

SACRAMENTO URBAN FOREST MANAGEMENT PLAN

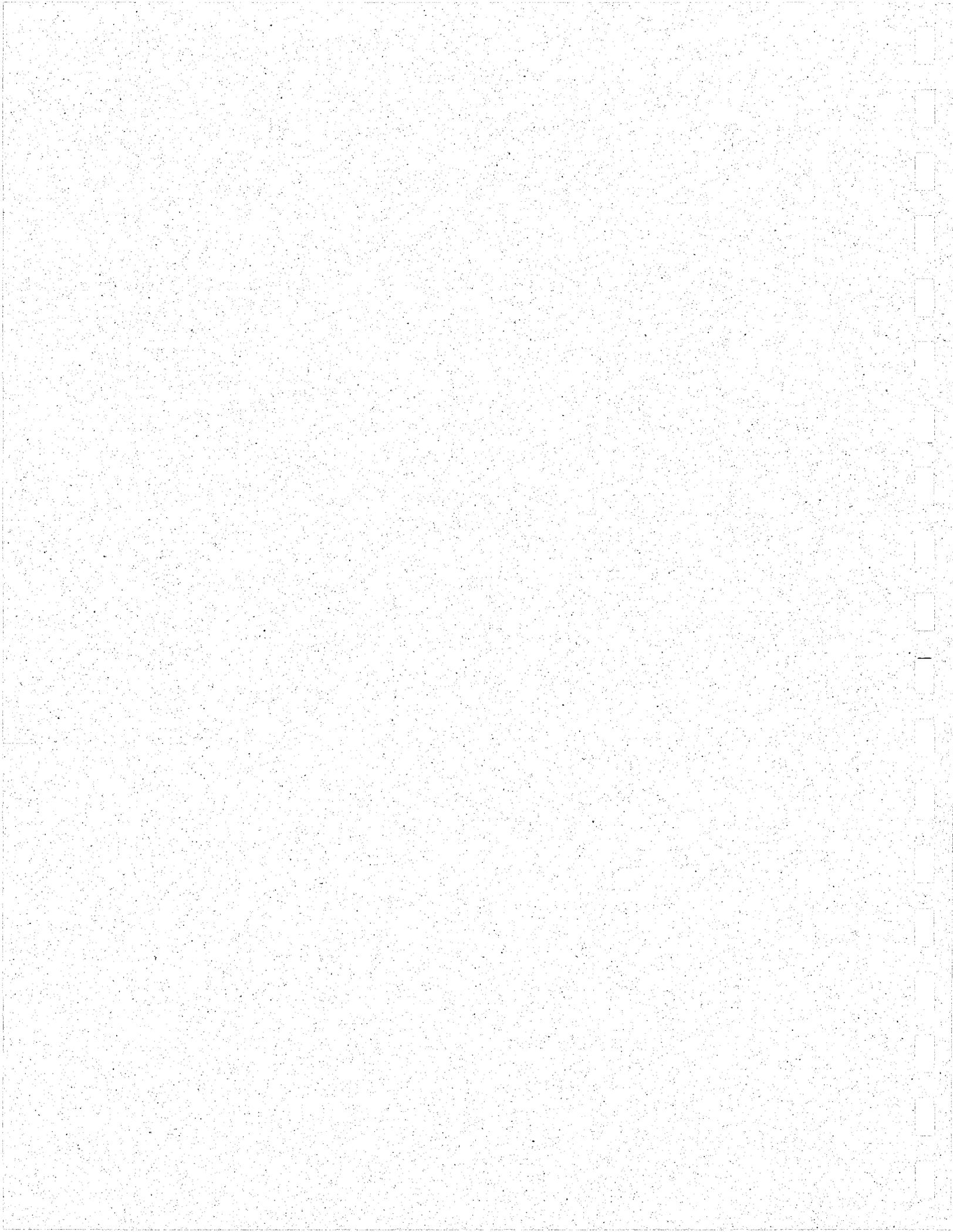


PREPARED FOR
CITY OF SACRAMENTO
NEIGHBORHOOD SERVICES DEPARTMENT
Formerly Parks and Community Services

BY
WOLFE MASON ASSOCIATES

In association with:
Royston, Hanamoto, Alley & Abey
Michal C. Moore

April 1994



CITY OF SACRAMENTO URBAN FOREST MANAGEMENT PLAN

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EXECUTIVE SUMMARY

SACRAMENTO URBAN FOREST MANAGEMENT PLAN

The Urban Forest Management Plan is a comprehensive guide to maintaining Sacramento as the "City of Trees". The Urban Forest includes all the trees of our City both public and private. As such, the Management Plan gives recommendations on how the City, private businesses and homeowners can participate in preserving one of our most unique resources. The Management Plan focuses on how the City can stretch limited financial resources to provide care for our valuable urban forest. Several service menus have been developed to help the community and decision-makers choose levels and types of tree care appropriate for our community.

GOALS OF THE MANAGEMENT PLAN

1. Establish a value for Sacramento's urban forest that acknowledges the environmental, economic and aesthetic benefits of a healthy and diverse tree population.
2. Integrate existing tree management policies and practices into one cohesive and consistent document.
3. Develop a proactive approach to urban forest management using sound forestry principles to increase efficiency and cost effectiveness.
4. Integrate design guidelines into a cohesive City-wide tree plan that ties together existing and future residential areas, commercial areas, and major transportation corridors and gateways.
5. Define the scope of responsibility for municipal tree care and identify the costs and funding sources necessary for tree maintenance.
6. Record uniform, professionally accepted practices and standards for all tree-related work.
7. Increase public awareness and stewardship of trees.

SACRAMENTO'S TREES

The urban forest includes all of the trees in the City of Sacramento. **Public Trees** are trees located in the public right-of-way, or on other public lands such as golf courses or parks. It is estimated there are approximately 92,500 public trees in the City which are maintained by City Tree Services. **Maintenance Easement Trees** are trees located in the maintenance easement (a utility access

easement on private property running approximately 6.5* feet back from the property line). These are very visible privately owned trees of importance to the street scape and urban forest. There are over 57,000 maintenance easement trees. **Private Trees**, outside of the Maintenance Easement and public right-of-way, encompass an estimated 500,000 or more trees located on private lands outside of the maintenance easement. All of these trees contribute to the heritage of Sacramento as a "City of Trees". Trees are one of Sacramento's most valuable assets with appraised value of public trees and maintenance strip trees estimated at \$176 million.

ISSUES AND OPTIONS FOR MAINTAINING THE URBAN FOREST

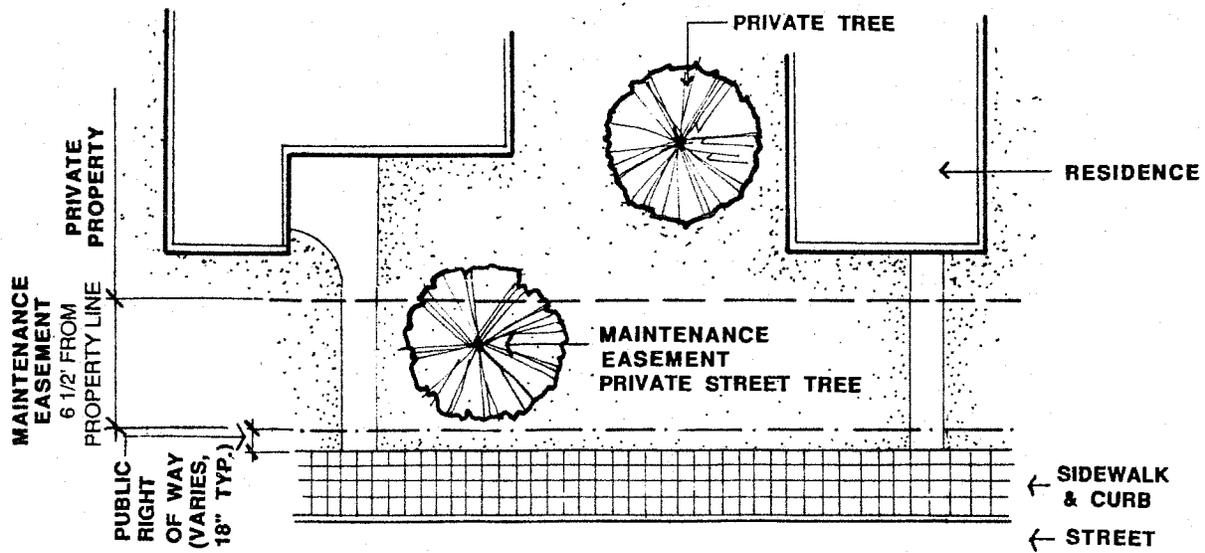
The Plan identifies several issues related to tree care which require public attention and guidance.

Issue 1: Care for Public Trees

How can the City increase the frequency of street tree maintenance necessary to maintain a healthy urban forest?

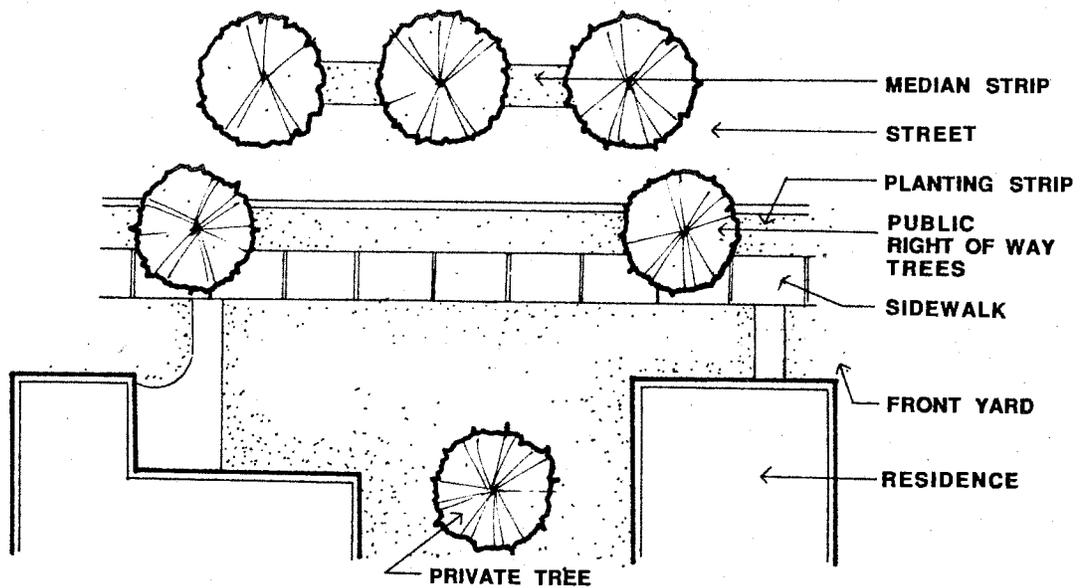
There are over 92,500 public trees in the City that provide distinction to our streets and parks. Many of these are mature trees that require attention for the health of the tree and public safety. Tree care specialists recommend routine trimming every 5-7 years. Currently, the City is providing an average pruning rotation of once every 12-14 years leaving the tree population more susceptible to disease and posing potential public safety hazards. Before 1990, when the City attempted to maintain both the public trees and the maintenance strip trees with available financial resources, the cycle for care was in excess of 20 years.

The Management Plan presents three basic options for achieving a healthy care rotation for the City's trees; these are tree care rotations of every 6, 8 or 10 years. The consultants recommend that the City increase the frequency of trimming rotations beyond the current 14-20 year rotation cycle. To accomplish this, the Management Plan recommends a "proactive" approach to tree care to reduce travel and work time per service call. Currently, under a "reactive" (complaint response program) the average cost of care per tree is \$163.39; under a proactive basis, the average cost could become \$43.21 over time as the benefits of a proactive program take effect. This means that the



NOTE: MAINTENANCE EASEMENT IS PRIVATE PROPERTY. PUBLIC FUNDS MAY BE USED TO MAINTAIN IF DETERMINED BY CITY.

RESIDENCE WITHOUT PLANTING STRIP



RESIDENCE WITH PLANTING STRIP

Figure 1. Residential Public/Private Tree Jurisdiction

City can expand service with limited fee increases to the citizens and achieve our goal of increased tree trimming rotations.

Issue 2: Trees in the Private Maintenance Easement

Who should be responsible for trees in the "private maintenance easement"?

Until 1990, the City attempted to help homeowners provide care of trees in the "private maintenance easement" (See Figure I). Trees in this easement are in close physical and visual proximity to the public right-of way trees. Public tree care was discontinued until a public consensus on financing for the service could be developed. There are over 57,000 trees affected by this change in service.

There are three basic options for trees in the private maintenance easement:

1. Continue to provide technical assistance ("self-help") to the property owner regarding tree care; however, the homeowner would still be directly responsible for the costs of tree care. This is the current level of service. This option provides assistance to the homeowner in identifying tree trimming work which needs to be done and in selecting a contractor at a competitive price. A budget to help defray a portion of the costs of tree care is suggested to assist persons on fixed income or hardship cases. While incentives are included in this option and greater participation is anticipated, all of the problems stated in option one apply here as well. Consistent, comprehensive tree care of maintenance strip trees will depend on the voluntary efforts of the property owner. This option also does not provide assistance to persons on fixed income or provide incentives for absentee owners to care for trees.

2. Make this a homeowner responsibility. This practice would mean that homeowners directly bear the cost of tree care for trees in the maintenance strip. Since there is no public enforcement of property owner's responsibility for tree care, and compliance will be voluntary, this may result in inconsistent or infrequent level of care these trees require to maintain tree health and human health and safety. Additionally, since the private maintenance strip trees are in close physical proximity, any pest or disease problems resulting from a lack of care will more easily spread to the public right-

of-way trees adjacent to them. This option presents the least comprehensive approach to urban forest management.

3. Increase public funding and add "maintenance strip trees" as part of the City's responsibility. Under this option, the maintenance strip trees would be maintained as part of the systematic care rotation for public trees. An underlying assumption of urban forestry management is that *all* trees within the population be maintained for the health of the forest and for human health and safety. Following this assumption, care of the private maintenance strip trees can either be provided by the City for a small annual tax or by the property owner who will bear the full cost of a private contractor. This option provides the most consistent, comprehensive care to all trees.

Issue 3: Preserving the Old Trees/ Encouraging New Trees

How can we preserve existing trees and encourage new plantings in a fast paced, growth oriented urban setting?

In newly developed areas, the City intends to ensure that the heritage of tree lined streets continues and in redevelopment areas to limit unnecessary tree removals or damage to existing mature trees.

The Tree Management Plan makes several recommendations for accomplishing the above objectives:

1. Encourage the preservation and enhancement of Sacramento's large tree population with adequate funding for large tree maintenance and by planting large canopy species wherever planting space allows it.

2. Revise the existing Tree Ordinance to make it as comprehensive as possible by consolidating references in existing ordinances and adding new sections where appropriate. Examples include setbacks for new highrise buildings that allow adequate space for existing trees to thrive also ensure that pruning of mature trees is done to professional standards by qualified tree care providers.

3. Set a goal of planting 3,000 new trees per year in order to keep pace with growth and renewal of the tree stock. Where space allows, large canopy shade trees are recommended. This would increase 1,200 trees over the current

planting rate.

4. Improve communication and coordination between City Tree Services and other City departments and community organizations. These steps would serve to preserve existing and heritage trees during plan review and to provide increased public education and support for the City's urban forest.

5. Develop design criteria for major commercial corridors and gateways to help define our City by the character of the trees.

Issue 4: Neighborhood and Resource Efficiency

How can the City and community work more closely to implement the urban forest concept in all neighborhoods?

All areas of the City have trees but have different tree care needs. In newer areas, younger trees may require special care to thrive; in older areas, mature trees need trimming and for some species (elms) special pest control procedures. The species of trees and planting patterns help define different sectors of the City. The Management Plan defines different tree population types for 28 neighborhoods within the City and recommends general tree management strategies for each. Implementing the Urban Forest Plan will require the City to understand different geographic areas of the City, establish connections with community groups, and be able to monitor and respond to neighborhood-specific tree issues.

The Management Plan recommends that the City enhance tree education and community involvement. Highlights include:

1. Divide the City into geographic zones and assign a tree crew to work in each major area. This will assist in implementing a proactive tree care program; strengthening community leadership and relationships and provide mutual understanding of neighborhood specific tree care issues.

2. Establish a new position of Community Education Coordinator to help organize volunteer efforts and work with the Sacramento Tree Foundation, schools, community groups, builders and developers, and other City departments.

3. Use private contractors for selected tree trimming and removal activities where the private sector can provide services more efficiently. The

Management Plan analyzes a range of options from all services provided by the City to all services contracted out. The most efficient method is to allow the City to maintain in-house tree crews for quick and consistent response to emergency and some "reactive" (requested) trimming as well as "proactive", or scheduled trimming. The remaining proactive work would be contracted for large, easily monitored work assignments through a competitive bidding process.

4. Institute a proactive tree care routine by dividing the City into logical geographic service areas. A City Tree Services crew would be assigned to each of the geographic areas to strategically ensure routine tree care is addressed in a consistent manner. This will save the unnecessary time and expense of "reactively" responding to tree care requests in remote and unrelated sections of the City. It will also allow the Tree Services staff to gain familiarity with neighborhoods and to help address problems specific to a given neighborhood such as mistletoe and replanting needs. Over time, as the proactive program is implemented, fewer reactive requests for tree care will occur. However, all of the above can only be accomplished where the rotation cycle is short enough in time to avoid the need for emergency response before the next scheduled visit.

To date, the ability of the City to provide assistance to these projects has been limited because routine service requests have been overwhelming. Many tree issues can be effectively solved through neighborhood liaison efforts, and current City programs (such as the "Tool Lending Program") can be more effectively administered.

Issue 5: Healthy Urban Forest and Tree Species Selection

What are the key ingredients for a healthy urban forest?

Diversity of age and species are key to a healthy urban forest. Currently, 78% of the public tree inventory is mature and continuing to age. With respect to species, Sacramento has an abundance of ash, elm and plane trees which are prone to diseases.

To avoid the problems of monoculture and an even-aged tree population, the Management Plan recommends species and age diversity. For example, in areas where ash trees are overabundant and subject to mistletoe infestations, selective

reforestation to introduce a more appropriate species is recommended.

The Plan also includes a species planting list appropriate for Sacramento and includes a Tree Planting and Maintenance Manual to ensure that proper procedures for planting and tree trimming practices are consistently administered.

Issue 6: Funding and Service Options

How should we finance tree care programs?

The attached tables review different funding and service provision scenarios. There is a "basic" services budget which is recommended to maintain primary operations. Also, different combinations of recommended services and expansion areas are provided. In order to accelerate tree care rotations for public trees or to assist private maintenance strip trees, an increase in budget is required. The Tables will help the reader understand what the cost of services are, and what additional cost a property owner would be asked to pay yearly for each service. Sources of funding could include bonds secured by assessments, Lighting and Landscape Act fees, developer fees or Mello-Roos assessments in developing areas of the City. These should be applied in a consistent manner, for commercial or large residential parcels as well as neighborhood residential. The current Lighting and Landscape District makes a provision for this distinction.

Service and Cost Options for Tree Maintenance

Maintaining a healthy urban forest means making conscious decisions on how to best spend limited resources. The attached tables outline various service options and their costs. The key terms and methods to explain the options available to the City are outlined below.

1. Table 1: Basic Services: This table itemizes the most basic services required for a tree care program **excluding** tree trimming costs which may vary depending on the service option selected. These are fixed costs.

2. Table 2: Tree Trimming Service Options: This table presents several options and the associated costs for tree trimming. The table presents options for care of both public trees and private trees in the maintenance strip. As noted above, at one time the City could afford to also maintain maintenance strip trees. However, due to budget

constraints this service was discontinued. Therefore, the table outlines the costs of restoring service to these trees under various options.

3. Table 3: Service Menu: By combining the basic services budget (Table 1) with any combination of tree trimming options (presented in Table 2), a "menu" of service options can be identified.

EXAMPLE: Basic Service Cost -fixed costs (Table I)

+Tree Trimming Option -varied costs (Table II)

=Service Menu Option (Table III)

4. Table 4: Funding Summary: The last table summarizes (1) existing funding sources, (2) new sources needed for each service menu, and (3) the fee impact of the additional revenue needed.

5. Assumptions: Certain assumptions are included in each service option. For example, it is assumed that the existing City Tree Services Staff numbers would remain constant and that any increased tree maintenance work load would be handled by competitively bid contracts with qualified tree care firms. For nearly all service options, a **proactive** maintenance program is assumed because of the inherent cost savings. Proactive tree care means that the City would pursue planned, routine care of trees by systematically addressing sections of the City one at a time. This reduces travel time and other costs by service call, resulting in the ability to better maintain more trees per year. Proactive tree care benefits, however, are only realized when the rotation period is short enough to reduce the need for emergency tree care between scheduled visits.

Prorating the costs between commercial or large parcels, not only residential lots should be continued similar to the criteria established in the current Lighting and Landscape District.

Table I. Basic Services Budget

<u>SERVICE</u>	<u>ANNUAL COST</u>	<u>COMMENTS</u>
1. Planting and Nursery Operations		
a. Nursery Operations	\$ 360,000	
b. Replacement Trees (750 per year)	\$ 16,000	
c. New Tree Plantings (750 per year)	\$ 16,000	
2. Removal of Diseased or Dead Trees	\$1,040,000	800 Trees/Year
3. Feeding, Root Pruning and Pest Control	\$ 770,000	
4. Tree Trimming	Varies	See Service Options Chart
a. Public Trees		
b. Private Maintenance Strip Trees		
TOTAL BASIC SERVICES <u>EXCLUDING</u> TREE TRIMMING \$2,389,000		
5. Coordination and Education*	\$ 75,000	
* New recommended budget item, not included in the current budget.		

Table II. Trim Cycle Summary Chart for Trees

<u>SERVICE OPTIONS</u>	<u>ANNUAL COST</u>	<u># TREES TRIMMED</u>
A. PUBLIC TREES (Trees in the City Right of Way)		
a. Proactive 10 Year Rotation	\$1,290,243	18,695 trees/year*
b. Proactive 8 Year Rotation	\$1,872,627	20,601 trees/year*
c. Proactive 6 Year Rotation	\$3,302,076	23,507 trees/year*
d. Current Reactive Program	\$ 816,953	5,059 trees/year*
(12-14 year rotation)		

*These are estimated numbers based on a fully operative proactive program. During the transition years this number will be less.

<u>B. TREES IN THE PRIVATE MAINTENANCE STRIP</u>	<u>ANNUAL COST</u>	<u>COMMENTS</u>
a. No City Assistance	\$0	
b. City Education and Self Help Program with Tree		
Maintenance Standards for private contractors		
c. Self Help Incentive Rebate Program	\$142,000	
d. City Maintains All Maintenance Strip Trees (57,500 trees)	\$342,000	
1. 6 Year Rotation (contract costs)	\$1,005,242	19,902 trees annually
2. 8 Year Rotation (contract costs)	\$638,151	18,219 trees annually
3. 10 Year Rotation (contract costs)	\$ 487,588	17,175 trees annually

*Refer to Figure I. Public/Private Tree Jurisdiction.

TABLE III. SERVICE MENUS

<u>SERVICE OPTIONS</u>	<u>ANNUAL COST</u>	<u>COMMENTS</u>
1. CITY PROACTIVELY MAINTAINS ALL PUBLIC AND MAINTENANCE STRIP TREES (6 YEAR ROTATION)		
a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$3,302,076	6 Year Rotation
c. Maintenance Strip Trees	\$1,005,242	6 Year Rotation
TOTAL:	\$6,693,318	
2. CITY PROACTIVELY MAINTAINS ALL PUBLIC AND MAINTENANCE STRIP TREES (8 YEAR ROTATION)		
a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,872,627	8 Year Rotation
c. Maintenance Strip Trees	\$ 638,151	8 Year Rotation
TOTAL:	\$4,899,778	
3. CITY PROACTIVELY MAINTAINS ALL PUBLIC AND MAINTENANCE STRIP TREES (10 YEAR ROTATION)		
a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,290,243	10 Year Rotation
c. Maintenance Strip Trees	\$ 487,588	
TOTAL:	\$4,166,831	
4. CITY PROACTIVELY MAINTAINS ALL PUBLIC (10 YEAR ROTATIONS)/ MAINTENANCE STRIP PRIVATELY MAINTAINED		
a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,290,243	10 Year Rotation
c. Maintenance Strip Trees	\$ -0-	
TOTAL:	\$3,679,243	
5. CITY PROACTIVELY MAINTAINS PUBLIC TREES (8 YEAR ROTATIONS)/ MAINTENANCE STRIP TREES PRIVATELY MAINTAINED		
a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,872,627	8 Year Rotation
c. Maintenance Strip Trees	\$ -0-	
TOTAL:	\$4,330,627	
6. CITY PROACTIVELY MAINTAINS PUBLIC TREES (8 YEAR ROTATION)/ SELF HELP PROGRAM FOR MAINTENANCE STRIP TREES		
a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,872,627	8 Year Rotation
c. Maintenance Strip Trees	\$ 142,000	
TOTAL:	\$4,403,627	
7. CURRENT CITY REACTIVE MAINTENANCE PROGRAM (12-14 YEAR ROTATION)/ SELF HELP PROGRAM FOR MAINTENANCE STRIP TREES		
a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$806,097*	12 Year Rotation
c. Maintenance Strip Trees	\$ 0	
TOTAL:	\$3,195,097	

*Current level of funding includes a \$200,000 augmentation which is essential for maintaining current level of service. Half of this is budgeted for trimming service request backlog, and half is budgeted for contract proactive trimming in the Downtown area of the City.

Table IV. Program Options per parcel Fee Impact

<u>REQUIRED FUNDING BY SERVICE MENU</u>	<u>EXISTING RESOURCES</u>	<u>ADDITIONAL FUNDS REQ'D</u>	<u>FEE IMPACT PER PARCEL</u>
Menu 1: \$6,765,318	\$3,196,000	\$3,565,318	\$24
Menu 2: \$4,968,778	\$3,196,000	\$1,768,778	\$12
Menu 3: \$4,235,831	\$3,196,000	\$1,035,831	\$7
Menu 4: \$3,748,243	\$3,196,000	\$548,243	\$4
Menu 5: \$4,330,627	\$3,196,000	\$1,130,627	\$8
Menu 6: \$4,472,627	\$3,196,000	\$1,272,627	\$9
Menu 7: \$3,200,000	\$3,196,000	\$0	\$0

*The City currently supplements treemaintenance funding through a City-wide Lighting and Landscape District. Approximately \$9 per parcel goes to landscape maintenance with a fraction of that for tree management.

IMPORTANT TREE FINDINGS

■ Sacramento is the City of Trees. The City has over 750,000 trees of which 92,500 are public trees along streets or in parks and medians; 57,500 are private located within the private maintenance strip that add to the streetscape; and an additional 500,000 are located on exclusively private lands.

■ Trees, like any other investment, need ongoing care to preserve their value. Sacramento is at a critical cross-roads where continued deferred maintenance will result in the premature loss and decline of one of our most significant resources.

■ 80% of the City's tree stock is mature or declining. To maintain a healthy canopy throughout the City, mature trees need routine trimming and care and declining trees need to be selectively removed and replaced. In addition, an aggressive tree planting program is needed to ensure that as the existing tree stock grows old and dies, new trees are maturing to take their place.

■ Sacramento has an abundant ash (11% of the tree population), elm (4%) and plane tree (12%) population. While these trees provide beautiful canopies, they are also prone to a variety of diseases and pests. Increasing the diversity of species can help reduce loss of trees and spread of diseases. The plan recommends no more than 5% of the population be comprised of any one species.

■ Trees are one of our most valuable community assets and they increase in value over time. To replace just the trees along our streets and public areas would cost over \$176 million.

■ Recent research conducted in conjunction with SMUD estimates that the average homeowner can reduce air conditioning costs by 20-57% if shade trees are strategically planted. SMUD promotes this energy saving, and as a result, is dedicated to an aggressive tree planting program as an energy conservation strategy.

■ The American Forestry Association estimates the average economic contribution of a tree per year to be: \$73.00 in energy conservation; \$75.00 for erosion control; \$75.00 for wildlife shelter; and \$50.00 for air pollution benefits. Over the lifetime of an average tree, a tree provides over \$57,000 in economic and environmental benefits.

■ Several studies indicate that mature trees increase a homeowner's property value by 7-10%.

■ A survey of citizens participating in the tree workshops for this master plan stated that trees are essential for defining a "sense of place" for a neighborhood. After reviewing the value of trees, nearly all respondents agreed that modest annual contributions to preserve trees was desirable.

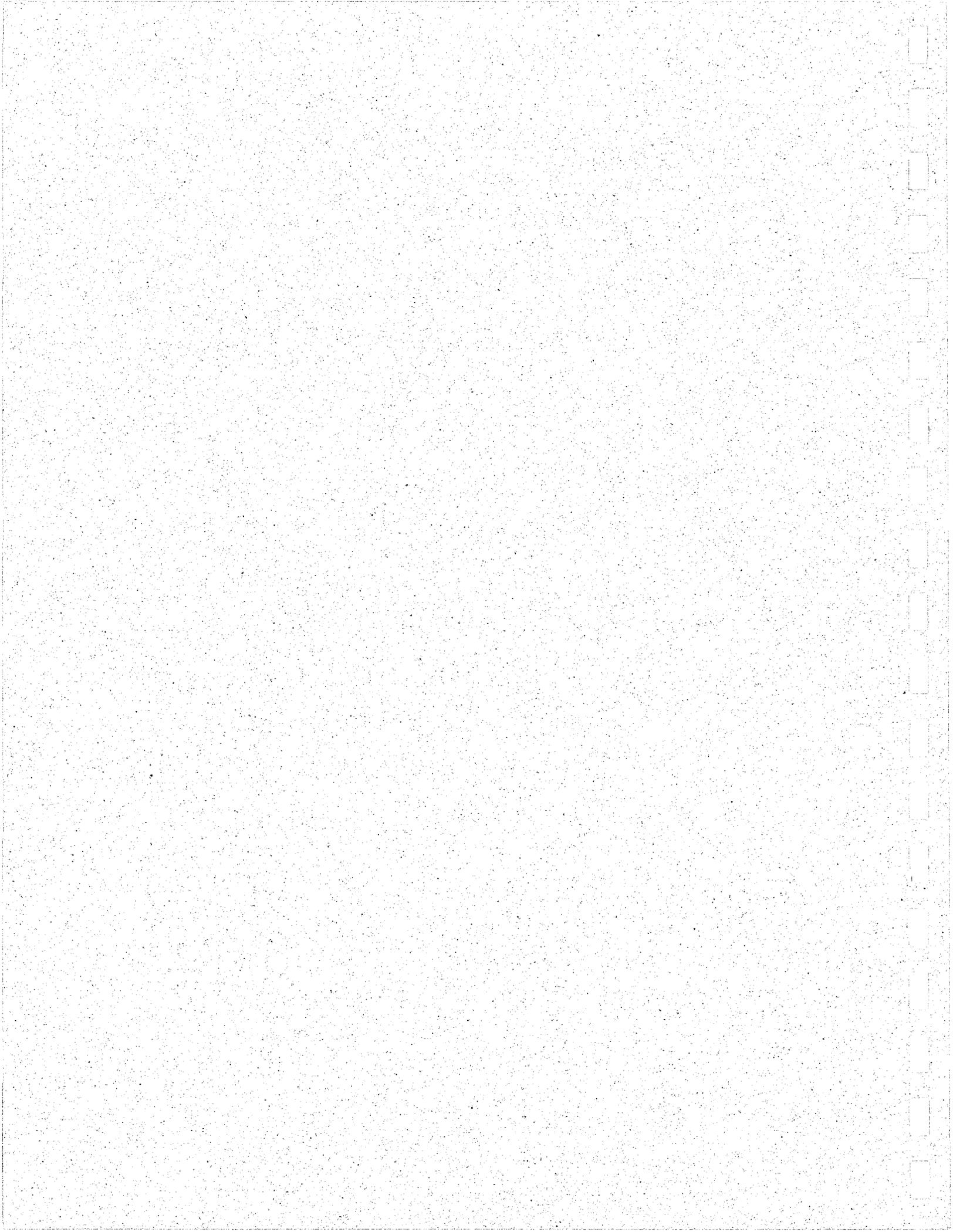
COUNCIL ADOPTION

■ The next page indicates adoption of the Master Plan by the City Council. Due to budget constraints, Menu 7: Existing Budget, Public Trees Only (12-14 year rotation) was selected with a Goal of reaching Menu 1: Public and Maintenance Easement Trees (6 year rotation). Staff was directed to work with SMUD to address trees as part of the City's Utility/Energy service.



Chapter One: Introduction

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I INTRODUCTION

A. IDENTIFYING THE ISSUES

Sacramento is known as the 'City of Trees'. This reputation is well deserved given the visual images of beautiful tree-lined streets that surround the State Capitol, the groves of specimen trees that cool the parks, the shade canopies that cover neighborhoods and the native species which line rivers and greenways. However, Sacramento's legacy of trees poses many challenges in today's environment of shrinking budgets, staff cutbacks and deferred maintenance. Presently, the City's Tree Services Division can not provide the professional level of care required to maintain a healthy urban forest. While the number of trees has increased 20% since 1970, the staff required to maintain them has dwindled 30%. Trees require a regular pruning rotation, usually every 3 to 10 years depending on age and species. Tree maintenance in Sacramento is reactive, which means that trees only receive care in emergencies or in response to a two-year service request backlog. As a result, trees only receive care every 12 to 14 years or 20 years before the owner is given responsibility for front yard trees. In contrast, other cities with large tree populations, such as Milwaukee, Seattle, Minneapolis and Modesto, have implemented "pro-active" maintenance programs by providing regularly scheduled tree pruning every 5 to 6 years.

With a mature urban forest subject to many years of deferred maintenance, the City recognized the mounting tree care problem. City staff needed to contend with human health and safety issues including safety pruning around traffic signs, preventative storm damage, mounting pest and disease infestations, increasing emergency

calls and the staff's inability to respond to citizen requests in a timely manner.

As an interim measure, the City Council in 1990 placed a tree maintenance moratorium on 57,500 trees within the private maintenance strip, turning responsibility of care over to property owners. Although this has reduced City liability and maintenance costs, tree health will continue to decline without adequate funds and education for the private sector's new burden. Since the public tree program is primarily financed through the General Fund, the program is annually subjected to competition from other City services and faces an unstable future.

Tree issues touch on all sectors of the community. Trees are classified as public or private depending on where they grow. Care of trees in the public right of way is handled differently than maintenance for ones on private property. With increased development pressures in the Downtown, large trees are in danger of being replaced with small ones when new structures are constructed. This not only affects the character of the area, but also reduces the environmental benefits of shade and carbon dioxide mitigation. Trees are abundant in Downtown and older neighborhoods but sparse along major arterial streets, medians, entry ways and new developments. Strategic and substantial tree planting in these areas will play a major role in strengthening and unifying Sacramento's community image as the 'City of Trees'.

Problems with tree maintenance and management have negative consequences which are compounded over time. Deferred maintenance results in poor tree health and becomes more costly than a pro-active program. It also increases

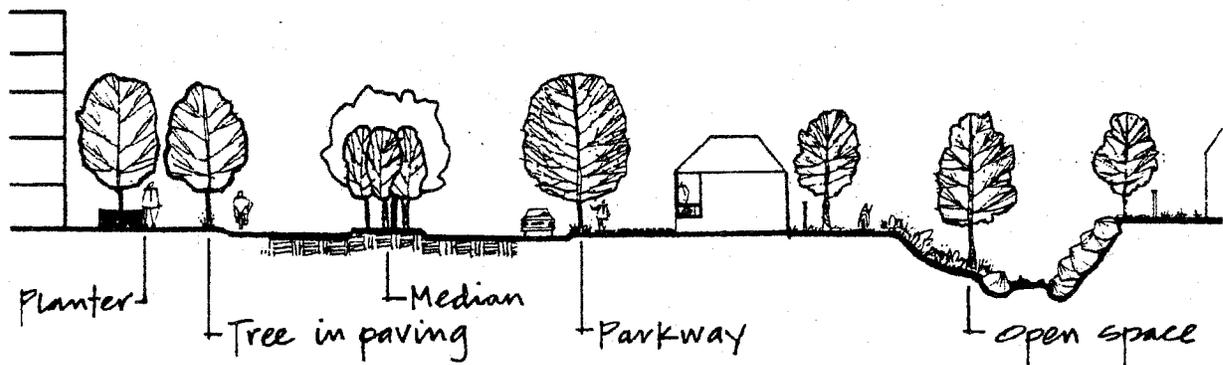


Figure 1. A Cross Section of the Urban Forest

the City's liability potential if trees become hazards. Unhealthy-looking trees have a negative visual impact on the City. When existing trees die and are not replaced, especially large, heritage trees, the tree population cannot adequately shade and cool the City or mitigate carbon dioxide emissions. By providing shade, oxygen and visual benefits, the urban forest is an integral part of the Sacramento. Its well-being is dependent on the design, maintenance practices, policy and budget decisions made today. The result of those decisions will shape Sacramento's urban forest of the future.

B. THE PURPOSE OF A MANAGEMENT PLAN

The purpose of a Management Plan is to: provide the City with a sound basis for management of its urban forest, financing mechanisms to ensure that an adequate level of care can be achieved now and in the future, design guidelines to create a unified plan for any new development and to establish policies that will allow the forest to provide the greatest number of benefits for the residents of Sacramento. To accomplish this purpose, the Plan sets forth clear and achievable goals:

The Management Plan's Goals

a. **Establish a value for Sacramento's urban forest**, one that defines its environmental, economic and aesthetic benefits. The Plan identifies an "ideal" model of canopy cover, composition, age and species diversity which maximizes this value. Value is measured by real estate investment, tax assessments, energy savings and tree replacement assessment.

b. **Integrate existing policies** regarding tree-related management and protection practices, planning and environmental concerns into one cohesive and consistent document. The Plan recommends policies and ordinance changes to strengthen existing practices.

c. **Develop a pro-active approach** to urban forest management that incorporates sound urban forestry principles and increases the efficiency and cost effectiveness of the program. This pro-active approach reduces potential tree hazards and public liability.

d. **Integrate design guidelines** from individual community plans into a cohesive City-wide tree plan that ties together existing and future residen-

tial areas, business and commercial areas, major transportation ways and gateways that connect the City.

e. **Define the scope of responsibility** for municipal tree care, the maintenance costs involved and the funding mechanisms needed to insure that life-cycle care (50 years) is budgeted.

f. **Document uniform, professionally accepted maintenance practices and standards** for all tree-related work which removes staff and private contractors from subjective and controversial decisions or procedures.

g. **Increase public awareness and stewardship** of trees and therefore increase public understanding and support for the funding of urban forest programs.

C. ASSESSING THE VALUE OF AN URBAN FOREST

Urban trees provide many environmental, aesthetic and financial benefits to our cities. Although these benefits are generally recognized, the value attached to these benefits must be quantified to justify our investment in an urban forestry program to protect this resource and human health and safety in the face of continually shrinking public funds. Some benefits are more easily quantified than others. From an environmental perspective, scientists are continuing to measure the ability of urban trees to cool our cities without using fossil fuels, retain soil and water, reduce pollutants in the air and to sequester carbon to reduce the greenhouse effect. PG&E estimates that 20-40% of the average home owner's air conditioning costs could be reduced by strategically planting trees around homes. The Lawrence Berkeley Labs conducted field studies in Sacramento during the summer of 1991, to measure actual energy savings. Their preliminary findings indicate that trees provided from 12-57% home energy savings (Akbari, November 1991, personal communication). When consumers substitute shade trees for air conditioners, they not only avoid the investment of power generation, but also reduce our reliance on imported oil and reduce the amount of water used to cool fossil fuel or nuclear plants. Seventeen percent of the water used to cool fossil fuel or nuclear plants is lost by evaporation into the atmosphere, (Rowntree 1991, personal communication).

In 1985, the American Forestry Association

measured the ecological benefits of a tree over its lifetime (Moll 1991, p. 308). It determined that on average, a tree would annually save \$73 in air conditioning costs, soil and erosion control benefits worth \$75, wildlife shelter worth \$75 and air pollution control worth \$50. The total value equals \$273 per year per tree in 1985 dollars. Recognizing that a young tree would have less value than a more mature tree, the total value for a single tree's lifetime compounded at 5% interest for 50 years equals \$57,000. Thus trees are major contributors to public economic welfare. Added to these environmental benefits are a tree's ability to sequester carbon, thus reducing the amount of carbon dioxide and other "greenhouse gases" in our atmosphere. The sequestering ability of our urban forest delays carbon build-up until clean alternative energy sources can be found. The longer-lived a tree and the larger the tree, the greater its benefits.

A dollar value can not easily be placed on the aesthetic, ephemeral and spiritual benefits of trees but this does not diminish their significance to the community. A survey of Sacramento residents who participated in urban forest planning workshops for the development of the Urban Forest Management Plan, ranked beauty as the most important quality of trees (Appendix 1. Tree Survey). From a design perspective, trees help define the City's character both historically and geographically within a regional context. Just as roads connect a city together, a cohesive urban forest design, articulated along the major arterials, major entry points and key city centers can visually reinforce a community's sense of place. Survey respondents indicated that trees (94%), historic landmarks (88%), individual neighborhoods (71%) and river park trails and bikeways (70%) made Sacramento distinctive from other California cities. In addition, respondents believed that the presence or absence of trees helped distinguish their neighborhood from others within the City.

Although beauty and quality of life can't be measured monetarily, trees do have an economic impact on Sacramento's ability to attract business, residents and tourism. Recent studies (Anderson and Cordell, 1988; Kielbaso, 1972) have shown a direct correlation between property values and the quality of landscaping either located on it or adjacent property. These studies suggest that between 7-10% of a home's value may be attributed to the presence of mature trees on the prop-

erty (young trees are statistically insignificant with regard to property values). Additionally, homes with trees appear to sell faster. In addition to a residential savings, the increase in value of a typical \$200,000 home represents a municipal gain in the form of an annual property tax increment of approximately \$200.

The most widely accepted method of assessing an individual tree's monetary value is based on a formula, taking into account its species, size, location and health. (ISA, 1985). When this formula is applied to trees within Sacramento's urban forest, the resulting value is estimated at \$176 million. As discussed in Chapter 3, the value of the urban forest is directly affected by its management. When managed under a pro-active program, maintenance becomes more efficient, costs decrease, tree health and thus tree value increases.

As the measurement of tree value becomes more defined, public acceptance of these values should drive the funding mechanisms necessary to implement successful urban forestry programs.

D. GUIDING PRINCIPLES

All of the recommendations presented in the Urban Forest Management Plan are based on the following principles:

1. The urban forest is more than street trees; it is an integral part of the natural ecology of Sacramento and the biosphere itself. Trees are a significant 'indicator species' that gauges a city's health. Management practices, such as integrated pest management, which respect the ecological balance of the biosphere, are more sustainable than those which produce a net resource drain on the environment.

