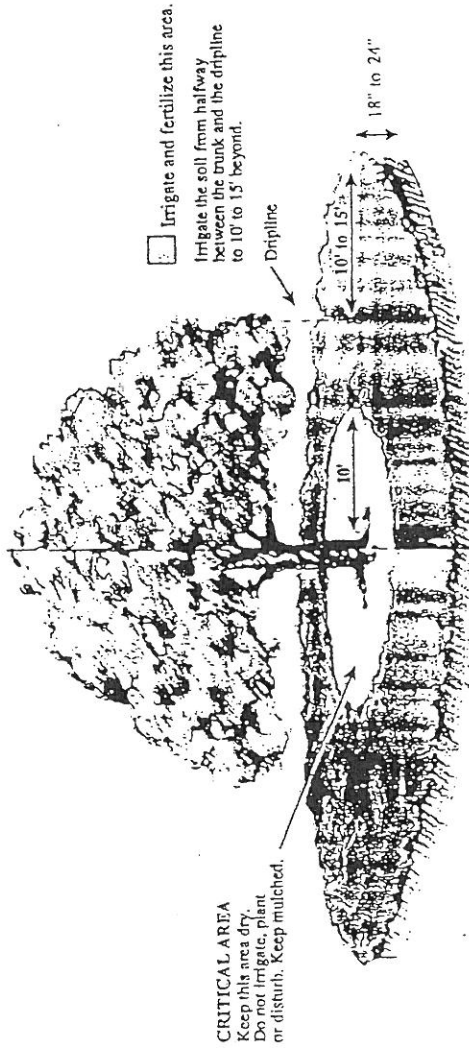
Schematic representation of root spread in a mature tree.



Schematic representation of the root system in a mature tree.

GUIDELINES FOR IRRIGATION AND FERTILIZATION

Figure 2



CRITICAL AREA
Keep this area dry.
Do not irrigate, plant
or disturb. Keep mulched.

Irrigate and fertilize this area.
Irrigate the soil from halfway
between the trunk and the dripline
to 10' to 15' beyond.

IRRIGATION

Generally, native oaks do not require irrigation.

- Additional water may be appropriate
- to minimize drought stress
 - when natural water sources have been altered
 - after root loss due to construction injury or transplanting
 - to establish compatible plants
 - when using fertilizer

Do not use sprinkler system; use dripline or soaker hose placed on surface and cover with mulch.
Check water infiltration.

FERTILIZATION

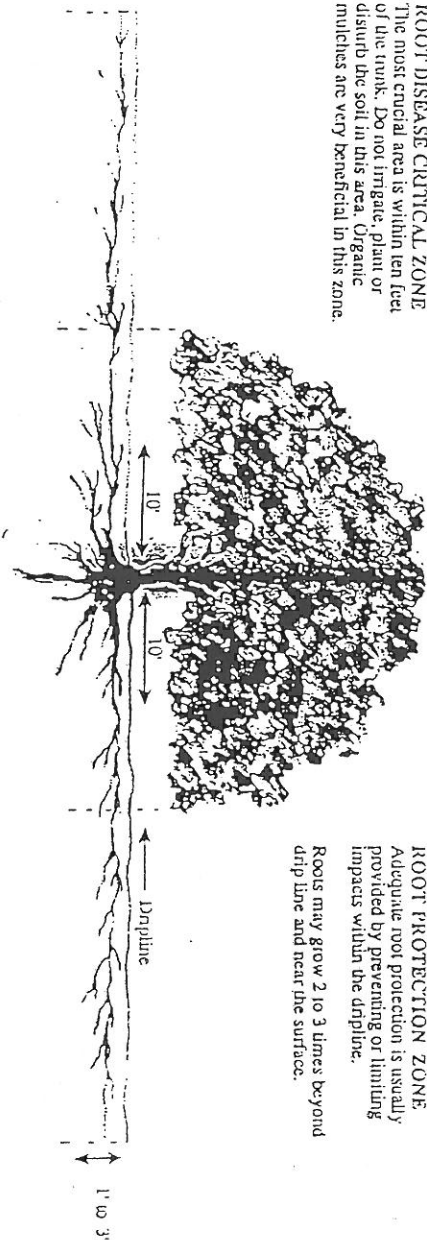
Healthy oaks growing in undisturbed conditions normally do not need supplemental fertilizer.

Stressed and weakened oaks should not be fertilized.

If needed, broadcast fertilizer in late winter or early spring when soil is moist and water in.

If fertilizer is applied in summer, irrigate soil before application then water in thoroughly (6" to 12" deep).

ROOT DISEASE CRITICAL ZONE
The most crucial area is within ten feet of the trunk. Do not irrigate, plant or disturb the soil in this area. Organic mulches are very beneficial in this zone.



ROOT PROTECTION ZONE
Adequate root protection is usually provided by preventing or limiting impacts within the drip line. Roots may grow 2 to 3 times beyond drip line and near the surface.

DO

- Select appropriate plants
- Mulch with 2" to 4" of organic matter
- Protect from compaction
- Tunnel through soil for utility line installation
- If paving is required, use porous paving, such as brick on sand or gravel

DO NOT

- Compact soil with heavy machinery, vehicles, livestock, etc.
- Change drainage patterns
- Raise soil grade
- Lower soil grade
- Trench or otherwise cut roots
- Till

CARMEL BUSINESS DISTRICT PLANTING POLICY

The Central Business District is a 20- block section that represents the City's area for commerce. It is bounded by Torres Street/Junipero Avenue, 8th Avenue, Monte Verde Street and 4th Avenue. This is the only area of the City that has formal curbs and sidewalks and yet the trees growing here contribute greatly to the overall forested charm and informal atmosphere of the village.

Managing the trees and tree planting in this area presents many challenges. Trees naturally grow in groups, their roots are free to extend in all directions. Pruning for building clearance or artificial water practices is not necessary. Trees growing in sidewalks, concrete planters, or small mini-parks are at a great disadvantage. These are hostile growing environments leading to stress, physical injury and disease. Any activities to install or care for trees living in a formalized commercial area needs to be cognizant of the negative environmental factors and employ mitigation's to minimize their impacts on trees.

Goal: To perpetuate and enhance the number, mix and vitality of trees growing in the Central Business District.

Objective: Favor planting of indigenous trees.

Policy: Until such a time as a pitch canker resistant Monterey pine is available, the upper canopy tree of choice shall be Monterey Cypress and coast redwood.

Objective: Increase tree planter size whenever reasonable.

Policy: The typical "tree square" is 16 square feet. It is advantageous to increase the size and to create a more curved planter configuration whenever sidewalks are replaced.

Objective: It is desirable to install native plants in sidewalk planters to enhance the natural look of the area.

Policy: Only native drought tolerant plant material shall be used on public property. Maintaining this theme is particularly important in the center island planters on Ocean Avenue. The forested nature of this area should not be augmented by an unnatural influence of exotic plants or colored flowers.

Policy: Wherever improvements are made to private property consideration should be given to landscape enhancements on the adjacent public property.

Objective: Improve the percolation of water in the root zone of trees.

Policy: Amend soil to improve drainage when necessary.

Policy: Any sidewalk replacement should favor sand set pavers.

Position Paper

Transport, Disposal, and Use of Woody Material Infested with the Pine Pitch Canker Fungus

Note: The practices described herein are key to the implementation of the Board of Forestry's Zone of Infestation.

Counties with infestations of pine pitch canker include Alameda, Contra Costa, Los Angeles, Marin, Monterey, Mendocino, Orange, San Benito, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, and Sonoma. Infestations may be localized or widespread depending upon the county. Know if you are in an infested area. If you are unsure, assume you are within an infested area whenever working with pine within an infested county. Most pines and Douglas-fir are susceptible to the disease, although the disease is most likely to be encountered in either Monterey or Bishop pines. In order to reduce the spread of pitch canker to uninfested areas, The Pine Pitch Canker Task Force recommends the following actions within infested areas:

TREE PRUNING AND CUTTING

- Tools and machinery which are used to prune, cut, or chip trees with pine pitch canker disease should be cleaned and sterilized before use on uninfected trees or in uninfested areas. Lysol™ or a 10% solution of bleach (1 part household bleach in 9 parts water) are effective sterilants. A logical alternative to repeated cleaning of equipment is to reserve one set of equipment for use only in infested areas and another set for use only in uninfested areas.
- Limbs and small pieces of wood from diseased trees may be chipped and the mulch deposited on site or they may be burned. Any material that is removed from the site should be tightly covered with a tarp during transit and taken to the nearest landfill or designated disposal facility for prompt burial, chipping and composting, or burning. Do not transport diseased wood out of infested counties.
- Logs from diseased trees may be split for firewood for local use, but the wood should be seasoned beneath a tightly sealed, clear plastic tarp to prevent the buildup of destructive insects. California Department of Forestry and Fire Protection **TREE NOTE #3, Controlling Bark Beetles in Wood Residue and Firewood**, provides specific guidelines for firewood tarping. Do not stack pine firewood next to living pine trees or transport it to uninfested counties.