2. The urban forest, as distinguished from a natural forest, is uniquely managed to: provide human comfort (shade, wind shelter), maximize canopy cover for energy conservation and enhance a city's aesthetic qualities.

3. Trees in the urban environment are a managed resource. Tree management practices follow conservation principles. The overall tree population remains stable, while individual trees exhibit a dynamic life of birth, growth, decline and death.

4. The urban forest provides value to Sacramento. When managed as a stable resource, it is a

part of the City's infrastructure which increases in value over time.

5. Trees are strong design elements when used cohesively along major arterial streets, especially in medians. Trees create an overall positive image for Sacramento.

6. The recommended professional service level for tree care in Sacramento is a proactive trimming rotation every six to ten years. There can be infinite flexibility in how maintenance responsibility is defined and how payment for tree care is appropriated.

7. Adoption and enforcement of comprehensive tree policies and care standards will enable the City to manage the tree population's health and to provide a City-wide plan for urban forest design.

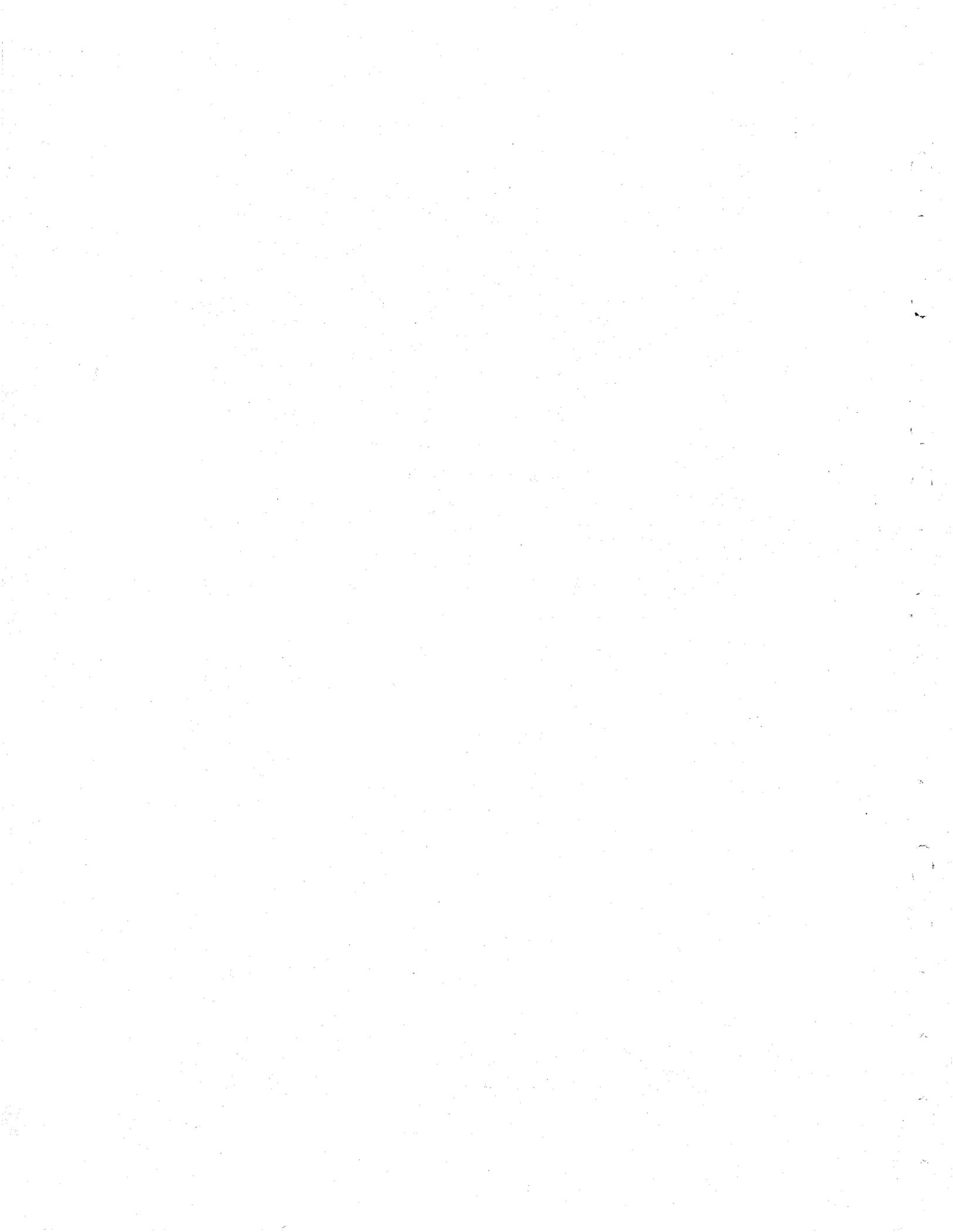
8. A protected, long-term funding source will enable the City to manage the urban forest as a stable resource.

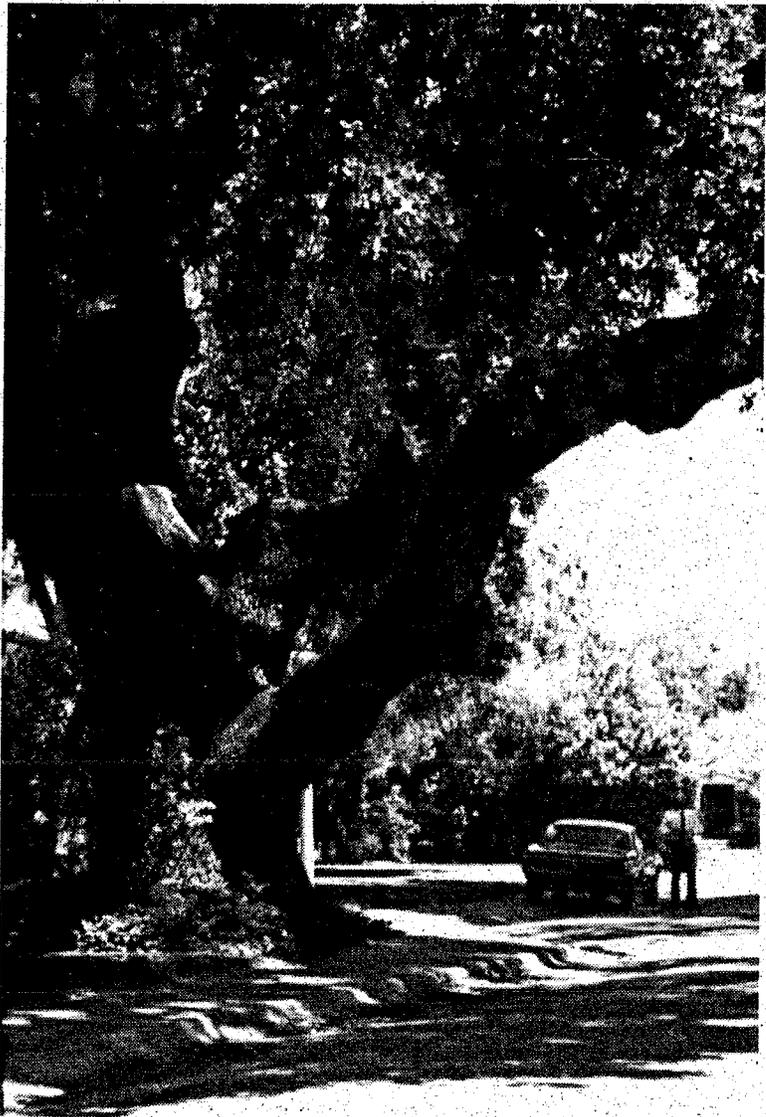
9. Sacramento has many resources for managing the urban forest. A comprehensive plan utilizes the services of each resource which is qualified and cost effective.

10. A successful urban forest program is dependent on a supportive community.



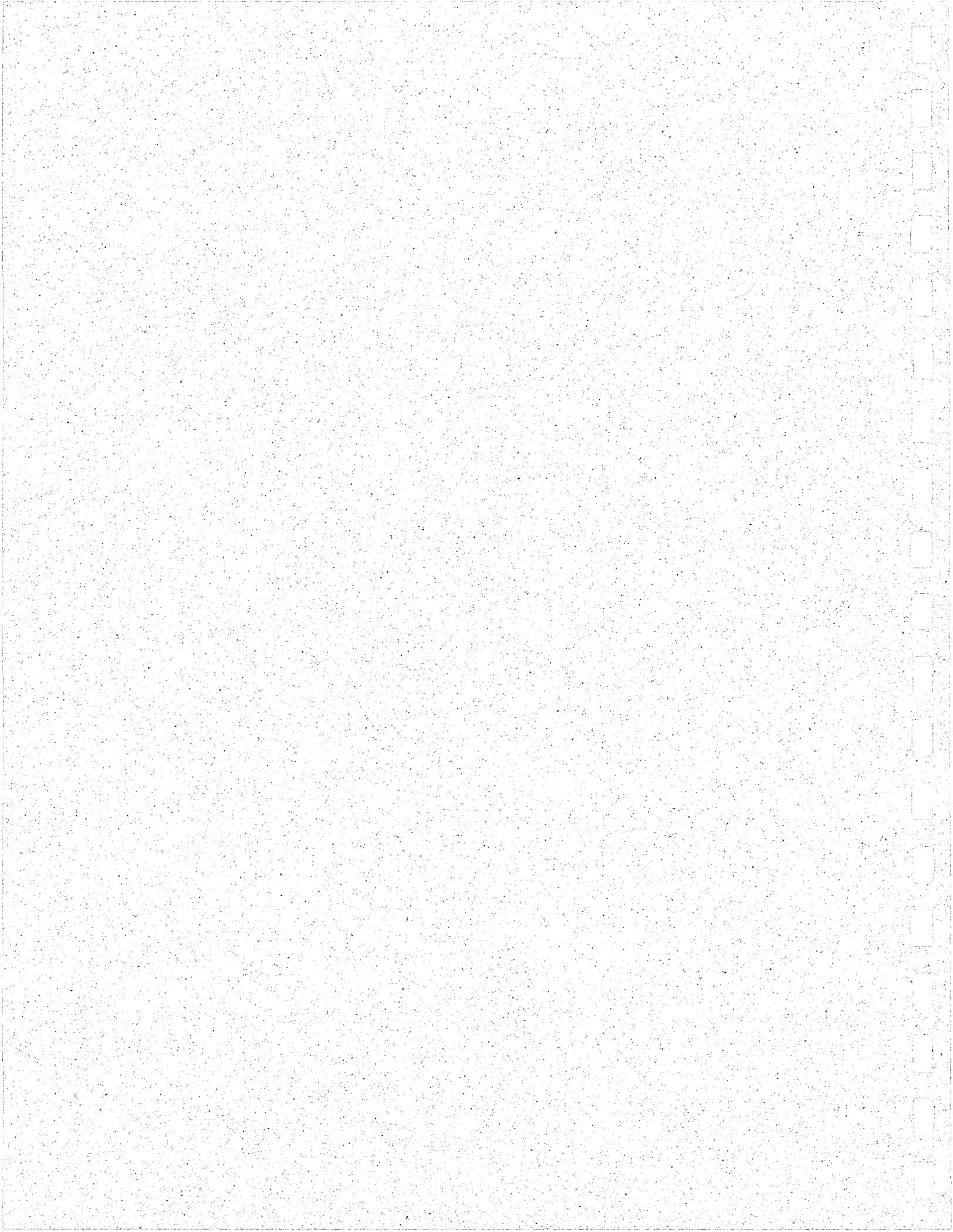






Chapter Two: Policy

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II URBAN FOREST POLICY

The Urban Forest Management Plan is a strategy for action based on recommendations and goals. This strategy must include the mechanisms for authorization and standards which are necessary to translate the recommendations into City policies and ordinances. Specifically, policies are the administrative directives from which procedures are developed and carried out by the City's various departments, while ordinances are the legal directives enforceable by law which are written into City Code to provide authority and performance standards.

A. AREAS OF JURISDICTION AND RESPONSIBILITY

The City designates specific boundaries to define public and private jurisdiction of the urban forest. Public jurisdiction allows the City to set a consistent and enforceable policy regarding tree standards. Defining whether a tree is within public or private jurisdiction is sometimes difficult. Due to historical precedence, the City has maintained trees within the City right-of-way. The right-of-way may vary from one property to the next. Consequently, it may appear to property owners that the City maintains trees in some residential front yards.

In addition to the City's jurisdiction of 92,500 public trees, it has authority to set maintenance standards for golf course trees and develop joint use agreements with any school district that shares park lands and the tree contained within them.

There has also been historical precedence for designating a 12.5 foot wide strip (measured from the back of curb) as a private maintenance easement. This zone contains approximately 57,500 street easement. It is recommended that the City enlarge its jurisdiction to include trees within the private maintenance easement to ensure consistent tree care of these trees. Having public jurisdiction allows the City to establish and enforce tree standards but not necessarily having the responsibility for tree care. Currently the City has responsibility to maintain 92,500 public right-of-way trees. Until 1990, the City also maintained the 57,500 private maintenance strip trees. This plan recommends options for future management of these trees in Chapter 3, Management.

Public Jurisdiction

The City of Sacramento has jurisdiction over an estimated 92,500 trees. Designated areas include:

Public Responsibility

- Public street right-of-way, varies per property and thus may appear to extend into private front yards (estimated to be 57,500 trees)
- Parks (27,000 trees)
- Medians (5,000 trees)
- Public facilities, including parking lots (3,000 trees)
- Soundwall planting areas (space between road and soundwall)

Shared Responsibility

- Golf courses (under City care standards)

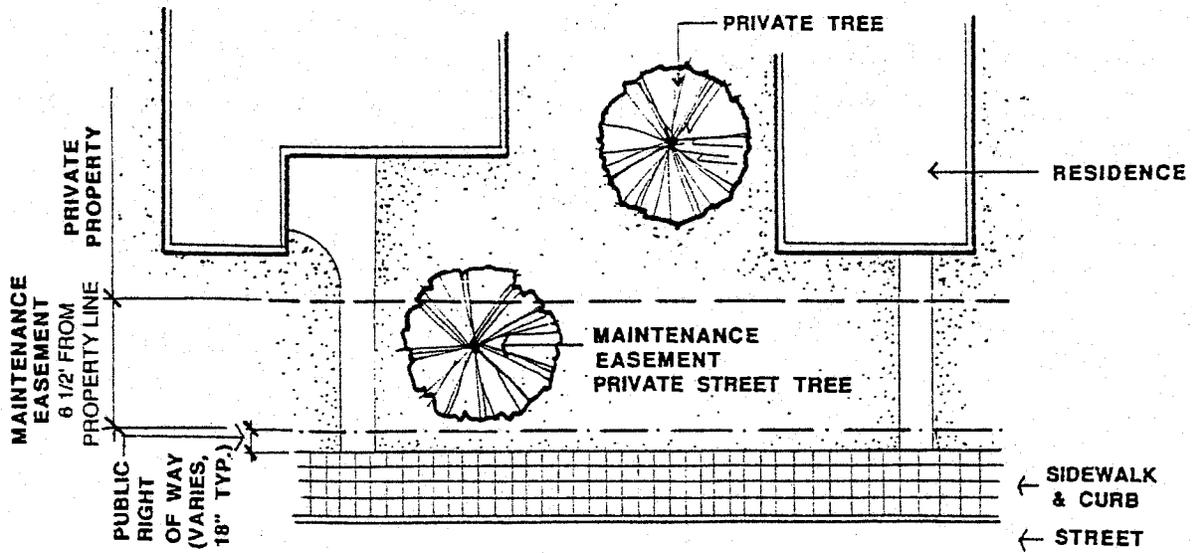
Private Jurisdiction and Responsibility

- Residential front, back and side yards (estimated to be 500,000 trees)
- Residential maintenance strip: 12.5 feet from back of curb (estimated to be 57,500 trees). *It is recommended that these trees be added to public jurisdiction. Options for either public or private responsibility are presented in Management, Chapter 3.*
- Business front side and back areas, including parking lots

Other Designated Areas of Jurisdiction

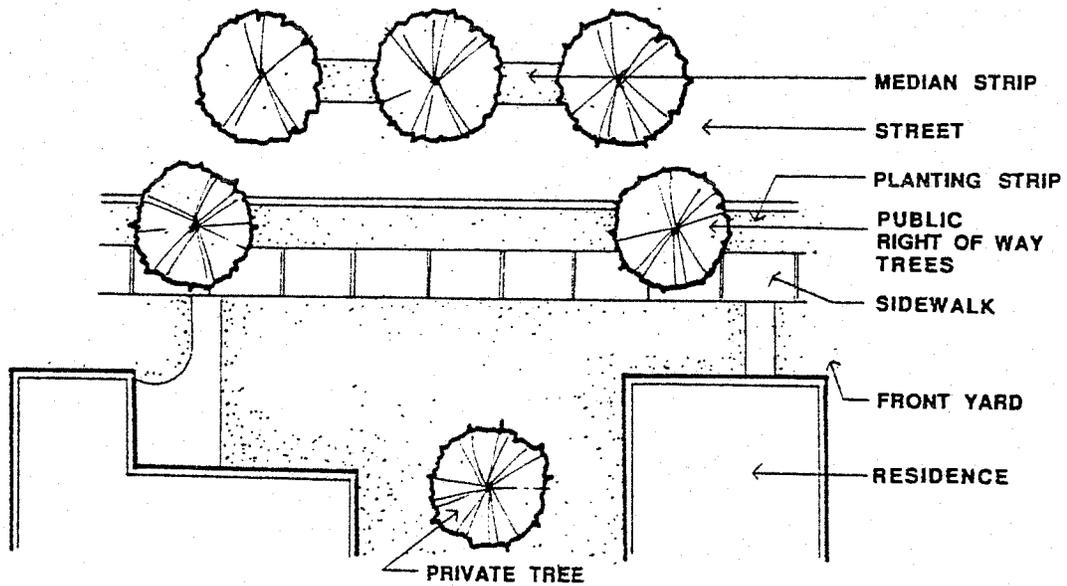
- Joint-use agreement with school districts, both public and private
- Utility right-of-way, maintained by SMUD
- Caltrans right-of-way, contract-maintained by City per City standards
- Greenbelts, public or private, depending on land use designation

These jurisdictional designations set the framework for developing a comprehensive management program. The program is designed to provide different levels of public service, everything from actual maintenance to self help programs (e.g., Neighborhood Tree Service, contractor business licensing and grant programs) depending on where the tree is located. Although the levels of public service may vary with available funding, every tree is considered part of the urban forest, and the management strategies discussed throughout this report apply to all.



NOTE: MAINTENANCE EASEMENT IS PRIVATE PROPERTY. PUBLIC FUNDS MAY BE USED TO MAINTAIN IF DETERMINED BY CITY.

RESIDENCE WITHOUT PLANTING STRIP



RESIDENCE WITH PLANTING STRIP

Figure 2. Residential Public/Private Tree Jurisdiction

B. ORDINANCE AND POLICY RECOMMENDATIONS

City policy and law are the main mechanisms for Management Plan authorization. The Management Plan recommends that a number of steps be taken to make regulations governing trees more comprehensive, accessible and binding, including:

- Adoption of policies by City departments and agencies, including Planning & Zoning; Parks and Community Services and Public Works.
- Revise and Amend Chapter 45 of the City Code to provide a comprehensive Tree Ordinance. The ordinance would combine all issues governing trees into one comprehensive ordinance. The Tree Ordinance would be developed from existing ordinances and would make specific suggestions to improve, enhance and strengthen weak or unclear parts of those ordinances.
- Adoption of a resolution statement by the City Council to authorize the program. The resolution statement should set broad goals and specific objectives by which the success of the urban forestry program can be evaluated.

Policies

The Management Plan is divided into five major areas: Management, Bioregion, Community Involvement, Design and Finance. These sections provide the City with a framework for implementing the Plan's target goals. Strategies and implementation mechanisms for the policies are described in each chapter. The policies set forth with-

in these sections should be adopted by various departments, agencies and organizations (e.g., Departments of Parks and Community Services, Planning, Public Works, Sacramento Tree Foundation etc.) as necessary. In addition to affecting the authority and standards within the departments/agencies, the policies will affect the structure of inter-departmental responsibilities and procedures. Refer to Chapter 8, Implementation for a complete list of interdepartmental functions.

1. Management Policies

Tree management establishes target goals in order to operate an efficient, professional and cost effective program for tree care. This program requires both enforcement policies and standards to support the established goals. The standards are detailed in the Planting and Maintenance Manual. The policies provide the mechanisms for enforcement.

Policy 1a: Maintain trees in a healthy condition by establishing the highest and most efficient standard of maintenance for public and private trees.

Policy 1b: Institute a rotational replacement program to maintain age and species diversity.

Policy 1c: Encourage the preservation and enhancement of Sacramento's large tree population with adequate funding for large tree maintenance and by planting large canopy species wherever planting space allows it.

Policy 1d: Coordinate all City tree-related activity through the Tree Services Section of the Parks and Community Services Department.

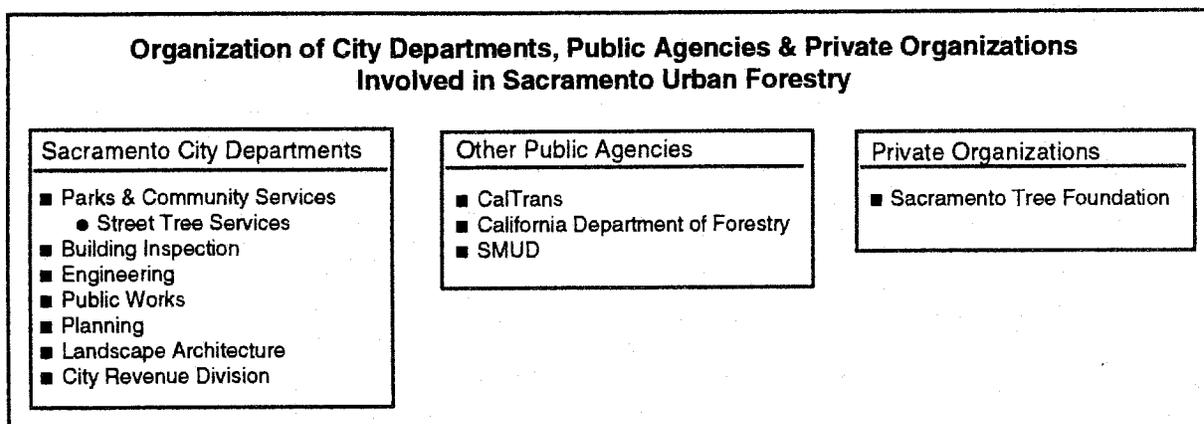


Figure 3. Organization Chart of Departments, Agencies and Private Organizations

Policy 1e: Review and revise the Management Plan after the first year and every five years thereafter.

2. Bioregional Environmental Condition Policies

As environmental problems increase in magnitude and scope, the benefits of trees become increasingly important to the community they serve and to the world at large.

Policy 2a: Establish and maintain maximum tree cover with large canopy shade trees wherever possible to improve the environmental health and livability of Sacramento.

Policy 2b: Conserve and protect existing tree resources especially groves and woodlands..

Policy 2c: Adopt a water management plan for all public plantings in the City.

Policy 2d: Preserve and extend native species and plant associations.

Policy 2e: Achieve the maximum environmental benefits of trees, using the most sustainable and cost effective means possible.

3. Community Involvement Policies

A large portion of the urban forest is in the private domain. On-going efforts to inform and educate residents about the urban forest will, in the long-run support the program and enhance in each property owner a sense of community. Increasing the public level of involvement in and responsibility to the urban forest is one of the Plan's major goals.

The City should offer an array of programs to assist citizens in the care of their individual treescapes and to build a sense of civic pride and accomplishment.

Policy 3a: Maintain close cooperation among all public agencies affecting the urban forest.

Policy 3b: Promote public awareness of the value and proper care of trees. Foster public involvement and support for urban forestry efforts.

Policy 3c: Facilitate the resolution of tree-related conflicts, such as hazard tree removals, through a public process.

4. Design Policies

On a macro-scale, design policy influences the ways in which trees provide Sacramento's overall image; on a micro-scale, it dictates how well trees

are integrated into the City's infrastructure.

Policy 4a: Require quality design and creative tree protection/installation techniques on all construction projects to enhance the City's identity and image as the 'City of Trees'.

Policy 4b: Create City-wide aesthetic unity for Sacramento with capital improvement projects which use extensive and cohesive plantings along major arterials, especially in medians.

Policy 4c: Link existing neighborhood forests together with planting materials on arterials, collectors, residential streets, pathways and greenways.

Policy 4d: Extend the urban forest into commercial, industrial, institutional and open space areas.

Policy 4e: Acknowledge the visual, social and cultural diversity throughout the City through design.

Policy 4f: Mitigate any adverse visual and physical impacts of roadways upon surrounding residential areas.

Policy 4g: Respect the environmental and functional planting requirements of each site and complement the natural ecological character of Sacramento.

5. Finance Policies

While recognition of the value of Sacramento's urban forest is growing and support for the urban forest is increasing, General Fund money is diminishing. Although some costs can be controlled by proactive maintenance practices, overall costs will increase as the forest expands and ages. Given increases in maintenance costs and the competition for public funds, establishing alternative funding mechanisms will provide a long-term, more stable source of funding.

Policy 5a: Assure sustained funding of the urban forestry program. Once the City Council has determined the annual budget necessary to maintain human health and safety and enhance the value of the forest, revenues from a variety of sources must be secured to additionally support the program.

Policy 5b: Provide necessary funding for enforcement of the comprehensive City Tree Ordinance.

Comprehensive Tree Ordinance

Although generally quite complete, the legal framework for implementing a Sacramento Urban Management Plan could be bolstered by augment-

ing existing City ordinances and adopting tree management policies and guidelines consistent with the management plan. Existing ordinances, summarized in the Appendix, need to be strengthened with the following additions:

- a workable mechanism for preservation of trees during the City’s plan review
- design standards for new development and construction to protect large trees
- a clear way to designate, define and protect heritage trees

Furthermore, incorporating these modifications into one comprehensive tree ordinance will centralize all public policy pertaining to trees into one document. It is recommended that the Comprehensive Tree Ordinance be written by the City (legal staff) to revise and incorporate the existing Articles of the Sacramento City Code relating to trees.

The recommended format is listed below and includes evaluations of existing ordinances as they apply to the Comprehensive Tree Ordinance. It also includes basic legal requirements for an Ordinance along with recommendations for supporting guidelines which help meet the Management Plan’s specific goals.

I. Value and Goals This section describes the benefits (e.g., softening urban development) and assets (e.g., increasing property value) of an urban forest, and includes:

- 1) Title: This ordinance shall be known as the Sacramento Tree Ordinance.
- 2) Findings: Current Code content is satisfactory.
- 3) Purpose and intent: Add goals list from Introduction
- 4) Definitions: Review and update through Plan Review, every 5 years.
- 5) Determination of definitions: Establish an authority responsible for interpreting definitions such as the Director, Parks and Community Services.
- 6) Heritage and protected trees: Recommend the following:

1. Modify the existing definition to include any healthy tree on public or private lands in the following categories:

- a. Any native *Quercus* species, *Aesculus californica* or *Platanus racemosa*, having a circumference of 36 inches or greater when a single trunk, or a cumulative circumference of 36 inches or greater when a multi-trunk.

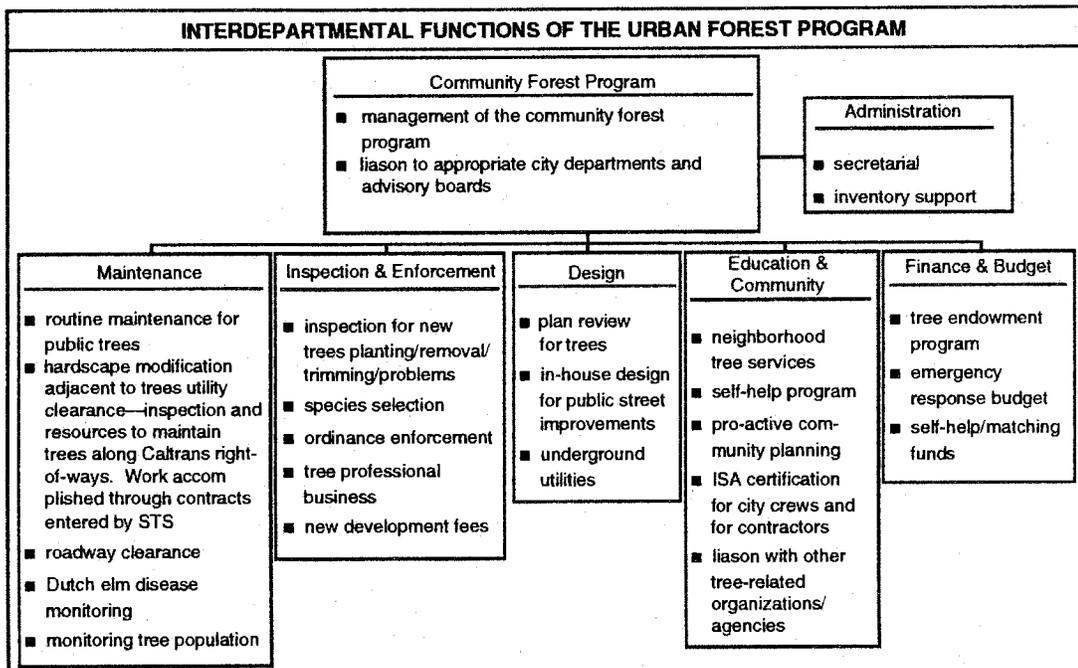


Figure 4. Chart of Interdepartmental Functions

b. Any healthy tree 36 inches in circumference or greater in a riparian zone. The riparian zone is measured 30 feet beyond the high water line.

c. Any healthy tree, grove of trees or woodland trees designated by resolution of the City Council to be of special historical or environmental value or of significant community benefit.

2. Continue notification process to private property owners.

3. Eliminate the requirement for an official tree register. The tree register will be for educational and reference purposes only.

7) Dutch Elm Disease: Current code is satisfactory

II. Jurisdiction and Responsibility: This section describes overall and distinct areas of responsibility and includes:

8) Liability disclaimer: Current Code is satisfactory.

9) Severability: Current Code is satisfactory.

10) Interference with maintenance personnel: Add text to prohibit interference with City staff who are involved in tree related activities acting in their official capacity on behalf of the City.

11) Designation of administrative responsibilities: Add text to delineate:

- City responsibility
- Maintenance contracts and specifications
- Private tree care professionals, certification and licensing
- Citizens and non-profit organization involvement

III. Authority and Enforcement: This section describes penalties, staffing and education, with references to financing mechanisms for existing and new development and includes:

12) Penalties for violations: Add text to establish the legal categorization of violations. See Enforcement section, this chapter.

13) Resolution of conflicts between trees and structures: Add text to set priorities for solving conflicts between trees and street improvements.

14) Abatement of hazards and public nuisances: Add text to set forth a procedure to abate hazards

and unacceptable situations that might jeopardize public health and safety (hazardous trees).

15) Harming public and protected trees forbidden: Modify existing text to prohibit negligence or intentional damage to trees and other plants growing in designated areas.

16) Permits required for tree removal and pruning: Coordinate with existing language to require Tree Service review of all tree pruning and tree removal.

17) Exemption from Solar Shade Control Act: Current Code content is satisfactory.

IV. Performance Standards: This section contains guidelines which support the Ordinance and describes design and maintenance requirements as stated in the Management Plan and includes:

18) Development of a comprehensive management plan: Add performance standards from the Management Plan along with the requirement to review the Management Plan every five years.

19) Design guidelines: Refer to text per Design chapter.

20) Tree preservation and protection: Planting and Maintenance Manual, Chapter 2, Section 9.

21) Conservation of trees and plant associations in natural areas (greenbelts): Add text to conserve groves, multiple plantings of trees, natural areas and native species as specified in Bioregion Policies, Chapter 3.

22) Planting: Develop text based on standards in Design, Chapter 4.

23) Pruning: Develop text based on standards in Planting and Maintenance Manual, Chapter 2, Section 5.

24) Other maintenance tasks: Develop text based on standards in Planting and Maintenance Manual, Chapter 2.

V. Community Support and Flexibility: This section includes guidelines to support the Ordinance and describes methods of public review and ways to build community support including:

25) Appeals: Modify text to provide the possibility for an intermediary step such as review by the Sacramento Tree Foundation's Technical Advisory

Committee and review by Director, Parks and Community Services prior to review by the City Council.

26) Performance evaluation of ordinance: Add text to evaluate the success of the ordinance provisions. Add text to require the Parks Superintendent and Tree Services Section, to collect and maintain all records and data to effectively evaluate the Ordinance. Provide an annual summary as part of the budgeting process.

30) Tree Endowment Fund: Designate a specific City fund, separate from the General Fund, to accept grants, donations and fines to be designated for the City Tree Program.

C. EDUCATION AND ENFORCEMENT

The City assures compliance with the Manage-

Resolution Statement

The following Resolution Statement serves as the comprehensive goals statement and resolution whereby the City Council adopts the policies, criteria, guidelines and standards of the Management Plan:

WHEREAS, the trees of Sacramento are inextricably linked to the character of the City;

WHEREAS, trees link the people of Sacramento to the natural world;

WHEREAS, trees provide the community with a multitude of environmental benefits, including reduced energy consumption, amelioration of air pollution, shade, wind reduction, noise screening, erosion control, clean water and enhanced wildlife habitat;

WHEREAS, trees can reverse the trend toward global warming ("greenhouse effect"), and therefore, tree-planting in Sacramento has biosphere ramifications;

WHEREAS, trees establish visual harmony and continuity along the City's streets, impart a distinctive identity to the City and to its various neighborhoods, enrich the aesthetic experience of the City, soften and screen urban development, increase property values, provide enhanced opportunities for children's play, and contribute to civic pride and involvement;

WHEREAS, trees are things of beauty that deserve proper planning, care and protection;

The City Council of the City of Sacramento does hereby adopt the Sacramento Urban Forest Management Plan, dated _____, including all policies, criteria, guidelines and standards contained therein, and further:

- directs City staff to carry out the provisions of said Plan; and further:

- urges all residents and property owners within the City to support the creation and care of a healthy and beneficial urban forest through their support of said plan, and further:

- establishes the following specific goals and objectives:

1. Set a value for Sacramento's urban forest, one that defines its environmental, economic and aesthetic benefits. The plan identifies an "ideal" model of canopy cover, composition, age and species diversity which maximizes this value. Value is measured by real estate investment, tax assessments, energy savings and tree replacement assessment.

2. Integrate existing policies regarding tree-related management, protection practices, planning and environmental concerns into one cohesive and consistent document. The plan recommends policies and legislation to strengthen existing practices.

3. Develop a proactive approach toward urban forest management, one that incorporates sound urban forestry principles and increases the efficiency and cost effectiveness of tree management operations. This proactive approach reduces potential tree hazards and public liability.

4. Integrate design guidelines from individual community plans into a cohesive City-wide plan that ties together existing and future residential areas, business and commercial areas, major transportation ways and gateways that connect the City.

5. Define the scope of responsibility for municipal tree care, the costs involved to maintain trees and the funding mechanisms needed to insure that their life-cycle care is budgeted.

6. Document uniform, professionally-accepted maintenance practices and standards for all tree-related work which removes staff from subjective and controversial decisions or procedures.

7. Increase public awareness and stewardship of trees and increase public support for funding of urban forest programs.

27) Tree Advisory Committee: Use the Technical Advisory Committee of the Sacramento Tree Foundation, and if the needs arises, form a Tree Advisory Committee within the City's commission structure to coordinate technical decisions, to strengthen the liaison with urban forestry professionals and to serve as a sounding board for conflicts which need a third party.

28) Citizen stewardship programs: Add text from "Policies" section, this chapter.

29) Resolution of tree disputes: Add text from "Policies" section, this chapter.

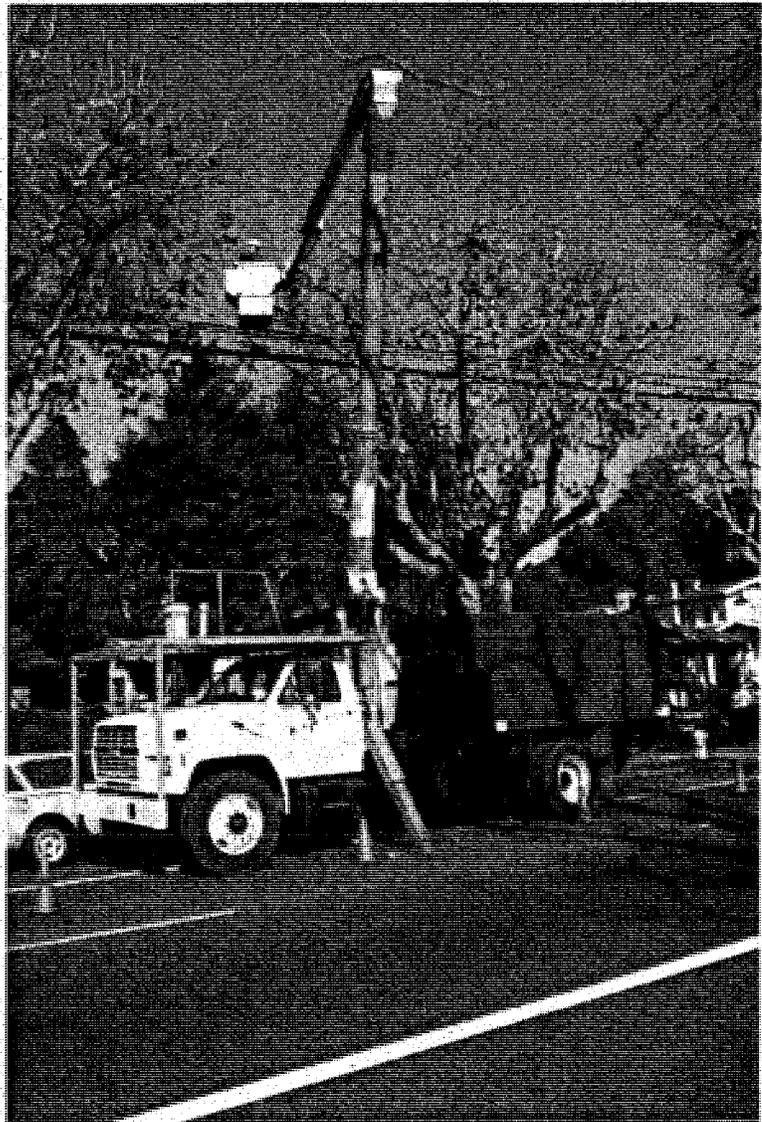
ment Plan's policies by education and enforcement procedures. The first procedure, education, involves the establishment of a new position, Community Education Coordinator in the Tree Services Section. The Coordinator will respond to technical questions regarding trees and will perform community outreach. For further information on education, see Chapter 6, Community Involvement. The second procedure, enforcement, assures conformance with Management Plan policies and includes:

- A business licensing and certification program

for contractors, providing pruning services on privately-owned trees. This program is an effort to protect, preserve and enhance the urban forest resource, and protect home owners and other people from inadequate maintenance and unhealthy trees. The licensing program is based on professional standards set forth by the Sacramento Tree Services Section. The Revenue Division would be the logical department to issue licenses; fees collected will be used for tree endowment programs. A further requirement of the licensing program is that all contractors become International Society of Arboriculture (ISA) certified, beginning three years from the Management Plan's adoption date.

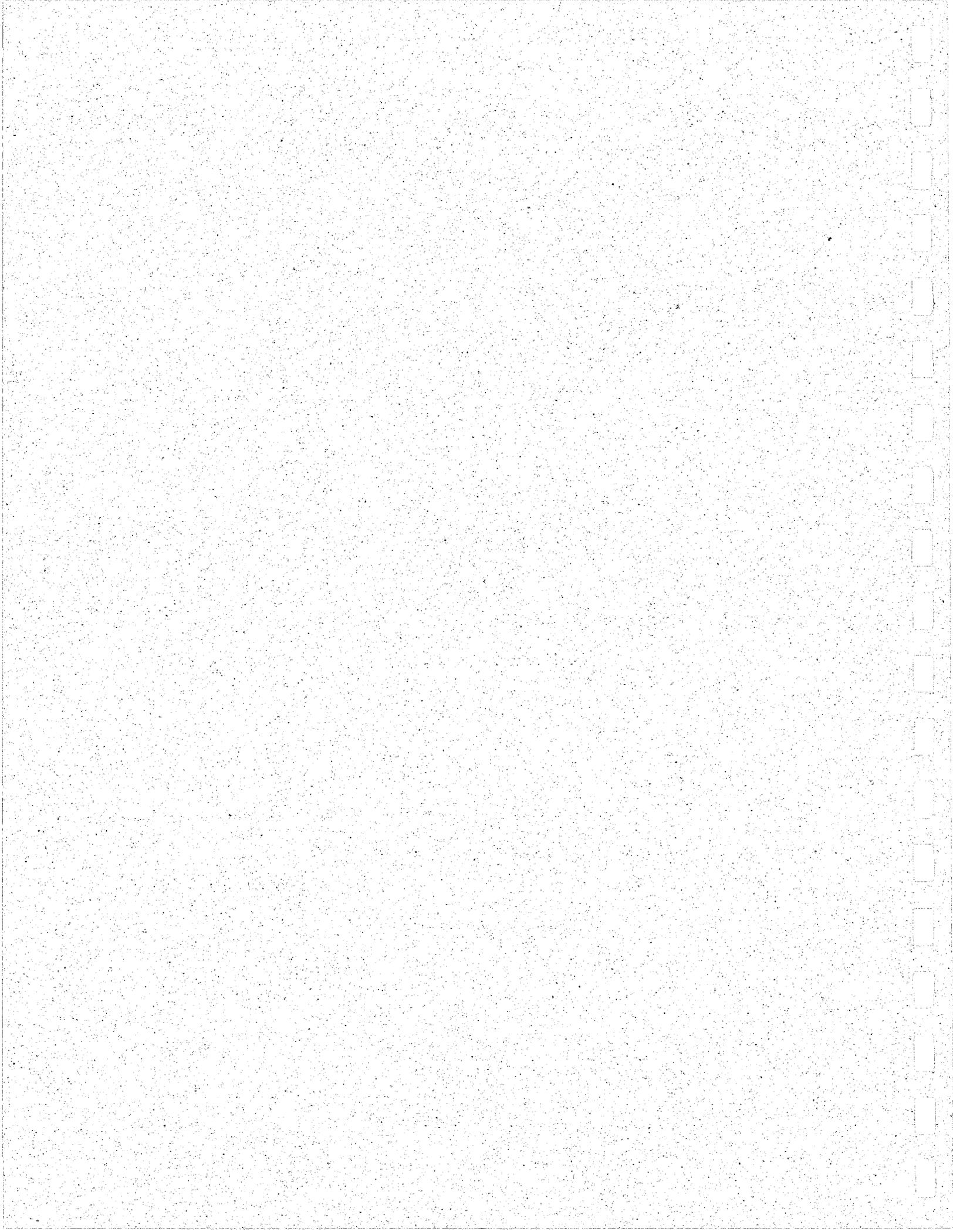
■ A policy to add new criteria to the Plan Review process. All departments involved in Plan Review (Building Inspection, Engineering, Landscape Architecture, Planning and Public Works) will incorporate the above policies into approval requirements for all projects in new developments and new projects within existing developments. For example, Plan Review staff would inspect for private parking lot compliance of the Shade Tree Ordinance. A sign-off box for STS will be required on all permit applications. The Tree Services Section will be involved in regular scheduled meetings with these departments. For heritage trees on sites not involved in Plan Review, Tree Services Section will provide advice and enforcement.

■ Legal options. If a violation occurs outside the parameters of these programs, (i.e., a heritage tree is destroyed), the City has the option of pursuing legal action through civil lawsuits.



Chapter Three: Tree Management & Budget

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III TREE MANAGEMENT AND BUDGET

A. EXISTING MANAGEMENT PRACTICES AND PROGRAMS

History

Sacramento has a long legacy of tree preservation. The City's numerous large heritage trees attest to both the sensitivity of early planners and strong community support for preserving trees over the last 100 years of dramatic urban growth. Sacramento's tree management program began as part of the 1911 City Charter, which mandated that the City "plant and exercise supervision over shade trees, shrubs and plants of all kinds on or in the streets and public grounds of the City and about the public buildings of the City" (Article 17, Sec. 206.). This program grew out of public concern for preserving the substantial native oak trees in the Land Park Area while streets were being constructed. Some of the oldest trees date back to the 1870s, including over 2,000 elm trees that remain in the downtown area.

In the 1930s, the tree population was estimated to be 40,000 street trees and 20,000 park and garden trees. Currently, the urban tree population is estimated to be 150,000, comprised of 115,000 street trees, 27,000 park trees, 3,000 public facility trees and 5,000 median trees. (In order to substantiate estimated number of trees in Sacramento, an independent estimate of the public street tree population was derived from analyzing tree canopy cover using aerial photos, a field sample of the number of trees per dwelling and the number of dwelling units in each Community Plan Area (Appendix 3.) The results show a marginal difference of 12% more trees than Tree Services had estimated, substantiating the City's earlier estimate.)

In 1990 a moratorium on City care was placed on trees planted in the private maintenance strip, 12.5 feet behind the curb. Because of this change, the City released approximately 57,500 trees from its maintenance responsibility temporarily during the development and adoption of the Urban Forest Management Plan. These trees are now the responsibility of the property owner. Of the 115,000 street trees, half (57,500) lie within the privately-owned maintenance strip, a 12.5 foot area behind the street curb. The remaining 92,500 public trees fall under City maintenance jurisdiction (Fitch 1991, personal communication). The Tree Services Section of the Department of Parks

and Community Services (Tree Services or STS), maintains all public right-of-way trees.

The City has demonstrated its commitment to trees by annually qualifying as a *Tree City USA* since the program's inception in 1976. Sacramento has met the criteria for inclusion by developing a tree ordinance, designating a tree department that has a tree maintenance division, spending a minimum of one dollar per capita toward public tree care and sponsoring a public commemorative tree planting event.

This Chapter analyzes the current state of the Sacramento Urban Forest, the City's management practices, budget and staffing. In general the City continues its commitment to trees by using current tree care practices and trimming equipment. The weakest link in management is that the City handles tree trimming reactively, that is by emergency and request backlog rather than proactively, on a planned basis. Reactive and proactive management strategies, their impacts on human safety, tree health and cost efficiency and recommendations for changing the City's program are detailed in the second section of this Chapter.

Inventory

The City undertook a street tree inventory to establish a base tree census. The inventory was conducted by field crews from 1976-1983 and the data was installed on a mainframe computer. The information collected included tree location by address, species, trunk diameter, condition, work required and reason for the required work. The inventory was verified in 1988 by aerial photos and followed by ground "truthing" for 100 tree blocks. The inventory was found accurate to within 2%.

The City found the inventory system cumbersome because it was driven by a location code instead of an easily discernible address code. In 1985, the City switched to an IBM compatible microcomputer using R-base software. Fields which record cost, crew composition, time, caller information and work completed dates were added to the new system. When tree service is requested, the caller's information is entered into the computer and a Work Request Form is generated. After the tree is inspected and work authorized by Tree Supervisors, work is performed according to the request backlog. Once completed, the database is updated and records are filed under work history. The database is kept current as work is completed on each tree. There are

25,000 trees in this database and Tree Services adds approximately 6,000 trees per year to it. At the current rate, it will take approximately 21 years to complete the database provided that the tree population is not increased. The microcomputer maintains a history of work requests generated since 1985.

Thus far, the original database has not been converted to the new system. As such, City staff has found it difficult to merge the new and old systems. Past in-house studies have concluded that conversion would be too costly. Also, the new computer needs to have its hard drive upgraded to handle the 150,000 plus anticipated tree records. Although a menu-driven application was developed to generate work orders (Appendix 4. Existing application structure), a computer support person outside of the Tree Services Section must be consulted to help generate summary reports which are used to monitor the City's tree population. Some staff arborists have recently been trained in R-Base to generate reports. In addition, it is important for the STS Superintendent, Arborist and Tree Trimmer Supervisor staff to be computer literate. They should be able to generate a population analysis, budget and work summary reports on a regular basis in order to monitor work and plan maintenance efficiently.

Further study is needed to evaluate the structure of the new and old inventory database. Decisions must be made as how they can be combined so that the computer can divide the City into manageable maintenance areas. The intent is to add many new fields and expand the menu-driven application program repertoire. Staff must have adequate training to become proficient in using the computer and all software programs. Any evaluation should determine whether the existing software is "user friendly" and whether it has the capability to generate the types of summary reports staff can easily put to use. In addition, the City's software system should be compatible with the Sacramento Tree Foundation and the California Department of Forestry's systems so that information collected from these sources can be added to the City's database. It is recommended that the City exercise its option under the Master Plan Contract to hire an urban forest computer consultant to study and resolve computer incompatibility issues as soon as possible.

Population Analysis

An analysis of Sacramento's Urban Forest profiles the tree populations size, composition and health. The analysis was prepared from information collected in the City's original inventory. It provides an assessment of the urban forest with which to identify short and long term management goals to improve a tree population's health. This is important in understanding the state of the urban forest and identifying how to plan for changes in management. The original inventory collected between 1976-1983 was used in this analysis. Although more recent information has been collected from work requests, this information is not representative nor an adequate sample size of the entire population. The original inventory's accuracy was verified in 1988 and is believed correct except where noted (Fitch 1991, personal communication). The inventory recorded fewer than the estimated 150,000 public trees. In each analysis, the sample size is noted and the tree figures are projected up to the estimated population. In instances where the database could not generate accurate figures, the Superintendent of Parks provided estimates and these instances are noted. The analysis is only as accurate as the actual data collected. Thus, as the entire population is inventoried and incorporated into the database, a more accurate assessment can be made.

Species Composition

The inventory identified 113,483 trees from an estimated 150,000 public trees planted in Sacramento. A summary of species reveals that there are 415 different species. Of that number, the most frequently occurring species are: 15.9 % *Fraxinus velutina* 'glabra' (Modesto ash), 7.6% *Platanus occidentalis* (western sycamore), 5.6% *Zelkova serrata* (zelkova), 5% *Liquidambar styraciflua* (sweetgum), 4% *Morus alba* (white mulberry), 3% *Platanus orientalis* (oriental sycamore), 3% *Pistacia chinensis* (Chinese pistache), 2.5% *Ulmus procera* (English elm), 2.3% *Fraxinus velutina* (Arizona ash), 2.1% *Cinnamomum camphora* (camphor) and 2.1% *Pinus* spp. (pine species). (Table 1. Species Composition). The 1991 tree population estimates indicate a reduction in the number of *Fraxinus* to 11 % and *Ulmus* to 4% of the population (Fitch, 1991 personal communication).

Table 1. Species Composition

Genus/Species	(Common Name)	# of Trees	% of Population
FRAXINUS			
F. velutina 'Modesto'	(Modesto ash)	18,053	15.90
F. velutina	(Arizona ash)	2,605	2.29
F. uhdei	(European ash)	534	0.47
F. spp.	(ash spp.)	259	0.24
F. holotricha moraine	(Moraine ash)	244	0.22
F. oxycarpa	(Raywood ash)	43	0.04
		21,738	19%
1991 update estimate (from M. Fitch)		16,000-17,000	11%
PLATANUS			
P. occidentalis	(American plane tree)	8,655	7.63
P. orientalis	(Oriental sycamore)	3,479	3.07
P. acerifolia	(London plane tree)	1,611	1.42
P. racemosa	(California western sycamore)	151	0.13
		13,896	12%
ULMUS			
U. procera	(English elm)	2,792	2.46
U. parvifolia	(Chinese elm)	1,829	1.61
U. americana	(American elm)	1,424	1.25
U. pumila	(Siberian elm)	643	0.57
U. spp.	(elm spp.)	270	0.24
U. hollandica	(Dutch elm)	1	<.01
U. alata	(wahoo elm)	1	<.01
		6,960	6%
1991 update estimate (from M. Fitch)		6,000	4%
ZELKOVA			
Z. serrata	(zelkova)	6,351	6%
LIQUIDAMBAR			
L. styraciflua	(sweetgum)	5,713	5%
MORUS			
M. alba	(white mulberry)	4,513	3.97
M. alba (fruitless)	(fruitless mulberry)	703	0.62
M. nigra	(black mulberry)	8	<.01
		5,224	5%
PINUS			
P. spp.	(pine spp.)	2,399	2.19
P. halepensis	(Aleppo pine)	409	<.01
P. thunbergiana	(Japanese black pine)	250	<.01
P. radiata	(Monterey pine)	196	<.01
P. patula	(Jelecote pine)	170	<.01
P. canariensis	(Canary Island pine)	134	<.01
P. pinea	(Italian stone pine)	8	<.01
P. sabiniana	(Digger pine)	21	<.01
P. nigra	(Austrian pine)	3	<.01
P. sylvestris	(Scotch pine)	3	<.01
P. densiflora	(Japanese red pine)	2	<.01
P. edulis	(pinyon pine)	2	<.01
P. muricata	(Bishop pine)	2	<.01
P. pinaster	(cluster pine)	2	<.01
P. jeffreyi	(Jeffrey pine)	1	<.01
P. torreyana	(Torrey pine)	1	<.01
		3,430	3%
QUERCUS			
Q. agrifolia	(coast live oak)	723	<.01
Q. suber	(cork oak)	443	<.01

Q. lobata	(Valley oak)	425	<.01
Q. ilex	(holly oak)	333	<.01
Q. spp.	(oak spp.)	127	<.01
Q. borealis	(red oak)	120	<.01
Q. palustris	(pin oak)	97	<.01
Q. phellos	(willow)	24	<.01
Q. coccinea	(scarlet oak)	10	<.01
Q. wislizenii	(interior live oak)	10	<.01
Q. douglasii	(blue oak)	9	<.01
Q. muehlenbergii	(chestnut oak)	5	<.01
Q. garryana	(white oak)	4	<.01
Q. robur	(English oak)	3	<.01
Q. chrysolepis	(canyon oak)	1	<.01
Q. engelmannii	(Engelmann oak)	1	<.01
Q. kelloggii	(California black oak)	1	<.01
		2,337	2%
CINNAMOMUM			
C. camphora	(camphor tree)	2,408	2%

Currently, Sacramento's tree population is relatively "top heavy", with a few species representing comparatively high percentages of the population and the rest of the species representing very low percentages. The largest three genera, *Fraxinus* (ash), *Platanus* (plane tree) and *Ulmus* (elm) make up over 37% of the population. At the low end of the species frequency scale, 10% of the population contains several hundred species.

What this means is that Sacramento must diversify its tree populations to maintain the health of its urban forest. For instance, a species or genus specific pest or disease could destroy a large percentage of the population. Dutch elm disease (*Ceratocystis ulmi*), which has devastated Midwestern and Eastern urban forests, provides a dramatic example of what one disease can do in a monoculture of species. If Dutch elm disease were to reach epidemic proportions in Sacramento, approximately 12,300 elms and zelkova trees or 10% of the City's tree population could be jeopardized. Street Tree Services has recognized the importance of maintaining diversity and has reduced, over the last ten years, the City's elm population to 4% and ash to 11%. It is recommended that the STS monitor and plan for adequate species diversity following the guidelines that "no genus should account for more than 10% and no species for more than 5% of the total population," (Kielbaso 1989, p. 46).

Although Sacramento's species diversity falls short of these recommendations, it fares much better than that of other California cities. In a survey of urban forests, more than half of the cities

tree managers reported that 80% of their forest is composed of just five species (Bernhardt et al. 1988).

Relative Age

The age of the urban forest can be estimated from analyzing the species composition and size of the population. Sacramento's tree population (by size) is composed of 8% small trees (less than 30 feet tall), 64% medium trees (between 30-60 feet tall) and 28% large trees (greater than 60 feet tall). This equates to approximately 12,000 small, 94,000 medium and 44,000 large trees.

Although the life span of trees varies by species and to some extent by location, age is best described in relative (young, mature and overmature) terms based on physiology. A young tree devotes 100% of its structure (biomass) toward producing sugar and trapping carbon dioxide for growth. As it matures, between 50-100% of its biomass transfers from food production to heartwood which provides structure but no longer provides growth. As the tree converts living biomass into static biomass, it sheds some branches and develops roots in order to balance its mass with its ability to make food. The outward signs of tree maturation are indicated by the dieback of small branches while the tree height and diameter increase noticeably. As it continues to age, the tree devotes less than 50% of its biomass to growth and thus its height and diameter slow to immeasurable rates. At the same time, an overmature tree undergoes a process of decline and decay. An estimate of the relative age of the population (Fitch, personal communication 1991) indicates that approximately 20% of Sacramento's

public trees are young, 78% mature and 2% overmature. Of the overmature trees, approximately half (1000 trees) are of heritage quality.

The population's age greatly influences the cost of maintenance. Young trees require yearly maintenance visits during the first five years to insure that they become successfully established. Although frequent, this care is not expensive, does not require heavy equipment and can be accomplished with municipal ground crews or trained volunteers. Mature trees require less frequent but more substantial general pruning which involves more costly tree climbers and equipment. Mature trees also provide the most benefits in terms of aesthetic form, shade, energy conservation and carbon sequestering to the urban forest. Once trees have reached the end of their useful life, they begin to decline and maintenance costs increase beyond their value as defined in Chapter 1. Overmature trees require more frequent inspections for hazards and eventual removal requires costly crews and equipment.

Managing an uneven age distribution of trees so that a large proportion of the population does not decline at the same time is most cost effective and ecologically sound. When the population is managed in this way, costly maintenance tasks can be spread out over time.

General Health

A summary of the population's general health is based on the presence of pests and diseases in the City's urban forest (Table 2. Tree Health). The database revealed that the vast majority (80%) of the City's trees are in fair condition. This rating means that the trees' condition can be improved at a reasonable maintenance cost. Seventeen percent of the population was rated poor. Trees in this category are costly to maintain and not likely to improve. Three percent were in good condition, with little or no insect or disease problems and one-half percent required removal since they were rated beyond pruning, pest or disease correction.

The most prevalent pests and diseases in Sacramento are the elm leaf beetle and mistletoe. The elm leaf beetle, *Pyrrhalta luteola*, larvae feed on elm leaves, skeletonizing them and causing early drop. Approximately 4,000 trees are affected to the extent that warrants chemical treatment. Mistletoe is a green parasitic seed plant that invades several species. It is controlled by pruning out mistletoe that grows in tree canopies. The inventory indi-

cates that although almost half of the population has a low incidence of mistletoe infestation (48%), meaning that less than one-quarter of the tree canopy is infested, it is a serious problem to the majority of ash trees. Seventeen percent of the population has one-quarter to one-half of their crowns infested and 35% of the population has over 50% of their crowns infested. A 1991 estimate of the population indicates that the condition of the population has improved over the last ten years. With the removal of 1,000 elms and 4-5,000 ash trees, the incidence of mistletoe and elm leaf beetle have been reduced. Additionally, white fly has become endemic in the Sacramento area in just the past two years, 1990-1992.

Dutch elm disease, recently detected in the City, has a devastating potential. This disease is caused by the fungus *Ceratocystis ulmi*. It invades the elm's water conducting system causing affected portions of the tree to wilt and die. The fungus is carried tree to tree by the European elm bark beetle, *Scolytus multistriatus*. Dutch elm disease (DED) was first detected in California in 1975 (Sonoma County) and was found in Sacramento County for the first time in 1990. Since then, five trees with DED have been found in the downtown area of Sacramento.

Control of the disease is accomplished by a combination of sanitary pruning, removal and disposal measures and a quarantine of infected areas. The California Department of Forestry (CDF) Dutch Elm Program has begun an initial survey to inspect all Sacramento City and County elms. A full-time Sacramento County DED coordinator will be employed by the State to establish an on-going monitoring program. The Dutch Elm Disease Ordinance gives the City authority to remove any diseased trees on public or private property.

Table 2. Tree Health*

CONDITION	TREE ESTIMATE	% OF POPULATION
Good	4,200	2.8%
Fair	120,000	80.0%
Poor	25,050	16.7%
Remove	750	.5%
Total	150,000	100%

*(the inventory sample size represents 74% of the estimated 150,000 trees)

The Parks Superintendent estimates that the vast majority (93%) of the mature trees require general trim work to remove dead, crossing and heavy branches or crown raising. An additional 85-95% of young trees require training pruning (Fitch 1991, personal communication). The 15% of the overmature trees (approx. 460 trees) not designated as heritage will require removal in the near future.

Hardscape Damage

Sacramento has a relatively moderate incidence of sidewalk damage. The 1976-81 inventory indicated that of the estimated 100,000 trees planted adjacent to sidewalks, only 2.3% of the hardscape had a greater than 1/2 inch displacement. Another 1.1% had less than 1/2 inch displacement. Liability judgements have been awarded in other cities from accidents resulting from sidewalk displacement that exceeds 3/4 inch. The bulk of trees planted adjacent to sidewalks occur in the downtown areas of Sacramento.

The Department of Public Works Street Maintenance Division, which is responsible for hardscape repair, estimates that \$500,000-600,000 is required annually for tree-related hardscape damage (Fitch, personal communication).

Hardscape damage resulting from trees is caused by roots that seek adequate water and oxygen. Since roots are most abundant near the surface of impermeable surfaces, sidewalk damage is inevitable. The design of adequate tree basins which provide essential tree requirements and the selection of species which have less aggressive rooting habits can significantly reduce the incidence of hardscape damage. Chapter 6 addresses design solutions for selecting and planting trees to minimize hardscape damage.

BUDGET

A summary of the current budget for tree services is shown in Table 3 (Fiscal Year 1994 Tree Services Budget). A complete cost breakdown, as calculated per crew size and assigned work, has been calculated and is detailed in Appendix 8 (Crew Size and Costs).

The budget has been primarily financed through the General Fund (Table 4. Fiscal Year 1994 Financial Resources) In recent years this has been augmented with special funding including:

- Funding for Management Plan development at \$150,000

- Lighting and Landscape Act budget supplement for 2 years (includes City Nursery at \$70,000 and backlog tree trimming of \$100,000).

Table 3. FY 1991 Tree Services Budget

ITEM	BUDGET	BUDGET %
Tree Maintenance*	\$770,000	21%
Tree Trimming	\$1,640,000	44%
Park Spray/Weed Cont.	\$415,000	11%
Nursery Operations	\$600,400	16%
Administration	\$317,700	8%
TOTAL	\$3,743,100	100%

* Tree maintenance includes planting, removal, pest and disease control and general inspection. Hardscape repair is budgeted in Street Maintenance.

Table 4 . FY 1994 Financial Resources

CURRENT SOURCES	1993/94 FUNDING LEVEL
A. General Fund Contribution	\$2,736,000
B. Lighting and Landscape Act	\$ 409,000
C. Grants and Miscellaneous Income	\$ 10,000
TOTAL	\$3,155,000

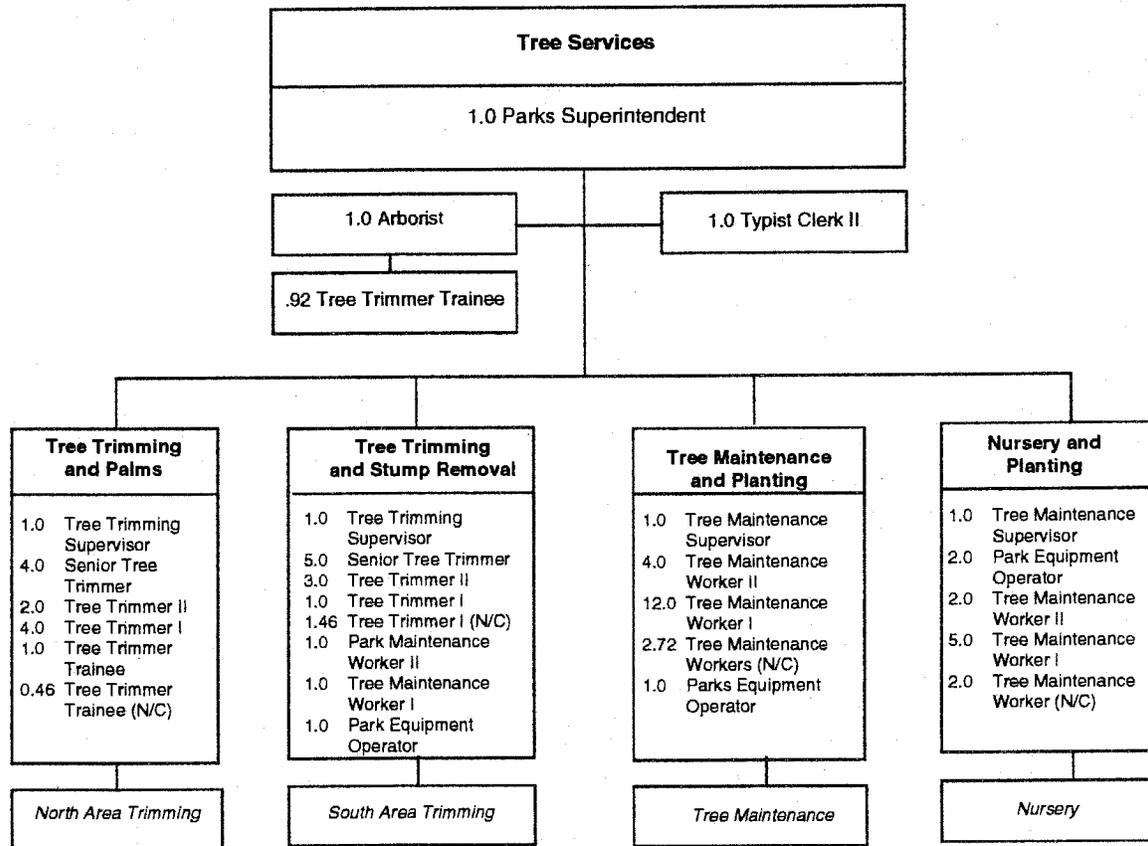
CURRENT STAFF STRUCTURE

Today, tree management is performed by the Sacramento Tree Services Section (STS) of the Parks and Community Services Department (Figure 5. Flow chart of Tree Services positions). The Section has 57.87 staff positions in tree services and has recently added 10 staff for park weed maintenance. The tree staff is divided into four units: Nursery and Planting; Tree Trimming /Removal and Palms; Tree Trimming/Removal and Stump Grinding and General Tree Maintenance, which includes pest control and low limbing. Each unit has a Tree Trimming or Tree Maintenance Supervisor who oversees the unit crew and handles citizen service requests for work. Tree care includes planting, early care, trimming, removal, weed, pest and disease control and emergency care. The supervisors inspect each request to determine whether the tree falls under City responsibility, whether a location is suitable for planting a new tree and the extent of work required. Tree Trimmers (II, I or limited term) are responsible for tree trimming and removals. The

senior tree trimmers also monitor contracted tree work. The limited term trimmers staff The Tree Maintenance Workers (II, I and limited term) are responsible for low-limbing, pest control, planting and early care. The Tree Maintenance Worker Supervisor is licensed as a Pest Control Advisor. The nursery staff, also classified as Tree Maintenance Workers are responsible for plant production, planting and early care. All four units come under the direction of the City Arborist, who inspects all problem trees and provides the next level of detection for the Tree Supervisors. The Parks Superintendent has overall authority for the Tree Services Unit and resolves disputes between a tree staff inspector and a citizen.

quence, the ratio of trees to Tree Trimmers increased until 1990, when the number of trees publicly maintained was reduced as a result of shifting the responsibility of private maintenance strip trees to property owners (Table 5. Public Trees to Tree Trimmers).

In addition to the Tree Services Section staff, the City Council created a volunteer Street Tree Task Force in 1986 to serve as a public hearing body to review policies regarding the City's Elm Reforestation Program and street tree plantings. The Task Force was charged with providing greater public participation in the review of City street tree policies. There was particular concern about the removal of elm trees in the Central



Date: March 1993

Figure 5. Existing Tree Services Staff

Decline in Tree Service

While the number of trees has increased over the years in conjunction with the growth in local land development, the number of City Tree Trimmers has dwindled. Since 1970, as a conse-

Business District. The 15-month study prepared by the Task Force recommended that:

1. The Tree Service Section's programs continue with adequate funding to maintain the present level of service.

2. The Elm Reforestation Program be replaced with a broad-based management plan which would include all species and maintenance care.

Table 5. Public Trees to Tree Trimmers

# Trees Publicly Maintained	Year	#Trees/City Tree Trimmer
100,000	1960	4,348
	1970	4,310
	1980	6,304
150,000	1987	6,152
92,500	1991	4,220*

*(1990 moratorium)

3. The City make a future commitment to the urban forest by providing adequate funding and staff levels to implement the new policies proposed in the Street Tree Master Plan.
4. The "Guidelines for the Tree Management Plan" developed during this study be used as a framework with which to hire an outside consultant who would develop a Tree Master Plan.

The Task Force essentially laid the foundation for the development of this Urban Forestry Management Plan. A Tree Advisory Committee was formed in February of 1991 to review and comment on the plan. This body currently serves as a liaison and tree advocate for the community.

CURRENT MANAGEMENT PROGRAM

A management program must always work within the means of its budget. There are different ways of managing a maintenance program in light of a limited budget. A progression from reactive to proactive strategies includes:

- Crisis Pruning
Taking care of landscape elements only when an emergency or near-emergency arises.
- Reactive or Request Maintenance
Maintenance is performed on a request basis from a work backlog.
- Task Pruning
Limited to certain high priority tasks such as low-limb or mistletoe control.
- Scheduled or Proactive Maintenance

A systematic, long-term care program based on the needs of species and age. This will prevent the need for crisis and reactive maintenance.

As each of these successive management strategies becomes implemented the end result is a healthier tree. However, without a planned system and a computer database to track all components of the maintenance operation, it is easier to defer work as a cost savings measure. In the short-term, this may be true, however, as work regresses to request or crisis management, the cost of care and liability potential increases.

With 150,000 public trees under their jurisdiction, STS work priorities have been reduced to a reactive, service request basis. Most trimming work is presently initiated by home owner calls. Service requests are made, trees inspected and then work is scheduled according to the month the call was received. The crews work on an 8 to 24 month request backlog. Trees are only approved for trimming for traffic and building clearance or for hazardous limb removal (deadwood that is greater than 4 inches in diameter). Once approved, the trees will receive a complete general trim.

In June 1990, the City Council provided an additional \$200,000 from the Lighting and Landscape Fund (reduced by \$100,000 in 1994) to catch up on the backlog. To date, much of the 1000 tree maintenance request backlog has been completed with the remainder to be completed by contract this year. Although the City has reduced the number of publicly-maintained trees with the 1990 private maintenance strip moratorium, overall tree health may diminish because the City does not enforce tree care standards on privately owned trees. STS will respond to all emergency calls for hazardous trees and there is a 24-hour emergency service for hazardous trees which is dispatched by a City operator.

TREE MAINTENANCE PRACTICES

With the release of the private maintenance strip trees, the STS currently maintains 92,500 trees, including those within the City right-of-way (which varies from property to property), park strips, street medians, parks and public facilities except schools. STS trims 5,000 trees per year. The City utilizes contract services for specialized tree pruning, with an additional 515 trees pruned annually at a cost of \$150,000. In addition, STS has a service contract to maintain trees on CalTrans rights-of-way along State routes through the City. This contract includes 15th and 16th streets through the Downtown, and Freeport Blvd, X, W, 29th, and 30th Streets along the freeways. In FY 1990, the contract was for \$15,000 and in 1991 for

\$42,350.

Tree Removal

STS removes 800 trees per year. Tree removal is an emotional issue with public sentiment divided between "removing all the messy trees" and "never removing trees until they fall on their own." *The Sacramento Friends of the Elm* was organized to prevent the removal of elm trees. The group has a preservationist philosophy which believes that elms should only be removed after they die or collapse to the ground. This runs counter to accepted professional urban forestry practices of replacing trees at the end of their useful life. Of course, trees in natural areas that do not interfere with people or property may be retained as wildlife habitat (see *Planting & Maintenance Manual*). Although the public has a generally favorable perception of City maintenance practices (Public Opinion Survey, Center for Consumer Research, 1987), there have been complaints.

In response to expressed public dissatisfaction, the Tree Task Force recommended the development of an Objective Tree Evaluation and Public Review Process for all non-emergency removals. In the Guide for Evaluating Tree Condition (Appendix 5), a point system is used to rate tree hazard potential. Staff's decision to remove a tree is followed by a 30-day notification process which includes posting the tree, giving written notice to the property owner, placing door hanger notices on adjacent properties and publishing tree removal lists in the local newspapers. For private tree disputes, the City uses the Nuisance Tree Evaluation form (Appendix 6.) to assist STS, property owners and neighbors identify problems and determine a reasonable course of action. This provides a City Council-approved method for objectively determining tree condition, a mechanism for public comment and liability protection. By addressing the public tree removal concerns prior to beginning work, this process, though lengthy, has reduced adverse public reaction and work delays. Most of the removals are performed by City crews. Because it is more cost effective, removal of elms in the downtown area is contracted-out.

Disease and Pest Control

Tree pest and disease control in Sacramento is limited by STS's budget to only the most serious problems. The City has increased efforts to control the elm leaf beetle. Control of this pest will be

extremely valuable in the early detection of DED during summer months (C.D.F. 1991). To control the elm leaf beetle larvae, the City injects approximately 3,800-4,000 elm trees with Bidrin until 1992-93, an organo-phosphate chemical which requires special permits, training and disposal procedures. In 1993-94 the City changed to Metasystox, which is slated for removal from the market. Its ultimate replacement is not known at this time. (See Appendix 7, Pesticide Training & Records). This treatment is also used to control drip-producing insects that attack elms. The City controls sucking insects that excrete objectionable drip, such as aphids and scale with either a Bidrin injection or an organo phosphate spray. The California Department of Forestry and Fire Protection is experimenting with a predatory wasp release program for ash whitefly primarily in the areas of K Street and Capitol Mall (Fitch, personal communication, 1991). Trees most affected include *Fraxinus* spp. (ash), *Pyrus calleryana* (ornamental pear), *Tilia* spp. (linden), *Acer* spp. (maple), *Liriodendron tulipifera* (tulip tree), and *Ulmus* spp. (elm). The redhump caterpillar is treated with a parasitic bacteria, *Bacillus thuringensis*. For mistletoe some recent research with Ethephon, a plant growth regulator, has shown promise and while the treatment may be too expensive for the City to use on a large scale, individual property owners could benefit.

In the early 1980s STS developed a ten-year mistletoe control reforestation program with supplemental funding. The program provided a one-time treatment followed by owner responsibility for control, however, the City abandoned the control program after four years because of budget cuts. Currently, citizens are encouraged to borrow pole pruning saws through the City's Self-help Program, in order to remove mistletoe infestations themselves. Citizens require special training so they don't top their trees in the process of removing mistletoe.

Anthraxnose is an endemic disease which affects almost all *Fraxinus velutina* (Arizona ash) and F.v. 'Modesto' (Modesto ash) as well as most *Platanus* spp. (Sycamore). The City does not provide treatment. Treatment is only marginally effective on sycamores and ash.

Tree Planting Practices

STS plants approximately 1,200 trees per year. Trees are planted as replacements for those removed by City crews and at the request of home

owners who want trees for their front yards. STS provides advice, and in the event that the tree dies, free replacements for up to three years. All new trees are added to the tree database. In addition, developers are required to pay a \$100 planting fee (\$200 for two trees on corner lots) for each new lot in a subdivision. The developer has the option of planting the required trees or contacting with STS to plant them once the residence has been occupied. Trees are selected from the approved Tree Planting List of 38 species and either obtained from the City nursery or purchased from private nurseries on contract. Contracts are awarded to the lowest bidder that meets STS specifications for quality and size. The City often purchases trees in smaller sizes which are housed at the City nursery for further growth.

City Nursery

Sacramento's City nursery has recently undergone budget and program changes. Prior to 1991, the nursery produced trees for use in public rights-of-ways, shrubs, bedding plants and indoor plants for use in City offices, parks and for special event use. The nursery staff also planted 1,200 trees and provided early care for 3,000 trees annually.

Under the new program, STS staff continues to grow acquire trees for public right-of-way replacements and new tree plantings.

The City nursery acquires and stocks species that are unavailable in commercial nurseries. It also does not stake most trees or remove the lower branches, a practice which produces a greater trunk taper and a stronger tree.

B. PROACTIVE MANAGEMENT

1. Management Policies

Summary of Recommendations

The goals of an effective and efficient urban forest management plan are derived from the City-wide policies established in Chapter 2. Specific policies are articulated into goals and strategies which become the basis for management recommendations:

Policy 3a. Maintain trees in a healthy condition by establishing a high and efficient standard of maintenance for public and private trees by:

- Establishing a proactive management program which includes a scheduled program of planting, maintenance of young, mature, declining trees, removals, inventory and design review
- Enforcing City maintenance standards as outlined in the Maintenance Manual. Institute a business licensing program for all private tree contractors who work in commercial, individual and common areas within the City with an ISA Certification license requirement. Educate private owners and establish incentives to perform to City standards.
- Providing a comprehensive training program for City tree-workers, with incentives for certification in various aspects of horticulture and arboriculture. This program provides for regular in-house training sessions using the Maintenance Manual as the basic text.
- Requiring City inspection for all tree pruning on public land. Work shall comply with ISA and City maintenance standards as written in the City's Maintenance Manual. Pruning shall not be performed solely to reduce canopy coverage.
- Assessing and upgrading an accessible, user-friendly computer database inventory to evaluate work goals against work accomplished, to adjust the following years goals, to define budget and monitor the condition and value of the urban forest on an annual basis. All work performed shall be recorded in the inventory, along with a field assessment of the condition of each tree at the time it is serviced. Potential planting sites will be documented. STS personnel shall be trained to make such assessments as a routine part of their

work, and sufficient office support shall be provided to input the data on a regular basis. Management staff shall be proficient in generating reports which evaluate tree health trends, planning future work, budgeting and developing work goals.

- Adopting an Integrated Pest Management Program for tree pest and disease problems.

Policy 3b: Institute a rotational replacement program to maintain age and species diversity by:

- Achieving a forest composition with no more than 5% percent of any one introduced species City-wide, 10% of a given genus City-wide, or 25% of a given species within a neighborhood. Species native to this area may be planted at 20% City-wide. Control species diversity by moving trees between the Recommended and Experimental Species Lists and the Conditional Species List relative to its population percentage.
- Achieving an age diversity goal of 20% young, 60% mature and 20% overmature of the population. This can be achieved by immediately replacing individual trees as they are removed, by intermixing fast and slow growing species and by planting replacement trees next to declining trees where feasible.
- Removing and planting a minimum target number of rotational replacement trees in addition to planting a minimum target number of potential new trees annually to maintain the tree cycle and achieve long-term forest canopy goals (see management target goals).
- Annually planting a minimum of 5% trees from the Experimental List.

Policy 3c: Coordinate all City tree-related activity through the Tree Services Section of the Parks and Community Services Department by:

- Maintaining close communication and cooperation among City departments on tree-related issues. STS staff shall participate in plan review meetings with other City departments as they pertain to trees. All City departments shall seek the advice and assistance of the City Arborist in any tree-related decision. The arborist shall regularly add articles and notices to City employee newsletters. (Refer to Interdepartmental Functions Table, Chapter 8, Implementation for an outline of a cooperative program)

- Appointing a liaison to tree organizations outside the City.

Policy 3d: Review and revise the Management Plan periodically

- The profession of urban forestry, the City of Sacramento and the environment in general will continue to undergo major changes, which in turn will necessitate flexible responses. It is suggested that the Plan be reviewed after the first year and every five years thereafter. Increasing experience with the City's trees and growing awareness of needs and benefits will undoubtedly require periodic adjustments to the City's forestry program and policies. Minor changes to the plan, including adjustments, maintenance and planting practices, addition of educational materials, and changes to wording or facts in the text, may be made at any time by the Parks Superintendent, Tree Services.

C. PROACTIVE TREE MANAGEMENT STRATEGIES

Policy and goals implementation strategies are based on urban forest conservation principles which assume that trees, like all living resources, have a life cycle. That is, they undergo a physiological period of rapid growth when young, slow growth when mature, eventual decline and death. When grown in a rural environment without human intervention, trees in decline will eventually fall over and become part of the soil for a new generation of trees. In the urban environment, trees must be managed to co-exist with people and the urban infrastructure. In the wild, trees have a natural life span. In the urban environment, trees are managed according to a shorter, useful lifespan and once a tree's cost of maintenance outweighs its value, it should be removed and replaced. All trees, except those classified as historically significant would be managed according to useful lifespan. This management assumption is necessary in an urban environment to justify the cost of maintaining the entire population and to limit the risk of property and personal liability.

An urban tree's lifespan is based on species, planting location and level of care. A tree planted in a remote area, with less risk of injuring someone can remain longer than a tree located adjacent to a busy downtown pedestrian walkway. Species have different lifespans. In general, fast growing trees such as ash have a shorter lifespan and are

more valuable when young because they provide a quick canopy cover. However, they prove more costly to maintain once they reach maturity. Slow growing species, such as ginkgo, have much longer life spans and become valuable once they've reached maturity. Heritage trees, so designated by their species, size, condition and location, are acknowledged to have value beyond their useful life. Thus more funds for public heritage trees are budgeted for their special care. This might require cabling and bracing, deep watering or more frequent care once a heritage tree goes into decline.

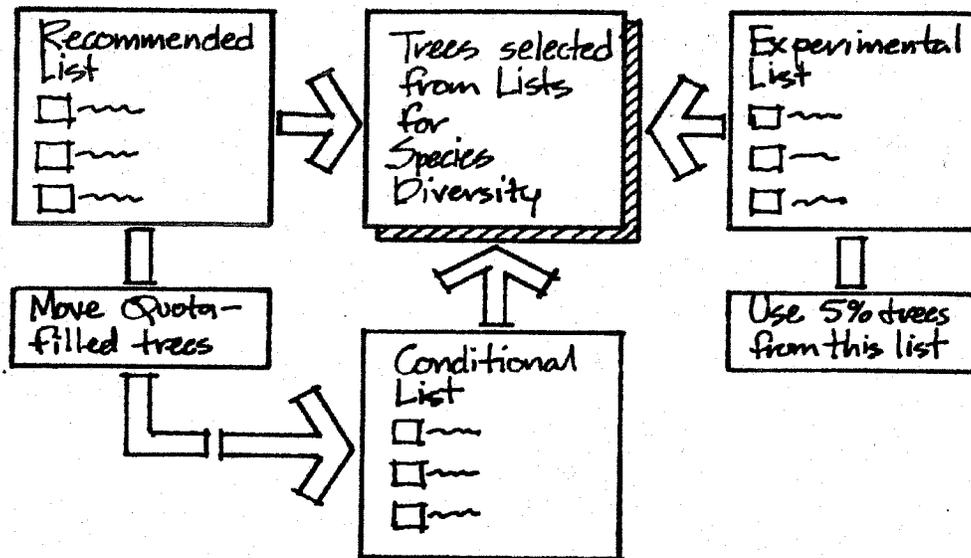
Rotational Replacement

Another assumption of conservation principles is that while individual trees are dynamic, undergoing change throughout their lives, the urban forest should be managed as a stable resource. In order to maintain the population, a certain percentage of trees need to be removed and replaced every year. Typically an urban forest will lose between 1-2% (Miller 1988, p. 346) of its population annually due to natural attrition and human-caused death (vandalism, vehicular damage, chemical damage, neglect etc.).

Figure 6. Achieving Population Diversity

Using a rotational replacement management strategy, a specified percentage of the population is removed and replaced every year. Currently, Sacramento removes 800 or .5% of its public trees annually. Removing trees is an emotional public issue and must be handled with sensitivity. Tree removal would be handled on a priority basis, taking hazardous trees out of the population first, followed by deformed and low vigor trees and then high maintenance trees as their useful life ends. The current tree removal notification and public comment process builds support for sound conservation practices and is essential for its success.

Over time, this rotational replacement strategy becomes the mechanism which allows the forest manager to adjust the age and species diversity of the population. Currently, Sacramento's forest has a 20% young, 78% mature and 2% declining population. The goal is to increase the age diversity of the forest so the City never has a high



Recommended: The trees on the Recommended List are either proven performers in Sacramento or new species and tree cultivars which are suited to the conditions found in the City.

Experimental: Experimental trees are those which meet all the same environmental, functional and design requirements of trees on the Recommended List, but which have not been planted in large enough numbers or for a long enough period of time in Sacramento to be able to judge long-term performance.

Conditional: Conditional trees are those with specific use and placement limitations. Limitations are listed. Conditional trees may only be used with the written approval of Street Tree Services

Not to Use in the Public Right of Way: The trees on this list are not to be planted in the public right-of-way

percentage of the population in decline. This situation would require costly removal and would reduce the beneficial impact of mature trees. Since trees live in the mature phase longer than in the young or overmature phase, an ideal distribution goal would be 20% young, 60% mature and 20% overmature. The relative age of each tree should be added to the database and a more accurate age diversity monitored. By controlling how many trees are planted per year, the population shift can be planned over time toward a more ideal distribution.