FIREWOOD

- Do not transport pine firewood out of infested counties. If you are traveling from an infested area to camp elsewhere, take another type of firewood with you, such as oak or cedar, or purchase firewood at your destination.
- If you are camping within an infested county, use up or leave behind any pine firewood you have with you. This should be done even if you brought the firewood with you from an uninfested county.

CHRISTMAS TREES

- Individuals are advised not to transport Monterey pine Christmas trees out of infested counties. Purchase and use trees locally; dispose of Monterey pine Christmas trees locally.
- Preferred methods of disposal include:
 - dispose of the tree promptly through a local recycling program, or
 - dispose at a local landfill which either buries or composts green waste, or
 - chip the tree and compost the chips or use them as a mulch around your home.

SEEDS

- Seeds collected in pitch canker infested areas may carry the pathogen, even if they are taken from cones on apparently healthy trees. Pine seeds should not be transported out of pitch canker infested areas.

CHIPS

- Unless the chips have been composted, do not transport pine chips out of infested counties. Composting chips prior to transport should greatly reduce or eliminate the potential for disease spread.
- Within infested areas, the use of infected chips for mulch would contribute little to the total number of sources of the disease. However, it is best to use chips near the site of origin as it will minimize dispersal of the pathogen to uninfested

- areas within an infested county. Avoid using potentially infested chips near healthy pines or Douglas-fir.

LOGS

- Do not transport pine logs with intact bark out of infested counties, unless you are positive the logs originated from an uninfested area. Removing all bark prior to transport should greatly reduce the potential for disease spread, as would prompt milling of the logs.
- Pine bark should not be transported out of infested counties. Handling, disposal and use is the same as for other pine green waste.

OTHER

- Any untreated pine material that originates within infested counties is a potential source of pine pitch canker disease, unless the material has been treated to eliminate the disease or has been certified to be disease-free.

BACKGROUND

Pine pitch canker is a fungal disease that infects many species of pine trees. It infects Monterey pine Christmas trees and has been found in ornamental Douglas-fir at one location in Santa Cruz County. First discovered in California in 1986, its range is spreading and now includes 16 coastal and adjacent inland counties from Mendocino to San Diego. There is no cure and thousands of Monterey and Bishop pine trees have been killed.

Bark beetles, which carry the fungus, primarily infest Monterey and Bishop pines but also feed and breed on inland forest trees such as ponderosa pine. As yet, the disease has not been found in the Sierra Nevada or other heavily forested parts of the state. Transport, disposal and use of diseased material should be done so as not to spread the disease to uninfested areas. Insects spread the disease locally, but people are responsible for long-distance spread. Pine firewood, logs, chips, branches, needles, cones, and trees may all be a source of the disease.

University of California scientists are currently doing studies to characterize the survival of the pitch canker fungus, *Fusarium subglutinans* f.sp. *pinj* and associated insects in pine green waste, but the full results are not yet in. The fungus can survive in cut wood up to a year. The fungus also survives in soil up to 8 weeks or more. Insects may survive in cut wood or chips for many months. Chipping does not eliminate insects. When branch tips infested with twig beetles are chipped, some insects may

emerge up to 12 weeks after chipping. Undoubtedly, some insects will survive even longer in chipped material. All of these findings implicate pine green waste as a viable source for the spread of pine pitch canker disease.

This position paper was developed by the Pitch Canker Task Force and approved on January 23, 1997 . It reflects conditions current as of that date.

For further information Contact:

Don Owen

CA Dept Forestry and Fire Protection Dept of Forest and Beach

6105 Airport Rd.

Redding, CA 96002

Phone: 530-224-2494

Email: Don_Owen@fire.ca.gov

Last edited June 26, 2000

Pitch Canker Task Force California Forest Pest Council

Guidelines for Handling Woody Material Infected with the Pitch Canker Fungus

Pitch canker is a fungal disease that infects many species of pine trees and Douglas-fir, but is most likely to be encountered on Monterey, Bishop, or knobcone pines. First discovered in California in 1986, the disease is spreading. Preventing spread is important because once pitch canker becomes established in an area there is no way to stop it from infecting and killing trees. No cure or preventative exists. Insects spread the disease locally, but people are responsible for long-distance spread. The fungus can survive in cut wood or soil for a year or more. Insects that carry the fungus may survive in cut wood or chips for many months. Chipping does eliminate most insects. Pine firewood, logs, chips, branches, needles, cones, trees and seedlings may all be a source of the pitch canker pathogen.

Counties with infestations of pitch canker include Alameda, Contra Costa, Los Angeles, Marin, Monterey, Mendocino, Napa, Orange, San Benito, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, and Ventura. Infestations may be localized or widespread depending upon the county. Know if you are in an infested area. If you are unsure, assume you are within an infested area whenever working with pine within an infested county. In order to reduce the spread of pitch canker to uninfested areas, the Pitch Canker Task Force suggests the following guidelines. Compliance with these guidelines is voluntary, except for commodities regulated by the California Department of Forestry and Fire Protection (CDF) or California County Agricultural Commissioners.

CDF has authority to impose conditions on the commercial harvest of trees from timberland. For all timber operations regulated by CDF, the Department must be informed if pitch canker is present within the operating area. The State Board of Forestry has declared a Zone of Infestation (ZOI) that largely coincides with the infested counties mentioned above and can be checked on the pitch canker website. Pitch Canker is a "B"-rated disease by the California Department of Food and Agriculture. As a result, the local or destination California County Agricultural Commissioner may restrict the movement of known infected host material. If you are planning to move diseased material from an infested to uninfested area, contact the local and/or destination agricultural commissioners' offices to determine if there are any restrictions.

GUIDELINES

Guidelines are divided into two sections:

Guidelines for various commodities – seeds, chips, compost, firewood, logs and lumber, nursery stock and Christmas trees, imported pine material, and other commodities

Guidelines for various clientele – homeowners, arborists and tree care workers, firewood cutters, registered professional foresters and licensed timber operators, and nurserymen and Christmas tree growers.

The first category addresses concerns and recommendations for specific types of woody material. The second section addresses concerns and recommendations for specific clientele that handle infected woody material. It is not necessary to read through the entire set of guidelines. For each section, consult the subcategories that apply to you.

I. GUIDELINES FOR VARIOUS COMMODITIES

SEEDS

Seeds collected in pitch canker infested areas may carry the pathogen, even if they are taken from cones on apparently healthy trees. Treatments which sterilize the surface of the seed will not eliminate internal infections, therefore pine seeds should not be transported out of pitch canker infested areas.

CHIPS

- Chipping infected wood will reduce but not eliminate insects that carry the pitch canker pathogen. Chipping has little impact on pathogen survival and may serve to more thoroughly distribute the pathogen among the chips through contamination.
- The preferred management option for infected, chipped material is to keep it within infested areas.
- Within infested areas, the use of infected chips for mulch would contribute little to the total number of sources of the disease. However, it is best to use chips near the site of origin as it will minimize dispersal of the pathogen to uninfested areas within an infested county. Avoid using potentially infested chips near healthy pines or Douglas-fir.
- Material that is composted under a treatment regime that eliminates the pitch canker pathogen (see guidelines below) may be transported out of infested counties.

- For chips that are not composted or otherwise treated to eliminate the pathogen, the following will greatly reduce the possibility of pathogen spread when said material is transported out of infested counties:
 - the transportation route is free of indigenous or planted pines
 - the material is shipped in tightly enclosed trucks
 - no indigenous or planted pine forests are within a ten mile radius of the destination area.

COMPOSTING

Composting can be an effective means of eliminating the pitch canker pathogen from infected branches. The composting operation should be conducted as close as possible to the source of the infected material.