Population Diversity

In order to meet species diversity goals, Sacramento should move all species from the Recommended Species List to the Conditional List (chapter 6) which exceed or are close to percentage quotas until the tree population shifts to a more diverse population (Figure 6. Achieving Population Diversity). In addition to smoothing out the "top heavy population", the low end of the species frequency list should be consolidated in order to achieve a more cohesive design palette. Chapter 6 discusses how to implement these guidelines into design and species selection. The Recommended Species List achieves both goals. The Management plan recommends 99 species, including many cultivars which are better suited to Sacramento's climate and soils and those from the Experimental List.

It is recommended that 5% of all new trees planted each year be selected from the Experimental List. Although some species might not be readily available, the extra effort would be worthwhile even if special orders are required. 'Sleeper' cultivars, ones that are unusual or relatively unknown, can solve many problems inherent in non-diverse tree populations. By ordering new cultivars, the City can create a demand for their use, forcing nurseries to grow them in greater numbers. The net result will be that better stock will be available within the nursery trade. In time, Sacramento's more popular tree species (the City has already deleted the *Fraxinus* and *Ulmus* genera and *Liquidambar styraciflua* and *Zelkova serrata* species from the current species list because of disease and surface root problems as well as overplanting) will become less prominent and less popular species will become more widespread.

New Planting Potential

In addition to the number of trees planted every year for rotational replacement, a specified percentage of potential planting sites should be filled to achieve the 50% forest canopy cover long-term goal established in Policy, Chapter 2. Projections of potential planting spaces have been identified from the aerial photo study (Appendix 3. Potential Residential Tree Population). Just as the existing residential tree population was estimated, the potential planting space for new trees was determined. It is estimated that a potential 55,000 residential trees could be planted in the private maintenance strip and parkways City-wide. Although the estimates could not be separated into the two jurisdictions, estimates were broken out by Community Plan Area. It is recommended that an actual count of available planting sites be identified and recorded as part of the inventory process. This information, added to the database, will facilitate proactive planting schedules for each community plan area.

A more achievable short-term planting goal would be to add at least 1% of the population annually, or 1,500 trees. This number, when added to the rotational replacement trees, equals a 3,000 tree annual planting goal. The City currently plants 1,200 trees a year. Implementing this increased planting goal could be accomplished through a partnership agreement with the Sacramento Tree Foundation. STF has an established program for community participation and can accommodate large tree plantings through their broad-based Community Forester and Volunteer Program. This would relieve STS staff of additional planting to focus on more highly skilled tree-care tasks.

Proactive Management

Tree management must move from a reactive to a proactive program if it is to offer quality tree care on a cost effective basis. Cities with large tree populations, such as Milwaukee, Minneapolis and Modesto have implemented proactive maintenance programs pruning their trees every 5-6 years. The City of Santa Maria, California has doubled its efficiency by implementing a planned maintenance program, scheduling work on a block-by-block basis within a specified geographic area and thus reducing travel time. (Hudson, 1989).

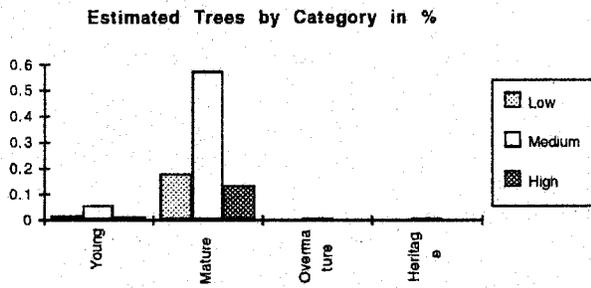


Figure 7. Relative Maintenance Need of the Population

Currently, Sacramento’s Tree Services respond to citizen calls for assistance and will schedule work only in the order received, which involves a backlog system. For example, in July 1991, crews were working on requests received during the previous October. This system is inefficient because of the time it takes to travel from one request site to another. The City is currently divided into two maintenance districts, by north and south, so that each crew must transect one half of the City to do its work. Even though STS prunes an average of 5,000 trees per year, most trees receive service only once every 20 years, and then only on request. Sporadic pruning decreases tree health, increases the risk of liability and is more costly than shorter, programmed pruning intervals, known as trim or maintenance cycles, recommended in professional practice.

Maintenance Cycles

Under a proactive program, once trees grow beyond their initial five-year establishment period, they would be assigned a relative high, medium and low maintenance cycle corresponding with their species requirements for care and location. A specified number of years between visits would be assigned. Trees with an inherently fast growth rate, planted in prominent locations, would receive a higher trim cycle than those with less rigorous pruning requirements. For example, an eight year cycle will vary between 3-9 years depending on age and species. Since each trim cycle varies with the age and species of tree a short-hand notation for the actual trim cycle is used throughout the Management Plan. Refer to Appendix 8. tables for the range of trim cycle years for each option presented below.

Figure 7 illustrates the concept of relative maintenance need by age and species based on Sacramento’s tree database. Each species in the inventory sample (60% of the estimated population) is assigned a high, medium or low level of maintenance (Appendix 9. Tree Population by Relative Maintenance Need). The population is subdivided into age categories to later determine a cost per tree. A summary of the population indicates that sixty-five percent requires a medium

Table 6. Trim Cycle Summary Chart for Trees in the Public Right of Way

SERVICE OPTIONS	ANNUAL COST	# TREES TRIMMED
a. Proactive 10 Year Rotation	\$1,290,243	18,695 trees/year*
b. Proactive 8 Year Rotation	\$1,872,627	20,601 trees/year*
c. Proactive 6 Year Rotation	\$3,302,076	23,507 trees/year*
d. Current Reactive Program (12-14 year rotation)	\$ 816,953	5,059 trees/year*

*These are estimated numbers based on a fully operative proactive program. During the transition years this number will be less.

level of care. Only a small proportion (15%) requires a high level of care. When these numbers are assigned a specific trim cycle, the annual number of trees requiring maintenance can be determined. Unit costs for trimming based on crew size, equipment costs and labor required is provided in Appendix 8. A summary table (Table 6) illustrates the number of trees annually requiring maintenance based on a range of trim cycles. The three service level options presented include: the proactive 6 year, 8 year and 10 year trim cycles. The current reactive 12-14 year cycle is illustrated for comparison.

CITY-WIDE MAINTENANCE

Using the strategies as discussed above, a City-wide program can be developed on a proactive basis. The scheduled maintenance strategy would apply to all aspects of tree management. By adopting the rotational replacement and vacancy planting strategies, a designated percentage of the population is planted, pruned, injected, sprayed and removed each year. In addition, a specified percentage of heritage trees would be monitored each year. For discussion and budgeting purposes, maintenance has been divided into two categories, basic services and trim cycle. Basic services includes planting, annual maintenance for new trees, pest/disease control, heritage trees, monitoring the inventory, and emergency maintenance (Table 7. Basic Services Budget).

Crews will always be needed to respond to emergency maintenance (storm damage, limb breakage and special City department requests), however the majority of work can be accomplished by a planned approach utilizing maintenance cycles. A transition period would allow some crews to focus on planned maintenance while others continue to work on request (see Implementation, Chapter 8). Eventually, most of the work would shift to planned maintenance. The proactive program would include:

1. Planting and Removal

Planting is based on rotational replacement of 1% of the population (1,500 trees) and an additional 1% of the population (1,500) for new planting sites. This total would include individual planting requests as well as a target number of trees for neighborhood needs as identified by a Senior Tree Trimmer assigned to a geographic zone and community. Removal would continue at approximately 850 yearly. Large canopy trees are to be planted wherever planting space allows.

2. Annual Maintenance for Newly Planted Trees

Annual maintenance would be required for a five-year establishment period to adjust or remove staking, weed and mulch basins, water if necessary, prune for training, detect pests or diseases early, remove lower branches and raise the canopy. Trees that are deformed or possess low vigor should be replaced. This five-year establishment program could also be contracted with the Sacramento Tree Foundation or a Youth Training Program.

As new trees are planted, it is obviously advantageous to plant species requiring a low and medium frequency of maintenance. The maintenance crews will be able to accommodate a greater percentage of the population over time. Frequency of maintenance is only one criteria for species selection, and a high maintenance rating should not preclude using a species. Aesthetic, historic or cultural, or species diversity can justify using such trees. However, the overall percentage of high maintenance trees should remain low within the population.

3. Scheduled Maintenance Cycle

A range of three service levels representing 6, 8, and 10 year proactive rotational pruning and the current 12-14 year reactive pruning is presented in Table 6. Trim Cycle Summary Chart. As discussed above, these cycles actually represent varying service levels years depending on the age of the tree and its relative maintenance need. It is estimated that 100% of the trees scheduled for a site visit will require pruning during the first trim cycle. Since the population will receive more frequent, regularly-scheduled care under a proactive program, the number of trees requiring pruning during every site visit should diminish. In proactive management, the upper limit for years between trim cycles becomes the duration of time that a tree is pruned according to schedule without the need for a visit in between cycles. A 10 year cycle would be the upper limit for proactive trimming (Fitch, 1991 personal communication).

This information should be tracked carefully so that if there is a budget savings, additional trees could be added to proactive care and /or the frequency of visits increased. The cycle of years can be adjusted depending on the ability of crews to accomplish work and available budget, although the relative maintenance need will remain

the same. As stated previously, the greater the frequency of trim cycle visits, the better the long term health of the population which ultimately translates into budget savings. In Sacramento, for a given trim cycle, approximately half the annual number of trees requiring pruning are young trees, which will require an annual site visit for the first five years.

4. Annual Pest/Disease Control and Monitoring

The number of trees requiring these services should be monitored through the database so that work can be planned. Sacramento City staff and The California Department of Forestry will continue to monitor elms and zelkova for Dutch Elm Disease and request that the City remove all infected trees.

5. Heritage Trees

Heritage trees, including groves and woodlands, are found anywhere in the City, on both public and private lands. Since a higher level of care is required to maintain heritage trees beyond their useful life, tree inspectors must make identification and regular evaluation the first priority as they make their rounds. A schedule for heritage tree care and eventual removal must also be established.

6. On-going Inventory Entries and Database Updating

All work performed would continue to be recorded and entered in the database. Since more trees would be inspected and pruned every year, the database would be completed in a shorter time-frame of approximately 6-12 years depending on the trim cycle selected instead of the 21 years projected under the current system of data collection.

D. STAFF RESTRUCTURING AND BUDGET

The efficiency of a proactive program is based on geographically dividing the City into smaller maintenance zones to minimize crew travel time. (Figure 8. Tree Services Staff Organization Under Proactive Management). The number of districts would depend on the level of service selected, available staff and equipment resources. Using existing STS staff, a Senior Tree Trimmer could assess and schedule work within their assigned zone, inspect all contract and in-house work, inspect shade tree compliance for parking lots, inspect heritage trees and update the computer

Table 7. Basic Services Budget

<u>SERVICE</u>	<u>ANNUAL COST</u>	<u>COMMENTS</u>
1. Planting and Nursery Operations		
a. Nursery Operations	\$ 360,000	
b. Replacement Trees (750 per year)	\$ 16,000	
c. New Tree Plantings (750 per year)	\$ 16,000	
2. Removal of Diseased or Dead Trees	\$1,040,000	800 Trees/Year
3. Feeding, Root Pruning and Pest Control	\$ 770,000	
4. Tree Trimming	Varies	See Service Options Chart
a. Public Trees		
b. Private Maintenance Strip Trees		
TOTAL BASIC SERVICES EXCLUDING TREE TRIMMING \$2,389,000		
5. Coordination and Education*	\$ 75,000	

* New recommended budget item, not included in the current budget.

database with new information regarding inspected trees. Crews would be assigned work in a geographical area of the City, but tasks may vary according to other needs. The Tree Maintenance Supervisors would identify specific neighborhood needs and work with the Community Education Coordinator on community based reforestation and education projects. Specific work could also be contracted out, as needed.

Although the standard for tree care as defined above must not diminish in order to achieve the goals of a healthy urban forest, there is great flexibility in defining who will be responsible for tree care. It is recommended that the City continue to maintain the 92,500 public ROW trees in-house using one of the proactive trim cycle options. In addition there is a spectrum of options to assist the public with the 57,500 private maintenance strip trees (refer to Figure 2. Public/Private Tree Jurisdiction in Chapter 2, Policy). Table 8. Maintenance options for trees in the Private Maintenance Strip provides four options; No Assistance, Self-Help, Incentive Rebates and City Maintenance.

1. Responsibility

responsibility. This is the current level of service. Continuing this practice means that homeowners directly bear the cost of tree care for trees in the maintenance strip. This may result in inconsistent or infrequent care of these trees, and presents the least comprehensive approach to urban forest management.

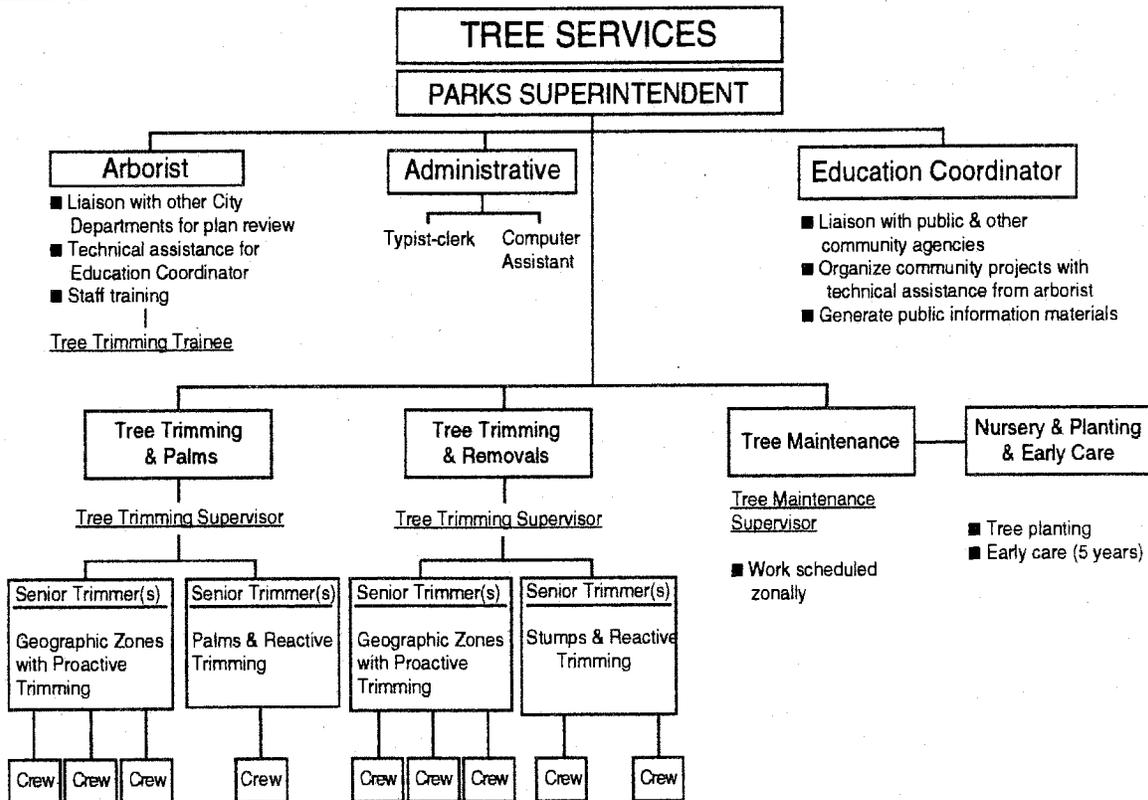
2. Self Help Assistance

City provides technical assistance ("self-help") to the property owner regarding tree care; however, the homeowner would still be directly responsible for the costs of tree care.

This option provides assistance to the homeowner in identifying tree trimming work which needs to be done and in selecting a contractor at a competitive price. The City would license private contractors and inspect private work to ensure work is done to standard. Two inspectors are included in this budget.

3. Self Help with Incentive Rebates

This option builds on the education assistance



Notes: Senior Tree Trimmer(s) to be assigned to a zone with responsibilities for updating inventory, work records and crew work. Reactive work should shift to proactive tree management by 20% each year. Crew size and composition will vary according to need.

Figure 8. Tree Services Staff Under Proactive Tree management Organization

provided above. In addition, a rebate program of an average of \$100 per tree, 2000 trees annually would be funded by the City to help defray a

Budget (Table 7). The possible combinations create a "menu" of service options for the entire tree management program. Since there are many

Table 8 Trees In the Private Maintenance Strip

<u>SERVICE OPTIONS</u>	<u>ANNUAL COST</u>	<u>COMMENTS</u>
1. No City Assistance	\$0	
2. City Education and Self Help Program with Tree Maintenance Standards for private contractors	\$ 142,000	
3. Self Help Incentive Rebate Program	\$ 342,000	
4. City Maintains All Maintenance Strip Trees (57,500 trees)		
1. 6 Year Rotation (contract costs)	\$1,005,242	19,902 trees annually
2. 8 Year Rotation (contract costs)	\$638,151	18,219 trees annually
3. 10 Year Rotation (contract costs)	\$ 487,588	17,175 trees annually

*Refer to Figure 2. Public/Private Tree Jurisdiction.

portion of the costs of tree care for persons on fixed income or hardship cases. While incentives are included in this option, consistent, comprehensive tree care of maintenance strip trees will depend on the voluntary efforts of the property owner.

4. City Maintenance of all Maintenance Strip Trees

Increase public funding and add "maintenance strip trees" as part of the City's responsibility. Under this option, the maintenance strip trees would be maintained as part of the systematic care rotation for public trees. The work would be undertaken by private contractors secured by competitive bids. City would regulate licensing as above.

This option insures that these trees which are often in close proximity to public trees (see jurisdiction map) would receive the most consistent and comprehensive tree care. The same trim cycle options presented for the public trees are available for these trees also.

Budget

The budget for a proactive maintenance program is calculated by selecting one Public ROW tree trim cycle option (Table 6.), one Private maintenance strip tree service option (Table 8.) and adding those costs to the Basic Services

possible menu options, Table 9. (Service Menus) details seven of those most feasible combinations.

There are tradeoffs associated with each service option when analyzing the two main variables of trim cycle frequency and private or public care of the private maintenance strip trees. Generally, as the trim cycle frequency increases, tree health, maintenance efficiency and cost increases. The incidence of tree related hazards related to human safety and property decreases. As discussed previously, an underlying assumption of urban forestry management is that *all* trees within the population be maintained for the health of the forest. Following this assumption, the care of the private maintenance strip trees can be provided by the City for a small annual tax or by the property owner for the cost of a private contractor. Public care of the private maintenance strip will provide the most consistent and competent care. Under private responsibility, consistent and comprehensive tree care would depend on the property owner. Since care of the private maintenance strip trees was returned to the property owner in 1990, tree care has been sporadic. An enhanced self-help program to encourage private care is expected to improve participation but care would still not be consistent Citywide.

TABLE III. SERVICE MENUS

SERVICE OPTIONS ANNUAL COST COMMENTS

1. CITY PROACTIVELY MAINTAINS ALL PUBLIC AND MAINTENANCE STRIP TREES (6 YEAR ROTATION)

a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$3,302,076	6 Year Rotation
c. Maintenance Strip Trees	\$1,005,242	6 Year Rotation
TOTAL:	\$6,693,318	

2. CITY PROACTIVELY MAINTAINS ALL PUBLIC AND MAINTENANCE STRIP TREES (8 YEAR ROTATION)

a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,872,627	8 Year Rotation
c. Maintenance Strip Trees	\$ 638,151	8 Year Rotation
TOTAL:	\$4,899,778	

3. CITY PROACTIVELY MAINTAINS ALL PUBLIC AND MAINTENANCE STRIP TREES (10 YEAR ROTATION)

a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,290,243	10 Year Rotation
c. Maintenance Strip Trees	\$ 487,588	
TOTAL:	\$4,166,831	

4. CITY PROACTIVELY MAINTAINS ALL PUBLIC (10 YEAR ROTATIONS)/ MAINTENANCE STRIP PRIVATELY MAINTAINED

a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,290,243	10 Year Rotation
c. Maintenance Strip Trees	\$ -0-	
TOTAL:	\$3,679,243	

5. CITY PROACTIVELY MAINTAINS PUBLIC TREES (8 YEAR ROTATIONS)/ MAINTENANCE STRIP TREES PRIVATELY MAINTAINED

a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,872,627	8 Year Rotation
c. Maintenance Strip Trees	\$ -0-	
TOTAL:	\$4,330,627	

6. CITY PROACTIVELY MAINTAINS PUBLIC TREES (8 YEAR ROTATION)/ SELF HELP PROGRAM FOR MAINTENANCE STRIP TREES

a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$1,872,627	8 Year Rotation
c. Maintenance Strip Trees	\$ 142,000	
TOTAL:	\$4,403,627	

7. CURRENT CITY REACTIVE MAINTENANCE PROGRAM (12-14 YEAR ROTATION)/ SELF HELP PROGRAM FOR MAINTENANCE STRIP TREES

a. Basic Services Budget	\$2,389,000	See Table I
b. Public R.O.W. Trees	\$ 806,097*	12 Year Rotation
c. Maintenance Strip Trees	\$ 0	
TOTAL:	\$3,195,097	

*Current level of funding includes a \$200,000 augmentation which is essential for maintaining current level of service. Half of this is budgeted for trimming service request backlog, and half is budgeted for contract proactive trimming in the Downtown area of the City.

Each of the service menus projects the additional amount of funding necessary for implementation. Table 10. Program Options Fee Impact compares the required funding for each of the service menus described above, the funding required in addition to the existing budget and the per parcel impact each scenario has. The parcel cost is spread equally to the residential and commercial parcels in the City. The financial mechanisms recommended to cover the service menu selected is discussed in Financing, Chap. 7.

E. NEIGHBORHOOD SERVICE MODELS

The urban forest is not uniform throughout the City. Just as a profile of Sacramento’s urban forest has been described, a similar analysis can be made by neighborhood. A detailed profile of 28 identified neighborhoods can be found in Appendix 3 (Neighborhood Tree Profiles and Recommendations). This analysis will be helpful in establishing work priorities in each neighborhood, defining maintenance districts that have common tree characteristics and may assist in establishing local

Table 10. Program Options per parcel Fee Impact

REQUIRED FUNDING BY SERVICE MENU	EXISTING ADDITIONAL RESOURCES	FEE FUNDS REQ'D	IMPACT PER PARCEL*
Menu 1: \$6,765,318	\$3,196,000	\$3,565,318	\$24
Menu 2: \$4,968,778	\$3,196,000	\$1,768,778	\$12
Menu 3: \$4,235,831	\$3,196,000	\$1,035,831	\$ 7
Menu 4: \$3,748,243	\$3,196,000	\$ 548,243	\$ 4
Menu 5: \$4,330,627	\$3,196,000	\$1,130,627	\$ 8
Menu 6: \$4,472,627	\$3,196,000	\$1,272,627	\$ 9
Menu 7: \$3,196,000	\$3,196,000	\$ 0	\$ 0

PRESERVING TREE VALUE

The value of trees is often lost in a line item of expenditures in a city budget. This is unfortunate because the urban forest, like buildings, roads, or sewers, and other municipal investments *increases* in value over time. The dollar value of Sacramento’s 150,000 public trees is worth approximately \$176 million (based on the International Society of Arboriculture’s method of tree appraisal) (Table of calculations). By instituting a proactive maintenance program and thus improving tree care, the value can be increased to an estimated \$313 million. When the population shifts to a more appropriate species diversity, the value can be increased further.

Since the majority of the City’s urban forest is mature, its value will be retained only if a rotational replacement program is implemented. Forest value will drop if large numbers of trees reach decline and are removed within a short time span. By implementing conservation practices as discussed in this chapter, the value of the urban forest resource will remain stable as will the value of the investment.

funding strategies. The existing database can not delineate information on a neighborhood basis. Consequently, the information presented is estimated from aerial photos, a ground truthing of a population sample and from observations provided by the Parks Superintendent.

Although approximate, this information provides a profile of the neighborhood tree population based on its relative age, species composition and the percentage of the neighborhood comprised of heritage trees. The following summary (Table 11. Urban Forest Composition by Neighborhood) is a general breakdown of urban tree forest composition by neighborhood type. Representative neighborhoods are identified for each forest type. Recommendations based on the composition breakdown and the individual neighborhood profile will assist STS staff and the Community Education Coordinator in focusing reforestation and education efforts.

Table 11. Urban Forest Composition by Neighborhood Type

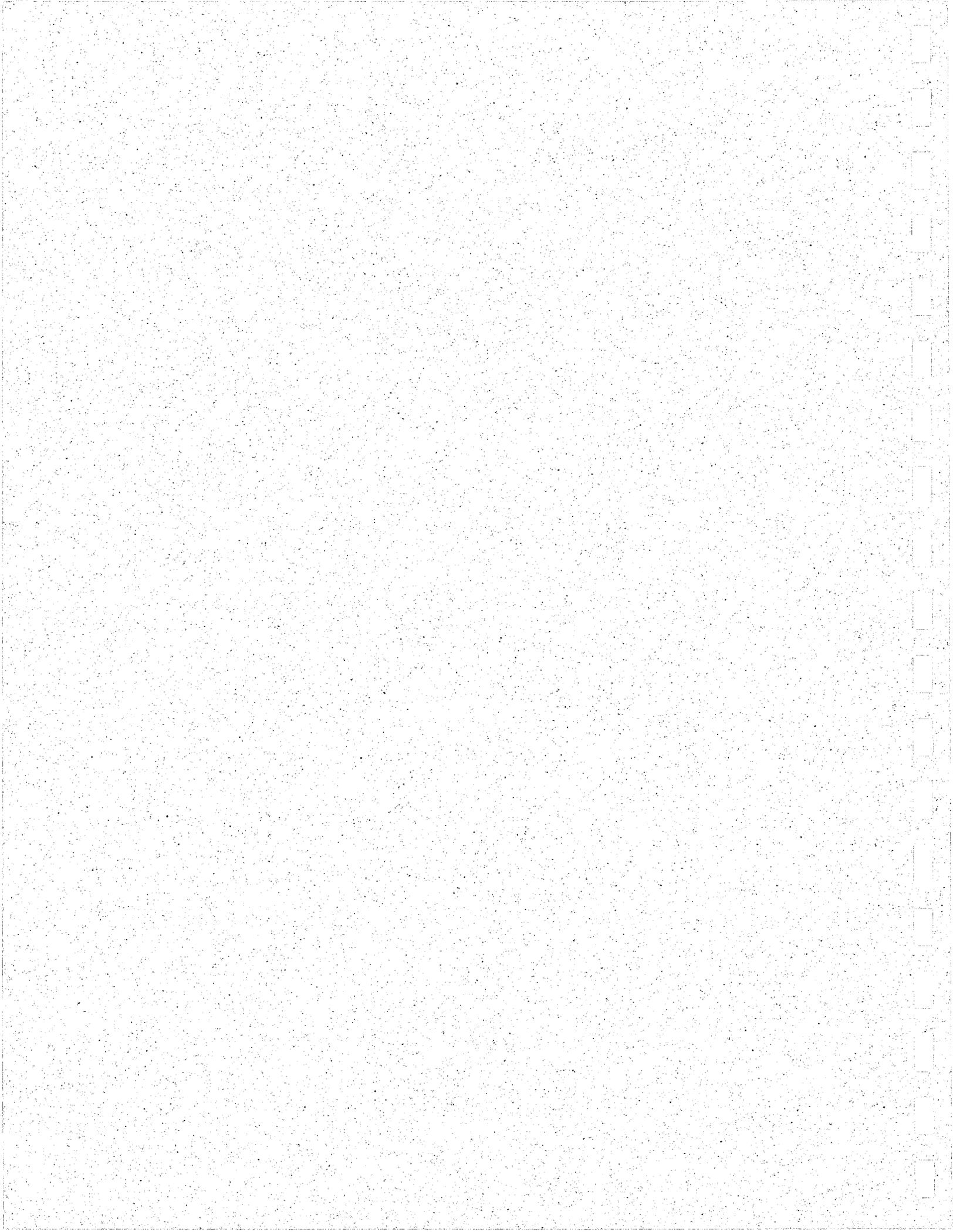
Type	Description	Recommendations	Representative Neighborhoods
Elm Dominant	Dominated by Elm Species and Zelkova Trees susceptible to Elm leaf beetle; minor Dutch Elm detected. Dominant trees are mature to overmature.	Short-term: Continue Elm leaf control program. Long-term: Rotational replacement of declining elms with other species. Select species that are resident or not susceptible. Monitor for Dutch Elm disease and remove diseased trees.	Alkali Flat, Boulevard Park, Oak Park, Poverty Ridge, South side, T-Street
Ash Dominant	Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.	Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Encourage Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.	Arden Arcade, City Farms, College Green, Curtis Park, E. Sacramento, Glen Elder, Meadowview-Florin, Oak Park, Poverty Ridge, River Park, S. Land Park, S. Natomas, T-Street, Tahoe Park, Valley High, Woodlake Robla.
Even-age Declining Trees	Higher maintenance required to pro-long removals to avoid clear-cutting.	Begin rotational replacement to replacethe declining trees. This should be done so as to increase the age diversity over time. Anticipate more frequent trimming of declining trees.	Boulevard Park.
Young Tree Population	Characterized by less than 15 years-old. In most cases, this population has a better species mix than older monoculture neighborhood.	Attention to additional planting in new developments, following policies on planting goals. Attention to be given to pruning.	North Natomas, Pocket.
Platanus Dominant	50+ years old. Slowly declining population with frequent accumulations of small dead wood. Low overall maintenance required. Frequent but not severe problems with Anthracnose and powdery mildew. Problems may cause trees to be unsightly. American Plum borer, mite, and scale are more sporadic and more seriously affect tree health.	The species requires dead wood trimming and opening up canopies. Replace with disease-resistant varieties of P. 'Bloodgood' and P. 'Yarwood'.	Curtis Park, E. Curtis Park, E. Sacramento, Land Park, Oak Park, Southside, T-Street, Woodlake, Noralto, Robla.
Mixed Species, underplanted	Trees are a desirable mixed age and species. Area has been dominated by industrial land use and therefore is underplanted.	More tree planting is needed. Co-ordinated with Richards Boulevard Master Plan.	Richards Boulevard.
Mixed Species, overplanted	Trees dominated by Purple Plum, Liquidambar and Alder. These species have been overplanted and spaced too closely.	Need to reduce number of trees for available planting space. Select more appropriate species which are disease resistant.	Campus Commons.
Mixed Species with Native Species	Desirable mix of species including heritage trees on private property.	Increase planting. Encourage native species to owners who will remove turf and avoid summer irrigation. Offer other species to owners who desire summer irrigation.	East del Paso Heights, South Natomas.
Mixed Species, poor care	Desirable mix of species, but under-planted. Existing trees not cared for.	Increase planting and community education for providing tree care.	Del Paso Heights, East del Paso Heights.





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IV THE SACRAMENTO BIOREGION

A. THE URBAN FOREST

The urban forest is more than individual trees within a city. It is a dynamic population which has age, species and health characteristics and complex biological and environmental interactions. Trees that make up the urban forest are found in front yards, parks, schools, cemeteries, city streets and medians, plazas, vacant lots, parking lots, in pockets of natural open spaces and along waterways. The boundaries of the urban forest typically cross city jurisdictional lines to form an integral part of the bioregion. Boundaries may be better defined by natural factors such as soil, climate and topography than by city limits.

Trees are indicators of the diversity and health of a community's natural systems. Planning, policy and management decisions regarding trees will affect a community's air, water, soil, wildlife, microclimate and energy systems. When an urban forest is managed so that its net benefits (such as carbon storage and oxygen production) outweigh its demands for resources (such as water, soil improvement and maintenance activities) over its lifetime, it is said to be "sustainable".

Sacramento's Tree Service can implement policies and practices to manage its urban forest in a sustainable way by conserving, recycling and reusing available resources whenever possible. Thus, by selecting trees well suited to the soil and climate instead of resource consumptive exotics, using reclaimed water instead of imported water, using composted organic materials instead of chemical fertilizers, biological controls instead of pesticides in an Integrated Pest Management Program (IPM) and chipping wood for mulch or fuel instead of disposing debris in landfill space, all will create a more viable ecosystem and a healthier city.

Environmental benefits of the Urban Forest

The City of Sacramento, which encompasses 96 square miles has a significant urban forest canopy. The foliage covering the City acts as a shelter, an umbrella to screen sun and wind, while providing many environmental benefits. Benefits include shade, the reduction of ground surface temperatures, prevention of rainfall run-off and wind screening. Using air photos, the existing canopy cover was estimated as a percentage of the land

devoted to a specific use. Predictably, the City's parks had the highest percentage of tree canopy (44%) followed in descending order by single-family residential (28%), wild and vacant (24%), multi-family residential (13%), institutional (13%), transportation (10%), commercial and industrial (8%), and other including agricultural (2%) (Rowntree, 1991).

A broad-reaching environmental benefit of trees is large scale carbon storage which can ease greenhouse gasses which contribute to global warming. Sacramento's forest of 150,000 trees currently stores 46,000 tons of carbon (Nowak, 1991). In 1992, 1,835 additional tons will be added. Every person in the U.S. is responsible for the production of 2.3 tons of carbon every year from the use of fossil fuels. As the tree population grows and ages, this number will fluctuate. The amount of carbon emissions the City generates is greatly reduced as the City steps up tree planting and upgrades tree care, thus increasing the broad environmental benefits of the urban forest.

Sacramento has a 28% residential tree canopy cover (Rowntree, personal communication, 1991). By increasing this percentage to 50%, many environmental benefits can be maximized. Of course, canopy coverage goals must be balanced with the ability to plant and care for the entire population. A 50% canopy cover should be considered Sacramento's long-term goal, while short-term goals for the City's neighborhoods must balance increasing the canopy coverage with planting and caring for existing trees.

B. ENVIRONMENTAL POLICIES

The policies as set forth in Chapter 2 provide the framework for protecting the environmental value of trees. Each policy is followed by recommended guidelines and specific actions for implementing these policies.

Policy 4a: Establish and maintain maximum tree cover to improve the environmental health and livability of Sacramento.

- Plant the largest species of trees with the widest spreading canopies in every appropriate and possible location to achieve a long-term goal of 50% canopy coverage of all paved street areas.

- Replace every public tree removed with at least one new tree. The location and species of the tree may be changed to achieve the best siting or benefit.

- Plant new trees in existing areas to reach the target goals in each Community Plan Area with a long-term goal of achieving 50% canopy cover.

- Plant new trees and regulate pruning in new developments to achieve 50% canopy coverage at 15 years from date of project acceptance.

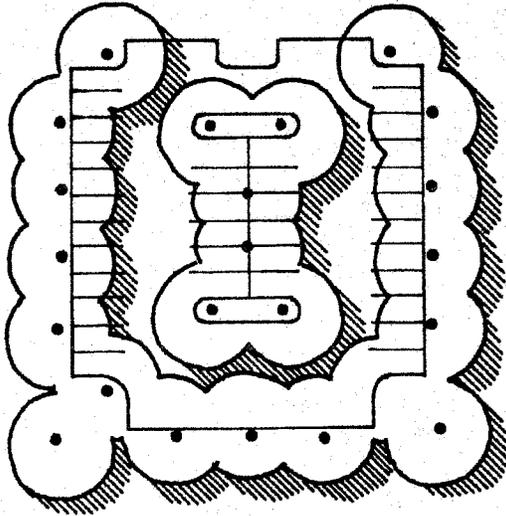


Figure 9. Parking Lot with Shade Canopy

- Plant trees and regulate pruning in parking lots to achieve 50% canopy coverage at 15 years from date of project acceptance.

- Require a landscape maintenance agreement for all new subdivisions within the City that requires the owner/developer to guarantee in perpetuity to plant and maintain trees to achieve the goal of 50% canopy coverage.

Policy 4b: Conserve and protect existing tree resources.

- All plans submitted for new or modified development permits must identify all existing trees, groves and woodlands with preservation and protection recommendations included.

- Follow tree conservation principles of useful life and significant trees (see Management, Chapter 3) for management and removal of over-mature trees.

Policy 4c: Adopt a water management plan for all public plantings in the City.

- Reduce irrigation of medians.
- Match plant choices to available water

supply for all major public plantings.

- Use permeable paving, where feasible, to help recharge groundwater.

- Use water-conserving irrigation systems and practices.

- Coordinate with the City's Public Works Department and the water management recommendations of the Management Plan.

Policy 4d: Preserve and extend native species and plant associations.

- Institute a "xeriscape" (water conserving plant selection) approach for publicly maintained landscaping.

- Identify and preserve greenbelt corridors.

- Phase out lawns in medians and publicly maintained parkways and replace with mulches and drought tolerant ground covers to conserve water and reduce maintenance costs. Reduce lawn square footage in public areas other than those where the ground surface is used for recreational purposes or where grass makes a critical contribution to the visual environment as an accent or special feature. No more than 15% of any planting shall be designated lawn for purely aesthetic reasons.

- Plant native species in natural open space areas and intermix with appropriate naturalized species from the Recommended Tree List in all other areas .

- Plant a variety of native species.

Policy 4e: Achieve the maximum environmental benefits of trees.

- Plant trees in locations near buildings to help lower energy consumption.

- Preserve and plant trees within a minimum of 30 feet of waterways to increase soil conservation and decrease erosion.

- Properly dispose of removed trees and clippings and recycle tree waste to the maximum extent feasible. Tree waste, which may harbor disease or insects, shall be chipped, burned, buried or tightly covered with a 6 mil. clear plastic tarp to prevent infestation of living trees. Otherwise, tree wastes shall be recycled as much as possible, a practice which conserves landfill space, derives maximum value from the forest and returns maximum yields to the earth. The urban forest program shall investigate and implement all such

measures which prove practical. Receipt of landscape wastes from residents and other sources and the sale of recycled products shall also be considered.

C. NATURAL FACTORS AFFECTING THE URBAN FOREST

Trees are affected more by a bioregion's natural factors such as climate, topography and soil, than by City limit boundaries. The following urban forestry recommendations respond to the policy guidelines stated above, the natural conditions of the Sacramento bioregion and to the specific microclimate conditions created by urban conditions. These recommendations include implementation strategies.

Geography

Just as the geography and topography of Sacramento combine to determine the overall climatic conditions affecting trees, the conditions at a specific site can vary greatly depending on its immediate surroundings. These locational conditions are referred to as the microclimate, and can often affect the choice of trees. The main influences on microclimate are topography (aspect and slope), structures, pavement and existing vegetation. The City of Sacramento lies in the Sacramento Valley of California, bounded by the coastal mountain range to the west and the Sierra Nevada range to the east. The terrain in and around Sacramento is fairly flat with very little relief. The Victor plain slopes upward to the east from an elevation of about 20 feet. Except for areas where the American River and creek and local drainages have formed low, near vertical stream banks, the ground slope does not exceed 8%, and is typically between 0 and 3%.

Topography. As already mentioned, the shape of the land can affect air drainage, resulting in warmer zones on sloped ground and cool areas in basins or where air flow is stilled. In addition, a valley or a low point along a ridge may funnel winds, causing greater turbulence and increasing velocity. The angle of the land in relation to the sun is also very important, with south- and west-facing slopes receiving the most direct sunlight and therefore being significantly hotter and dryer than the cool, moist microclimates of north- or east-facing slopes.

Structures. Buildings or other structures act as artificial topography, both funneling and deflecting winds and creating oven-like southern exposures or completely shaded northern areas. Where

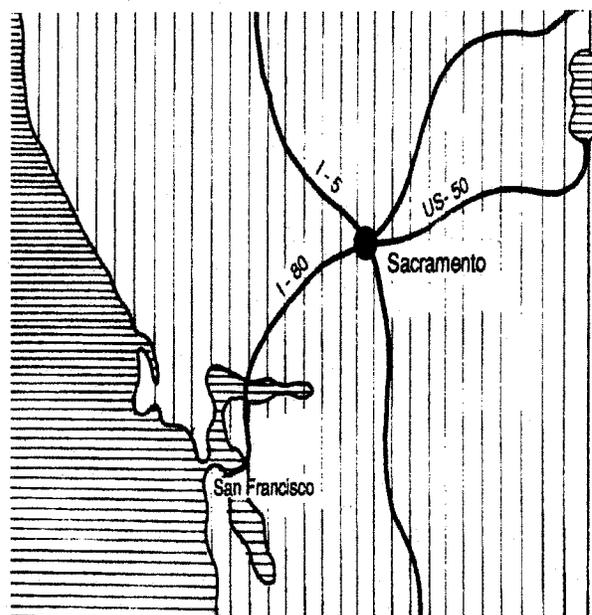


Figure 10. Area Location Map

building forms combine, as along a street or setback line, or where buildings are especially tall or massive, these effects are intensified. As a result, appropriate tree species may differ greatly from one side of a building to another.

Pavement. The reflected heat from street, sidewalks, parking lots and other paved surfaces, as well as roofs, turns cities into "heat islands" several degrees warmer than the surrounding countryside. In hot summer climates like Sacramento, this effect is especially pronounced. For trees, the result is hotter, drier conditions, changing the microclimate of a parking lot, for instance, to near-desert intensities.

Other Vegetation. Stands of existing trees can block wind or create shade in the same way that buildings do. Large areas of vegetation, including shrubs and ground cover, reverse the effect of urban heat islands by absorbing sunlight and by releasing moisture into the air by transpiration from the leaves, cooling the surroundings like a huge air conditioner. Airborne moisture from fog or other sources also tends to condense on the surfaces of leaves and needles, causing a wetter, cooler microclimate.

Climate

The combination of climate and soils has made

this region one of the richest agricultural areas in the world. A California Mediterranean climate of a dry and wet season is exhibited here with hot, dry summers and cool, rainy winters. The summer temperatures range from 58-93° F (with summer heat waves often exceeding 100° F) and winter temperatures range from 38-53° F. Although temperatures may drop below 32° F, the freeze of December 1990 recorded unusually low temperatures of 17° F, which damaged or killed many plant species.

Climate Recommendations

■ **Use species which are hardy (frost resistant) in the temperature extremes of local climate zones.**

Winter temperature lows are the most critical factor in limiting the range of ornamentals, plants which are not frost resistant. Sacramento is not within the moderating influences of the coastal zone, and therefore freezes are common. A clear understanding of microclimate is needed when planting with non-hardy plants. Young trees especially need protection during cold winter months.

■ **Use drought-tolerant species.**

Sacramento's annual rainfall is 17 inches per year, with most falling between November and April. Southern winds predominate in the summer. Marine breezes flow through the Carquinez Strait. Winter winds originate from the north and Tule Fog, providing heavy moisture, is common during this season. During years in which the high pressure system lingers, winter storms can be reduced drastically, leading to periods of sustained drought such as occurred in 1975-77 and 1986 to present. The result is a semi-arid climate in which plants must be adapted not only to relatively low overall rainfall but also to the stress of regular summer dryness and occasional long-term drought.

Although irrigation on a deep watering cycle can be used to sustain trees which are not drought-tolerant, it is wiser to select species which will survive on Sacramento's natural water supply. Even drought-tolerant species need periodic watering during the first few summers until root systems are well developed.

■ **Use strong-branched and wind-tolerant trees.**

Although the average yearly windspeed does

not exceed 9.0 mph from the south-southwest, strong winds sometimes accompany winter storms. Trees with strong branching habits are the best insurance against wind breakage. Proper staking of young trees helps stabilize them until they become established. Careful pruning to remove weak or poorly formed limbs helps strengthen the remaining structure, while canopy thinning allows winds to pass through. However, species which are genetically predisposed to breakage usually cannot be pruned frequently enough to prevent all breakage. Winds can also increase the effect of drought by drying out a plant's tissues and causing windburn. The coated leaves of many drought-tolerant species resist this effect. (The tree matrices indicate species' relative wind tolerance).

■ **Plant for potential future climatic changes.**



Worldwide, the six hottest years in the last century occurred during the 1980s. There is much evidence that the "greenhouse effect," caused by human actions including the burning of fossil fuels and the destruction of the world's forests, is bringing about significant shifts in global climate. More violent weather patterns and greater extremes of weather have been predicted. Although experts disagree on the potential effects of this trend, it seems prudent, in light of such predictions to plant increasing numbers of drought-tolerant and wind-resistant species able to withstand extremes of hot and cold temperatures.



The American Forestry Association has begun a program to counteract this phenomenon, called Global ReLeaf. The program's goal is to plant 100 million trees in this country by 1992, and includes plans for funding and implementation. Trees reduce the greenhouse effect by removing carbon dioxide from the atmosphere. In addition, the program has federal, state and international goals. The state program, California ReLeaf,

intends to plant 20 million trees in the state by the year 2000. Many cities in addition to Sacramento (San Francisco, Los Angeles and San Diego), have joined these organizations.

Soil

A tree draws its life from the air and the soil. The soil is itself a complex living medium of mineral particles, organic materials, trace elements, water, air and living organisms. Since these components vary greatly from place to place, trees differ in ability to adapt to soil conditions. Selecting trees that will thrive in a site's natural soil is therefore critical to the success of a tree's survival.

Soil Recommendations

■ **Determine soil type and composition.**

Soil type. The City lies at the confluence of the American and Sacramento Rivers. This confluence has contributed to a vast richness of alluvial deposits that have been accumulating over the last 100 million years, providing the area with prime soils.

The materials deposited here are from the surrounding uplands and include successive layers of clay, silt, sand and gravels. These deposits form the surface sediments found in Sacramento today. The surface sediments are primarily of the Victor Formation, Floodplain Deposits and Basin Deposits. The soils map and legend (Figure 11) illustrates the distribution of soil conditions present in Sacramento, although they do not accurately reflect post-development levels of compaction or otherwise altered soils.

Test pits and soil probes. Even in areas of prime natural soils, earth materials will undergo dramatic changes in structure when modified by development. Soils can get compacted, mixed into impervious layers which will create poor drainage and difficult growing conditions. When analyzing soil type, it is important to determine whether there is a continuous column of uniform soil texture.

Visual inspection of soil by digging a pit, using a soil probe or simply finding an exposed area can give more specific information about a site. Particle size, moisture content and rockiness can be appraised. Drainage rates can be observed by filling a pit with water.

Performance of existing plants. From a visual survey of Sacramento tree health, most soils

appear to be of reasonably good to very good quality (Coate, 1991). There are areas with calcareous soils, which create a lime-induced chlorosis in sensitive plants. This is exhibited by pale yellow shoot (tip) growth in species such as Liquidambar. In these areas it is important to select species that are tolerant to high pH (refer to Recommended Species List in Chapter 6).

Laboratory analysis. For large plantings, soil samples from several spots on the site should be submitted to a professional soil laboratory. The resulting chemical analysis provides information about both the makeup of the soil and recommendations for corrective measures. An appropriate plant list can be generated after soil analysis.

■ **Select trees adapted to the soil's drainage characteristics.**

Too little soil moisture can desiccate trees, but too much water can suffocate roots.

Water retention. Sandy soil is made up of large particles, allowing water to pass freely among them; such soil is very well aerated, but dries out quickly. Clayey or silty soil consists of minute particles which bind tightly together; water is trapped in the small spaces between these particles by capillary action, moving slowly and restricting oxygen to the roots. Root tips may be killed from lack of oxygen. Either drought or saturated soil will prevent distribution of moisture and minerals to foliage crowns, reducing vigor or resulting in plant death. Most trees prefer intermediate soils with good drainage but adequate water retention, such as those found in many valley areas in Sacramento. Trees requiring especially good drainage are noted in the Recommended Species List.

Water table. Groundwater reservoirs within reach of a tree's roots can allow some species to thrive in soils that would otherwise be too dry. However, a water table that is too close to the surface will drown the roots of most species.

Slope. Quick water run-off from steep slopes can also contribute to excessively dry soil, while low spots collect run-off and may therefore be wetter than the surrounding soil.

■ **Select trees adapted to the soil's chemistry.**

While the planting palette generally consists of trees adapted to poor soil conditions, the following conditions may require special attention.

Nutrients. Serious deficiencies of nitrogen, phosphorus, potassium or other elements necessary for plant life will limit species to those able to withstand the particular deficiency.

Soil pH. Most of the City's soils appear to be of good quality although there are some areas with calcareous soils. In such soils, roots will not be able to absorb the broad range of balanced minerals needed for normal growth and will develop chlorosis, which limits growth and produces unhealthy foliage. Acid-loving plants, such as camellias, are indicators of where alkaline conditions may be a problem. Camellias that exhibit eight inches of growth per year demonstrate that the native soils are very deep and do not have a high pH. In areas where alkaline conditions are present, species which can tolerate a high pH are noted in Recommended Species List (Chapter 6, Design).

Salinity. High salt content is another soil problem characteristic of dry areas. Low rainfall and rapid evaporation tend to concentrate salts near the ground's surface, where it stunts plant growth by desiccating the root system. Brown or withered leaves sometimes indicate salt burn.

Iron. Chlorosis caused by iron deficiency, indicated by a yellowing of leaves between the veins, is commonly observed in Sacramento. Species especially subject to chlorosis should be avoided where iron is low.

■ **Where soil depth is limited, select trees that can survive in shallow soils.**

Bedrock. Shallow bedrock can prohibit deep root development and prevent a tree from obtaining adequate moisture and nutrients.

Hardpan. Layers or lenses of clay in otherwise porous soil can limit the penetration of roots and water. Roots may expand adequately when young, but with age will be adversely affected by the poor percolation of water, and the tree will begin to decline.

Compaction. The soil on construction sites is often compacted—either unintentionally, due to the movement of heavy equipment and materials, or deliberately, to help the soil bear the weight of buildings and pavement. These "engineered" soils can create conditions similar to both bedrock and hardpan, especially when the existing soil has a high clay content. Trees should never be planted in soils which have a compaction rate higher than

85%. Loosen the planting-area soil as described in Planting and Maintenance Manual for all planting areas.

■ **As a last resort, consider soil modifications for particularly troublesome situations.**

Most tree roots eventually reach quite deep and wider than the tree's branches, making extensive soil modification improvements impractical. Therefore, the Management Plan has stressed a selection of trees able to thrive on the natural elements provided by the site. However, the following measures can sometimes be useful in overcoming specific soil problems.

Nutrients. Specific deficiencies can be counteracted by adding the missing ingredients in slow-release form directly to the root zone.

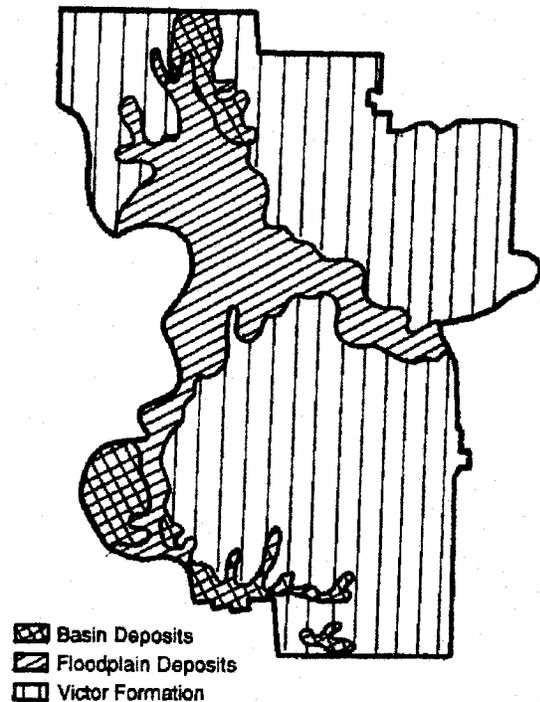
Iron. Likewise, iron can be added where chlorosis is a problem.

Drainage chimneys. In very slow-draining soils or where rock or hardpan is encountered, small holes bored through the hardpan or to a minimum depth of twice the planting pit can help reduce the problem of standing water in the rootball area.

Soil amendments. Soil amendments should only be used in the case of highly alkaline soils. The use of amendments or improved soil mixes in the planting pit of a newly planted tree can create a sharp boundary between "improved" and native soils, inhibiting roots from venturing into unimproved soil beyond and inhibiting water movement into the pit. The use of natural soil which has been well-aerated, without amendments, is usually preferred.

D. NATIVE VEGETATION

An important part of the urban forest (although not generally as intensely managed as street and park trees) are the natural plant communities. The Sacramento General Plan Update Environmental Impact Report (March 1987) has identified ten habitat types in the Sacramento area. Of these, the natural communities which are still intact include blue oak woodland, riparian, rivers and canals, ponds and marshes, northern hardpan vernal pool and annual grasslands. The blue oak woodland and riparian corridors provide very important tree cover habitats for wildlife. The remaining four (old fields, fence row, agricultural areas and urban lands) have developed as a result of human habitation.



1. Victor Formation

This surface sediment is located on a plain between the Sacramento River and the foothills of the Sierra Nevada mountains, in the southeast and northeast sections of the City. Through ancient weathering processes, this complex mixture of sediments has developed a hardpan layer near the surface which significantly decreases rainwater percolation. There are significant incidents of tree blow-down in strong storms when the hardpan layer is saturated and the shallow soils have not anchored the median to large trees (Fitch, 1988).

2. Floodplain Deposits

Floodplain deposits cover areas of the current Sacramento and American River channels, including the Central City, South Natomas, a major portion of North Natomas and along the American River flood plains in East Sacramento. These sediments represent deposits made prior to the stream flow and drainage changes of the last 135 years and include unconsolidated layers of sand, silts and clays. These deep, rich, sandy loams are moderately to highly permeable.

3. Basin Deposits

Basin deposits are found in the old flood plains further from the rivers, primarily in two areas: the Pocket area, with fingers extending into Airport Meadowview and South Sacramento; and an area north of Sacramento which extends into North Natomas. Deposits also represent floodwater deposits made prior to the streamflow and drainage changes of the past 135 years. They consist of unconsolidated clay, with very low permeability.

Figure 11. Soils Map

Natural habitats, especially riparian, are vital in urban areas because they protect water quality and control soil erosion. Runoff from agricultural areas can introduce large amounts of nitrogen into surface waters causing severe eutrophication, which can result in the destruction of coastal and fresh water ecosystems. Tree cover encourages groundwater infiltration allowing some chemicals to be broken down by soil microorganisms. A band of native vegetation at the edge of all waterways, usually at least 30 feet wide, but varying in width depending on slope, is needed to adequately screen out excessive amounts of nutrients (Brown, 1991). Sediment loading from agricultural land and from urban land under development are 100 and 1000 times, respectively, as great as forest land. The American Forestry Association has estimated that every tree generates \$150 in benefits related to erosion control and wildlife shelter (Moll 1991, p. 308).

1. Blue Oak Woodland

Although historically widespread on upland portions above the floodplains, this habitat is uncommon in Sacramento today. Blue Oak Woodlands are characterized by sparse to dense stands of blue oak trees. Interior live oak and digger pine trees are often interspersed. A sparse shrub understory can be present and consists of buckbrush, manzanita, toyon, poison oak, and coffeeberry. The annual grassland understory is dominated by non-native grasses but with considerable amounts of forb cover. The Blue Oak Woodland provides shade, shelter and nesting areas for many wildlife species. In the Central Valley, these include many species of mammals, birds and reptiles. Remnants of blue oak woodland occurs in the Del Paso Park, Robla, North Sacramento areas of the City. There are small scattered patches along the American River which is currently being used as rangeland.

2. Riparian Stands

The riparian community of plants and animals is a significant resource to Sacramento and warrants preservation because it is becoming increasingly more scarce given continued development pressures. Large numbers of plant and animal species depend on an undisturbed riparian habitat. Vegetation plays a very important role in maintaining water quality by filtering watering entering the system, and by forming a buffer between the water course and the developed land adjacent to it. The riparian community helps control erosion and moderate floods.

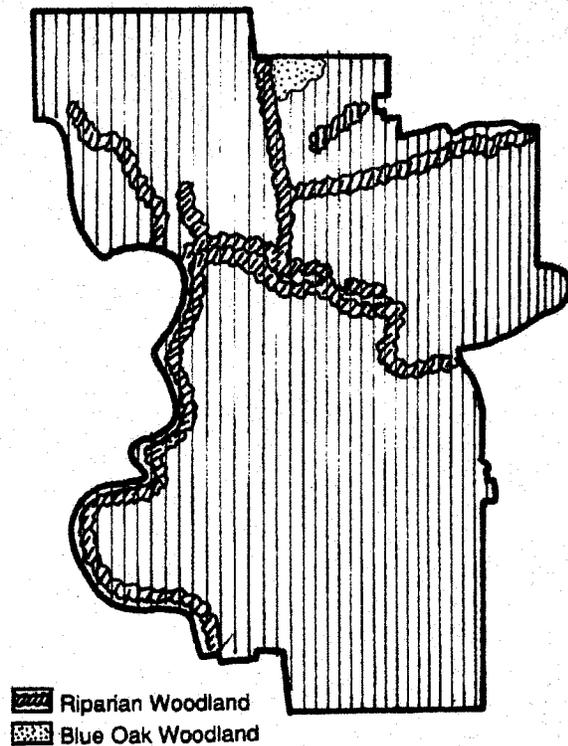


Figure 12. Remnant Native Plant Associations

Prior to settlement in the 1800s, riparian woodland and forest habitats were widespread in the Sacramento area. Historically, these woodlands formed a several mile-wide band along river courses and their associated bottomlands (Smith 1977). Although the estimates for Sacramento County list 11,413 acres of woody riparian vegetation (Katibah), in the Sacramento area, the acreage consists of areas only along narrow river, creek and canal corridors, with larger tracts at scattered sites along Del Paso Park and Bannon Slough.

Habitat subdivisions occur within the larger riparian habitats of the Central Valley and are related to stages of community succession—that is, plant and animal associations replacing each other in response to environmental change. Early stages are defined by dense immature forests of willow and cottonwood trees, later stages may include one of several different habitat subdivisions, most typically 60-80 foot tall riparian forests with several vegetation layers and a dense understory of shrubs and vines. The valley oak wood-

land is another common mature plant subdivision and occurs at a distance from the main channel. The valley oak forest, however, is the rarest of the subdivisions, remaining today because it exists on the land most desired for agriculture and development.

Typically, riparian vegetation is dominated by an overstory of box elder, black walnut, western sycamore, Oregon ash, Fremont cottonwood, Gooding's willow, white alder and valley oak. The understory of the intermediate and mature successional stage is very dense and can be impenetrable. Typical shrubs include sandbar willow, mugwort, buttonwillow, false willow and wild rose. Vines include wild grape, poison oak, honeysuckle, western clematis, Himalayan berry and wild blackberry. The herbaceous layer includes various non-native grasses and forb species, sedges and rushes. Wildlife is very dense and more diverse in a riparian forest than in any other terrestrial habitat in California. Many species of mammals, birds and reptiles, including rare and endangered species, are typically found in Sacramento's rich riparian habitat.

Today, the Sacramento River still has significant tracts of riparian vegetation north of Discovery Park. The Lower American River contains a highly significant riparian stand from Folsom Dam to its confluence with the Sacramento River. This 23-mile stretch of river, maintained by Sacramento County contains about 5,000 acres of riparian habitat, making it California's largest riparian habitat surrounded by urban development.

E. HUMAN INFLUENCE ON THE URBAN FOREST

The urban forest now seen in Sacramento is the creation of the past 125 years, a forest shaped by human settlement. It has been planted, preserved and altered to serve uniquely human purposes—from aesthetics, shade and recreation to home sales.

Before the settlement of Sacramento, the Nisenan (Southern Maidu) Indian tribe lived on this land. The forest was vastly different from the one that exists today, although some of those trees still remain. For millennia, the tree community was of vital importance to the valley's human community, supplying "mast" or fallen acorns, which were ground by stone mortar and pestle into a flour that was a dietary staple. Today,

remnant oaks still punctuate the City, reminders of an earlier time and landscape. And along streambeds and in other protected spots, other native species remain from the Central Valley's original landscape—California sycamores, willows, bay laurel, big leaf maples, cottonwoods and black walnuts.

The settlement of the Sacramento area by European and eastern American settlers included traders and trappers, ranchers and farmers and miners. Gradually, agriculture became the primary land use and continued well into this century. Ranch animal grazing greatly affected the character of the oak woodlands, as the compaction of soil, trampling and eating of oak seedlings by cattle reduced adequate oak tree regeneration.

Between the time of the Nisenan and the advent of the freeway, the era of the rancho and then the farmstead added more features to the valley's landscape, marked by characteristic species and patterns of trees not native to the area, and by prolonged grazing which left the land and surrounding hills covered with introduced grasses rather than native chaparral and abundant oaks. Traveling around town, one still encounters densely planted eucalyptus windbreaks, rows of elms shading former roads and billowing masses of trees enclosing and protecting old houses from wind. As with native species, these introduced trees of a previous agricultural landscape now convey the texture of another time.

As might be expected, most of the trees in Sacramento's urban forest, like most of the City's inhabitants, have their historical roots elsewhere in the world. Eucalyptus from Australia, elms from Asia, plane trees from Europe, pines and palms from the Canary Islands, ash trees from Arizona and sweet gums from the eastern United States are among the most numerous species in the City. As people have settled here, they have brought with them a preference for trees fondly associated with their homelands—often places with environmental conditions very different from those of Sacramento. The result is a somewhat eclectic forest, not particularly well-rooted in the environmental conditions of the region.

If trees help us read the history of the City's landscape, they are also the means to make history. The young trees planted today will become the grand urban forest of the next century, profoundly affecting the quality of life in Sacra-

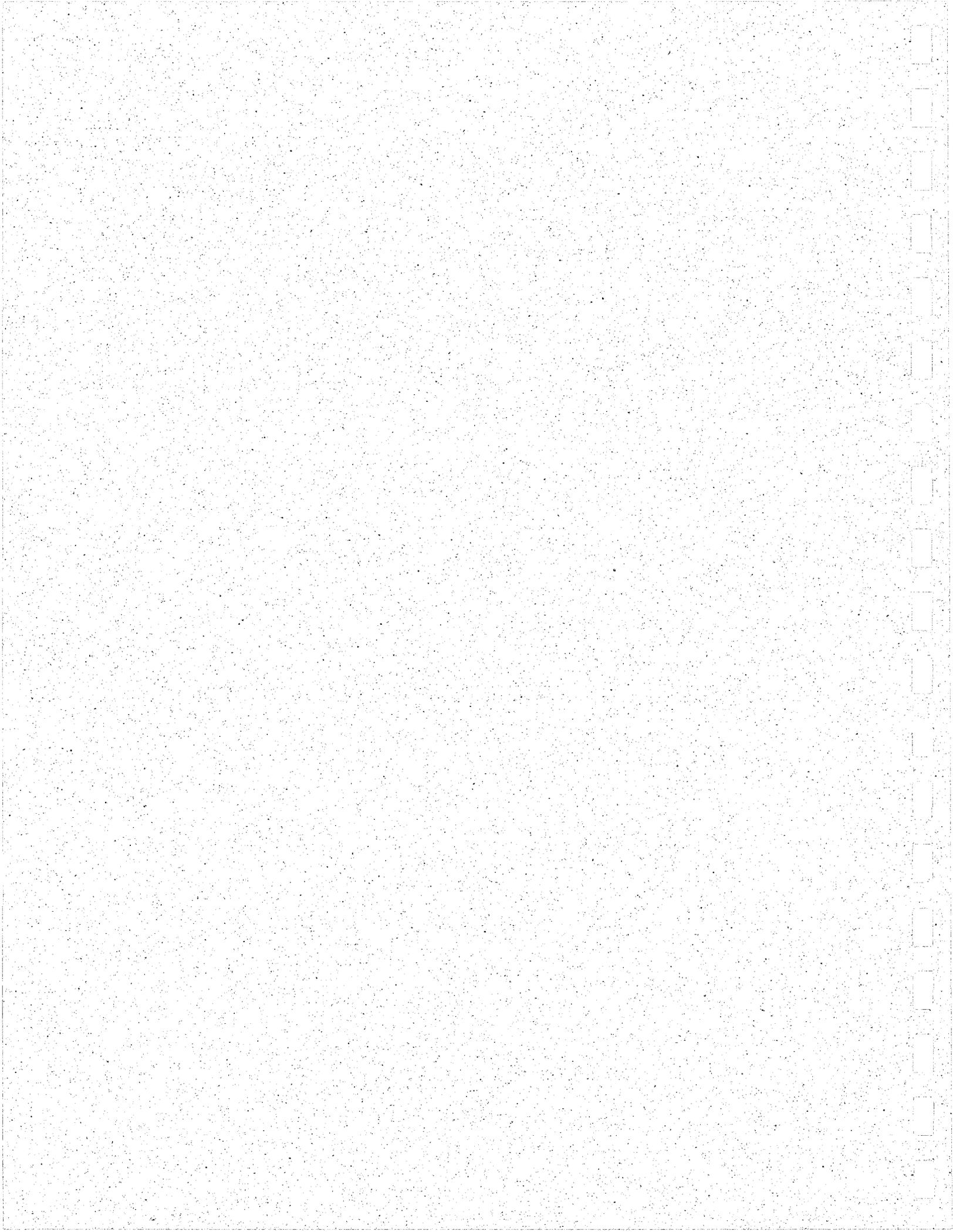
mento while connecting people today with future generations. Just as in the past, the reasons we plant today will be interpreted by Sacramento's community far into the future.





Chapter Five: Community Involvement

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V COMMUNITY INVOLVEMENT

A supportive community ultimately becomes the driving force for perpetuating a successful urban forestry program. An informed public that takes pride in trees and is active in stewardship will support adequate funding. Support for urban forestry programs is strongest in communities that have active tree information programs (Bernhardt et. al. 1989, p 40.). Urban forestry advocates recognize the value of a well-informed citizenry.

In the mid-1980s when Sacramento residents voted to close the Rancho Seco nuclear power plant, the community sent a strong message to the legislature and to energy industries stating environmental concerns and their desire to deal with energy consumption in new ways. Public sentiment has opened the door for many environmentally conscious opportunities including public support for energy conservation through the use of shade trees. The City's public, private and non-profit sectors have some programs in place which foster tree stewardship. Broad-based public support, combined with the professional coalition of urban forestry groups provides many opportunities to strengthen tree awareness, develop new public stewardship programs and promote comprehensive, joint programs among the public and private sectors.

A. BUILDING PUBLIC STEWARDSHIP

Building public stewardship begins with an awareness that trees have value and are of benefit to everyone. Public perception of trees must then be broadened to include the entire urban forest whereby residents understand that individual trees may be planted and removed without affecting the overall health and vigor of the forest. Awareness can be reinforced with education that recognizes trees as living resources with life-cycles including birth, growth and death; it is important to provide the public with pertinent information about trees and the care required throughout their lifespan.

A well-coordinated stewardship program should utilize the existing expertise of the urban forest community and reach out to all community sectors. This means developing a public education strategy and program in conjunction with active urban forestry groups. Such a program builds on the strengths and resources of existing programs without duplicating efforts or sending mixed messages to the public.

B. POLICIES

The goals of a community involvement program are grounded in the policies as stated in Chapter 2. The strategies are listed below:

Policy 5a: Maintain close cooperation among all public agencies affecting the urban forest.

- Eliminate duplication of services between the City, public agencies and private organizations wherever possible.
- Train building construction inspectors to inspect tree planting and tree protection devices.

Policy 5b: Promote public awareness of the value and proper care of trees and foster public involvement and support for urban forestry efforts.

- Establish a Community Education Coordinator position in Tree Services to be the liaison to the Sacramento Tree Foundation's Education program and Advisory Committee.
- Involve nurseries, landscape architects, contractors and other local "green industries" in promoting the Urban Management Plan, good planting and maintenance practices.
- Ritualize the importance of trees at annual community plantings. The urban forestry program shall coordinate these events with other tree related groups and conduct them with full media and public participation as renewals of the City's commitment to its forest and its natural environment. Special places for trees, such as memorial forests or heritage tree groves can be established.

Policy 5c: Facilitate the resolution of tree-related conflicts.

- Facilitate the use of the Nuisance Tree Evaluation for private trees.

C. RECOMMENDATIONS FOR A COMMUNITY INVOLVEMENT PROGRAM

The City's community involvement program should be two-fold. First, the City should assist property owners in tree maintenance within the private maintenance strip, re-defined as 6.5 feet from back of curb. Assistance can range from low cost, self-help and cost sharing programs to fully funded City-wide maintenance. Secondly, the program should allow for and encourage proactive neighborhood efforts. Mobilized neighborhoods can tackle specific problems, voice recommendations and coordinate efforts with

other agencies and organizations through an established community liaison. The two components of this program are detailed below.

Privately Maintained Trees

Property owners are presently responsible for tree maintenance on property within the private maintenance easement (6.5 feet back of curb). The following recommendations reflect varying levels of tree service that the City could provide.

The Self Help Program.

Develop additional brochures with information about the proper method of pruning, public/private tree identification and responsibility, and a phone assistance/referral program to provide information to individuals seeking maintenance advice and assistance. The City currently has several public information brochures (Appendix 10) including "What Your Tree Wishes You Knew," a guide to the programs offered by the Tree Services Section. The 12-page brochure includes tips on tree selection and general tree care. The "Tree Selection Guide" describes 38 trees suitable for street tree planting. The new Recommended Tree List expands species selection options. City-produced flyers are available regarding Dutch elm disease and mistletoe control to increase public awareness and inform them of control methods.

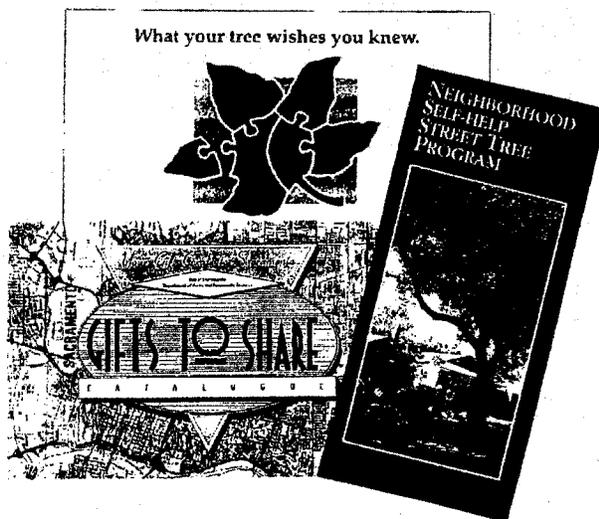


Figure 13. Sacramento's Public Information Brochures

Sacramento's Street Tree Services Section (STS) has offered a neighborhood self-help street tree program: to assist home owners in identifying street tree maintenance work which falls within private responsibility, to recommend reputable tree service contractors and to provide a sample contract for citizens. The City Arborist is available to supervise contract work. A negotiated group price for a neighborhood tree project with a minimum of 25-30 trees costs between \$150-300 per tree, saving the home owner an average of \$150.

Tree Maintenance Standards with Enforcement.

To ensure the work quality of private contractors, tree maintenance standards could be enforced through the issuance of a business license. The STS would periodically review contractor performance as a condition of license renewal. Fees collected would be earmarked for the Tree Endowment Program (see below).

Public/Private Maintenance Matching Fund.

Citizens could apply for tree care matching funds for their private maintenance strips. Funds would be earmarked from the Tree Maintenance Budget and distributed on a first-come, first-served basis.

City Maintenance of Trees in the Maintenance Easement.

Prior to 1990, all trees within the 12.5 foot maintenance easement were maintained by STS and maintenance monies were provided by the General Fund. Public maintenance is desirable as it ensures that the urban forest is routinely and systematically maintained. With alternative financing mechanisms (see Finance) and more efficient proactive maintenance practices (see Management), adequate funds may be found to reinstate this public program.

Neighborhood Services/Outreach/ Public Education

Establish a Public Education Coordinator staff position. This person would develop a public education outreach program and act as liaison to the community, other tree-related agencies and organizations. Current estimates calculate this position and program will cost \$75,000/year. The

following responsibilities would fall under the aegis of the Public Education Coordinator.

Tool Lending Program.

Designate a tool lending program. STS currently lends tools, such as eighteen-foot pole pruners, to property owners to prune mistletoe from their trees. Resident participation has varied from 200-450 people annually. Public participation levels have varied depending on the attention given to outreach (Fitch, personal communication, 1991). The Coordinator would actively promote this program to increase participation and to teach residents about correct pruning methods.

Contractor Selection Assistance.

Select a City-negotiated contractor to carry out standardized maintenance procedures as specified by the City Arborist and according to approved estimates. All work completed would be subject to City inspection. This program has been most popular in East Sacramento, College Greens and Land Park neighborhoods, with group maintenance reaching a high of 200 trees per year.

Urban Forestry Community Education and Outreach.

With the help of other urban forestry groups, the Public Education Coordinator would plan a community education strategy. This could be achieved with assistance from the Sacramento Tree Foundation's Technical Advisory Committee. The intent would be form a new Advisory group to develop joint programs and implement the Urban Forest Management Plan. The group would include City Arborists who represent technical perspectives and the Educational Coordinator, who represents greater public concerns. This new Advisory Committee would serve as an objective sounding board for resolving disputes between City and community. The Coordinator would cooperate with and use the expertise of existing agencies and organizations to achieve public outreach and education. The Coordinator would cultivate new partnerships with related professional groups such as The American Society of Landscape Architects (ASLA), The International Society of Arboriculture (ISA), The California Association of Nurserymen (CAN), realty organizations and private developers.

The Coordinators job is to strengthen urban forestry visibility among local community and

business associations. As the City's liaison, the Coordinator should present the Management Plan to these groups at their membership meetings as a way of disseminating information about policy changes, addressing concerns and building a support base. The Coordinator should develop printed information to inform and educate the public regarding urban tree issues. Printed materials could be underwritten by members of the business community and distributed throughout the City with utility bills. The Landscape Maintenance Training Program with STF and City staff should be continued. On-going educational training for STS staff, both in technical procedures and in community relations, should be developed. "STS staff must view their contributions with professionalism and perform work of the highest quality in order to gain the respect of the Community" (Fitch 1988, P. 42).

Proactive, Planned Community Plantings.

The Coordinator should address specific neighborhood tree needs and issues (i.e. mistletoe control, reforestation, young tree pruning training) by developing a planting partnership program and act as liaison to the Sacramento Tree Foundation for residential tree planting aimed at both replacement planting of declining species and increasing the City's canopy cover. The Coordinator should develop a strategy for addressing neighborhood needs via educational meetings and group plantings. Through public events, highly publicized annual or seasonal rituals can promote and indirectly support the Urban Forest Management Plan. Significant tree planting projects in prominent areas of the City, tree celebrations or formal school yard planting programs are ways to involve the public in urban forest issues.

The Coordinator should work closely with the Sacramento Tree Foundation, which has a successful community tree planting program and has the ability to expand in order to accommodate its long term planting goals. The program focuses on public participation and through an extensive education process and builds a sense of stewardship. STS, Sacramento Housing and Redevelopment Agency and the Sacramento Tree Foundation sponsor a seven-week training program for young adults. In 1989, fifty-six 14 to 18-year-olds were trained in basic urban forestry practices. This program provides experience, skills and responsibility in preparation for future employment.

Tree Endowment.

Establish a tree endowment fund through grant writing and a system of fees and fines which secures discretionary funds for special needs such as low income assistance. A current example is the City-organized "Gifts to Share" program which outlines several "giving" projects. It provides the public with the opportunity to purchase and plant a tree of their choice to commemorate a person or event in a neighborhood park for a \$50 contribution (the amount is subject to change).

Heritage Trees.

The Coordinator should work closely with STS staff to involve the community in the identification, preservation and promotion of heritage trees, groves and woodlands.

D. PARTICIPATION

Public involvement fosters a sense of stewardship and can take many forms, everything from participating in the planting and care of neighborhood trees, to developing legislation and advocating funding for improved care. With a public involvement program in place, the STS should tap all sectors of the community.

Residents

Residents will be primarily interested in their immediate neighborhood or street. As the City strengthens its public information program, there will also be increasing numbers who are passionately interested in City-wide tree issues. Information can be disseminated to individual households through City-initiated newsletters, utility bills or through groups such as home owners' associations and neighborhood improvement organizations.

Information should be disseminated regarding all aspects of public tree care. It "increases visibility and credibility for tree protection during all stages of municipal undertakings" (Fitch 1988, p.38). The City's public information process concerning tree removal is an excellent example of communication that works well—it gives the public ample opportunity for comment. This strategy could be developed for all tree operations. Printed information can be disseminated on door hangers when tree operations such as planting, trimming, removing storm damage debris and clearance pruning of vegetation on private property from public right-of-ways, occur.

Local Business

Local business of all kinds, including large corporations with local offices, benefit from the urban forest. A community full of trees makes a city a more attractive place to do business, helps attract and keep workers and reduces energy costs. Trees planted on or near business sites have a positive impact on the image of the business as well as the city as a whole. Tree-lined commercial districts draw more customers than treeless ones. In Sacramento's warm summer climates, trees provide a more comfortable microclimate in which to shop.

Involvement in urban forest issues depends on the type of business. Local business associations can be influential in the expansion of the urban forest, especially when their intent is to make commercial districts more attractive and human scale. They should be involved in the design of commercial streets so that tree selection and placement meets expectations and needs. Businesses such as the Chamber of Commerce, the Welcome Wagon, realty companies and developers can effectively disseminate information about the urban forest to new residents.

The "Gifts to Share" endowment program could be expanded so that businesses can donate trees for other land use areas. For example, Realtors in San Francisco donate a new street tree as a gift to their client once a home is purchased. Local retail nurseries can offer classes on various aspects of tree selection, planting and maintenance. Businesses can sponsor events that attract public attention to the urban forest such as annual Arbor Day festivities, Tree City USA award ceremonies and local competitions for such categories as the best community tree design, historic trees and Sacramento's worst pruned trees.

Institutions

Parks, schools, hospitals and libraries offer many opportunities to promote the urban forest. Their grounds provide a living classroom to watch projects that expand the forest and their strong connections to the community create a natural forum for education. Memorial groves, permanent tree displays, tree labeling and docent-led walks which discuss trees and urban forestry issues, build community support. Regularly scheduled events which are held in public gathering places, such as neighborhood fairs, farmers markets,

summer festivals and musical presentations, are examples of high visibility opportunities to disseminate information or have demonstration booths.

The Professional Community

Sacramento's existing coalition of urban forestry groups can reach out to other professional organizations working with trees such as the local ISA, representing arborists, ASLA, representing the design industry, and CAN, representing the nursery industry. These professionals can recruit natural allies of the urban forest to assure their full participation in the forestry program, especially as points of dissemination for public information about the program. For instance, nurseries might be encouraged to stock appropriate species and to mark those species approved by the City with special "City approved" tags.

The Sacramento Tree Foundation

The Tree Foundation has a staff of 23, a volunteer Board of Directors, 1,350 volunteers who participate in the Foundation's programs and two advisory boards: the Community Relations Committee and the Tree Advisory Committee (TAC). TAC is composed of urban forest professionals representing public, private and non-profit sectors of the Sacramento Community. Members include consulting arborists, landscape architects and public sector staff representing Cooperative Extension, City and County Arborists, SMUD and CalTrans. This interdisciplinary Committee's mission is: "to address technical issues dealing with the natural systems of the Central Valley, to identify places where natives and suitable non-native trees can be planted and to promote proper tree selection, placement and maintenance practices. Their considerations shall encourage shade, cooling and energy conservation and shall take a long-term approach (100 years). All work and recommendations shall be coordinated through representatives from public agencies who are members of the committee and the Sacramento Tree Foundation. Although TAC mostly engages in technical decisions, tree-related legislation and policy positions will be stated with a majority of opinion," (TAC Mission and Goals Statement, 1991). STF has entered into partnerships with public agencies, including the City of Sacramento and private business to implement various community involvement tree programs. TAC could play a key role to resolve controversial disputes between the City and community.



Trees for Public Places Program

This program establishes a partnership between the Tree Foundation, community groups and neighborhood volunteers to plant and care for trees along streets, at schools and parks and other public places.

Shade Tree Program

STF organizes block-by-block neighborhood deciduous tree plantings for the purpose of planting shade trees for energy conservation. Working with STF community foresters in partnership with SMUD, the program plans to plant 1,500 trees annually in Sacramento County. The cost for planting and three-year stewardship ranges between \$56-75 for a 5-gallon sized tree. The trees are free to recipients. The stewardship program includes an annual tree visit, semi-annual reports from designated tree managers and quarterly care information for each resident participant. All planted trees are monitored through STF's computer database.

Education Program

This program targets docents, teachers, community group leaders, and volunteers who wish to teach young people about trees in the urban forest. Programs include an annual youth poster contest, educational displays which promote tree planting and stewardship at fairs, conferences and other community events, Seed-to-Seedling curriculum for K-6th grades which utilizes Proposition 70 funds, Project Learning Tree and Educator Workshops.

Neighborhood Forester Training Program

This is an in-depth, 27-hour adult course for

professionals and interested individuals regarding arboricultural practices, volunteerism, Sacramento tree ordinances and policies. After completion of the program, participants are required to give 30 hours of volunteer time back to the Tree Foundation by participating in tree planting, stewardship or education programs. Forty people attended the first training session held in 1991.

Community Urban Tree Care Workshop

This workshop is a free, three-part session for the general public concerning planting and tree care techniques and an introduction to STF planting and stewardship programs.

Landscape Maintenance Personnel Training Program

This program was designed for City parks and school maintenance personnel. A 12-hour course emphasizes proper tree planting and maintenance techniques and is offered at no cost to participating agencies. Topics covered include tree physiology, selection, urban soils climate, pruning, fertilizers, bracing and cabling, pests and diseases, tree inventories and management systems, certification programs and special consideration for oak trees. Training emphasizes hands-on demonstrations. To date, 10-12 City staff have participated in the program.

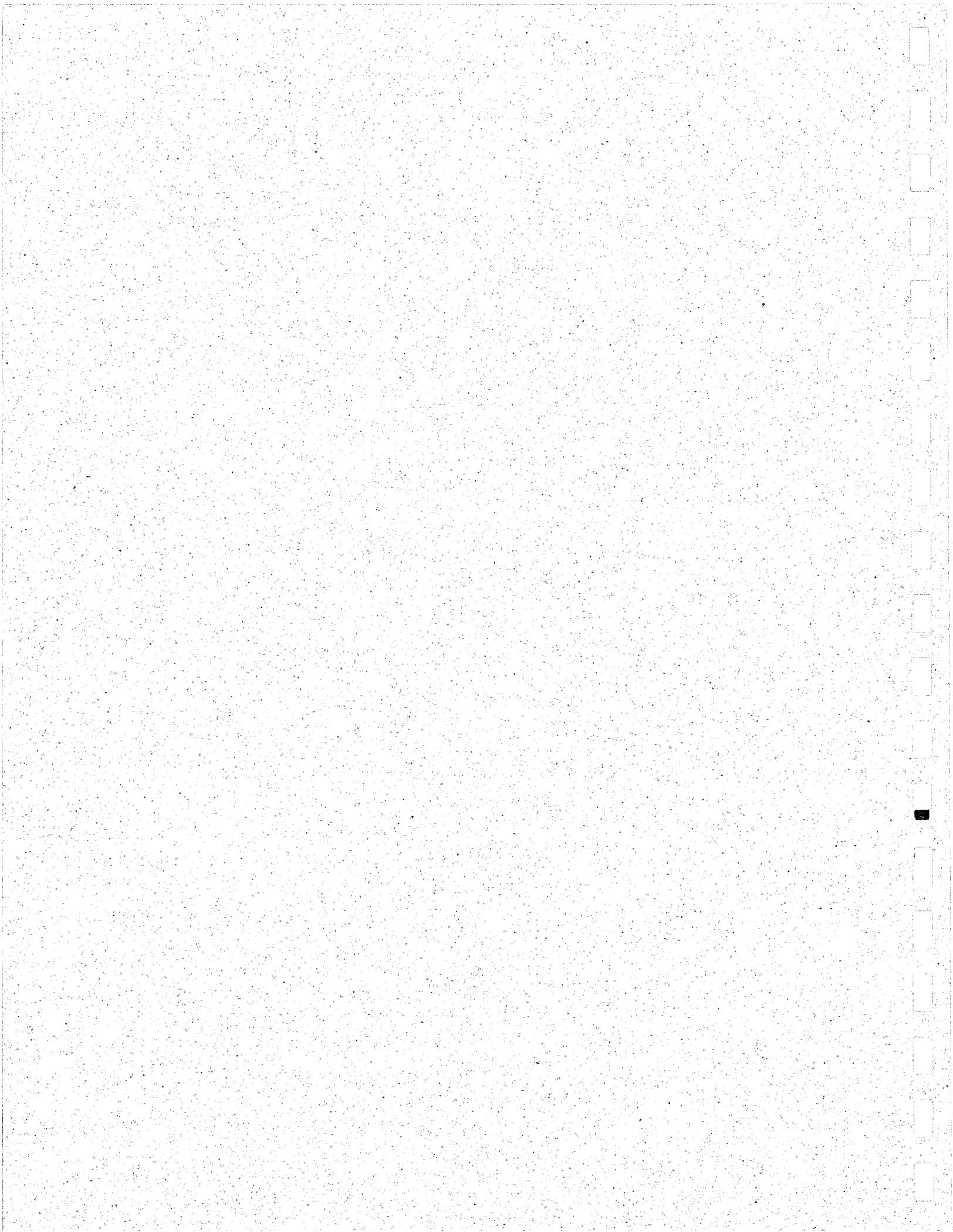
Other Tree-Related Organizations

There are several other local tree-related organizations in Sacramento. Among them are the Sacramento Tree Foundation, the California Oak Foundation, the Master Gardener Program through U.C. Agricultural Extension, the Environmental Council of Sacramento, the Sacramento Native Plant Society, the Sacramento Chapter of the Audubon Society, the Sacramento Old City Association, the Sacramento Friends of the Elm and numerous garden clubs and community environmental groups.