Wood to be composted should be chipped and mixed with a source of nitrogen such as grass clippings or manure. Elimination of the pathogen requires exposure to 50 C (120 F) or higher for at least 10 days. As it will be necessary to turn the pile to ensure exposure of all material to the higher temperatures at the interior, the duration of the composting will necessarily be longer than 10 days. Standard commercial composting operations will ordinarily exceed the minimum time and temperature required to kill the pathogen, but if this is in doubt, temperatures should be monitored to confirm they are high enough. Note that moist conditions in a compost pile facilitate the elimination of the fungus. If dry heat is used, as by simply placing logs under plastic, higher temperatures may be required to kill the fungus.

FIREWOOD

- Do not transport pine firewood out of infested counties, either for sale or for personal use. If you are traveling from an infested area to camp elsewhere, take another type of firewood with you, such as oak or cedar, or purchase firewood at your destination.
- If you are camping within an infested county, use up or leave behind any pine firewood you have with you. This should be done even if you brought the firewood with you from an uninfested county.

LOGS AND LUMBER

- The preferred management option for untreated pine logs is that they be milled within the Coastal Pitch Canker Zone of Infestation (see addendum).
- If pine logs originated from an uninfested area (defined as a minimum of 10 miles from the nearest known infected tree) and the source trees are inspected to

confirm they are disease-free, the logs pose little or no threat of spreading the pathogen out of the Zone of Infestation.

- Pine logs from infested areas pose little or no threat of spreading the pathogen out of the Zone of Infestation if the logs have received one of the following treatments:
 - have been stockpiled for one year or more within the Zone of Infestation.
 - heated to 160°F at the center of the log for 75 minutes
 - have been completely debarked and all bole cankers removed
- When logs from within the Zone of Infestation are processed outside of the Zone, wood residue from those logs should not be stored, utilized, or disposed of in a manner that brings it in close proximity to living pines. Consider burying, burning, or composting the material. If it is used as a soil amendment or mulch, keep it away from living pines.
- Kiln-dried lumber (dried until the center of the largest dimensional piece reaches 140°F) can be shipped out of the Zone of infestation immediately after treatment.
- Air-dried lumber, provided it is free of deep-wood insects, does not present a hazard for pitch canker spread. Lumber which comes from trees that were dead or dying prior to their harvest could harbor deep-wood insects, and thus should be used within the Zone of Infestation or cured a minimum of one year prior to being moved out of the Zone.
- Pine bark should not be transported out of infested counties. Handling, disposal and use is the same as for chips.

NURSERY STOCK AND CHRISTMAS TREES

Purchasers of Choose and cut Christmas trees

- Individuals are advised not to transport Monterey pine Christmas trees (choose and cut) out of infested counties. Purchase and use trees locally; dispose of Monterey pine Christmas trees locally.
- Preferred methods of disposal include:
 - dispose of the tree promptly through a local recycling program, or
 - dispose at a local landfill which either buries or composts green waste, or
- chip the tree and compost the chips or use them as a mulch around your home.

Sellers of Nursery Stock and Christmas Trees

Christmas tree growers

The best approach to management of pitch canker is to prevent it from becoming established. The pitch canker fungus can be introduced to a Christmas farm as contaminated seed, or as infected seedlings. To avoid such problems, do not use seed that originated within the Zone of Infestation and be sure that seedlings are disease-free. If you do use seed from within the Zone of Infestation, treat the seed prior to use and do not transport it out of the Zone of Infestation. The pathogen can also survive in soil and consequently, it is advisable to remove soil from tools or equipment that have been used in an infested area before moving them to a non-infested area; a high-pressure water wash can be used for this purpose. Additionally, wood-by-products (e.g. shredded fir and pine bark) or compost material used in growing media should be from a source free of pitch canker.

Once pitch canker has become established, it is possible to manage the problem through timely removal of infected trees and treatment of soil. Removal should include the stump and as much of the root system as possible. Disposal of the infected material should be undertaken according to the above guidelines for arborists and tree care workers. Spot fumigation with registered materials can be used to eliminate the fungus from soil at the site of tree removal. Consult with your Country Agricultural Commissioner or U.C. Cooperative Extension office for specific treatment options. On replanting, trees should be closely monitored for development of pitch canker symptoms. If trees become symptomatic they should be removed and the site retreated. Guidelines for growers of nursery stock

The pitch canker pathogen, *Fusarium circinatum*, is a "B" rated pest in California. All nursery stock sold in California must be free from "B" rated pests unless sold under a "buyer - seller agreement". Growers of nursery stock must apply for a "License To Sell Nursery Stock" and are subject to at least annual inspection to assure that State standards for pest cleanliness, labeling and quality are being met. For a "B" rated pest like the pitch canker pathogen, the standard of cleanliness is to be "free from," meaning that all nursery stock shipments in California must be free from visual symptoms of pitch canker. It is your Agriculture Commissioner's responsibility to perform visual inspections and determine if the nursery stock meets the "free from" standard of cleanliness, and if it does, to issue California Nursery Stock Certificates for Interstate and Intrastate Shipments (CNSCs).

If you are operating a nursery within the Zone of Infestation, it is recommended that you work with your County Agriculture Commissioner to determine if you have susceptible stock and to acquire and maintain a "free from" pest status for your nursery. Most species of *Pinus* are susceptible to pitch canker and are considered possible carriers of the pitch canker pathogen. This includes nearly all native California pine species as well as many non-native pine species. Since pitch canker can be soil borne, it is recommended that only bare root stock be shipped outside the Zone of

Infestation. Nurseries located within the Zone of Infestation and producing susceptible species of pines should be monitored and tested for *Fusarium circinatum* at a California Department of Food and Agriculture certified laboratory. Susceptible pines should only be sold if tested and found free of pitch canker, even within the Zone of Infestation. Testing specifications may need to be tailored to each individual case but example protocols are available from your Agricultural Commissioner or Cooperative Extension offices. The Agricultural Commissioner, Cooperative Extension, along with many private foresters and nursery professionals can give you valuable information on ways to raise your nursery stock to minimize the risk of infection. Your nursery may enter into a compliance agreement with your Agricultural Commissioner to help facilitate the movement of "free from" nursery stock of susceptible species.

Sanitation practices in your nursery are critical to ensure a standard of cleanliness that qualifies your stock for CNSCs. Since the pitch canker pathogen is readily transferred, contaminated tools, equipment, etc. can transmit pitch canker to susceptible pines. All tools, equipment, etc. that you use should be routinely sanitized between uses with Lysol or other suitable solution. Each nursery operation needs to be evaluated to determine the most effective means to manage pitch canker. It is necessary to work with your Agricultural Commissioner and Cooperative Extension personnel to control this destructive tree disease.

Shipments with CNSCs need not be held for inspection in California, but are subject to review by the Agricultural Commissioner of the receiving county. The destination Agricultural Commissioner may verify the shipment meets the State standards for nursery stock cleanliness. If pitch canker is found in your shipment, the destination Agricultural Commissioner may, at your expense, destroy the infected part of the shipment, return it to your nursery, or have you make other arrangements, or may approve a "Buyer/Seller Agreement."

Note. The Pitch Canker Task Force recommends that in addition to meeting the California standards for "free from" that Monterey pine growing stock be lab tested to determine whether the pitch canker pathogen is present. We believe that visible inspection is not adequate to determine "free from" status. We encourage nurserymen

to enter into voluntary compliance agreements in the county of origin. Seedling buyers need to be aware that there is a significantly increased risk of pitch canker pathogen spread if they purchase stock that has not been lab tested for the pathogen.

IMPORTED PINE MATERIAL

- Pitch canker occurs naturally in the southeastern United States and Mexico and has been introduced to some other countries. It is not known how pitch canker came to California, but the closest possible sources are the Southeast and Mexico. In the southeastern US, pitch canker is distributed from Virginia to Florida and west to eastern Texas. The complete distribution in Mexico is

unknown, but it occurs in at least 14 states, from the Texas border into central Mexico.

- Pine material from these areas could potentially be contaminated with or infected by the pitch canker pathogen. For example, it was recently discovered that bales of pine needles imported into California from Georgia were contaminated with the pathogen.
- Only import pine material from these areas if it is known to be free of pitch canker. If infected or contaminated material is imported, it should be treated to eliminate the pathogen or only used in settings far removed from living pines.

OTHER

Any untreated pine material that originates within infested counties is a potential source of pitch canker disease, unless the material has been treated to eliminate the disease or has been certified to be disease-free.

II. GUIDELINES FOR VARIOUS CLIENTELE

HOMEOWNERS (for related information, see the press release "[Living With Pines Infested With Pitch Canker](#)".)

Tree pruning and cutting

- Tools and machinery which are used to prune, cut, or chip trees with pitch canker disease **WILL BECOME CONTAMINATED** with the pitch canker fungus. If pitch canker is already present on your property, the use of contaminated tools is not likely to spread the disease any more than would occur naturally.
- If contaminated tools are to be used in an area free of pitch canker, the tools and machinery should be cleaned and sterilized before use. Lysol® or a 10% solution of bleach (1 part industrial bleach in 9 parts water) are effective sterilants. A two

minute soak time is recommended when using bleach. A logical alternative to cleaning of equipment is to reserve one set of equipment for use only in infested areas and another set for use only in uninfested areas.

Wood Disposal

- The best alternative for reducing the spread of pitch canker is to keep wood from infected trees on site.
- Logs from diseased trees may be split for firewood for local use, but the wood should be seasoned beneath a tightly sealed, clear plastic tarp to prevent the buildup of destructive insects. California Department of Forestry and Fire Protection **TREE NOTE #3, Controlling Bark Beetles in Wood Residue and**

Firewood, provides specific guidelines for firewood tarping. Do not stack pine firewood next to living pine trees or transport it to uninfested counties.

- Limbs and small pieces of wood from diseased trees may be chipped and the mulch deposited on site or they may be burned.
- Any residual woody material that is removed from the site should be tightly covered with a tarp during transit. Consult with county waste management staff for disposal options. Do not transport diseased wood out of infested counties.

ARBORISTS AND TREE CARE WORKERS

- Tools and machinery which are used to prune, cut, or chip trees with pitch canker disease **WILL BECOME CONTAMINATED** with the pitch canker fungus and should be cleaned and sterilized before use on uninfected trees or in uninfested areas. Lysol® or a 10% solution of bleach (1 part industrial bleach in 9 parts water) are effective sterilants. A two minute soak time is recommended when using bleach. A logical alternative to repeated cleaning of equipment is to reserve one set of equipment for use only in infested areas and another set for use only in uninfested areas.
- Limbs and small pieces of wood from diseased trees may be chipped and the mulch deposited on site or they may be burned. Any material that is removed from the site should be tightly covered with a tarp during transit and taken to a designated disposal facility for prompt burial, chipping and composting, or burning. Do not transport diseased wood out of infested counties.
- Logs from diseased trees may be split for firewood for the landowner for local use. Advise the landowner to season the wood beneath a tightly sealed, clear plastic tarp to prevent the buildup of destructive insects. California Department of Forestry and Fire Protection **TREE NOTE #3, Controlling Bark Beetles in Wood Residue and Firewood**, provides specific guidelines for firewood tarping.

Do not stack pine firewood next to living pine trees or transport it to uninfested counties.

- Logs that are removed from the site should be taken to a designated disposal facility for prompt burial, chipping and composting, or burning. Do not transport logs from diseased trees out of infested counties unless they are treated according to the log treatment protocol described in Section I of the Guidelines.
- If you are outside of the Zone of Infestation, contact CDF or the County Agricultural Commissioner's office to report trees you suspect might have pitch canker.
- Make sure that clients and co-workers are aware of these guidelines.

FIREWOOD CUTTERS

- Tools and machinery which are used to cut trees with pitch canker disease **WILL BECOME CONTAMINATED** with the pitch canker fungus. There is little chance of spreading pitch canker if contaminated tools are only used on dead trees or on trees that are not pines. However, if contaminated tools or machinery will be used on living pines, the tools should be cleaned and sterilized before use on uninfected trees or in uninfested areas. Lysol® or a 10% solution of bleach (1 part industrial bleach in 9 parts water) are effective sterilants. A two minute soak time is recommended when using bleach. A logical alternative to repeated cleaning of equipment is to reserve one set of equipment for use only in infested areas and another set for use only in uninfested areas.
- Do not transport pine firewood out of infested counties. Sell pine firewood for local use only.

REGISTERED PROFESSIONAL FORESTERS AND LICENSED TIMBER OPERATORS

On June 4, 1997 the State Board of Forestry passed a resolution establishing the Coastal Pitch Canker Zone of Infestation. The Zone encompasses all or parts of 21 counties on or near the coast from Mendocino County to San Diego County. Infested counties are listed at the beginning of this document.

Map of the Zone of Infestation. The Zone includes all infested areas as well as adjacent areas that might reasonably be expected to become infested in the near future. The distribution of the disease is discontinuous and thus there are infested as well as uninfested areas within the Zone.

- Know when you are working within an infested area.
- The Department of Forestry and Fire Protection (CDF) has the authority to impose conditions on the commercial harvest of trees from timberland within the Zone of Infestation. Such actions are be carried-out on a case by case basis and depend upon the harvest operation's potential to contribute to disease spread. For all timber operations regulated by the Department, the Department must be informed if pitch canker is present within the operating area.
- Do not transport infected or contaminated material to areas that are free of the disease.
- When cutting or pruning a diseased tree, clean tools with a disinfectant before using them in uninfested areas. Lysol® or a 10% solution of bleach (1 part household bleach in 9 parts water) are effective sterilants. A two minute soak time is recommended when using bleach.

- If you are outside of the Zone of Infestation, contact CDF or the County Agricultural Commissioner's office to report trees you suspect might have pitch canker.
- Make sure that clients and co-workers are aware of these guidelines.

The initial draft of this position paper was developed by the Pitch Canker Task Force and approved on January 23, 1997. It was amended and reapproved on September 7, 2000 and reflects conditions current as of that date.

Position Paper on the Retention of Pines Infected with Pitch Canker (Revised September 25, 2001)

The purpose of this document is to update the position of the Pitch Canker Task Force concerning when the presence of pitch canker justifies the removal of a diseased tree. Decisions concerning tree removal are often complex and the following information is a general policy statement and not a substitute for on-site professional hazard tree evaluation.

Monterey pine, along with many other pine species, is susceptible to pitch canker. The earliest symptom of pitch canker is dieback in the canopy, caused by infections on individual branches. Infections on large branches and the main stem of a tree can lead to top-kill and, in some cases, death of the entire tree. Trees differ in their susceptibility to pitch canker (see "What is Genetic Resistance?"), but nearly all will sustain some infections. Thus, when a tree shows early symptoms of pitch canker, it is not possible to predict how far the disease will progress in that tree. Recent research indicates that approximately 10% of Monterey pines are at least somewhat resistant to pitch canker, and will not sustain serious damage from this disease. Furthermore, some trees that do become heavily infected will recover from pitch canker.

Pitch canker infection is not a sole reason to remove a tree. The decision to remove a tree should be based on more general criteria, such as safety. Thus, if a tree has been deemed hazardous for any reason, it should be removed, regardless of its prospects for recovery from pitch canker.

Any recovery of the tree will be from living material. Infected trees may have numerous dead branches or the top section of the tree may be dead. Dead parts of the tree will not recover and will become increasingly weakened and unpredictable over time. Large dead material should be mitigated as soon as possible. Sometimes the tree may need to be removed even if it shows signs of recovery.

Most pitch canker affected trees will be found in areas where the disease is already present, and the above policy will be applicable. However, where pitch canker occurs in an area that is otherwise free of the disease, more aggressive might be appropriate. To determine if this is applicable to your situation, contact your city forester, county agricultural commissioner, the Department of Forestry and Fire Protection, or your local U.C. Cooperative Extension office. Please keep in mind that county or municipal regulations may require that a permit be obtained prior to tree removal.

TALKING TREES WITH YOUR CONTRACTOR

The largest single physical impact to trees in our urban forest occurs during the process of modifying the human environment, or more simply put, building something. Significant changes in a tree's soil, water, energy, and biological resources can occur in this process.

Carmel-by-the-Sea's urban forest is one of the unifying elements of the community. Most lots have trees that are owned by individual property owners, but these individual trees are part of the larger forest that is enjoyed and appreciated by all. Tree-generated values impact psychological, social, and biological aspects of daily life. Trees also add tremendous monetary value to the site on which they grow.