Chapter Six: Design

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VI DESIGN

Design provides a framework for enhancement of the visual and aesthetic relationships between the built environment and its surroundings. Design guidelines outline ways to strengthen these relationships to create a city with continuity, unity and identity. Sacramento, with its existing and substantial urban forest, can be brought visually together with good landscape design that accentuates existing areas and responds assertively to new development with cohesive, and well thought out design schemes that reinforce the City's identity as "The City of Trees."

This chapter proposes design guidelines so that policies stated in Chapter 2 can be more readily implemented. The Plan offers City-wide urban forest recommendations that take into consideration detailed tree care specifications for Sacramento's central business district, neighborhoods and City open spaces. Finally, tree selection criteria are provided in the form of a species list matrix to assist in the understanding of design recommendations.

A. DEFINING DESIGN PRINCIPLES

Landscape Design

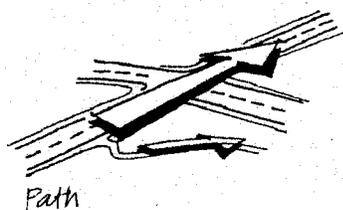
Landscape design attempts to find a balance between the needs of the natural world and its human inhabitants. In the case of the urban forest, tree and human needs vary greatly. Trees must fit the constraints of a variable environment as well as the physical conditions unique to a site. Trees in the landscape can solve a variety of problems. Shade trees on the south and west sides of buildings reduce cooling costs by 20 to 40 percent. Rows of densely planted trees reduce wind speeds. Planted along roads, trees help to screen views as well as catch particulates emitted by cars.

A tree's aesthetic character is based on the design principles of scale, form, color and texture. Scale is the size of the tree in relation to its surroundings, as measured by its height, diameter, limb and trunk size. Choosing an appropriately scaled tree can bring a large building or wide street into human scale, or a scale that feels comfortable to people. Form refers to tree shape. Tree can take any form, from tall and columnar to broad and round-headed. Countless variations exist in tree color. Color is provided by leaves or needles, bark, flowers and/or fruit. Texture refers to the size of the foliage, with large-leafed species being coarse-textured and small-leafed species

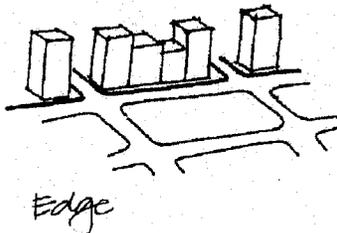
being fine textured. All of these elements form the basis of landscape design.

In Kevin Lynch's book, *The Image of the City*, he defines five elements that relate to the form, layout and perception of an urban environment. They are described as a series of images that create a memorable pattern or impression that express an area's character. The city becomes readable, or "legible," to use Lynch's term. The five elements are paths, edges, districts, nodes and landmarks. Urban landscape design seeks to identify these elements, define their structure and strengthen the relationships between them in order to transform the image of a city into a memorable, exciting place.

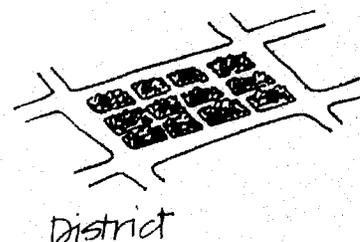
Sacramento has the opportunity to enhance its image as the 'City of Trees'. To expand on its existing image, visual identification and aesthetic reinforcement of its paths, edges, districts, nodes and landmarks must occur within the context of the urban forest. This is not to say that flexibility and diversity of design and landscape is not encouraged. Rather, the following design recommendations, including flexible application of set backs and architectural motifs can strengthen Sacramento's image by using trees to combine these five elements with landscape design principles.



Path



Edge



District

Paths are "channels" along which the observer customarily, occasionally or potentially moves, such as streets, sidewalks, bike paths, train lines or rivers. Paths are the most common element in the urban environment. The four other elements occur along paths.

Edges are "breaks in continuity" or boundaries between areas of common use such as shore lines, river edges, railroad cuts, walls, edges of a development or neighborhood. They are lateral reference lines and may be barriers which enclose a region and hold an area together. Edges are important points of reference for many people.

Districts are sections of the city that have a common use or theme and have an identifiable character that can be perceived from the inside and outside.

B. DESIGN IMPRESSIONS OF SACRAMENTO

Design Impressions

Sacramento creates images in one's mind of big trees, rivers and agriculture. These images can be directly translated into a viable, buildable design theme unique to the City of Sacramento. A design theme is composed of elements that promote continuity, unity and identity. By repeating elements within the urban tapestry of path, node, landmark, edge and district, a legible, memorable pattern which imparts a distinctive image is created.

Sacramento has a well established downtown district that acts as the City's central node or core. The downtown is enriched by landmarks such as historic structures, the Capitol, the Mall, new highrise structures and large, deciduous trees that are a signature distinct to Sacramento. The downtown is edged by residential areas which, like Downtown, form a distinct and separate design environment. The City's total urban forest is not a cohesive whole. The City treescape (the trees in

front yards, along streets, in public spaces, Downtown and along waterways) is like a patchwork quilt throughout the urban area.

Although it may seem that there's little rhyme or reason to the shape of Sacramento's urban forest, the potential to connect scattered areas is great—and may become an exciting reality through the adoption of this Plan. The Sacramento Urban Management Plan is putting forth a grander vision of the City, providing decision makers with an overview, a new way to look at the patchwork quilt. From the pieces, the Plan offers a way to make the City whole, a way to make the Sacramento landscape readable and understandable.

Sacramento's urban forest provides the living canopy under which the City operates. Always changing, trees are nonetheless our constants, our 'visual companions' to where rivers flow through the City, to where flat grassy agricultural land meets the built forms of the City, to where neighborhoods and the urban center collide. The foliage defines edges and, like the grid of Downtown

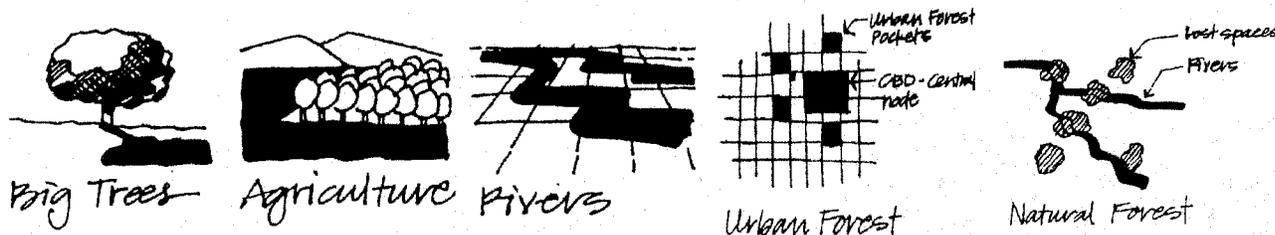
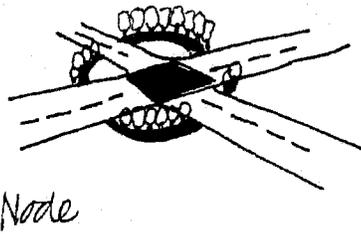
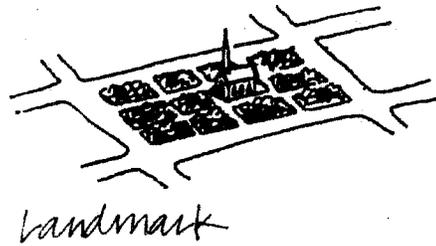


Figure 14. Design Impressions



Nodes are strategic points with intensive foci such as the intersection of two paths or places where districts meet or both. Nodes punctuate a path, an edge or a district and are usually junctions or concentrations of uses.



Landmarks, like nodes, are also reference points within the landscape or cityscape. For example, they can be town squares, buildings, a sign, a mountain, etc., that are unique to a district. Landmarks are reference points and are frequently used for identification.

streets, can be rigid and geometric or loose and informal. Trees announce entries, intersections, greenways and parks and create a sense of place in neighborhoods and in the heart of commercial downtown. No matter whether they are in parking lots or median islands, trees are the constant. Trees form the recognizable patterns that tie a cognizant thread through the City—one that will leave a positive and indelible impression in the minds of both visitors and residents.

That thread is the urban forest. Tree planting on major roadways and neighborhood streets that run through the City, repetition of key trees and grouped tree arrangements, trees in open space areas that vertically translate the natural flow and confluence of Sacramento's rivers, trees lining the freeways and the trees that provide cool summer shade—all are visible pieces of the living fabric that surrounds the City, connecting it to the urban grid.

C. DESIGN POLICIES

Implementing Design Policies

Design policies, extracted from the City-wide policies in Chapter 2, articulate the vision for Sacramento's urban forest; they direct the design effort and, in a broader sense, embody the pertinent points of the design process. Such policies form a baseline for the creation of a design theme for Sacramento's urban forest. They also outline the physical and cultural requirements of trees to ensure an attractive, healthy and well-adapted urban forest.

A City-wide design theme enhances and strengthens visual and aesthetic relationships. Implementation of the theme involves translating the policies into specific objectives and actions that guide the design process. Design policies and recommendations for implementation are listed below:

Policy 4a. Enhance the City's identity and image as "The City of Trees" by:

- accenting gateways or entry points into the City.
- accenting intersections which are important local connections.
- selecting trees that are adapted to existing climatic conditions so they perform well and reinforce the positive image of the City. Trees selected solely for aesthetic character can be extremely unattractive if they are not well-adapted to site conditions and may detract from the City's image if growth performance is poor.
- creating a strong, cohesive street design with dominant tree species and emphasize or contrast with accent species.
- extending and replicating native and historical landscape patterns, i.e., oak savannah, riparian communities, homestead groves, agricultural windbreaks, roadside shade trees and landmarks.
- promoting and protecting heritage trees and woodland groves, especially those that define neighborhoods and serve as landmarks.
- emphasizing special effects such as flowers, fragrance, unusual bark, leaf patterns and tex-

tures, shadow patterns and the expression of wind that create an identifiable district or sense of place.

Policy 4b. Create City-wide aesthetic unity for Sacramento by:

- repeating forms, colors, textures and materials.
- using coordinated elements such as structures, walls, furnishings, signing, paving and planting that visually unite and define the streetscape.
- using a strong planting scheme as the common thread throughout.
- marking major intersections and gateways with special plantings.
- using medians on major arterials to provide City-wide cohesiveness and design unity.
- using informal, naturalistic tree groupings along freeway corridors to give a sense of "open space" matching trees with the patterns and species present in other City open spaces.
- using trees to create a variety of spatial experiences; allees, bosques and groves are all traditional ways to use trees to form "outdoor rooms."

Policy 4c . Link existing neighborhood forests together by:

- planting on arterial, collector and local streets thereby extending the urban forest.
- establishing a greenway system throughout the City connecting urban neighborhoods, parks and open spaces.
- allowing for and enhancing key views into adjacent properties and beyond for regional context and visual connection to the City.

Policy 4d. Extend the urban forest into commercial, industrial, institutional and open space areas by:

- using accent trees to announce commercial areas, highlight building facades or add visual interest. Accent trees can also be used as part of the dominant theme, found regularly along the street.
- planting on arterials using a strong planting scheme as the common thread throughout.
- replicating native and historical landscape patterns in unplanted open space areas, i.e., oak savannah, riparian communities, homestead groves, agricultural windbreaks, roadside shade trees and landmarks.

Policy 4e. Acknowledge visual, social and cultural diversity throughout the City of Sacramento by:

- varying the plant palette, spacing and intensity to reflect, enhance and complement adjacent land use.
- creating a distinctive tree palette and planting design for each neighborhood by:
 - fitting the plant palette to match the scale and character of the area.
 - varying tree spacing and species to create a richer streetscape.
 - involving residents in decision making as much as possible.
- allowing for individual neighborhood and resident expression.
- encouraging community participation in urban forestry efforts.
- reflecting and emphasizing the City's geographic setting.
- making use of public land in neighborhoods for groves of trees that help relieve linearity, enhancing visual and species diversity.
- creating a focus in each neighborhood for a single tree or tree grove that will become a future landmark or heritage tree or grove.
- protecting views both into and out of the City that are part of the City's personality and setting.
- using unusual alternatives to traditional tree-lined streets, such as clustering, meandering sidewalks and planting islands.

Policy 4f. Mitigate any adverse visual and physical impacts of streets by:

- responding to the individual site constraints.
 - tree planting size
 - setback requirements
- providing adequate growing space (as detailed in planting criteria)
 - parkways wherever possible
 - residential planting width
 - CBD setbacks
 - parking islands

- screening objectionable views.
- separating incompatible uses.
- providing sound walls or berms to attenuate traffic noise.
- providing clear access points into the community.
- choosing shade trees to reduce heat and glare on streets and pedestrian/bike paths.

Policy 4g. Respect each site's environmental and functional planting requirements and the spatial requirements of trees planted there by:

- selecting trees adapted to the environmental conditions of the site.
- satisfying any functional reasons for planting such as objectionable views, energy conservation, wind reduction, air pollution abatement, noise reduction, shading pavement areas to reduce the "heat island" effect.
- using a diversity of species instead of over planting with a popular tree type thus reducing chances of tree loss from disease. Achievable by:
 - using alternating species in the neighborhoods on a block-by-block basis;
 - intermixing accent species in the dominant tree grid as understory species or to high light key buildings or intersections.
 - grouping popular but over planted trees in large plantings, lessening their use as street trees.
- planting to attract and support wildlife.
- planting appropriate species in compatible growing spaces which are large enough to support healthy tree growth and which minimize damage to adjacent structures.

Policy 4h. Complement the natural, ecological character of Sacramento by:

- extending native tree species of the Sacramento region by:
 - using native species.
 - preserving and enhancing riparian tree areas within the urban forest.
 - reintroducing native species which are dying out, such as blue oaks, and using such species in

places where they might naturally occur.

- using non-natives of a similar form, texture, color and horticultural requirements as natives in places where it may not be appropriate to use natives.

- using special care when modifying conditions near existing natives.

It should be noted that design policies can be applied to improvements within existing areas as well as new developments. Where existing landscaping has been found to conflict with a desired site's use, or to create high maintenance conditions, these policies can aid in making appropriate changes.

The City of Sacramento has enacted many policies regarding trees but, until the Urban Forest Management Plan, has not had one comprehensive document for both preservation and future planning. Existing City ordinances and plans relating to tree design guidelines include:

- Median Strip Master Plan and Criteria, 1987
- City of Sacramento Proposed Street Median Landscaping Priorities and Ten-Year Funding Program, 1990
- Design Review Guidelines Plan
- Sacramento Urban Design Plan, Street Guidelines, 1987
- Sacramento General Plan of 1988
- Parking Lot Tree Shading Ordinance, 1987
- Developers' Guidelines for Street Trees.

In addition, many of the neighborhood community plans include references to existing landscapes in their specific areas. Each of the above plans and programs has helped establish Sacramento's reputation as the "City of Trees," but none addresses the comprehensive issue of maintaining and expanding the urban forest within Sacramento. A brief description of each plan can be found in Appendix 11. The following design recommendations present methods for future planning and enhancement of existing areas while complementing past ordinances and plan guidelines.

D. DESIGN RECOMMENDATIONS

City-wide

The recommended design theme for the City of

Sacramento emphasizes tree planting on city streets (paths) as a unifying element and highlights key entry points and intersections (nodes) into and within the City. The theme can be further articulated by extracting the pattern of Sacramento's rivers into a scheme for greenways and open spaces. Both old and new elements: commercial, retail, parking lots, the Central Business District and residential areas can receive either the formal treatment, reminiscent of urban geometric structure or the informal, naturalistic

naturalistic arrangement of trees along a road or an edge. The strong edge between rural and urban remains and is announced by gateways accenting entry to the built environment. The river and street grid form a relationship that represents the City and its environment unique to Sacramento.

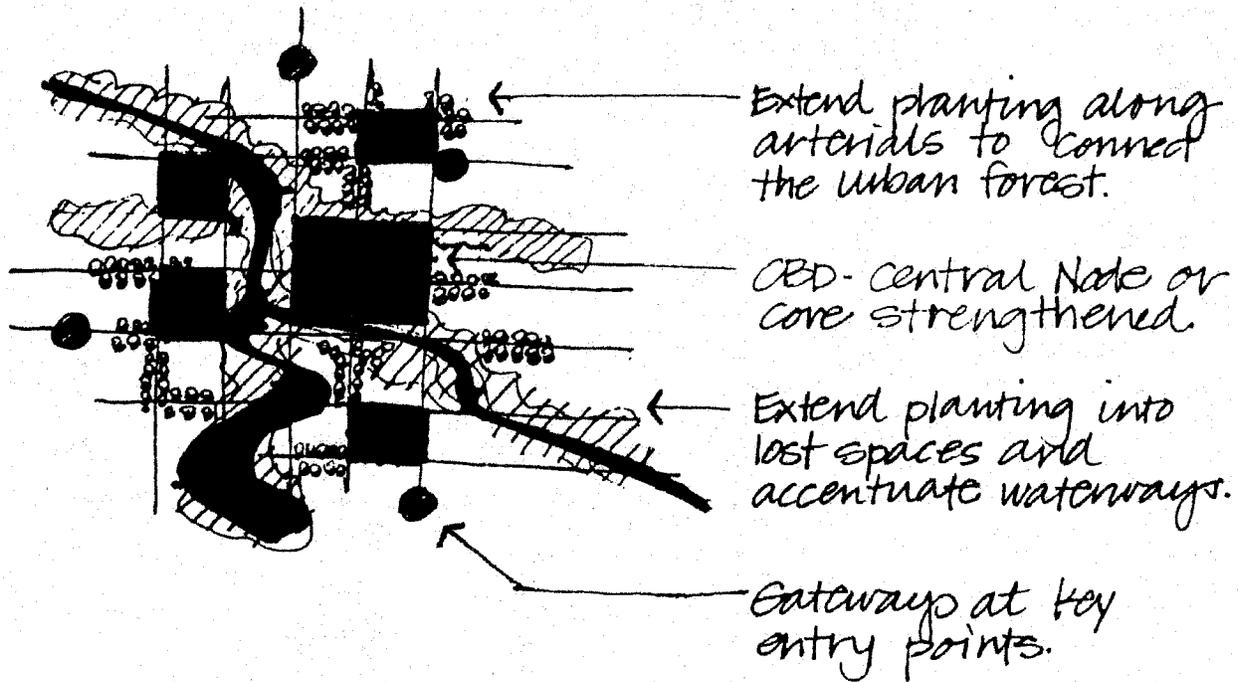


Figure 15. City-wide Design Theme

arrangement and interpretation of the natural environment. One of the best ways to bring trees into the roadway is to install trees, shrubs and groundcovers in medians. Planting treatments alongside travel lanes can reinforce the planting theme used in medians and can reflect the scale and feeling of surrounding land uses. Repetition of key colors, shapes, materials, textures, signature plants and site furnishings within the landscape scheme further enrich a design theme. Figure 15 (City-wide Design Theme) illustrates a City-wide design theme. Sacramento's downtown is accentuated and serves as the dominant foci for the City. Landscaped paths, natural and urban, radiate out from that core. The free form river is expanded into lost spaces and alluded to in the informal or

Gateways

Gateways are important front doors to a city. By providing a first impression and creating a sense of arrival, they establish the visual character of an area. These points represent the most significant opportunity to signal a transition between edges and districts. Landscape treatments should provide a rich palette of texture and color that reflect the importance of these areas. Regional gateways should be created at the urban edge signaling the transition between agricultural and open spaces and the City.

Regional gateways should convey the primary image of Sacramento. The entries identified in the Median Strip Master Plan and Criteria are secondary gateways and should receive a treatment

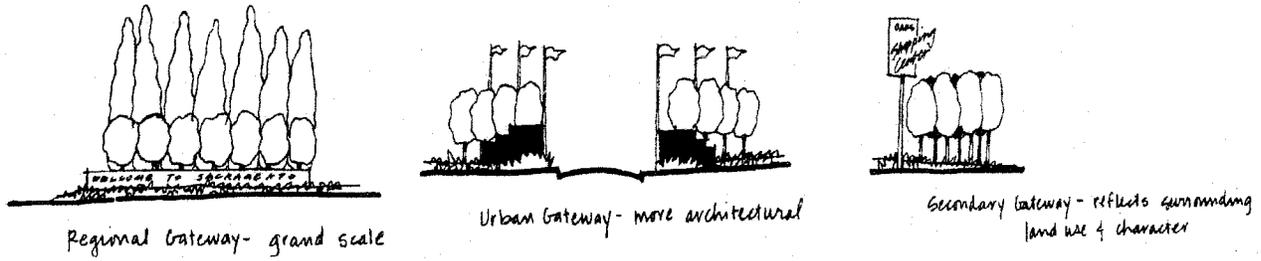


Figure 16. Gateways

that reflects the surrounding land use and landscape character of that area. Architectural treatment of gateways such as arches, flagpoles, walls, pillars, fountains and bollards are most appropriate in high intensity use areas such as the Central Business District. See Figure 16 (Gateways) for recommended gateways and locations.

Intersections

Key intersections, the crossing of two or more major arterials, function as nodes or accent points along the street system. Intersections are places of high visual attention because of car slower speeds and longer viewing time frames. It is important to give a sense of spatial enclosure and definition at intersections while maintaining visibility. Landscape treatments at intersections can complement surrounding land uses by calling attention to the image of adjacent functions. They also can serve a physical function, such as slowing traffic. Examples of key intersection treatments can be seen in Figure 17 (Key intersection Treatments)

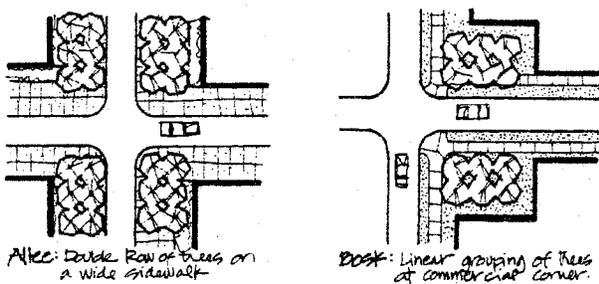
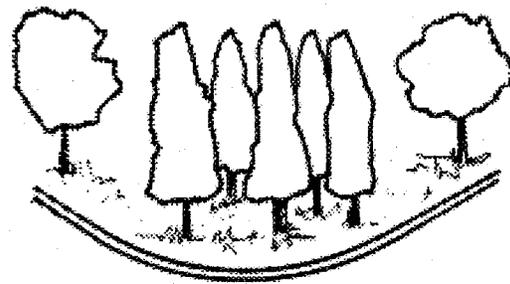


Figure 17. Key Intersection Treatments

Major intersections within commercial areas may receive a more formal treatment than in residential areas. In commercial areas, intersection treatments can feature accent plants to call attention to the area and any special use. Accent planting highlights building facades and signs,

and can add visual interest to the streetscape. Trees with special characteristics, like profuse spring bloom, can be used as a signature tree or can form or reinforce a district. In neighborhoods, intersection treatments should have more species variety and should reflect the dominant tree species of the surrounding area. One example of commercial and residential treatments is shown in Figure 18 (Minor intersection treatments).



Landmark area of vertical trees contrasts with round shaped street trees

Figure 18. Minor Intersection

Hierarchy of Streets

Streets strongly contribute to a city's image, and essentially tie a city together. In the context of an urban forest, street aesthetic unity can be achieved by the creation of street planting systems that establish a rhythm and sense of place. As adjoining land uses change along a street, so should its character. A streetscape creates visual images that provide a sense of arrival at key points, maintains visual interest and continuity and enhances a city's many diverse neighborhood images. The hierarchy of streets includes high-

ways, arterials, collectors and local streets, each plays a different role in a City's circulation system and dictates different streetscape treatments.

the community from the freeways.

Arterials

Arterials are the major roadways that link areas

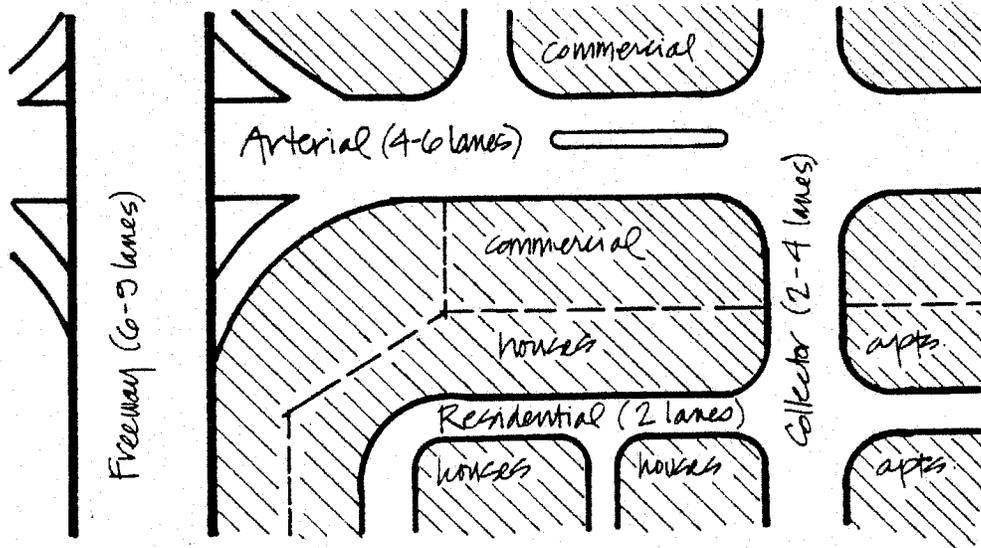


Figure 19. Street Standards

Streetscape treatments need to convey the street position within the hierarchy. This aids in understanding the overall circulation system. Motorists driving at different speeds are able to key into the street use by virtue of the landscape treatment as the landscape progresses from bold and simple on highways and arterials to detailed and individualistic on local streets, (Figure 19. Street Standards).

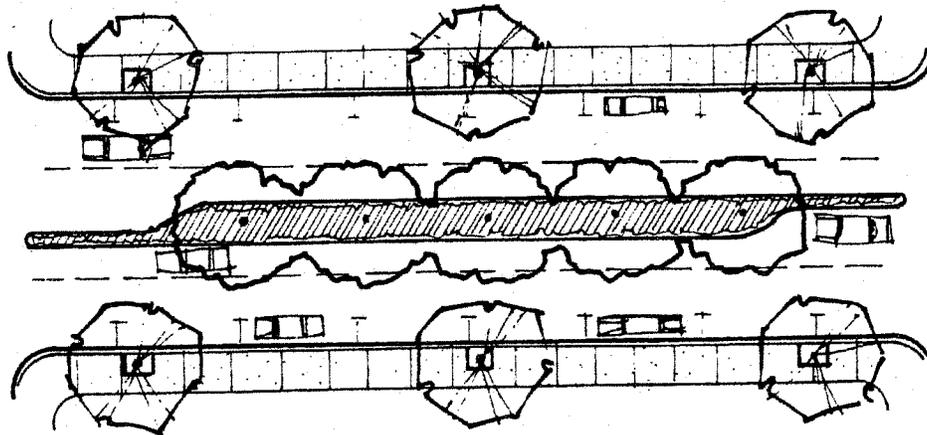
Highways

Highways are under the States' jurisdiction and are therefore are not within the City's direct responsibility, although the City does currently maintain surface street highway routes under a contract from CalTrans. In addition to maintenance, it can be suggested to CalTrans that highways and interchanges support the design character of Sacramento. Gateways can be planted alongside the highway and landscape buffers along the corridors can form an expanded visual "open space." Native plantings used at interchanges create semi-natural woodlands in the expanded rights-of-way. Plant species should be compatible with Sacramento's species lists. Implementation of freeway planting and maintenance programs compatible with the City's urban forest goals strengthen a positive impression of

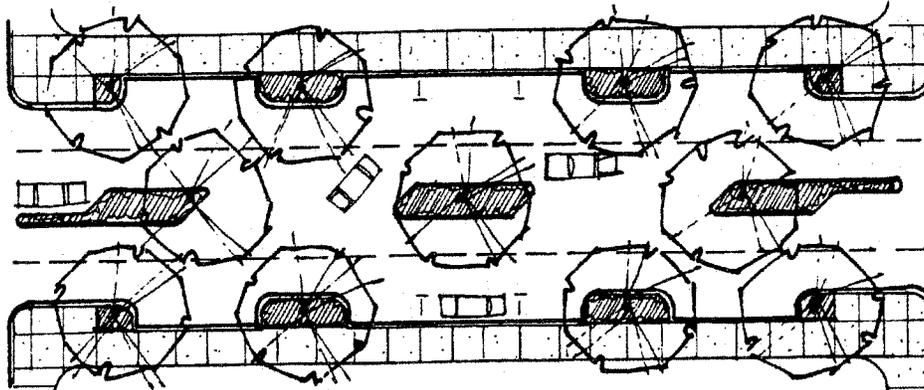
of the city together. A unified arterial system can communicate sequence and continuity while reflecting the diversity of the area. Continuity is created by repeating landscape patterns or tree species. Repetition of a dominant species on major streets gives each a distinct character. Rural roads, for example, are an appropriate place to extend agricultural species into the heart of Sacramento. Diversity of land use is reflected in the introduction of accent trees. Accent trees at key intersections can tie the landscaping to adjacent neighborhoods by complementing that neighborhood's dominant tree. However, arterials should appear uniform to convey the street's function within the City's transportation system.

Large-scaled canopy trees are recommended for arterials to enclose the space created by broad streets. Evenly spaced rows of trees can direct the line of site farther down the road which correlates to the faster speeds occurring on arterials. Arterials running through the central core should meet the specific design solutions and species requirements outlined in the Central Business District section.

Medians in the center dividers of roadways leave the sides of the road unchanged. Two types



Full Medians: Consistent tree cover; turns only at intersections



Partial Medians: Consistent tree cover with addition of planting islands in parking lane; left turns into parking lots; right turns only out of parking lots.

Note: These alternatives may be combined with each other.

Figure 20. Arterials

of medians are possible; the continuous median that breaks only at intersections or the broken median that allows for parking or through traffic to the opposite side of the street, (Figure 20. Arterials). Both rows or clusters can be used in median treatments depending on the surrounding context or desired effect.

Collectors and Local Streets

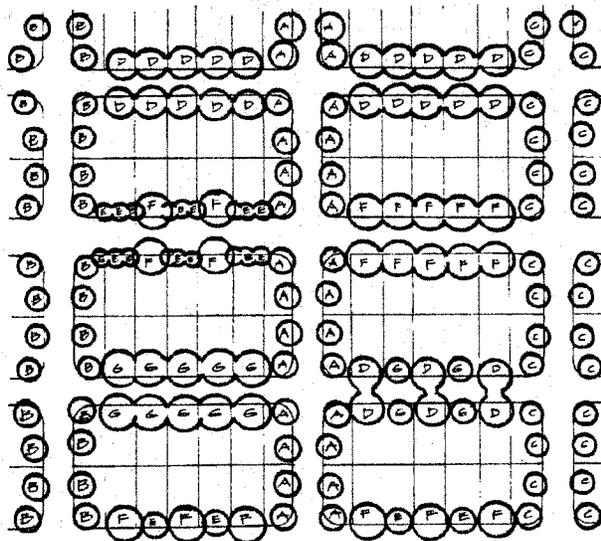
A collector street gathers traffic from local streets and feeds it to arterials. Collectors are used

mainly by residents of the surrounding areas and therefore should reflect the scale and feeling of those neighborhoods. The scale of collectors is generally smaller than arterials, so tree palettes can be made up of a broader range of species.

On local streets in residential areas, planting should be more intensely cultivated with closer spacing and a greater variety of plant material. In commercial areas, where visibility is crucial, spacing should be clustered to call attention to the

area and direct views into the site. Conversely, in industrial zones, the main objective is to screen views. In open spaces, enhancing and framing views from the roads to surrounding areas is paramount. The tree palette and planting design should reflect the informality of these areas by incorporating loose masses and a mixture of species. In the native riparian corridors, only indigenous species and informal, natural planting schemes should be used.

A key factor in selection of a design scheme should be the existing landscape patterns in the individual neighborhoods. In the older sections of Sacramento with grid street patterns, tree planting schemes should reflect the formality of the street configuration with regular spacing of trees. Informal groves with a variety of species are more appropriate to newer areas with informal street patterns. Tree spacing can be closer and more random using a broader range of species for more detail in areas where traffic will be slower and pedestrian use greater. All planting schemes should support the City goal of 50% shade coverage of streets and paved areas. (Figure 21. Collector and local streets).



Neighborhood Planting Design:
Species diversity is dominant while still allowing for design unity.

Figure 21. Collector & Local Streets

Other Landscape Elements

Soundwalls

Soundwalls are used adjacent to residential areas to mitigate traffic noise and the visual impacts of roadways. The wall's height and length is calculated by the amount of road traffic noise. Walls can be textured, colored and sited to mitigate the roadway's effects while helping to create a common design element along roadways throughout Sacramento. Walls are usually configured in straight lines. A more pleasant effect is to stagger their alignment so planting can be accommodated on both sides of the wall. Consistent configurations and design treatments used on soundwalls reinforce the identity of Sacramento.

Concrete masonry units are a cost effective material for soundwalls. Masonry units are versatile, coming in dozens of colors, textures and sizes. The most effective treatment, however, is a neutral color block, like grey or tan, with a split-faced surface. The split-faced design interacts with changes in daylight resulting in varied appearance throughout the day. Individual neighborhood expression can be achieved with the addition of smooth-faced or scored blocks in accent bands or patterns on the walls. Planting in front of soundwalls adds seasonal interest and visually softens the wall's hard edge.

Greenways

Greenways are the connectors between natural and urban areas. They are linear open spaces along rivers, streams and railroad rights-of-way. Often they include official or unofficial paths which provide alternative routes for pedestrians and cyclists to the more formal and rigid urban network. Greenways should connect parks, schools, community centers to natural systems, thus unifying the park and recreation system. Natural planting arrangements and groupings of native plants are characteristic of greenways.

Greenways can be expanded by planting in open space such as vacant lots or in corporate business parks, parking lots and city or state land preserves. These areas can be turned into mini-forests, pocket parks or community gardens, increasing the urban forest. This 'restoration/ecology' approach might be carried out by concerned residents, clubs, school children or business groups through 'adopt-a-' or cleanup programs. Stream corridors are often times the dominant greenway which can be planted to extend the forest. Restoring habitat for riparian species

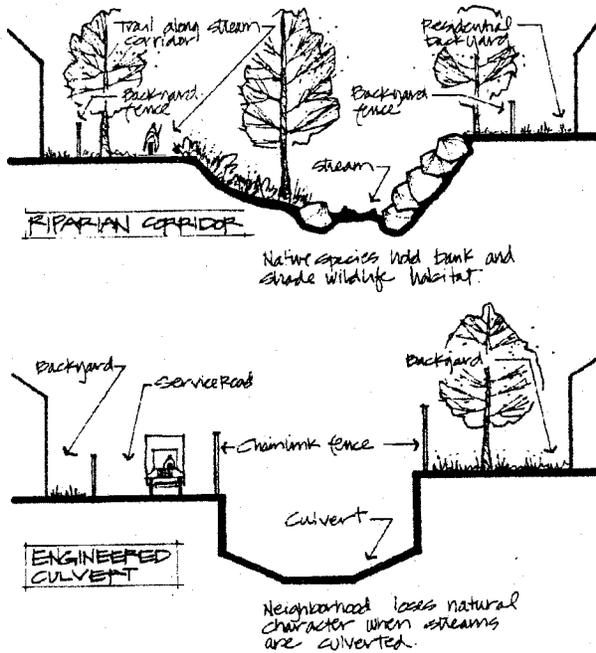


Figure 22. Expanding Greenways

(flora and fauna), and creating a network of paths throughout the community, connects the urban grid with the natural stream system. Corporate parks, where groves of trees and large underutilized, lawn areas occur, can receive a system of paths that run through these parklike settings, further linking the urban area with greenways. Even better, these high maintenance lawns can be easily converted to native grasses and vegetation which encourages wildlife and reduces maintenance costs. (Figure 22. Expanding greenways).

Parking Lots

Parking lots are generally unsightly, cover acres of land and contribute substantially to the "heat island" effect. This phenomenon, universal to urban areas throughout the world, is caused by the ability of paving materials to absorb more heat at a faster rate than natural materials. The result is an increase in temperature. There is also substantial evidence indicating that unshaded parking lots create significant energy drains on surrounding buildings since air conditioning systems work extra hard to reduce heat. Planting trees not only reverses the heat island effect but reduces heat damage to cars and contents. Trees in parking lots add to the urban forest.

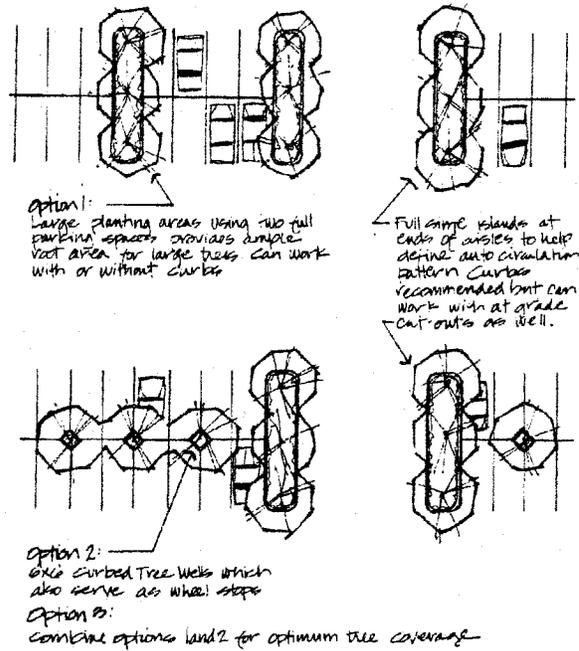
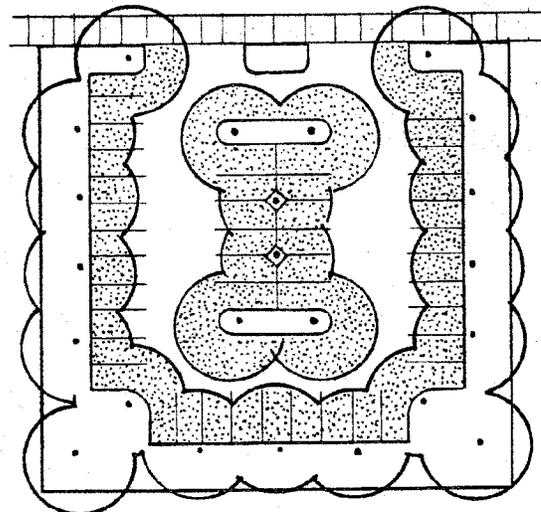


Figure 23. Parking Lot Treatment



Total Paved Area: _____
 Total Paved Area Shaded: _____
 Estimated Percentage of Paved Area Shaded at 15 years: _____
 Actual Percentage of Paved Area at 15 years: _____
POLICY: 50% of the paved parking lot surface shall be shaded with canopies within 15 years of acquisition of building permit.

Figure 24. Parking Lot Treatment

parking lots can be designed with planting islands between the rows of cars with hammerhead ends. Existing parking lots can be retrofitted with tree wells or planters. Large planting areas equalling two car spaces provide ample root area for trees. A less effective alternative, used alone or with the other planting islands, is a 6' x 6' curbed tree well positioned between car spaces. (Figures 23. and 24. Parking lot landscape treatments).

The Central Business District

The Sacramento Urban Design Plan Street Guidelines establishes design guidelines for the streetscape within the Central Business District (CBD). Key elements include:

- identification of main streets and gateways within the CBD
- prescribed design treatments of major streets
- special treatment of key intersections and entries
- details of materials and street furniture to be used throughout the planning area
- financial mechanisms to implement plans
- a street tree planting program for major streets

This document is an excellent planning tool for the CBD because it sets forth general design guidelines. The Management Plan City-wide design theme is compatible with the Urban Design Plan recommendations for the Central Business District, which strengthen the downtown as a central core or district within the surrounding City. The Plan recommends reinforcing major parallel street pairs (I & J, 9th & 10th, and 15th & 16th) with boulevard-scale streetscape treatments for major vehicular arteries and by identifying treatments for key intersections and entries using special signing, lighting, street furnishings and landscaping.

Old Town Junction in Downtown acts as a gateway to the river off of State Highway 99 on 2nd and 3rd Streets from I to J Streets. Intersection treatments are suggested at I and J Streets, 3rd and 4th, 7th and 12th, 9th, 10th, 15th and 16th Streets, and L Street at 9th and 10th Streets.