If you are planning to modify your human environment, it is critical to the health of the trees on your site to communicate with your architect and contractor the care that must be employed regarding tree health and safety to ensure that the work to be done does not upset the balance needed for tree survival. In this way you can avoid the disappointment and cost associated with having to remove a dead or unsafe tree once the project is complete.

The following are some tips for avoiding tree damage during construction:

Soil Compaction

What happens below the ground is more important than what meets the eye above ground. The key to tree survival in the years following construction is protection of the roots during construction. This is probably the most insidious problem because the results of compaction cutting off air and water passages in the soil show up slowly. When barriers are not possible to keep away vehicles and foot traffic, other protective methods that can be used include: spreading several inches of wood chips; pumping concrete from the truck through conveyor pipes instead of driving over root systems; and bridging root areas with plates of steel.

Severing roots

Some cutting of roots near construction is inevitable, but much is avoidable. For example, the routing of underground utilities does not have to follow a straight line from street to house. Careful route selection can often avoid important trees. When that is not possible, tunneling is a good way to reduce damage. To reduce trenching for foundations, posts and pillars can be substituted for foundations and walls.

Drainage Changes

If terrain is altered, there will be a change in how water drains from the land. If flows are created that add too much moisture to a wooded site, a drainage system may be needed to maintain the previous amount of moisture (which provided the natural growing conditions for the existing trees). Similarly, existing trees along the edge of a new pond may eventually die from their roots suffocating. On sites deprived of water, irrigation may be needed to maintain existing trees.

Soil Chemistry

Poisoning or other wise altering the soil can result in weakened trees, making them more susceptible to insect and disease. In some cases, trees can be killed outright within a few years after construction. To prevent adverse effects on soil chemistry:

- Spread heavy plastic tarp where concrete is to be mixed or sheetrock will be cut. The alkalinity of these materials can change the soil pH.
- Read labels. Do not use wood products containing pentachlorophenol. These are deadly to roots. CCA-treated lumber (greenish color) is a safer alternative
- Paint brushes and tools should not be cleaned over tree roots.
- Chemical wastes (paint thinner, etc...) should be disposed of properly and not drained on site. Local sanitary authorities can advise on recommended disposal methods.

There are many techniques that will help save trees during construction, but this is only one part of the challenge. The key to success is communication. It begins with the property owner making it very clear to the architect that mature trees on a lot are just as important as the size of the kitchen. In fact, you may want to seek out an architect who has an interest and has experience designing with trees in mind.

Most importantly, communication with the actual builder is essential. Many builders sympathize with the need to save tree, but often they view it as too time consuming or otherwise costly. Still others may not know much about tree saving techniques as you do, so there is an education challenge.

Finally, there are dozer operator, truck drivers, painters, masons, and a small army of others who are on the site daily. While it is usually not possible to work with each one or even visit the site daily, it is possible to convince contractors and foreman that you are serious in your desire to save trees and that they need to relay this concern to their workers.

CARING FOR THE COAST LIVE OAK

The majestic Coast Live Oak that we enjoy in Carmel is an integral part of the landscape. Since this is a native species, it is well adapted to our climate, soil, and geographic environment. Native oaks, when young, are very adaptable and fairly quick growing, making them excellent landscape assets.

The Coast Live Oak is a hardy tree that provides beauty, shade, and is essential to many species of birds and animals. Oaks increase property value - a single mature tree can add thousands of dollars to the value of a homesite. Under ideal conditions, oaks should live for hundreds of years.

While oaks are hardy, mature trees cannot tolerate many changes. They are sometimes subjected to stress which could endanger their lives.

Three items to consider are:

#1. Watering

Once established, native live oaks need little or no irrigation to survive, since they

are adapted to this climate, but they may benefit from some watering and fertilizing. Do not over water. Damage due to over watering may not appear immediately, but will hasten the demise of your prized tree.

When watering, (and it is best to water in the fall or winter), keep water at least four feet from the trunk of an oak. Moist, warm soil near the base of a native oak promotes crown and root rot. Water on the outer edge of the root feeding zone, which is beneath the tips of the outer branches. Irrigation should be by the "deep watering method" only once or twice a season.

Frequent, shallow watering not only encourages root rot, it also results in ineffective, shallow roots, a needless waste of the tree's energy. When watering, you can use a soaker hose, or deep water with a probe attached to your hose.

A good mulch three to four inches deep out to the drip line (outer tips of branches) is helpful in retaining moisture and eliminating competing plants. Avoid raking within the root zone of trees.

Fertilizing can be helpful. For large trees, it is best to apply fertilizer in holes spaced two feet apart — out at the drip line.

#2. Grading

Changing the surface around the base of an oak can be detrimental to its health. Filling or grading soil away from trees results in injury to the roots since nearly

all of the lateral root system occurs within the top three feet of soil. Also, this leaves only the poorest soil in which trees cannot be expected to do well.

If fill is necessary, the common practice is to leave a pit around the trunk of the tree. Wall up to the rim of this pit with rock or brick to allow air to reach the trunk and crown of the tree. Since heavy fills may kill the tree despite this precaution, avoid fills whenever possible.

Grading the soil away from the oak tree is especially detrimental to the roots since it destroys the trees' power to gain nutrients and moisture essential for growth.

#3 Planting Near Oaks

Planting lawns, flowers, ivy, ferns, or shrubs which require extensive watering around the base of oaks can be detrimental to the trees in that the roots could get waterlogged and rot. Only drought resistant plants that require no summer watering should be selected.

There are a number of plants, some of which are native to California that can be grown beneath oaks. For an extensive listing of compatible natives to plant around oaks, contact the city forester.

A place of plants, other types of ground cover can be used to landscape beneath oaks. Cobbles, gravel, and redwood bark are good examples, when installed properly, that do not interfere with the roots' ability to obtain oxygen.

If you have questions or need additional information, please call the city forester at 624-3543.

ADOPT A TREE PROGRAM

Want to help your favorite city tree survive – that tree in front of your house or store? Then why not join the “ADOPT A TREE” program co-sponsored by the Carmel Soroptomist Club and Friends of Carmel Forest.

Many trees in the urban forest are subject to stress and lead a precarious life due to mankind’s “improvements,” i.e. paving, compacting, cuts and fills and over and under watering. Also, nature does not always cooperate. Bark beetles attack stressed trees; the drought, now in its fifth year, causes problems.

So what can you do? What is required to “Adopt a Tree?”

The age and species of the tree will determine what is required. But they will all require (1) deep root watering, (2) mulching and some fertilization.

Seedlings

All young trees, regardless of species, that are newly planted or up to two feet tall require sufficient water until the roots are able to tap available ground water. They need water every two weeks. Mix in a little Miracle-Gro® or spread a small amount of long lasting, slow release Osmocote® fertilizer around the base.

If you are caring for a seedling or a young tree, why not measure its height and see how much it has grown in a year and let us know.

Watering

Trees should be deep watered and fertilized a couple of times during the fall and winter. It is important that the watering be slow and deep to maximize absorption by the tree’s feeder roots and to avoid wasting water form run-off. Water at least 4 feet away from the trunks. The objective is to get the soil around the tree wet to a depth of 18 to 24 inches. It takes around 10 gallons of water for each 10 square feet of root area. If you can reach your adopted tree with a hose, use a soaker placed around the tree out at the drip line (outer branches of tree).

If you choose to use a deep watering probe, insert the probe into the soil at an angle to a depth of 12 to 18 inches every 3 feet around the entire drip line of the tree and let it run for 8 to 10 minutes at the location of each penetration. You can buy a watering probe for four or five dollars at a hardware store – or better yet, just borrow one from Friends of Carmel Forest.

If you are hauling the water, let it percolate slowly into the soil. You may want to use a rubber trash container. Fill it with water and poke a few small holes in the bottom for slow drip into the soil. This works well.

Mulching

All trees will benefit from a good, deep 3-inch mulch. The mulch will help retain soil moisture, reduce soil cracking, which can damage small roots, prevent soil compaction from foot traffic and reduce weed growth.

Quite often the Forestry Department has wood chip mulch available from branches and leaves they have ground up. So call them if to see if any is available. Otherwise, you can buy mulch from a garden shop.

Bark Beetles

Eradication of Red Turpentine Bark Beetles.

Stressed Monterey pines are prone to Bark Beetle infestation and construction sites with new lumber attract these beetles. So, be aware of these potential tree killers.

It is quite simple to spot a tree that has been infested, by the Bark Beetle. There will be a pinkish-colored sawdust or fine popcorn-like material in small heaps, usually somewhere around the base of the pine. This is called "frass", and it is the digested wood from the beetle's trail. If one looks up from the frass, a "pitch tube" entrance hole marker can often be discovered. This is a small clump (about 3/4" in diameter) of sticky material, ranging in color from light pink to brownish-red, with a small hole in the center. Beetle presence over a short time will also cause yellowing and death of individual branches. If these conditions exist, please contact the City Forester's office for their pamphlet on eradication of Bark Beetles.

Dr. Roy Thomas reports success in eliminating the Bark Beetle by using termite spray available at hardware stores. Just put the tube into the beetle hole and spray. It's worth a try!

GROW YOUR OWN OAK TREE

Oaks are easy to grow and develop rapidly. Trees that best survive are the native trees that have evolved genetic traits favoring the local conditions of soil, moisture, climate, etc. By planting acorns from local trees, you maximize chances for survival and minimize damaging local stock by introducing trees with poorly adapted genes

Here's how to proceed:

1. Collect acorns in the fall from healthy, vigorous trees in your neighborhood – from the tree or under it on the ground, choosing large acorns. Remove the cap if it is attached.
2. Soak the acorns for one hour if picked off the tree or 24 hours if taken from the ground. Add ½ cup of bleach per gallon to the water. Discard any acorns that float or have holes, cracks or other defects. Dry the acorns on towels, newspaper or other absorbent material.
3. Pack the acorns in zip-lock plastic bags and place in the refrigerator (not freezer) for at least a month. This should stimulate faster and more complete germination. Check the stored acorns occasionally for mold. If mold develops, repeat the soaking and drying and return to the refrigerator. Acorns can be stored in the refrigerator for several months.
4. After refrigeration, plant the acorn in the ground or in a container (see Paragraph 6). When planting in the ground, choose a sunny, weed-free spot with well drained soil. With a hand trowel or shovel, dig a shallow hole. Loosen the soil several inches under the hole and add a pinch of Miracle-Gro®. Plant the acorn, sideways, one inch below the surface. Water lightly.
5. Water weekly until the seedling is well established. Do not over-water; this will cause the acorn to rot. After the seedling is established, watering two or three times during the dry season should be sufficient.
6. For container-grown seedlings, use a quart milk carton or similar container slit near the bottom for drainage. Fill with potting soil. Thoroughly moisten the soil and place on a saucer or pie tin. After planting acorn, place the container near a window where it will receive adequate light.

7. Container-grown seedlings should be transferred to the planting site when 3 to 4 inches high. Scrape a circle two feet in diameter around the seedling to remove other vegetation, thus eliminating competition for moisture. Placing some type of mulch around the seedling will also help conserve moisture and discourage competing plants.

For further information, call the Carmel Forestry Department at 624-3543. Acorns are available from Friends of Carmel forest by calling 625-2855.

HOW BEAUTIFUL TREES CAN ADD SUSTANTIAL VALUE TO YOUR HOME

Trees not only affect our living environment, they also have a direct impact on the value of our homes.

Trees perform a variety of functions in the landscape, all of which impact the quality of our lives and our pocketbooks.

Trees reduce air pollution noise and light pollution, reduce soil erosion and water run-off, aid in climate control, and improve the viewshed and aesthetics of the neighborhood.

Research has shown that trees and landscape planting can save 20 to 25 percent of energy use in the home for both cooling and heating. In fact, without the moderating effect of trees, urban areas grow hotter and drier—an effect felt by anyone seeking the shade of a tree.

Numerous studies have shown that people are willing to pay more for homes that have trees on the property. But how much more? Depending on the area of the country, anywhere from 3 to 18 percent more.

So what does this mean for developers and the real estate business? Very simply this: in most cases homes with mature trees will sell for more and will sell faster.

Although developers often cite the increased cost of preserving existing trees, studies have shown that this extra cost is more than offset by the increased aesthetic value and marketability of the home. Trees not only increase in their individual value, but also add to adjacent property values.

If a community is going to remain economically viable—if it is going to attract long-term residents and businesses—the community must be concerned with its appearance livability and “feel.” Protecting the community’s natural resources—particularly trees and open space—contributes to a positive image for the community, and that translates into a sound economic base.

TIDY GARDENS OR BENIGN NELECT BY GARY GIRARD

With a title like that, you might be expecting a slanted article on perfection, but being the contrarian that I am, sometimes benign neglect can look very refreshing in a community driven by property values.

In fact, if you're a seasoned Carmel person, history paints a simpler picture of how individual gardens happened then. Those old gardens were often just the pine needles that dropped between the manzanitas, or a coffee can on the porch with a happy red geranium. It is now a romantic notion in our busy minds of how it used to be, but the times change and sophistication slips in on us. Sophistication has several meanings, but one obscure definition is the absence of nature.

Several years ago, I was asked to design a garden in a spot that I remembered for its old tangled growth and mysteriousness that only time can bring to a garden, and yes, it was neglected. I tried to be gentle with this almost spiritual feeling of the landscape, but lost in my effort to clean up before creating the new landscape. The completed garden took several months to develop, and when it was completed, it was new and fresh in a sort of negative way. The earlier essence was long gone and in its place was an adolescent waiting desperately for maturity.

I receive a number of landscape trade magazines and their pictures pridefully show the just finished, immature gardens with dots of color along the edge of a newly-sodded lawn with other just-planted shrubs in a gawky posture. All freshly mulched like the garden was just shipped in from the County Fair. If a person could add time as a quality in designing a garden, it would surely be included.

So the title of this piece is really just a subjective judgment and another dance around the old idea of what is beautiful. But beautiful doesn't have to be a consensus of opinion anymore than it has to follow obvious standards that lead to thoughtless boredom. A well-designed garden that becomes old and shows some neglect can be considered natural in a refreshingly laid-back way. It might even be considered real.

Gary Girard is a landscape architect an former Forest and Beach Commissioner

TREE NOTES

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

Pete Wilson, Governor, State of California

Richard A. Wilson, Director

Douglas Wheeler, Secretary for Resources, The Resources Agency

NUMBER: 3

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Controlling Bark Beetles in Wood Residue and Firewood

Sherburn R. Sanborn

Forester, Resource Management, P.O. Box 670, Santa Rosa, CA 95402-0670

Revised 1996 by Donald R. Owen,

Forest Pest Specialist, 6105 Airport Rd., Redding, CA 96002.

Each year, timber losses in California forests due to bark beetle attack exceed those caused by wildland fire. Drought conditions worsen this situation. It was estimated that 10 million trees were killed throughout the state in 1989 and 1990 alone, destroying enough timber to build one million three bedroom homes.

Many valuable urban landscape trees are also killed due to drought stress and bark beetle attack. In some urban areas of Southern California, pines are frequently killed by bark beetles transported in infested firewood obtained from dead and dying trees in the Southern Sierra Nevada (personal communication, Eric Oldar, CDF Service Forester). Firewood may harbor immature beetles (larvae) which complete their development, emerge, attack and kill nearby pines in the urban landscape. This problem may be occurring in other areas as well.

This article discusses several techniques that may be used by both forest landowners and urban dwellers to reduce tree mortality by reducing local bark beetle breeding sites. An important first step before applying any of the following techniques is to determine if a potential bark beetle problem exists. Next, identify the species of bark beetle infesting the wood as well as the species of tree (host) infested. Because host preference and life cycle are so variable among different species of bark beetles, reducing tree mortality may depend on

the proper selection and timing of control techniques. Because these techniques are preventative in nature, their use may be justified even where bark beetle problems do not exist. This is particularly true where high value trees, such as those in parks or residential areas, are at risk.

Firewood Pests and Regulations

Wood from tree removals, salvage logging, and forest thinning is often used for firewood. The freshly cut wood of many trees can attract bark beetles which can breed in it, while the wood of trees killed by bark beetles may harbor developing brood. Trees of particular importance are pine, true fir, Douglas-fir, elm and eucalyptus. Whenever wood is moved, there is a risk that associated insect and/or disease pathogens are moved as well. This can result in the introduction of new pests or exacerbate existing pest problems. Some bark beetle species become so numerous during periods of drought that they will mass attack and kill healthy trees.