Major streets, I Street, called 'Civic Center Boulevard'; 9th and 10th Streets, called 'Central Core/Civic Spine'; 7th and 12th; L Street called 'Capitol Edge'; 15th and 16th Streets called 'Boulevard Edge to Downtown' have species noted by street. The Management Plan recom-

mends that some of the suggested trees be changed as noted below to more appropriately reflect the horticultural requirements of the downtown area. The list supersedes the Urban Design Plan's original tree list. The approved recommendations are:

I Street: Platanus occidentalis, American sycamore; Quercus lobata, Valley oak

J Street: Celtis occidentalis, Common hackberry; Ginkgo biloba 'Fairmont', maidenhair tree

9th & 10th: Platanus occidentalis, American sycamore; Platanus acerifolia, London plane tree; Acer platanoides, 'Emerald Queen' Norway maple

7th & 12th: Umbellularia californica, California bay; Magnolia grandiflora, Southern magnolia; Quercus suber, Cork oak

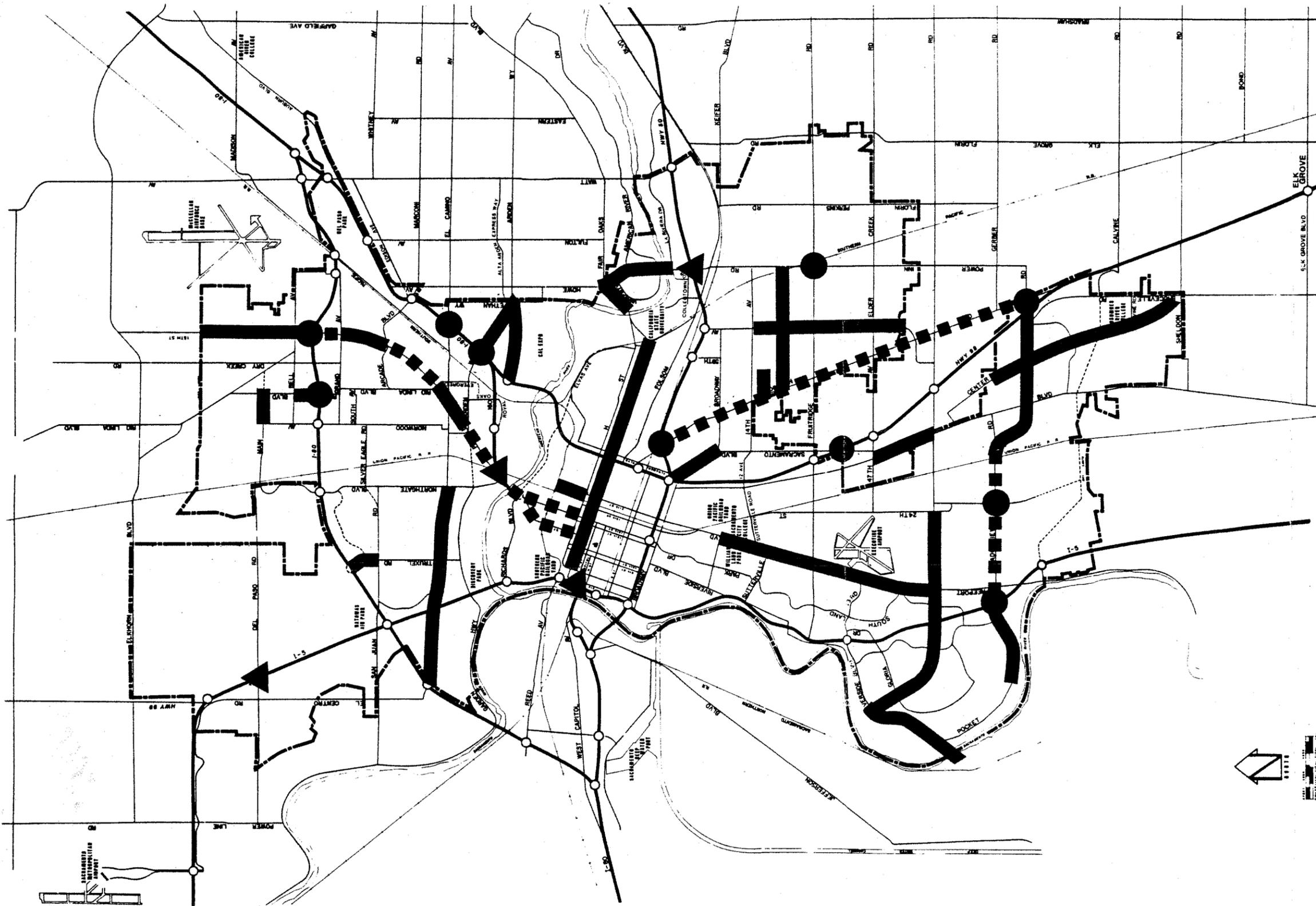
15th & 16th: Platanus occidentalis, American sycamore; Platanus acerifolia, London plane tree

L Street: Quercus agrifolia, California live oak; Quercus lobata, Valley oak

A downtown tree replacement and maintenance program should be developed to fill in and improve major streets according to a palette of dominant species per street. Accent trees at building entries should be installed and new building facades should step away from the street to allow for unobstructed growth of the street tree canopy. Due to vulnerability to disease, a single species is not desired or recommended for the total length of a street, however, the majority of tree planting within a single block may be of one particular species. Key streets, intersections and gateways are identified in (Figure 25 Gateway, streetscape and median projects). Continuous streetside planting strips could be kept in tact by discouraging additional driveway cuts along street fronts or on site parking in front and side street yards. Using the rear of properties for on site parking and alleys for access to that parking alleviates the loss of landscape area in street rights-of-way and front yards along the blockface.

Commercial and Retail Areas

Commercial areas in the CBD should have a uniform appearance. Trees can be installed in medians, pop-outs at corners and/or parking spaces along major streets in existing commercial areas. Special design solutions, such as flexible paving and root barriers, minimize potential



Key

- City identified gateways
- ▲ Potential gateways
- ▬ City identified median projects
- ▬ Potential median projects

**Gateways,
Streetscape &
Median Projects**

Figure 16. Gateways

pavement damage from tree roots. Other techniques include grade beams, bridging, special concrete depth and width, concrete reinforcing, root pruning and alternative street design and layout. (Figure 26. Planting in Paved Areas).

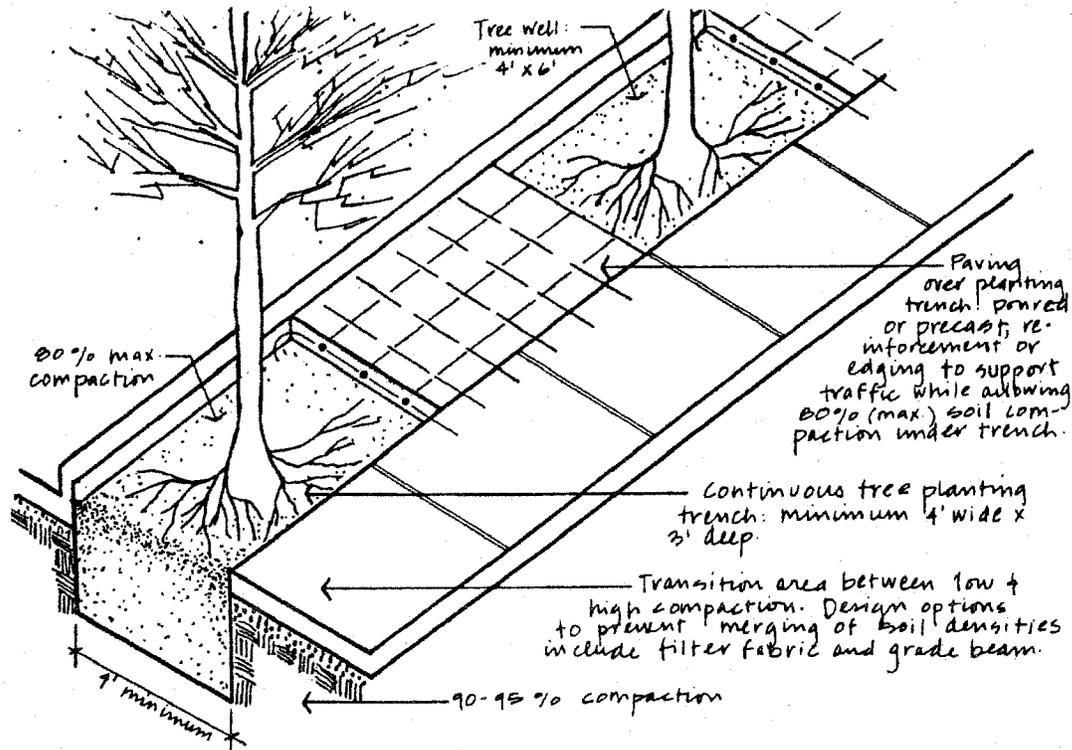


Figure 26. Planting in Paved Areas

A formal scheme is appropriate for commercial areas in urban zones. Plantings should reflect the hierarchy of land uses. The installation of formally arranged trees and the landscaping of medians should occur wherever possible. Trees should be placed to avoid obstructing signs or buildings.

Accent species call attention to specialized land use. Accent plantings highlight building facades and signs and can add visual interest to the streetscape. Solutions must allow room for trees in commercial areas while providing fully for handicap accessibility, pedestrian and traffic safety and visibility. (Figure 27. Commercial Planting).

Those commercial and retail zones in the City's suburban areas which have large plantings will require extensive reforestation.

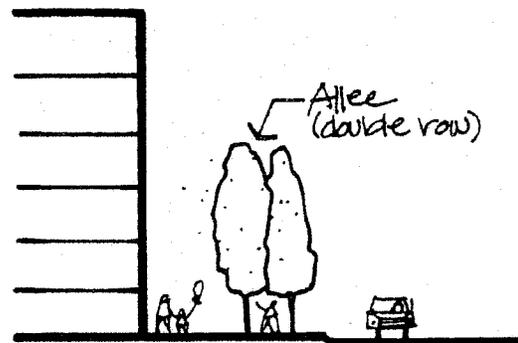


Figure 27. Commercial Planting

Neighborhoods

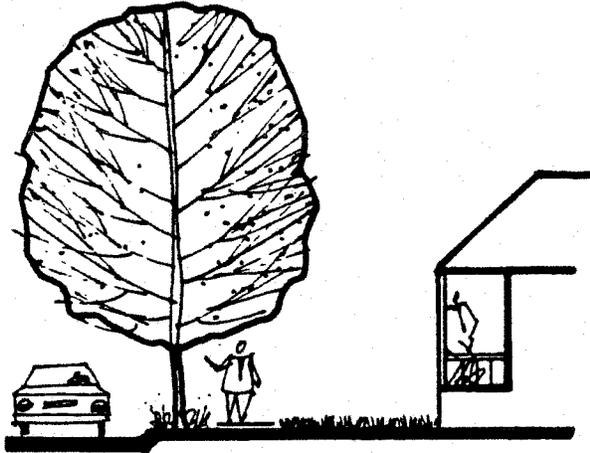


Figure 28. Residential Planting

Sacramento has been divided into eleven Community Plan Areas for planning purposes (City of Sacramento General Plan Update, 1986). For this study, areas were further divided into 28 neighborhoods, each identified by its own character and tree population.

This section describes the role Sacramento's neighborhoods play in the urban forest and how these areas require a different design approach than design for just street trees. Guidelines specific to neighborhood design will assist residents and others to make appropriate choices about neighborhood trees. All major tree planting in neighborhoods needs to be reviewed by the City Arborist. Appendix 3 describes each neighborhood in terms of existing land use and tree population. Recommendations for management strategies are detailed in Chapter 5.

While major streets need unity and strong overall themes, neighborhoods call for variety. On major streets, the wide range of experiences and architectural styles is best complemented by repetition of a regularly spaced, dominant tree species or cluster of trees. In neighborhoods where houses are often of similar styles on lots of one size, a variety in the treescape can bring richness. Plantings should retain enough consistency however, to enhance the public character of the streetscape and help harmonize the neighborhood. If existing neighborhood forests are disconnected from each other and the rest of the City they can be connected by plantings along arterials, greenways, collectors and local streets.

Neighborhoods showcase the finer points of a particular species. Details that would be lost on a motorist traveling at 40 miles per hour become important at the pedestrian's pace. Fragrance, texture, shadow patterns and unusual bark can be used to full effect on the local-street scale. Neighborhoods also provide the opportunity for ecological diversity, so important to forest health. Trees can also be used to create a diversity of spatial experiences in quieter neighborhood streets. Fitting the plant palette to match the scale and character of an area is the first step in neighborhood tree planting efforts. Varying tree spacing and species creates a richer streetscape.

In areas where some parking space can be sacrificed, small groves can be established. Focal areas in each neighborhood consisting of a single tree or tree grove, will become future landmarks or heritage sites.

Alternatives to existing right-of-way standards must be considered to create more habitable neighborhoods and to provide greater tree coverage between street and sidewalk. Narrower streets, medians and bumped-out planting bulbs within the parking lane are a few of the design solutions to achieve human scale. Wide parkways in residential areas, meandering sidewalks and planting areas for plant clusters give consistency to the neighborhood while providing ample growing areas for trees. (Figure 35. Meandering Sidewalk to Create Space for Tree Clustering).

Tree wells in pavement should be a minimum of 4 x 6 feet wide (24 square feet), with 6 x 6 feet wide or larger preferred. (Figure 29. Tree wells).

Existing tree wells should be expanded to these standards wherever possible. To be effective, new parkway planting strips should be a minimum of six feet wide wherever possible, allowing for adequate room for roots and driveway slopes without compromising handicap access. Narrower existing parkways should be widened wherever possible. Existing front yards and streetside planter strips could be kept in tact by discouraging the provision of additional driveway cuts along street fronts and on site parking in front and on the side of residences. This applies to both existing and proposed residential and non-residential development. Using the rear of properties for on site parking and alleys for access to that parking alleviates the loss of landscape area in street rights-of-way and front yards along the blockface.

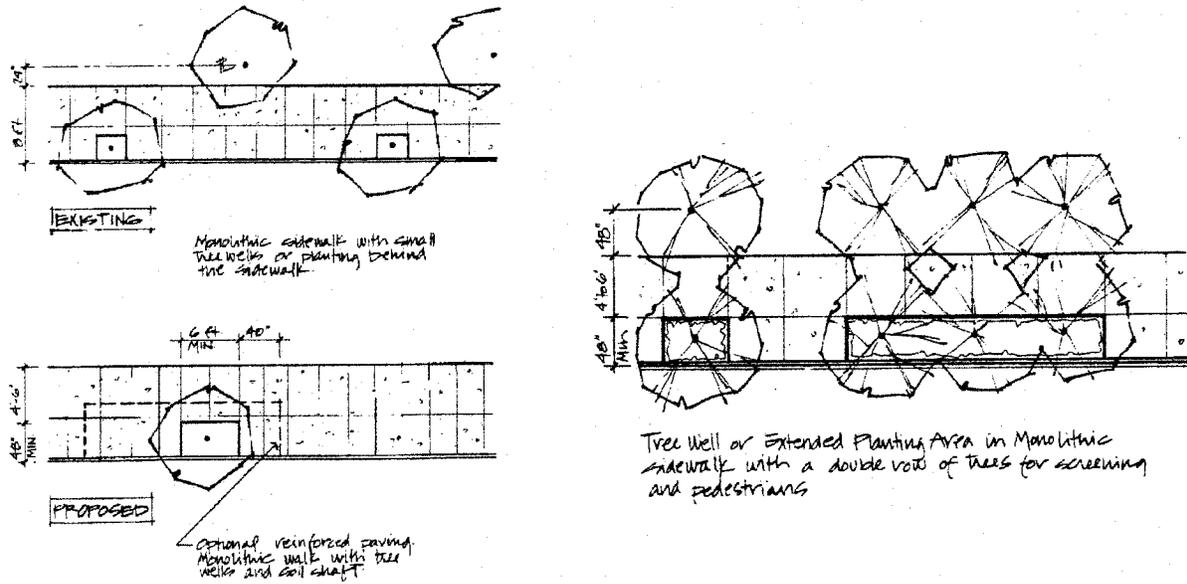


Figure 29. Tree Wells

In new developments, utilities should be undergrounded outside the street tree root zone to protect utilities, unclutter the landscape and provide more room for trees. New lines should be the maximum distance possible from intended planting sites—optimally twenty feet between the eventual root ball and utility lines. Where overhead utilities occur, properly selected plant species which will not interfere with overhead utilities and/or replacement of existing problem trees under lines, will ensure problem-free and long-lived neighborhood forests (Figure 30. Undergrounding utilities outside of the root zone.)

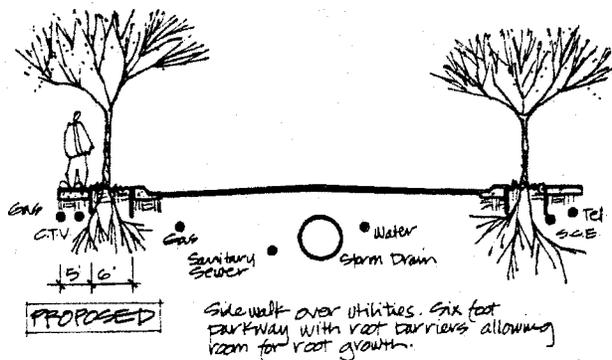


Figure 30. Undergrounding Utilities Outside of the Root Zone

Spatial Considerations

Trees share the city environment with many other elements. They must be selected and placed to work in concert with the rest of the landscape and in a way that avoids creating conflict. Such practice not only keeps surrounding elements from being damaged or compromised, but also protects the tree from injury, excessive pruning and premature removal. Costly repairs and maintenance are thereby avoided and the tree is perceived in its rightful role as a contributing member of the environmental community, rather than as a problem.

Site conditions ultimately control the longevity and health of any plant. If tree roots are constrained by a small opening to air and water, as in the case of a street tree in a four foot square opening in concrete, the tree cannot be expected to grow as rapidly, be as healthy or live as long as the same type of tree growing in an open field. The following recommendations detail spatial specifications which satisfy a tree's growth requirements within the constraints of urban planting spaces.

■ Size trees to the space they will grow into.

Species should be chosen that will comfortably fit the space available to them—both above and

below ground—when full grown. This growing space is usually defined by surrounding buildings, streets, sidewalks, utilities and other trees.

Most standards for height and spread of trees relate to optimum growing conditions. Since most street tree planting conditions are not optimum, a different set of criteria for spacing and locating trees has been developed. The following rule of thumb applies to trees which are to be planted in an even spacing pattern:

- Large canopy trees: 30 to 40 feet apart
- Columnar or medium-sized trees: 20 to 30 feet apart
- Smaller accent trees: 15 to 20 feet apart

■ **Provide adequate setbacks for healthy tree growth.**

Tree Protection & Setbacks

In general, existing street side setbacks in Downtown are five feet for buildings up to three stories high, one foot is added per each additional story to a maximum of ten feet (Ordinance #82-043). Minimum setbacks are required for the protection of existing trees and the planting of new trees in all development situations. It is recommended that setback requirements be modified, as described below, to provide adequate soil area, air space and solar radiation for healthy, mature tree growth. Setbacks are required for all building zones in all City areas, but especially in dense urban development situations in Downtown. Maximum spacing for street trees is 40 feet on center, 25 feet in from intersections and 15 feet in from alleys. (Figure 31. Street Intersection Sight Lines). Flexible or creative design solutions are encouraged to foster the intent of the following setback recommendations. Clustering trees in common planting areas are encouraged since they support healthier tree growth. Exceptions to the spacing requirement are allowed only by mutual agreement of the directors of the departments of Planning and Development and Parks and Community Services or their designees.

Soil Area

No excavation greater than 12 inches below a tree's finished grade is permitted within a 10 foot radius measured from the outside edge of the trunk; paving is not permitted within 24 inches of this same edge. Subsurface techniques such as boring, pier and gradebeams, soil shafts and

cantilevering are encouraged to extend a tree's soil area beyond these minimums (Figure 32. Tree Protection and Setbacks: Soil Area.

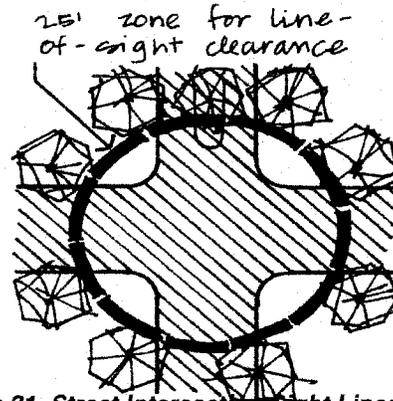


Figure 31. Street Intersection Sight Lines

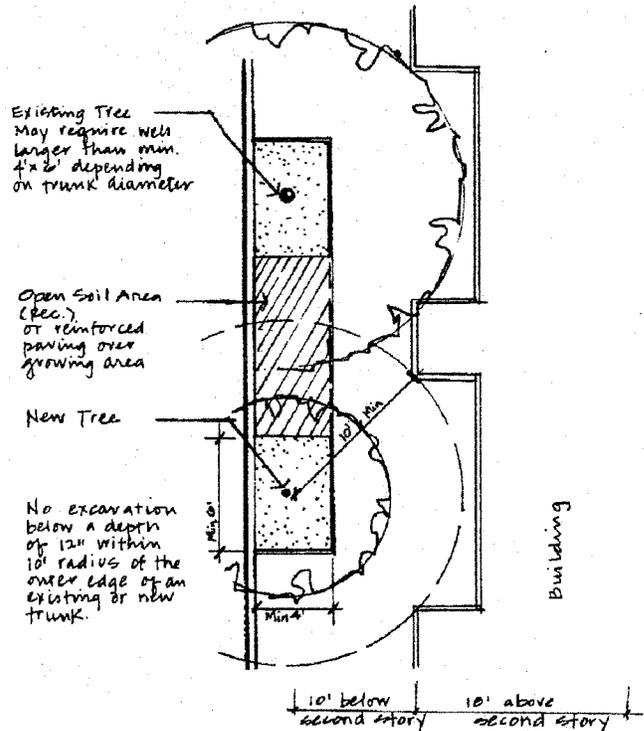


Figure 32. Tree Protection Setbacks: Soil Area

Air Space

No building facade is permitted within a 10 foot radius, measured from the outside edge of a tree

trunk for the first two stories of a building. Setbacks for buildings over two stories in height shall be a minimum 18 foot radius as measured from the outside edge of the tree trunk. Alternative planting locations, such as islands in the parking lane, may be considered adequate to meet air space setback requirements (Figure 33. Tree Protection and Setbacks: Air Space).

Solar Radiation

Setbacks are required between buildings and for courtyards within a building which allow a minimum of four hours of direct solar radiation to every tree on any day of the year. This setback requirement must be coordinated with those for soil area and air space and may require setbacks greater than those minimums to achieve the solar radiation requirement (Figure 34. Tree Protection and Setbacks: Solar Radiation).

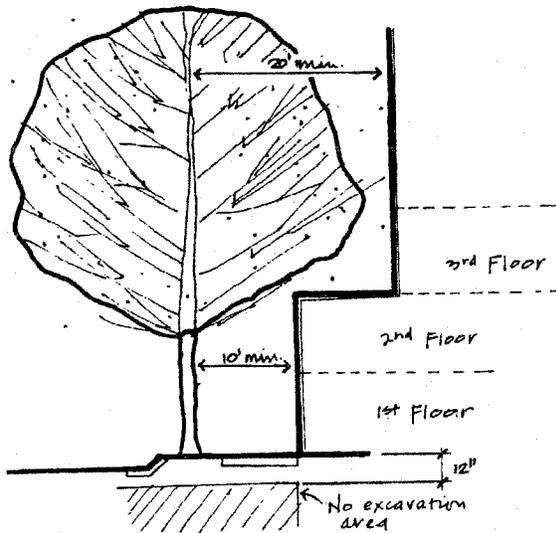


Figure 33. Tree Protection Setbacks: Air Space

■ Design to minimize conflicting uses.

Intersections. 25 feet from sidewalk and median trees to keep traffic sightlines clear.

Traffic signs. Far enough away to allow easy visibility, given the speed of street traffic.

Parking. For parallel parking, place trees at least 3 feet inside the curb and between stall markings to avoid damage from opening car doors. For diagonal or perpendicular parking, place trees at least 4 feet inside the curb to allow for car overhang.

Driveways. At least 5 feet to avoid being hit by turning cars.

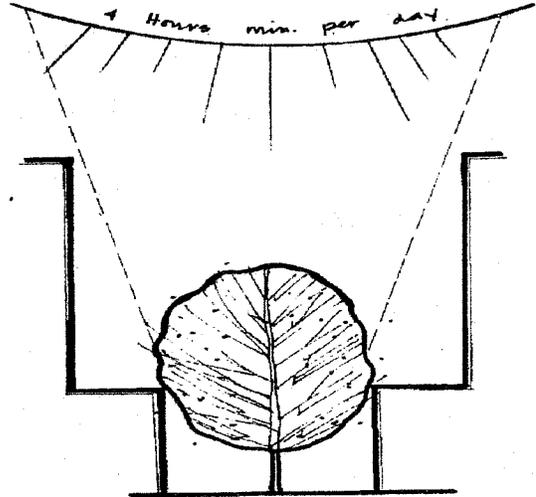


Figure 34. Tree Protection Setbacks: Solar Radiation

Bus zones. At least 6 feet from inside the curb to allow loading and unloading.

Pedestrian and wheelchair clearances. A minimum of 4 feet of clear sidewalk should be provided to allow comfortable passage.

Street lights and utility poles. At least 15 feet so as not to obstruct light or access to the poles.

Fire hydrants. At least 5 feet away to keep accessible.

Meter and valve boxes. At least 5 feet away, far enough to keep clear of tree wells.

Other street furniture—benches, trash cans, etc. Space in a pleasing, logical and functional composition; align with trees in a sidewalk amenity zone along the curb. At least 5 feet away.

■ Use species which can be pruned above the height of trucks, service vehicles and commercial signs.

A vertical clearance of 14 feet to the first limbs will generally not interrupt deliveries or visibility of storefronts. Residential areas usually require 8 feet of clearance.

■ **Use strong-branched trees near structures, streets and activity areas.**

Harm to people and property, interruption of traffic and costly clean up, can be avoided.

■ **Plant fruiting trees or those with large seed pods in planting areas that have a broad band of soil or ground cover to catch the fruit.**

Fruit drop is not only messy, but can create a hazard on sidewalks, in parking lots and over bike lanes. Large seed pods, such as those of Liquidambar and some Eucalyptus, can be dangerous to pedestrians, wheelchair users and cyclists in paved areas. (Trees that produce debris are identified in the tree matrices.) Fruit and nut trees are encouraged for those areas with groundcover underneath where they can be harvested by residents or school children.

■ **Locate trees to minimize conflict with overhead and underground utilities.**

Oversized trees under utility wires result in either damaged lines or misshapen trees, and often both. However, since trees greater than 25 feet in height will come in contact with overhead wires, this must be considered an important design constraint. Some overhead wires may be scheduled for undergrounding, or can be re-aligned to accommodate a street-tree planting. If neither of these options is possible, select a species with a thin upper canopy so that pruning it will not destroy the form of the tree. Another alternative is to plant small, closely spaced trees that will not reach the height of the wires. Plant trees as far away as possible from utilities to avoid damage to water, sewer and other underground lines from roots in search of moisture, and to avoid trenching through the root zone when lines are serviced. Contact utility companies to locate lines before determining planting locations. Trees that are appropriate under power lines are identified in the tree matrices.

■ **Give the tree the largest planting area possible.**

Match the particular tree's root behavior to the available planting area. Make the tree planting area as wide as possible (minimum four feet by six feet) and only as deep as needed (approximately 36"). Most roots grow horizontally in the top 12-30" of soil. More than 1,000 cubic feet of rooting space is desirable to grow a healthy tree 25" to 30"

in caliper (Moll 1989, pg. 134). Trees planted in less soil will probably begin to show signs of decline, stunting or dieback at smaller and smaller sizes as the soil volume is decreased.

Assuming that little additional soil is available beyond the planting hole in the urban environment, a typical four inch caliper tree will completely fill the rooting space of a 4 x 4 foot tree well in less than four years.

Existing sidewalk tree wells in Sacramento vary considerably. Existing parkway strips are typically 6-8 feet wide but range from 2-15 feet. Street trees are also planted in easements behind the sidewalk and in front yards and medians. The planting palette lists species which will grow in each of these spaces while lessening the threat of lifting the surrounding pavement if existing openings cannot be enlarged. In most soils, any species will eventually damage surrounding pavement if planted in openings less than three feet wide.

Tree Wells. Tree species must be selected to conform to the available planting space. The minimum allowed in Sacramento is 4 x 6 x 3 feet deep, with 10 x 10 or larger recommended. Tree wells with an opening of less than 8.3 square feet (2.5 x 2.5) will support only small trees to maturity or medium-sized species for 10 to 15 years. Tree wells with an opening of 48 square feet (6 x 8), on the other hand, will allow a tree to achieve 20 inch trunk diameter.

Parkway Strips. The same constraints associated with tree wells apply to strips, with regard to species selection. The design of new streets or retrofitting existing streets with a 6 foot wide parkway is essential for healthy tree growth. A 2.5 foot wide planting strip will not support a medium or large sized tree without pavement damage any better than would a 2.5 x 2.5 feet (8.3 square foot) opening. The benefit of planter strips over tree wells is increased tree vigor and growth, due to a larger surface area of exposed soil and intermingling of roots.

Back of Sidewalk. When planting behind the sidewalk, place the trunk at least 3 to 4 feet from the pavement. The larger surface area of exposed soil in this configuration allows greater air and water access to the roots. The increased water supply from home owner irrigation can also be a benefit, except in the case of trees which do not tolerate summer watering (coast live oaks, for

example).

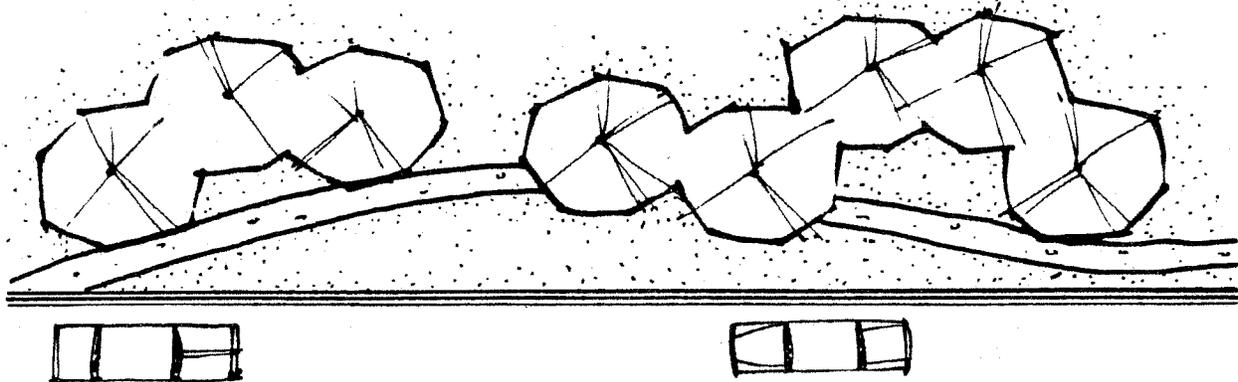
Meandering Sidewalk. Meandering sidewalks create the opportunity for using groups of trees in a single large planting area rather than in smaller spaces, which significantly increases tree health, reduces structural problems and prolongs longevity. Design solutions which allow such large planting areas are preferred.

Existing spaces should be enlarged by removing pavement whenever possible. Planting hole size is probably the most limiting factor in species selection.

Ways to Enlarge Planting Areas:

- Build wider parkway strips (6-10 feet wide) in new developments. This will provide greater shade canopy over the street.
- Plant behind sidewalks in planting beds or lawn areas. In lawn areas, keep the grass at least 4 feet from the trunk to reduce competition for nutrients.
- Use pervious paving materials around tree wells. Interlocking pavers, bricks and decomposed granite, all of which accommodate wheelchair access, allow greater amounts of air and water to reach the root zone.

- Use subsurface soil shafts. This involves creating a gravel-filled air gap under the concrete slab around the tree well, and reducing the compaction under the slab in this area to less than 85%. A typical concrete slab can be made to span up to four feet beyond the tree well with only minor modifications to its reinforcing.
- Cut larger planting holes in paving for existing trees (minimum 4 x 6 feet).
- Use meandering sidewalks, planting area islands in parking lanes and medians.



Alternate tree locations to break linearity of trees into more natural tree groupings and to open up views.

Figure 35. Meandering Sidewalk to Create Space for Tree Clustering

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E. A PLANTING PALETTE FOR SACRAMENTO

This section provides a palette, or range of tree choices for Sacramento. The index of trees gives a list of recommended, experimental and conditional trees for future plantings and trees from the city's existing tree list which have problems and may not be recommended for use.

Recommended: The trees on the Recommended List are either proven performers in Sacramento or new species and tree cultivars which are suited to the conditions found in the City. New species replace some old favorites which have had serious problems and therefore cannot be recommended. All trees on the Recommended List will do well if each tree's environmental requirements are met, however, they will not necessarily do well in every location. Refer to spacing requirements for each species.

Experimental: Experimental trees are those which meet all the same environmental, functional and design requirements of trees on the Recommended List, but which have not been planted in large enough numbers or for a long enough period of time in Sacramento to be able to judge long-term performance. These species should be planted in smaller quantities at first, and monitored for more widespread use. Annually, at least 5% of all trees planted in Sacramento are to come from this list. Some species may need to be grown in the City nursery or contract-grown since they may not be readily available in the nursery trade.

Conditional: Conditional trees are those with specific use and placement limitations. Limitations are listed. Conditional trees may only be used with the written approval of Street Tree Services.

Not to Use in the Public Right of Way: The trees on this list are not to be planted in the public right-of-way. The matrix identifies one or more reasons for inclusion on this list. Some species were taken from existing City Trees Lists.

Trees Not to Use: The factors for this section of the matrix are defined as follows: **Pest and Disease:** Pest problems serious enough to be difficult to control and/or are considered to be an untreatable disease.

Pavement Destruction: Pavement problems

caused by highly invasive roots.

Overplanted: Causes a danger to a large percentage of a species if overcome by pest or disease problems. An area planted in one species may be entirely destroyed.

Freeze Damage: Likelihood of suffering severe damage during frost.

Availability: Difficulty in locating within the nursery trade.

Horticulturally Difficult: Horticultural idiosyncrasies which make training difficult.

Species problems have been noted and the severity of the problem ranked. The index identifies where species appears on matrices and categorizes each species by the physical size of the planting area required for growth. Following the index are matrices, identifying tree design and horticultural factors.

Tree Matrices

The tree matrices are used to narrow down choices. They should be used in conjunction with the computer inventory database and recommendations in previous sections to make individual site-specific tree selections. Photographs, sketches and additional horticultural, functional or aesthetic descriptions found in supplementary materials such as Sunset Western Garden Book can also help in decision making.

Species Nomenclature

On all charts, plants are listed alphabetically by botanical name followed by its most widely used common name. The capitalized first name indicates the plant genus, and the second lower-case name is the species. The third name, which is capitalized and in single quotation marks, indicates the cultivar. A cultivar is a variety that is asexually reproduced from the parent stock to exhibit particular positive characteristics or eliminate debilitating horticultural problems.

Tree Characteristics

Except for the overall index and the "trees not to use" sections, the matrix is formatted on two facing pages, with information for each tree running across both. The factors on the left-hand pages of the matrix are defined as follows:

Type: California natives are important to preserve the natural ecosystems and visual

character of an area. They should be used in open spaces or in areas where they are intermixed with appropriate naturalized, drought-tolerant species. Evergreen trees hold their leaves all year while deciduous trees lose leaves each year, usually in the fall or winter. For the purposes of the Management Plan, evergreen trees are divided into broadleaf evergreens, a tree with leaves, or a conifer, a tree with seed cones and evergreen needles. Deciduous trees are identified as trees which drop leaves all at once, usually at the onset of winter.

Height: Three heights are used, based on expected growth for trees in restrictive street tree environments. Sizes are smaller here than in other references where sizes reflect optimum growing conditions.

- Small: Under 20 feet tall
- Medium: 20 to 40 feet tall
- Tall: More than 40 feet tall

Spread: Spread is a more dominating factor than height in describing the impact a tree will have on a street, neighborhood or the larger community. This categorization will designate which species can be used as shade canopy trees. For example, a tall, narrow tree such as *Pinus canariensis* provides minimal canopy, while a tall, broad tree such as *Quercus lobata* provides maximum canopy. Horizontal width of the tree canopy is identified as:

- Narrow: Less than 20 feet wide
- Average: 20 to 40 feet wide
- Broad: More than 40 feet wide

Growth rate:

- Slow: Will take many years to develop its mature form.
- Medium: Will begin to acquire mature characteristics within 20 years.
- Fast: Will begin to develop a tree canopy after the first five years, if planted from a 15 gallon can or larger size.
- Very fast: The same as for fast trees except form begins within five years. These trees should be used as secondary or support species only, as they usually have high maintenance requirements and are short-lived.

Spacing:

- Small trees: 15 to 20 feet apart
- Medium trees: 20 to 30 feet apart
- Large trees: 30 to 40 feet apart

The factors on the right-hand pages of the matrices are defined as follows:

Life span: Useful life expectancy under stressful urban street conditions .

Form: The shape of the tree's crown.

Preferences: Horticultural conditions preferred by the tree, such as good drainage, regular watering, no watering, etc., or design situations which limit growth, such as overhead utilities and medians which require a minimum of 8 feet in growing space. Abundant seeds or fruit which fall from the tree periodically. Trees that produce organic litter should be planted over surfaces that accommodate it without becoming an excessive maintenance or safety problem. These trees are wonderful assets if planted in appropriate locations. Accent trees refers to smaller trees that should be used for infill planting or as a design highlight.

Tolerances: Horticultural conditions which a tree tolerate, such as alkaline soil, wind, frost, etc.

Planting Space: Since the number one factor which limits the growth of a tree is the size of the available planting area, each list of trees is subdivided into the following categories based upon the minimum distance from paving required for healthy growth without breaking up sidewalks and paving. Three categories of planting space widths are listed in the Tree Index. Root barriers may be recommended in specific locations depending on the soil type, planting space and species. The City Arborist shall recommend root barriers on a case by case basis.

- Small Planting Sites: Existing spaces less than 4 feet wide which cannot be enlarged.
- Medium Planting Sites: 4 to 8 feet wide tree wells, 10 to 15 feet wide medians.
- Large Planting Sites: Parkways, tree wells and other openings between 8 and 15 feet wide, including medians.

TREE INDEX

Refer to ' RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X	
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *		
1	<i>Acer buergeranum</i> Trident Maple	●										
2	<i>Acer campestre</i> Hedge Maple	●										
3	<i>Acer campestre</i> 'Queen Elizabeth' Queen Elizabeth Hedge Maple				●							
4	<i>Acer macrophyllum</i> Big Leaf Maple								●			
5	<i>Acer nigrum</i> 'Green Column' Green Column Black Maple					●						
6	<i>Acer palmatum</i> Japanese Maple	●										
7	<i>Acer platanoides</i> 'Columnar Broad'					●						
8	<i>Acer platanoides</i> 'Emerald Queen' Emerald Queen Norway Maple					●						
9	<i>Acer rubrum</i> 'Autumn Flame'					●						
10	<i>Acer rubrum</i> 'Frank's Red' Red Sunset Maple					●						
11	<i>Acer rubrum</i> 'October Glory' October Glory Red Maple					●						
12	<i>Acer saccharinum</i> Silver Maple											●

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Not to use as p.r.o.w. trees
13	<i>Acer saccharum</i> 'Flax Mill Majesty' Flax Mill Majesty Sugar Maple				●						
14	<i>Acer saccharum</i> 'Legacy' Legacy Sugar Maple				●						
15	<i>Aesculus californica</i> California Buckeye							●			
16	<i>Aesculus carnea</i> 'O'Neill Red' O'Neill Red Horsechestnut				●						
17	<i>Alnus</i> sp. Alder Sp.										●
18	<i>Callistemon citrinus</i> Lemon Bottlebrush	●									
19	<i>Calocedrus decurrens</i> Incense Cedar							●			
20	<i>Carpinus betulus</i> European Hornbeam							●			
21	<i>Celtis australis</i> European Hackberry	●									
22	<i>Celtis occidentalis</i> Common Hackberry		●								
23	<i>Celtis sinensis</i> Chinese Hackberry	●									
24	<i>Ceratonia siliqua</i> Carob Tree								●		

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X	
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *		
25	<i>Cercis canadensis</i> Eastern Redbud	●										Not to use as p.r.o.w. trees
26	<i>Cercis canadensis</i> 'Forest Pansy' Oklahoma Redbud				●							
27	<i>Cercis occidentalis</i> Western Redbud	●										
28	<i>Cercis reniformis</i> 'Oklahoma' Forest Pansy Canadian Redbud				●							
29	<i>Chionanthus retusus</i> Chinese Fringe Tree				●							
30	<i>Chitalpa tashkenensis</i> 'Pink Dawn' (<i>Catalpa</i> and <i>Chilopsis</i> hybrid)					●						
31	<i>Cinnamomum camphora</i> Camphor Tree									●		
32	<i>Crataegus viridis</i> 'Winter' Winter King Hawthorne				●							
33	<i>Cornus kousa chinensis</i> Chinese Dogwood								●			
34	<i>Cupressocyparis leylandii</i> Leyland Cypress										●	
35	<i>Eucalyptus gunnii</i> Cider Gum					●						
36	<i>Eucalyptus microtheca</i> Coolibah Tree					●						

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Not to use as p.r.o.w. trees
37	<i>Eucalyptus polyanthemos</i> Silver Dollar Eucalyptus		●								
38	<i>Eucalyptus sideroxylon</i> Red Ironbark	●									
39	<i>Fagus sylvatica</i> European Beech								●		
40	<i>Fraxinus sp.</i> Ash Sp.										●
41	<i>Ginkgo biloba</i> Ginkgo	●									
42	<i>Koelreuteria bipinnata</i> Flame Tree	●									
43	<i>Koelreuteria paniculata</i> Goldenrain Tree	●									
44	<i>Lagerstroemia indica</i> Crape Myrtle	●									
45	<i>Laurus nobilis</i> Sweet Bay							●			
46	<i>Liquidambar styraciflua</i> American Sweet Gum								●		
47	<i>Magnolia grandiflora</i> 'Majestic Beauty' Majestic Beauty Magnolia		●								
48	<i>Magnolia grandiflora</i> 'Russet' Russet Magnolia		●								

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	
49	<i>Magnolia grandiflora</i> 'St. Mary' St. Mary's Magnolia			●							
50	<i>Magnolia soulangiana</i> Saucer Magnolia	●									
51	<i>Maytenus boaria</i> Mayten Tree								●		
52	<i>Morus alba</i> White Mulberry										●
53	<i>Nyssa sylvatica</i> Tupelo		●								
54	<i>Phellodendron amurense</i> 'Macho' Male Cork Tree						●				
55	<i>Pinus canariensis</i> Canary Island Pine								●		
56	<i>Pinus densiflora</i> Japanese Red Pine								●		
57	<i>Pinus eldarica</i> Mondell Pine					●					
58	<i>Pinus halepensis</i> Aleppo Pine								●		
59	<i>Pinus patula</i> Jelecote Pine	●									
60	<i>Pinus pinea</i> Italian Stone Pine									●	

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	
61	<i>Pinus radiata</i> Monterey Pine										●
62	<i>Pinus roxburghii</i> Chir Pine				●						
63	<i>Pinus sylvestris</i> Scotch Pine								●		
64	<i>Pinus thunbergiana</i> Japanese Black Pine	●									
65	<i>Pistacia chinensis</i> Chinese Pistache		●								
66	<i>Platanus acerifolia</i> 'Bloodgood' London Plane								●		
67	<i>Platanus acerifolia</i> 'Yarwood' London Plane		●								
68	<i>Platanus cashmeriana</i> Cashmere Sycamore					●					
69	<i>Prunus blireiana</i> Flowering Plum								●		
70	<i>Prunus cerasifera</i> 'Atropurpurea' Purple Leaf Plum								●		
71	<i>Prunus cerasifera</i> 'Thundercloud' Flowering Plum								●		
72	<i>Prunus okame</i> Okame Flowering Cherry					●					

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	
73	<i>Prunus sargentii</i> Sargent Flowering Cherry				●						
74	<i>Prunus 'Snow Goose'</i> Snow Goose Flowering Cherry				●						
75	<i>Pyrus calleryana 'Chanticleer'</i> Chanticleer Pear							●			
76	<i>Pyrus calleryana 'Redspire'</i> Redspire Pear							●			
77	<i>Pyrus kawakamii</i> Evergreen Pear							●			
78	<i>Quercus 'acutissima'</i> Sawtooth Oak				●						
79	<i>Quercus agrifolia</i> California Live Oak	●									
80	<i>Quercus bicolor</i> Swamp White Oak				●						
81	<i>Quercus coccinea</i> Scarlet Oak	●									
82	<i>Quercus douglasii</i> Blue Oak	●									
83	<i>Quercus frainetto 'Schmidt'</i> Forest Green Oak				●						
84	<i>Quercus Ilex</i> Holly Oak							●			

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X	
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *		
85	<i>Quercus lobata</i> Valley Oak	●										
86	<i>Quercus macrocarpa</i> Burr Oak				●							
87	<i>Quercus palustris</i> Pin Oak					●						
88	<i>Quercus rubra</i> Red Oak	●										
89	<i>Quercus shumardii</i> Shumard Oak				●							
90	<i>Quercus suber</i> Cork Oak	●										
91	<i>Quercus virginiana</i> Southern Live Oak	●										
92	<i>Quercus wislizenii</i> Interior Live Oak	●										
93	<i>Rhus lancea</i> African Sumac				●							
94	<i>Robinia ambigua</i> 'Idahoensis' Idahoe Pink	●										
95	<i>Robinia pseudoacacia</i> 'Decaisneana' Black Locust				●							
96	<i>Sapium sebiferum</i> Chinese Tallow Tree	●										

* Recommended minimum distance to nearest paving material.