Pine pitch canker is an incurable tree disease that has killed thousands of Monterey pines and other pines in the state. Bark beetles and other insects help move the disease around. Pine logs, firewood, branches, needles, and cones may all be a source of the disease. This material should not be transported from one part of the state to another unless you are sure it is disease-free. Contact your local Agricultural Commissioner's office or California Department of Forestry and Fire Protection forester to determine if you are in a pitch canker-infested area.

Elm wood is of particular concern because the European elm bark beetle which breeds in it vectors the Dutch Elm Disease (DED) fungus. The spread of DED over long distances has invariably been due to the movement of elm firewood from infested areas.

The eucalyptus longhorned borer (ELHB), a native of Australia, was introduced into Southern California in 1984. Since then, it has spread to a number of locations in the state. Many mature eucalyptus trees have been killed in areas where this insect has become well established. The movement of eucalyptus wood has become an increasing problem because ELHB and other introduced insects can be carried great distances in firewood. The transport of ELHB infested wood is prohibited under section 4714.5 of the Public Resources Code.

Firewood Tarping

Tarping and sealing wood piles with clear plastic is a very effective way to prevent the emergence of beetles from the wood. This technique will also prevent them from colonizing freshly cut un-infested wood. To properly tarp a wood pile you will need the following materials: Six mil clear plastic sheeting of a size sufficient to cover your wood pile. This material is available in various sizes at most hardware supply stores. If available, six mil ultra-violet (UV) resistant plastic sheeting such as CIL Durafilm

Polyethylene Greenhouse film is excellent. Do not use black plastic because beetles are attracted to areas that are lighter in color and they chew through it.

- Lumber such as 2X4's to use as runners to keep the wood off the ground.
- An old tarpaulin, carpet, cardboard, automobile tires or similar material to protect the plastic from tearing.
- Soil, gravel or other material to seal the plastic along the ground.

Figures 1 & 2 are examples of how to stack the wood. Use these examples and the following procedures to tarp it:

1. The wood stack can be any size provided it can be covered by a single sheet of plastic that will allow for 12 inches of overlap along the ground.
2. To aid in drying, keep the wood off the ground by stacking it on 2X4 runners. Placing the stack in partial sunlight will reduce drying time, minimize the breakdown of non-UV resistant plastic and render the wood unsuitable for beetle breeding.
3. Prior to covering the stack, make sure there are no sharp projections which could pierce the plastic. Place a tarpaulin, cardboard, automobile tires (see diagrams) or similar material over the top of the stack to protect the plastic.
4. Cover the stack with plastic allowing 12 inches of material to overlap along the ground (see diagram).
5. Seal overlap against the ground with soil, gravel or similar material. Tarp must be sealed entirely around the stack.

6. After sealing, the plastic may become tightly stretched over the wood stack. If this occurs, gently pull up on the plastic allowing 2-3 inches of slack to relieve strain. This will reduce punctures and tears. If the plastic is held too firmly against the bark, tarpaulin, cardboard or other materials, beetles will get between that material and the plastic and escape by chewing their way out. This would necessitate retarpping the wood.
7. Inspect tarping frequently for damage. Repair small holes and tears with duct tape. Larger tears may require retarpping.

Wood should be tarped for one season after cutting, from April 1 until November 1. Firewood seasoned in this manner through one spring and summer will not support beetle colonization. Any beetle brood present in the wood when it is tarped will be killed. Wood that is tarped dries more rapidly, particularly during the winter.

Slash Treatment

Slash is woody material generally consisting of branches and tops of trees left behind after commercial logging or thinning operations. Those materials with bark still attached may become a breeding site for bark beetles and can lead to a bark beetle population buildup. There are several techniques which can be used to render this material unsuitable for beetle breeding.

Lop and scatter involves 1) severing branches from bolts 3 inches or larger in diameter, and 2) scattering the branches and bolts so that they receive maximum exposure to the sun. This technique is recommended where pine trees are being logged or thinned particularly when beetles of the genus *Ips* are already abundant. Heat from the sun increases the temperature under the bark and hastens drying. Both heat exposure and drying can greatly reduce the breeding success of bark beetles. To be effective, lop and scatter slash within one week of slash creation. As an alternative, avoid activities in pine stands that will place "green" slash on the ground from February through June.

To be effective, the remaining techniques must be completed within five weeks of slash creation or before beetle broods emerge:

Piling and burning is another effective technique which will render the slash unsuitable for beetle colonization or will kill beetles infesting the slash. This may be a very cost effective approach in rural areas where burn permits (LE-7) can be obtained through CDF.

Chipping is a very effective way of reducing bark beetle population buildup in logging slash and wood residue from pruning, thinning or tree removal in urban areas. Chipping destroys most beetle brood present in the wood while leaving chips that are unsuitable for bark beetle breeding. Many tree services have chippers that can chip wood up to 12 inches in diameter. Whole-tree chippers are also available for biomass production.

Debarking logs, or bark removal, destroys the habitat where bark beetles breed and their larvae feed. Once removed, the bark and the wood are unsuitable for bark beetle breeding. The wood can then be left on site or used for firewood without concern. Wood that is still green or freshly cut is easier to debark than dry or seasoned wood. There are various devices available that can speed the process. They range from steel bars and chain saw attachments to commercial log debarking machines.

Chemical Control

Controlling bark beetle infestations through the application of pesticides have demonstrated varying levels of success. On commercial forest land, insecticides are costly and difficult to apply on a large scale. They can also disrupt the effect of natural enemies, and their effectiveness in controlling beetle outbreaks has been variable. In the urbanizing forest, it is possible to manage bark beetle-caused mortality with insecticide application as a temporary prevention measure or to reduce pocket killing. However, this should be considered a short term remedy used in conjunction with long term practices that improve the growing conditions for the tree.

Conclusion

Whichever technique(s) you choose, be sure to investigate the legal requirements pertinent to your activities. If you are involved in timber harvesting, insure that you are in compliance with the California Forest Practice Rules. The Registered Professional Forester (RPF) or Licensed Timber Operator (LTO) responsible for the timber harvest plan will be aware of current rules. If you plan to burn woody material, you will need a burn permit from the California Department of Forestry and Fire Protection (CDF) or other local agency. There are many communities that have ordinances restricting the removal of trees.

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Jesse Rios : Editor, Design and Layout
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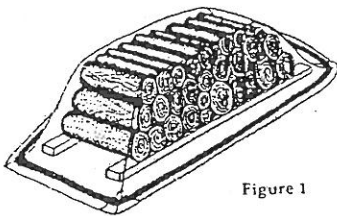


Figure 1

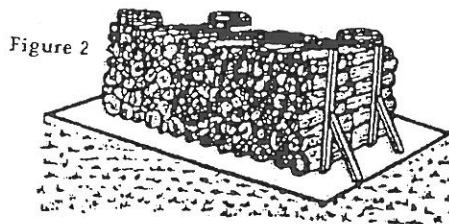


Figure 2

Principles and Recommendations Concerning Conservation of the Amount, Structure, and Integrity of Genetic Diversity of native Monterey Pines at Carmel-by-the-Sea and Environs

Prepared: October 25, 2001

Introduction

Genetic diversity is important to the ability of Monterey pine to inhabit different environments and to its longterm survival as a species. Genetic diversity provides the potential for persistence of a species through various changes in the environment. For example, with changes in climate or introductions of new insects or diseases, there is more potential in a genetically diverse and healthy forest to accommodate and survive these influences, than in a genetically impoverished or stressed forest. The maintenance of genetic diversity is also a relatively inexpensive management tool, as genetically based traits are inherited from one generation to another, without requiring the constant input of resources to maintain them.

In Carmel and surrounding areas, Monterey pine grows in contrasting contexts including native forests, transportation corridors, planted greenbelt areas, and natural and planted residential settings. Each of these uses has implications for the genetic and ecological well-being of the native forests, in addition to the value of the specific use. For example, planted Monterey pines in urban environments will influence the genetic composition of the nearby native forests through pollen and seed movement. Depending on specific choices, planted trees can either complement or undermine the local adaptations and longterm viability of Monterey pine forests. Similarly, planted trees can either complement or detract from other processes and values of the native forests (e.g., wildlife habitat, soil composition, disease dynamics) depending on the specific decisions involved in planting projects. Because of the interconnections via genetic exchange, disease transfer, and ecological processes among the native Monterey pine forests and the various extended and introduced uses of Monterey pine, it is recommended that science-based information pertaining to the pines and other forest species and processes be appropriately considered and incorporated into decisions at the various scales (e.g., city, county, regional, state) and with the various constituencies (e.g., private, NGO, public) that influence Monterey pine forest health. Furthermore, it is recommended that any practice that involves selective removal of Monterey pine trees, or planting of trees, be carefully planned and reviewed in the context of the overall and longterm ecological and genetic consequences for Monterey pine forests.

Provided here are some principles and recommendations to assist in genetic conservation of Monterey pine. As there isn't much specific information on spatial structure of genetic diversity in the (former or current), Carmel-area forests or on distances of pollen travel within this region, the recommendations are mostly based on genetic principles and rules of thumb for genetic conservation.

General Genetic Principles

In general, it is best to maintain as much of the natural genetic diversity in Monterey pine as possible. Activities that can reduce genetic diversity include removing individual trees, harvesting/converting forested areas, planting clonal material, planting many seedlings from one parent tree or a narrow genetic base, etc.

The integrity or local adaptations of Monterey pine should be maintained. Activities that can compromise genetic integrity, over the long run, include planting trees from nonlocal or unknown sources.

The natural genetic diversity of Monterey pine may have spatial patterns. That is, the remaining (or former) trees in one geographic area (e.g., along the coast) may have some different types of genetic diversity or different adaptations than trees in other areas (e.g., further inland, higher elevation, different soil type, etc.). It is important, to the extent possible, to respect these patterns; maintaining the structure of genetic diversity.

Activities that tend to support the native levels and structure of genetic diversity in Monterey pine are the using seeds from local (native) trees in replanting programs, planting more seedlings than are desired at maturity, and allowing for natural selection to play a role in determining which trees survive, which remain healthy, and which reproduce.

Recommendations

1. Keep records on individual trees and forested areas that identifies, if possible, whether the trees are native or have been planted. For all current or future planting efforts, keep record of the genetic source of the seedlings (i.e., not just the nursery, but the geographic area from which the seeds were collected).
2. For any planting projects of Monterey pine (individual pines or reforesting areas):
 - a. Use seeds collected from trees in a similar ecological/geographic area (i.e., rather than seeds from a distant or different area, from a different region of Monterey pine (e.g., Cambria), or imported seeds (e.g., from New Zealand). Be sure to match the characteristics of the source tree's environment with the planting environment. That is, until/unless there is further genetic information available at that time to warrant lumping, I would take the approach of keeping the seedlings segregated by 'site type' and using only those site-matched seedlings for replanting events.
 - b. To the extent possible, allow natural screening by planting several seedlings and allowing for some to die or be removed later.
 - c. Plant seedlings rather than clonal material, thereby maintaining more genetic diversity, unless there is a well-supported reason to plant clonal material.

3. Maintain seedbanks, if possible, of local native Monterey pine. To develop these seedbanks, the following principles should be employed:
 - a. Avoid collecting from any non-native or planted trees (as the latter may not be local in origin).
 - b. Sample from a range of tree sizes, as a proxy for tree age (and thus getting different pollen mixes and natural selection pressures, etc.). One could also sample the same tree in different years to get some variation.
 - c. Sample from many native trees over the full natural range that they occur in the region. If possible, don't collect from immediate neighbors as they may be closely related and have similar genetic compositions.
 - d. Avoid sampling from trees that are isolated by long distances from other Monterey pines. These trees, because of their distance from others, may have high levels of inbreeding in their seeds.
 - e. Collect cones from several heights and different aspects of the tree. By collecting from different sites within the crown, you will again be increasing the chance that you're sampling from different pollen donors, different selection pressures (e.g., amount of heat due to differences in aspect) on the seeds (determining differential survival of seed, etc.), etc.
 - f. Keep records on the location and site characteristics of each tree from which seed were collected.
 - g. Maintain the identity (i.e., parent tree location/information) of the seed collected from each tree or area to allow proper matching for planting needs.
 - h. In the absence of direct information on how genetic diversity is structured (or spatially arranged) in the Carmel area, use proxies such as: elevation, soil type, riparian or other habitat type, differences in associated vegetation, distance from the ocean, etc. That is, select trees from a range of these categories over the entire (Carmel) area.
4. If individual native trees, or forested areas, have to be removed (e.g., for safety or other reasons), collect seeds from these trees and deposit them in the seedbank prior to removal.
5. Avoid applying unnecessary filters in seed collecting, seedling development, or planting decisions. Rather, try to sample the native genetic diversity as broadly as possible and allow natural selection to play a role in determining which trees survive and reproduce in the long run. Strongly selecting for certain traits (e.g., fast growth, insect resistance) could have the inadvertent impact of removing some genetic diversity that could have been useful to Monterey pine in surviving future influences.

Related Issues

Education: There is a need to increase the genetic literacy among the general public as it pertains to the conservation and management of Monterey pine. There is lack of understanding of the long-term consequences of using a small genetic base (which is superficially appealing because of uniformity) for planting purposes. This lack of understanding may reduce the suite of options for conservation-related management. For example, one possible manifestation of genetic illiteracy could be public intolerance of diversity in planting stock and/or intolerance to accepting some survival risk (e.g., in the seedlings) by using an array of individuals rather than clones. Although it may be appealing to plant clonal Monterey pines that have some particular feature, doing so may—if planted in many copies over a broad area for a long period of time—contribute to lower genetic diversity in natural Monterey pine forests because of the lower genetic diversity in the pollen and seeds of these clonal trees. There is considerable evidence for inbreeding depression in Monterey pine. The public could assist in good genetic conservation strategies by using locally-adapted Monterey pine planting stock (rather than trees from a different geographic area or an unknown geographic source), by using seedlings rather than clonal material, and by planting a larger number of trees each with some survival risk rather than trying to install a few trees with perhaps lower individual survival risk but with less genetic diversity. This would allow more opportunity for natural selection, maintenance of genetic-environmental relationships, and maintenance of genetic diversity.

Pitch canker resistance: Introduced diseases stimulate debate and research concerning the most appropriate, if any, management response. Currently, the nature and genetic basis of resistance to pitch canker are not well understood. As a species, Monterey pine is one of the least resistant among the 23 pine species studied for resistance to pitch canker (in one study). Results of controlled studies may vary according to the source of genetic material for the pines, the type of fungal isolates used, the infection protocol, and how resistance is measured. One greenhouse study found little resistance to pitch canker among samples from the native mainland and Cedros populations of Monterey pine. In other studies, variability in susceptibility among individual trees of Monterey pine suggests there may be some genetic basis. The diversity within the fungus (measured in one system as vegetative compatibility groups, VCGs), coupled with evidence for recombination between VCGs of the fungus in the laboratory, suggest that there is the potential for a dynamic relationship between host and pathogen. Furthermore, there is the possibility that different genotypes of Monterey pine may have different susceptibilities to infection by different strains of the pathogen, although there is no evidence of this to-date for pathogen strains resident in California. However, exotic strains (from México and Florida) have been found that are more virulent than resident strains, based on growth chamber inoculations. Such strains could compromise genetic resistance in some Monterey pine genotypes.

Numerous laboratory, nursery, and field trials are in progress and planned which should elucidate genetic relationships. Any breeding and delivery program aimed at providing disease-resistant trees for use within the genetic sphere of influence for native Monterey pine populations should be well-informed about the genetic basis of resistance for that disease, the inheritance of the desired trait, its interaction with the environment, and the overall impact of artificially selected genotypes on the genetic diversity and population viability of Monterey pine. Any such program should not unnecessarily screen out potentially valuable genetic diversity. Deployment of propagules from such programs should proceed only when and if their use is well reasoned and well informed. Natural regeneration and selection processes should be encouraged and accommodated as much as possible, and unnecessary artificial selection should be avoided. Given the long-lived nature of Monterey pine and the uncertainty of how any resistance may play out over the lifetime of an individual tree, the potential for complex interactions between the pines and new variants of an introduced pathogen, and the potential to inadvertently screen out valuable genetic diversity, a cautious and conservative approach to any genetic manipulation motivated by introduced biotic influences is indicated. A crucial factor is that disease resistance is almost always just one of many components of fitness, and any selection for resistance is likely to incur a cost in the selection differential for other fitness components. A large palette of genetic diversity, expressed in good levels of regeneration, will allow scope for strong natural selection to operate in a biotic crisis.

Deborah L. Rogers, Ph.D.
Conservation geneticist, Genetic Resources Conservation Program
Founding Director, Monterey Pine Forest Ecology Cooperative
University of California