TREE INDEX

Refer to 'RECOMMENDED', 'EXPERIMENTAL', 'CONDITIONAL' and 'NOT TO USE' Tree Lists following this index for species specific information.		Recommended			Experimental			Conditional			X
		Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	Less than 4 feet *	4 to 8 feet *	8 to 15 feet *	
97	<i>Sequoia sempervirens</i> Redwood/Coast Redwood		●								
98	<i>Sequoiadendron giganteum</i> Sequoia/Sierra Redwood										●
99	<i>Sophora japonica</i> 'Regent' Regent Japanese Scholar Tree				●						
100	<i>Tilia americana</i> 'Redmond' Redmond Linden	●									
101	<i>Tilia americana</i> 'Wandell' Legend Linden Tree				●						
102	<i>Tilia cordata</i> 'Olympic' Olympic Linden				●						
103	<i>Ulmus</i> 'Homestead' Homestead Elm										●
104	<i>Ulmus</i> 'Pioneer' Pioneer Elm										●
105	<i>Umbellularia californica</i> California Bay					●					
106	<i>Washingtonia filifera</i> California Fan Palm										●
107	<i>Washingtonia robusta</i> Mexican Fan Palm										●
108	<i>Catalpa bignonioides</i> Common Catalpa										●

* Recommended minimum distance to nearest paving material.

RECOMMENDED PUBLIC R.O.W. TREES

		TYPE			HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
1	<i>Acer buergeranum</i> Hedge Maple		●				●			●				●		25
2	<i>Acer campestre</i> Trident Maple		●			●			●						●	15
3	<i>Acer palmatum</i> Japanese Maple		●			●			●					●		25
4	<i>Callistemon citrinus</i> Lemon Bottlebrush			●		●			●						●	10
5	<i>Celtis australis</i> European Hackberry		●			●			●					●		40
6	<i>Celtis occidentalis</i> Common Hackberry		●				●			●		●				40
7	<i>Celtis sinensis</i> Chinese Hackberry		●			●			●				●			40
8	<i>Cercis canadensis</i> Eastern Redbud		●			●			●					●		20
9	<i>Cercis occidentalis</i> Western Redbud	●	●			●			●						●	15
10	<i>Eucalyptus polyanthemos</i> Silver Dollar Eucalyptus			●			●		●			●	●			30
11	<i>Eucalyptus sideroxylon</i> Red Ironbark			●			●		●			●				30
12	<i>Ginkgo biloba</i> Ginkgo		●			●			●						●	30

RECOMMENDED PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES					TOLERANCES					SPACES					
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet		4 - 8 feet	8 - 15 feet
		●	●					●		●	●				●			●		●			1
		●	●					●		●	●			●	●	●	●			●			2
	●		●					●			●		●		●			●		●			3
	●						●				●	●		●	●	●				●			4
		●					●	●	●	●				●	●	●	●				●		5
	●						●		●	●				●	●	●	●					●	6
		●	●				●		●	●				●	●		●				●		7
●							●			●		●		●						●			8
●							●				●	●		●	●					●			9
	●		●						●					●	●	●	●				●		10
	●		●						●					●				●		●			11
		●		●					●	●	●		●	●			●			●			12

RECOMMENDED PUBLIC R.O.W. TREES

		TYPE			HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
13	<i>Koelreuteria bipinnata</i> Flame Tree		●			●			●			●				40
14	<i>Koelreuteria paniculata</i> Goldenrain Tree		●			●			●				●			20
15	<i>Lagerstroemia indica</i> Crape Myrtle		●			●			●					●		15
16	<i>Magnolia grandiflora</i> 'Majestic Beauty' Majestic Beauty Magnolia			●			●		●					●		30
17	<i>Magnolia grandiflora</i> 'St. Mary' St. Mary's Magnolia			●			●		●					●		30
18	<i>Magnolia grandiflora</i> 'Russet' Russet Magnolia			●			●		●					●		30
19	<i>Magnolia soulangiana</i> Saucer Magnolia		●			●			●				●			20
20	<i>Nyssa sylvatica</i> Tupelo		●			●			●				●			30
21	<i>Pinus patula</i> Jelcote Pine				●		●			●				●		30
22	<i>Pinus thunbergiana</i> Japanese Black Pine				●		●			●				●		15
23	<i>Pistacia chinensis</i> Chinese Pistache		●			●			●				●			20
24	<i>Platanus acerifolia</i> 'Yarwood' London Plane		●				●			●			●			30

RECOMMENDED PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES					TOLERANCES					SPACES					
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet	4 - 8 feet	8 - 15 feet	
	●						●	●		●				●	●			●			●		13
	●						●	●						●	●	●		●			●		14
	●		●				●	●		●	●			●	●	●		●			●		15
		●	●						●	●					●			●				●	16
		●	●						●	●					●			●				●	17
		●		●					●	●					●			●				●	18
		●		●				●	●	●		●			●			●			●		19
		●			●				●						●			●			●		20
	●						●		●			●			●	●		●			●		21
		●	●					●				●			●	●		●			●		22
	●	●	●				●							●	●	●		●			●		23
		●	●		●			●	●	●				●	●	●					●		24

RECOMMENDED PUBLIC R.O.W. TREES

		TYPE				HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)	
25	<i>Quercus agrifolia</i> California Live Oak	●		●				●			●			●	●		30
26	<i>Quercus coccinea</i> Scarlet Oak		●					●			●				●		30
27	<i>Quercus douglasii</i> Blue Oak	●	●					●			●						30
28	<i>Quercus lobata</i> Valley Oak	●	●					●			●				●	●	30
29	<i>Quercus rubra</i> Red Oak		●					●			●				●		30
30	<i>Quercus suber</i> Cork Oak			●				●			●				●		30
31	<i>Quercus virginiana</i> Southern Live Oak			●				●			●						25
32	<i>Quercus wislizenii</i> Interior Live Oak	●		●				●			●				●	●	30
33	<i>Robinia ambigua Idahoensis</i> Idaho Locust		●					●			●			●			20
34	<i>Sapium sebiferum</i> Chinese Tallow Tree		●					●			●				●		20
35	<i>Sequoia sempervirens</i> Redwood/Coast Redwood	●			●			●			●			●	●		40
36	<i>Tilia americana 'Redmond'</i> Redmond American Linden			●				●			●				●		30

RECOMMENDED PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES					TOLERANCES					SPACES					
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet	4 - 8 feet	8 - 15 feet	
		●	●					●				●	●	●	●						●		25
		●				●			●	●					●	●					●		26
		●	●						●					●	●	●					●		27
		●	●						●		●			●	●	●			●		●		28
		●				●			●	●	●			●	●	●		●			●		29
		●	●						●	●				●	●	●		●			●		30
		●	●						●	●	●				●	●		●			●		31
		●	●						●			●		●		●		●			●		32
				●				●	●	●		●		●	●		●	●			●		33
●	●		●					●		●	●			●	●	●		●			●		34
		●				●			●	●	●				●							●	35
		●				●			●	●	●			●							●		36

EXPERIMENTAL PUBLIC R.O.W TREES

		TYPE			HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
1	<i>Acer campestre</i> 'Queen Elizabeth' Hedge Maple (A-E)		●				●			●				●		20
2	<i>Acer nigrum</i> 'Green Column' Green Column Black Maple (B-D)		●				●		●				●			20
3	<i>Acer platanoides</i> 'Emerald Queen' Emerald Queen Norway Maple (B-D)		●				●		●				●			30
4	<i>Acer platanoides</i> 'Columnar Broad' (B-D)		●				●		●				●			20
5	<i>Acer rubrum</i> 'Autum Flame' (B-D)		●				●		●				●			30
6	<i>Acer rubrum</i> 'October Glory' October Glory Red Maple (B-D)		●				●		●				●			20
7	<i>Acer rubrum</i> 'Frank's Red' Red Sunset Maple (B-D)		●				●		●				●			30
8	<i>Acer saccharum</i> 'Flax Mill Majesty' Flax Mill Majesty Sugar Maple (1) (B-D)		●				●		●				●			40
9	<i>Acer saccharum</i> 'Legacy' Legacy Sugar Maple (1) (B-D)		●				●		●				●			40
10	<i>Aesculus carnea</i> 'O'Neill Red' O'Neill Red Horsechestnut (A,B,F)		●				●		●					●		30
11	<i>Cercis canadensis</i> 'Forest Pansy' Forest Pansy Canadian Redbud (A-D,F)		●				●		●				●			20
12	<i>Cercis reniformis</i> 'Oklahoma' Oklahoma Redbud (A-C,E,F)		●				●		●				●			20

A) Low Maintenance B) Pest Free C) Beautiful Form D) Fall Color E) Drought Tolerance F) Beautiful Flowers

(1) These cultivars do not have the structural problems of silver maple.

EXPERIMENTAL PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES					TOLERANCES					SPACES					
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet		4 - 8 feet	8 - 15 feet
		●	●					●		●	●				●	●				●			1
	●				●				●	●	●				●	●					●		2
	●			●					●	●	●				●	●		●			●		3
	●			●					●	●	●				●	●		●			●		4
	●			●					●	●	●				●	●		●			●		5
	●			●	●				●	●	●				●	●		●			●		6
	●			●					●	●	●				●	●		●			●		7
	●			●					●	●	●				●	●		●			●		8
	●			●					●	●	●				●	●		●			●		9
		●		●					●	●		●			●	●		●			●		10
	●			●					●			●			●					●			11
	●			●					●					●	●	●	●			●		●	12

EXPERIMENTAL PUBLIC R.O.W TREES

	TYPE			HEIGHT			SPREAD			GROWTH RATE					
	Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
<i>Chionanthus retusus</i> Chinese Fringe Tree (A-C,F)		●			●			●					●		20
<i>Chitalpa tashkentensis</i> 'Pink Dawn' <i>Catalpa</i> and <i>Chilopsis</i> hybrid (A-C,E,F)		●			●				●			●			30
<i>Crataegus viridis</i> 'Winter' Winter King Hawthorne (A-D,F)		●			●			●					●		15
<i>Eucalyptus gunnii</i> Cider Gum (B,C,E)			●			●		●			●				30
<i>Eucalyptus microtheca</i> Coolibah Tree (B,C,E)			●			●		●			●				25
<i>Phellodendron amurense</i> 'Macho' Male Cork Tree (A-E)		●			●			●				●			40
<i>Pinus eldarica</i> Mondell Pine				●		●		●				●			15
<i>Pinus roxburghii</i> Chir Pine				●		●		●				●			15
<i>Platanus cashmeriana</i> Cashmere Sycamore (A-E)		●			●			●				●			35
<i>Prunus okame</i> Okame Flowering Cherry (C,D,F)		●			●			●					●		20
<i>Prunus sargentii</i> Sargent Flowering Cherry (C,D,F)		●			●			●				●			30
<i>Prunus</i> 'Snow Goose' Snow Goose Flowering Cherry (C,D,F)		●			●			●				●			20

A) Low Maintenance B) Pest Free C) Beautiful Form D) Fall Color E) Drought Tolerance F) Beautiful Flowers

EXPERIMENTAL PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES					TOLERANCES					SPACES					
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet	4 - 8 feet	8 - 15 feet	
	●		●					●		●	●				●	●		●		●			13
●							●		●	●		●		●	●	●					●		14
	●		●					●		●	●							●			●		15
	●				●				●					●	●	●		●				●	16
	●		●					●	●					●	●	●						●	17
	●					●			●	●				●	●	●	●					●	18
	●				●				●					●	●	●	●					●	19
	●				●					●	●			●	●	●		●	●			●	20
		●			●				●	●	●			●	●	●						●	21
●			●					●		●		●			●			●			●		22
	●					●			●	●		●		●				●			●		23
	●		●					●		●		●		●				●			●		24

EXPERIMENTAL PUBLIC R.O.W TREES

		TYPE			HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
25	<i>Quercus acutissima</i> Sawtooth Oak (A-C)	●				●			●			●				40
26	<i>Quercus bicolor</i> Swamp White Oak (A-C)	●					●			●		●				40
27	<i>Quercus frainetto</i> 'Schmidt' Forest Green Oak (A-C,E)	●					●			●		●				40
28	<i>Quercus macrocarpa</i> Burr Oak (A-C,E)	●					●			●		●				40
29	<i>Quercus palustris</i> Pin Oak	●					●			●		●	●			40
30	<i>Quercus shumardii</i> Shumard Oak (A-E)	●					●			●		●				40
31	<i>Rhus lancea</i> African sumac			●		●			●						●	20
32	<i>Robinia pseudoacacia</i> 'Decaisneana' Black Locust (D,F)	●					●			●		●				20
33	<i>Sophora japonica</i> 'Regent' Regent Japanese Scholar Tree (A-C,F)	●					●			●				●		30
34	<i>Tilia americana</i> 'Wandell' Legend Linden Tree (A,C)	●					●			●				●		25
35	<i>Tilia cordata</i> 'Olympic' Olympic Linden (A,C)	●					●			●				●		25
36	<i>Umbellularia californica</i> California Bay (A,B,E)	●		●			●			●				●	●	40

A) Low Maintenance B) Pest Free C) Beautiful Form D) Fall Color E) Drought Tolerance F) Beautiful Flowers

EXPERIMENTAL PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES					TOLERANCES					SPACES					
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet	4 - 8 feet	8 - 15 feet	
		●				●		●		●				●	●					●			25
		●				●		●		●				●	●					●			26
		●				●		●	●	●			●	●	●					●			27
		●	●					●	●	●				●	●					●			28
		●	●					●	●	●		●					●					●	29
		●				●		●	●	●				●	●		●			●			30
	●		●					●		●	●			●						●			31
	●			●				●		●										●			32
		●	●					●	●	●	●			●	●	●	●	●		●			33
	●					●		●	●	●				●	●		●			●			34
	●					●		●	●	●				●	●		●			●			35
●						●		●		●				●						●		●	36

CONDITIONAL PUBLIC R.O.W. TREES

		TYPE				HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf	Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
1	<i>Acer macrophyllum</i> Big Leaf Maple	●	●					●			●			●			25
2	<i>Aesculus californica</i> California Buckeye	●	●				●			●					●	●	20
3	<i>Calocedrus decurrens</i> Incense Cedar	●				●				●						●	25
4	<i>Carpinus Betulus</i> European Hornbeam		●					●		●					●		20
5	<i>Ceratonia siliqua</i> Carob Tree			●			●			●					●		20
6	<i>Cinnamomum camphora</i> Camphor Tree			●			●			●						●	30
7	<i>Cornus kousa chinensis</i> Chinese Dogwood		●				●			●						●	15
8	<i>Fagus sylvatica</i> European Beech (1) (A)		●					●		●						●	15
9	<i>Laurus nobilis</i> Sweet Bay			●			●			●						●	15
10	<i>Liquidambar styraciflua</i> American Sweet Gum (D)		●				●			●					●		20
11	<i>Maytenus boaria</i> Mayten Tree (D)			●			●			●						●	20
12	<i>Pinus canariensis</i> Canary Island Pine			●			●			●				●			15

CONDITIONAL PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES					TOLERANCES					SPACES					
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet		4 - 8 feet	8 - 15 feet
	●		●					●	●		●				●							●	1
	●		●					●	●					●	●	●			●			●	2
		●				●			●	●					●	●	●					●	3
	●					●			●	●	●				●		●					●	4
	●		●					●			●	●		●	●	●			●				5
	●		●						●	●	●				●	●	●					●	6
	●		●					●	●	●		●			●						●		7
		●				●			●	●	●	●			●	●			●			●	8
	●					●		●			●	●	●	●	●		●			●			9
	●					●			●	●	●				●		●	●				●	10
	●		●					●	●	●					●						●		11
	●			●					●		●			●	●	●			●			●	12

A) Susceptible to Pest Problems B) Short-lived C) Messy D) Causes Sidewalk Damage

CONDITIONAL PUBLIC R.O.W. TREES

		TYPE			HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
13	<i>Pinus densiflora</i> Japanes Red Pine				●			●					●			20
14	<i>Pinus halepensis</i> Allepo Pine (A)				●			●					●			20
15	<i>Pinus pinea</i> Italian Stone Pine				●					●				●		30
16	<i>Pinus sylvestris</i> Scotch Pine				●			●						●		15
17	<i>Platanus acerifolia</i> 'Bloodgood' London Plane (2) (D)		●				●			●				●		30
18	<i>Prunus blireiana</i> Flowering Plum (A-B)		●				●			●				●		15
19	<i>Prunus cerasifera</i> 'Atropurpurea' Purple Leaf Plum (A-B)		●				●			●				●		15
20	<i>Prunus cerasifera</i> 'Thundercloud' Flowering Plum (A-B)		●				●			●				●		15
21	<i>Pyrus calleryana</i> 'Chanticleer' Chanticleer Pear (A)		●				●			●				●		20
22	<i>Pyrus calleryana</i> 'Redspire' Redspire Pear (A)		●				●			●				●		20
23	<i>Pyrus kawakamii</i> Evergreen Pear (A)			●		●				●				●		15
24	<i>Quercus illex</i> Holly Oak (A,C)			●			●			●				●	●	30

(2) Has proven to have serious mildew problems in other communities, although the problem appears to be minor in Sacramento.

CONDITIONAL PUBLIC R.O.W. TREES

LIFESPAN			FORM					PREFERENCES						TOLERANCES					SPACES				
Less than 30 years	30 to 60 years	Over 60 years	Rounded	Oval	Columnar	Pyramidal	Vase	Good under utilities	Good for medians	Good for irrigation beds	Prefers monthly watering	Best used as accent	Requires good drainage	Little or no water	Frost (below 25 degrees)	Wind	Alkaline	NOT for alkaline	Produces debris	Under 4 feet	4 - 8 feet	8 - 15 feet	
	●					●		●		●				●	●			●			●		13
	●				●							●		●	●						●		14
	●		●					●		●				●	●	●	●					●	15
	●				●			●		●				●	●			●			●		16
		●			●			●						●	●	●		●		●			17
●			●					●	●	●	●			●				●		●			18
●			●					●	●	●	●			●				●		●			19
●			●					●	●	●	●			●				●		●			20
	●				●					●				●	●					●			21
	●				●			●		●				●	●					●			22
●			●					●		●		●		●	●					●			23
	●		●					●		●				●	●			●		●			24

A) Susceptible to Pest Problems B) Short-lived C) Messy D) Causes Sidewalk Damage

CONDITIONAL PUBLIC R.O.W. TREES

		TYPE			HEIGHT			SPREAD			GROWTH RATE					
		Native to California	Deciduous	Broadleaf Evergreen	Conifer	Small, under 20 ft.	Medium, 20 to 40 ft.	Tall, over 40 ft.	Narrow, under 20 ft.	Average, 20 to 40 ft.	Broad, over 40 ft.	Very Fast	Fast	Moderate	Slow	Spacing (Feet)
25	<i>Sequoiadendron giganteum</i> Sequoia/Sierra Redwood (3)	●			●				●						●	25
26	<i>Ulmus 'Homestead'</i> Homestead Elm (4)		●				●			●		●				30
27	<i>Ulmus 'Pioneer'</i> Pioneer Elm (4)		●				●			●		●				30
28	<i>Washingtonia filifera</i> California Fan Palm (C)						●		●						●	15
29	<i>Washingtonia robusta</i> Mexican Fan Palm (C)						●		●						●	15
30	<i>Catalpa bignonioides</i> Common Catalpa		●			●			●				●			25
31	<i>Catalpa speciosa</i> Western Catalpa		●			●			●				●			30

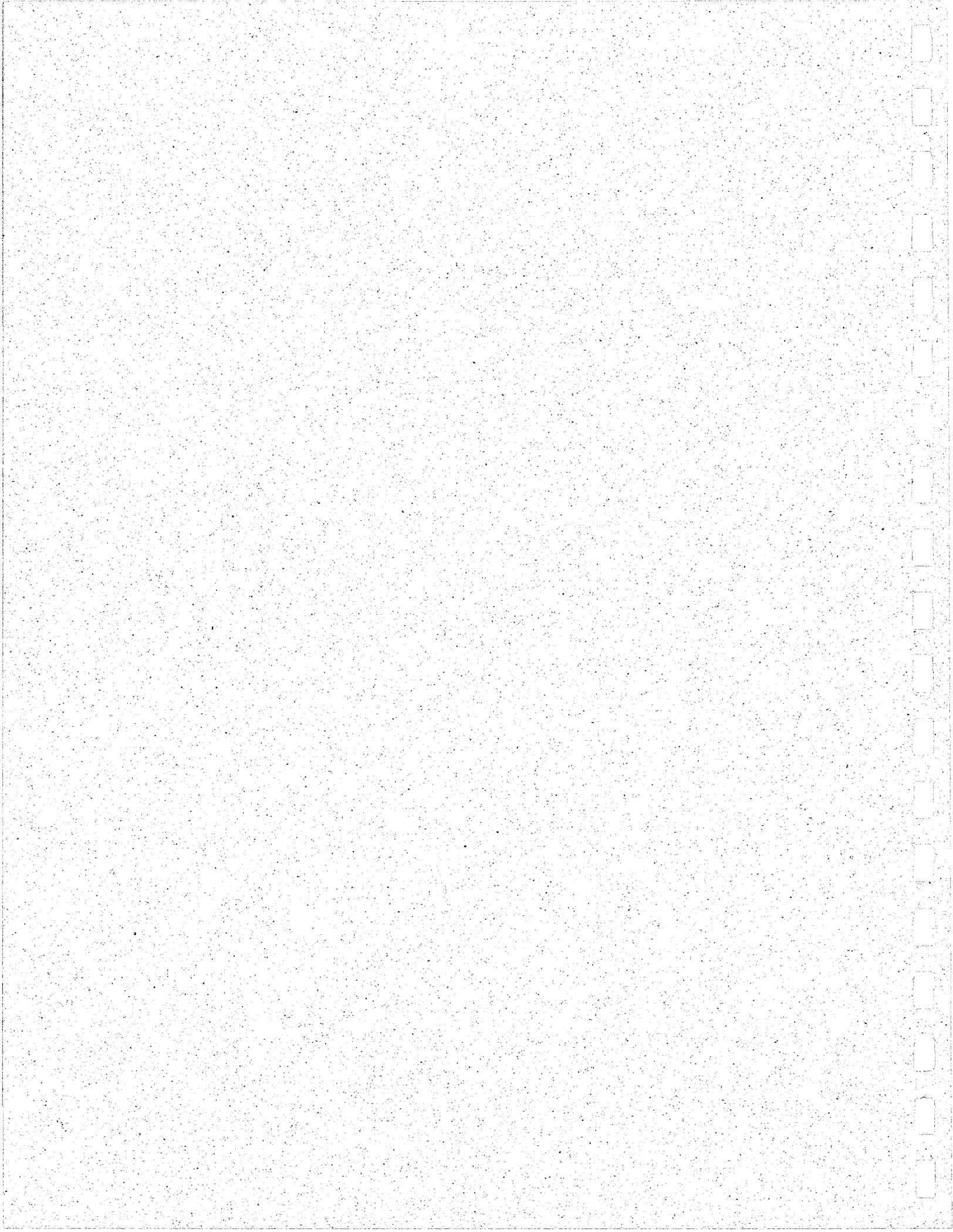
NOT TO USE AS PUBLIC R.O.W. TREES

		Pest / Disease	Structural Problems	Pavement Destruction	Maintenance	Overplanted	Freeze Damage	Availability	Horticulturally Difficult	
1	<i>Acer saccharinum</i> Silver Maple	●	●		●					1
2	<i>Alnus sp.</i>	●		●	●	●				2
3	<i>Cupressocyparis leylandii</i> Leyland Cypress	●				●				3
4	<i>Fraxinus sp.</i>	●				●				4
5	<i>Morus alba</i> White Mulberry	●		●	●					5
6	<i>Pinus radiata</i> Monterey Pine	●	●							6
7	<i>Betula sp.</i> Birch	●	●							7
8	<i>Ligustrum lucidum</i> Glossy Privet				●	●				8
										9
										10
										11
										12



Chapter Seven: Financing

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VII FINANCING

Funding Tree Services through the life of this Management Plan and beyond depends on a mixture of foresight needed to anticipate and accommodate new demands and the ability to design flexible financing systems or programs that will continue to provide revenues over time. The funding needed will reflect the structure of the Management Plan finally adopted and as a consequence will depend on intensity of care, cycles of maintenance, the level of contract services and the degree to which the City intends to maintain its own plant stock.

A. POLICIES

The policy directives, stated in Chapter 2, establish a framework for the long-term financing strategies recommended below:

Policy 5a: Assure sustained funding of the urban forestry program. A reasonable investment in relation to value returned needs to be determined, and the means of assuring the necessary funds need to be identified.

■ **Administer a City-wide urban forest assessment district as the primary means of securing dedicated funds on an on-going basis.** It is recommended that the City establish such a district to cover the basic costs of planting, maintenance, removals and replacements necessary to attain and sustain a full complement of public street trees. Attendant administrative, plan review, inspection, repair and inventory maintenance work shall also be included in the amount assessed. The City shall work to develop the legislation necessary to modify the City's existing and lighting and landscape district to provide funds for the above purposes. (In addition to Sacramento, 36 California cities use this method to fund their tree programs totally or in part (Bernhardt 1989, pg. 20).

■ **Establish and manage a Tree Endowment Fund for urban forest enhancement.** The Fund shall be structured to receive that proportion of special fees that correspond to the level of unique or direct planting and maintenance to be received by the future residents. The fund shall receive all special fees designated for planting and maintenance from developers and other sources including the first five years of maintenance of developer-planted trees. The Tree Endowment Fund shall be structured to receive funds from all tree-

related sources, including but not limited to fines and penalties for violation of tree ordinances, court and arbitration awards, accident restitution, developmental conditions and contributions from corporations, institutions and the general public. This endowment for future or unforeseen needs of the forestry program shall be dedicated to special uses including but not limited to the tree inventory, community and staff education, tree purchasing, research, community plantings or replacements of specific trees and specific requests of the donor. Interest from the funds shall be annually credited to each appropriate fund for future urban forest needs.

■ **Encourage private sector active support in the urban forestry program through contributions to the Tree Endowment Fund.** The City shall promote such contributions by undertaking a business-involvement program, emphasizing the value of trees to the local business environment and focusing contributions on special efforts like the improvement of particular commercial streets or other plantings.

■ **Seek funding for special projects such as the tree inventory from foundations and government sources such as the California Urban Forestry Program administered by the California Department of Forestry and Fire Protection.** STS shall apply for such funds as may become available to pay for special projects undertaken by the program.

Policy 5b. Provide the necessary funding for enforcement of the Comprehensive Tree Ordinance.

B. FINANCING HISTORY

Funding History

Tree Services derives the majority of its funding from the City General Fund. The financial source for the General Fund is from property and sales taxes, with budgets for departments such as Tree Services subject to annual budget and allocation review. Budget shortfalls, such as those experienced in the current year and perhaps for years to come, make this area of service an attractive target, in part because of a common perception that deferred maintenance on such a resource as trees can be made up at a later date, (In fact, the costs of maintenance are significantly higher when measured on a per tree basis by deferring regular care. Crew size increases and the incidence of preventable damage rises, with concomitant increases in cost). In the absence of a dedicated funding source, this view can be expected to

persist or intensify in the future.

Services Affected by Management Plan

The Management Plan provides a framework to sustain and improve the quality of Sacramento's urban forest. Current services include regular and extraordinary maintenance, stump removal, education and pest/disease control. This analysis assumes the level of service dictated by the plan will be available whether services are provided by the municipality or by contract services.

Where extraordinary demands or levels of service are requested by citizens, as in specific neighborhoods where higher levels of service are desired, then that level of upkeep and maintenance may necessitate the creation of a special funding district such as a Mello-Roos CFD in order to avoid disproportionate demands on the General Fund.

The Source of Demand

Demand for tree services is a function of design standards, owner preferences and climactic conditions which result in tree damage such as freeze, drought or high winds. This analysis assumes demands from three sources: residential (existing and new), municipal or community wide facilities (such as parks, open space or median strips) and commercial/industrial areas. It is assumed that there will be only two categories of service that satisfy the demand: community-wide (such as in parks or common areas and median strips) and neighborhood (represented by individual home owners). The importance of differentiating between community-wide improvements of care and those endemic to individual neighborhoods, is related to the ability of the municipality to impose differential fees for service.

For example, residents of a single neighborhood may desire a higher level of care than that ultimately offered by the City. Several options are available, including forming a special financing district with very restricted boundaries and with limited taxing authority. The services that could be charged would only reflect that level of service over and above levels enjoyed by the balance of the community. This option is available to any area where the benefits received are not generally enjoyed by the community, including industrial parks or gated subdivision communities.

C. FUNDING SOURCES FOR ON-GOING MAINTENANCE

Use of the General Fund of the City

Since the General Fund provides the bulk of the financial support for tree services, it provides the easiest manner in which to continue funding the program. Current levels of funding could supply the majority of funds needed to continue current program levels or provide the transitional base that would support conversion to a proactive maintenance program.

The drawbacks to the use of the General Fund include the obvious reliance on a pool of money that must compete with such budgets as protective services (fire and police) as well as the inherent difficulty of trying to develop a relationship of money spent to benefit received while using such a fund base. Demand for funds to develop a fully proactive maintenance program exceed current levels of funding, depending on the level of service chosen. The prospect of augmenting General Fund expenditures for this budget seems unlikely given current and expected economic conditions. As a consequence, we feel that the reliance on the General Fund should ultimately be discontinued in favor of a transition to a broad based benefit assessment district serving residents City-wide.

Why Benefit Assessment is Appropriate

Tree maintenance and proper tree care reflect in property values, both public and private. In the case of private property, this value can be expressed in many ways (see Chapter 1, but the most common is the reflection of the increase in assessed value attributable to them. Research suggests this value lies between 7 and 10 percent of a properties total value. Additionally, private property owners benefit from the proximity to public facilities such as parks or median strips that are well maintained. Uniform tree care benefits can be assumed to generate approximately equal per parcel costs when seen in a long term care program. Thus, the logical funding sources for such a program are those which spread costs uniformly (in order to reflect relatively equal benefit) such as expenditures from the General Fund or from Special Benefit Assessment Districts. The use of benefit assessment district funding is most appropriate in the case of support for on-going maintenance, although capital facilities funding is available as well. The most likely

candidates include:

- Per Parcel Annual Charges
- Lighting and Landscape District Benefit Charges
- Property Transfer Fees
- Special Mello-Roos Neighborhood Districts
- Development Fees

Other options include, depending on the level or type of maintenance program that is developed, the use or dependence on homeowner maintenance or direct private contracts with maintenance firms or City contracts with private maintenance firms with direct pass through of costs to homeowners.

Per Parcel Annual Charges

Some jurisdictions (such as Riverside County) have established area wide financing vehicles with a per parcel annual charge for services. In this procedure, a special district boundary is established and an appropriate charge voted by the electorate. Funds are expended for specific purposes outlined in the district creation but can include on-going maintenance of landscape and open space areas. The authorization for changes in the per parcel charge must be included in the initial vote creating the district. This authorization must be generated through the State Legislature.

The district would be subject to a general referendum by the voters. This plebiscite would determine not only whether or not the district would be formed (2/3 vote necessary) but the appropriate level of the charge to be levied against each parcel. The measure would be considered a special tax, and adjustment procedures would have to be established when the measure was voted into effect. These measures would necessarily include the rules for annexation (for new development) and would establish the level of service to be expected. The governing body would be defined within the legislation but could be the members of the City Council acting in the role of a district board of directors. Charges for the services of such a district would be apportioned on a per parcel basis (not ad valorem).

Landscape and Lighting District Act of 1972

As pointed out above the purpose of this Act which is currently in use throughout the City, is to

allow public agencies to raise funds for installing, maintaining and servicing public landscaping and lighting facilities. This Act can be used on a neighborhood by neighborhood basis to establish on-going maintenance funding with the charge levied proportional to the extra benefit received. The Act could be used as well to fund current operations of the Tree Services Division on a City-wide basis. The measure requires a vote of the City Council for enactment and definition of benefit relationships and is subject to majority protest provisions. The advantages of this funding mechanism include:

1. Such a district already exists, and can be modified to reflect the benefit charge for the program selected. A parallel district dedicated solely to tree care could also be established. The procedure for creating a new district is outlined in Chapter 8, Implementation.

2. The charge is subject to a majority protest, and does not reflect the 2/3 majority needed for other financing mechanisms.

3. The district is designed to reflect "benefit" charges, match that very closely approximates Tree Services.

4. The district charge can be adjusted annually to reflect levels of care and reflects a dedicated budget, which is not a direct reflection of the General Fund.

5. The charge can be instituted at a level which will approximate the funding demands during the transition period (funding in excess of that contributed currently by the General Fund), and which should cover expected costs after that period is finished.

6. Benefits can be uniquely tailored to neighborhoods that desire contract services or special care and wish to have them collected through the tax rolls.

This district would also impose its fees on a per parcel basis. The fee would be adjusted annually to reflect changing needs, at a public hearing by the City Council.

Property Transfer Fees

An option available for additional funding is represented by the property transfer tax. The current rate for this tax (as of September 1, 1991) is .00275. By definition, this fund bears a direct relationship to the value of the property at the time of sale and thus reflects the enhancement of the landscaping surrounding it and the level of care afforded to it. Changes in the rate are subject

to a vote of the governing body.

This source of funds could be used to provide transitional funding as support from the General Fund was diminished or to augment it in the event it remains as the base. This budget will fluctuate annually not only in response to changing real estate sales levels but to changes in transfer prices. For example, if the average house sale during a budget period were \$160,000, the transfer tax generated currently would be $(160,000 \times .000275)$ \$44. If this amount were doubled to assist in tree maintenance, and if we assume a turnover rate of 8% annually the revenue generated could be approximately $(.08 \times 147,000 \text{ parcels} \times 44)$ \$517,000. Clearly this source would not fund the entire budget but could be utilized as the bridge or support for transition or for emergency services.

Special Mello-Roos Neighborhood Districts

Mello-Roos Community Facilities Districts (CFD) are typically used to repay a bond issue, usually for the construction of a capital facility such as a fire or police station or school facilities. In addition, they can finance services such as the operation and maintenance of parks, parkways and open space. They can be formed either at the request of the property owners in a neighborhood or through legislative initiative. Mello-Roos CFD's are classified as special taxes and are subject to a 2/3 vote of the affected property owners for passage. They can provide an attractive vehicle for financing increments of care unavailable on a community wide basis or to develop levels of landscape coverage in excess of existing standards.

As a practical matter, the use of Mello Roos Districts is most easily accomplished in conjunction with new developments. Since they require a 2/3 vote for approval, the likelihood of passage within existing developments, and especially when viewed on a City-wide basis is very low. However, when new developments are in the approval process, the calculation of the marginal cost of providing equivalent levels of service can often be accommodated easily through the creation of such a district, since a single landowner or developer can effectively vote the district into existence. The charge would be apportioned on a benefit received basis and would most likely be charged per parcel, although discrimination of charge by use type (i.e. commercial vs residential) could also be established.

This district is considered infeasible for implementation on a City-wide basis. This conclusion is based on the voting constraints involved in the formation of this type of district. Successful formation depends on a positive vote from two-thirds of the registered voters or landowners within the proposed district. City-wide issues that can generate this level of support are infrequent. (Mello Roos charges are considered special taxes and are not assessments. There is no requirement that the special tax be apportioned on the basis of benefit to property, although they *may* be so apportioned.) This type of assessment district is most appropriate for subdivisions or small defined regional areas where either strong common interest exists (for instance in the funding of school facilities) or where the property is subdivided but not yet developed or where the voting electorate is small.

Incentives

It may also be possible to encourage greater levels of private care by establishing incentive programs where levels of planting or maintenance result in tax rebates or other inducements. These represent a potential tax loss to the City and must be measured against the benefits received, but could over time prove to be cost efficient.

Development Fees

Development fees provide a one-time source of funding for programs or improvements that the City may deem important prior to the approval of a project. These fees could, for instance be the source of funding for parks, medians or tree projects within the development, if these improvements are required to establish a level of service that is consistent with the rest of the City. They must be established by ordinance and must reflect the benefit received without creating an unusual or inappropriate burden (when measured against similar homeowners elsewhere in the City) that is unique to the subdivision where they are applied. Thus, programs which could be seen as providing community wide benefits (such as landscaping in a regional or City park) could not be funded from this source. The funds available would vary according to the type of improvement constructed by the subdivision.

D. TAILORING THE FINANCIAL PROGRAMS TO MEET COMMUNITY AND NEIGHBORHOOD NEEDS

The funding mechanism chosen for Sacramento

Tree Services, assuming a change from reliance on the General Fund is sought by the City, must reflect the level of care adopted in the Management Plan. (Special funds cannot be segregated within the General Fund.) Funding mechanisms must also respond to those residents who want a higher standard of care than the at-large community. Thus the following steps must be taken to determine the level of public support prior to designating the funding source(s).

Establish Which Funding Level Is Needed

The funding level is a function of the plan alternatives chosen and the level of service that is desired. The budgets established for the proposed levels of tree care (Appendix 8.) illustrate the estimates of future expected costs. It is realistic to expect that for any alternative chosen, a gradual phase in program of up to five fiscal years could be established. This would allow staffing levels to be increased gradually and in the case of capital improvement debt, for the debt issue to be developed and implemented without undue haste.

Other variables will affect the funding level including the degree to which outside contracts are used, the level of revenues from private entities and the level of volunteer or community assistance that is developed.

Differentiate Different Community Level Financing

It may be possible to develop supplemental funding sources for neighborhoods or sub-communities if local residents so desire. Financing would then be based on possible differences in neighborhood preferences. This kind of funding normally takes the form of benefit assessment districts with very localized boundaries, designed to establish a taxing base for unique or extraordinary levels of care. Typical requests for this type of additional financing come from gated or exclusive communities where the preplanning of the subdivision did not include the establishment of a financing tool such as a Mello-Roos CFD. (This level of funding is established in addition to any other normal or city-wide charges.)

Ascertain Willingness to Pay

The imposition of a charge for changed levels of service (that is, outside those services which the Council deems it possible to pay for out of the General Fund) will either involve a direct vote of

the electorate or be subject to a majority protest action. Prudent planning suggests the use of one or more "willingness to pay" public opinion surveys to ascertain not only the likely public response to such a charge, but the appropriate level of the charge.

E. DEFINING THE LEVEL OF SERVICE CONCEPT AND REQUIRED FUNDING

The Management Plan (see Management and Budget, Chapter 3) presents various levels of maintenance service menus. Each menu is a function of two key variables: the length of time between visits and the number of trees defined as public responsibility. The implications of the various service menus are discussed in Management, Chapter 3. The current Tree Services budget provides approximately 3.0 million dollars, largely supported by the General Fund. Utilizing a base of 147,000 residential units (ignoring the impact of commercial and industrial properties) a per parcel fee is estimated for each service menu. Table 10. presents the cost required in addition to the current budget for each of the service menus.

F. THE FRAMEWORK OF FUNDING OPTIONS

It is recommended that the appropriate future financing of the City's Tree Services Division be based on a City-wide Benefit Assessment District. There are three options for establishing the future funding of a Benefit Assessment District within the context of the current General Fund source:

Option 1- Continued Reliance on the General Fund

This option is a continuation of the current status quo. Funding is derived from general revenue sources available to the City and must reflect annual or biannual budget review and appropriation. By its very nature this budget source is unstable, since it must compete against changing social priorities for other services in order to be funded each cycle. Given current local government constraints this funding source is unlikely to increase and in fact may be subject to budget cuts in coming years. As a consequence of these factors, reliance on this budget source makes it difficult to respond to changing demands for service levels.

Option 2- Use of the General Fund and Augment with Benefit Assessment Funding

This option carries with it the difficulties mentioned above, but is mitigated somewhat by the augmentation of funds from a benefit assessment district, such as that available under the Lighting and Landscape Act. Thus, the special district funds can offset cuts in General Funds or provide funding for emergency services. This option can prove to be an awkward hiatus, however, as it becomes easier to shift general funding to special district funding without the ability to shift back over time. The mix of funds can also make it difficult to define and differentiate the benefits received through the special benefit district.

Option 3- Phase out the use of the General Funding and into Special District Funding

This option provides an opportunity to shift from the General Fund into a dedicated funding source that is readily associated with a local benefit or service. The transition would be accomplished over a period of time (see Implementation, Chapter 8) with the final budget being funded entirely from the special benefits district. The authorization of charges for the special benefit district must be reviewed annually and as such is expected over time to produce a close correlation between the charge and the benefits received. Changes in the charge, when measured on a per parcel basis are predictable in nature. As an additional benefit, the use of this option frees up an equivalent amount of General Fund money over time.

The City of Oakland, California changed from General Fund support to a 100% Lighting and Landscape Assessment District in 1988. The City charges approximately \$86 per parcel which provides for their tree program in addition to other landscaping, sidewalk repair and lighting services (Acosta, personal communication, January 1992).

The Additional Assistance Available

Additional sources of revenue are available to support City tree services, although each is hampered in the sense that revenues so generated cannot be dedicated to a specific use. These funds would accrue to the General Fund and are subject to annual or biannual appropriation by the City

Council. In each case, however, an increase in revenue increases the value of the urban forest.

Public/Private Partnerships

Tree planting and maintenance programs can be a joint effort of property owners and the City. This union can result in greater awareness and cooperation in downtown commercial areas and greater support for park and median plantings within new subdivisions. Support for on-going maintenance can be enhanced through volunteer programs or support offered by private foundations such as the Sacramento Tree Foundation.

Developer Fees

Dedication of specific developer fees can result in bringing new developments up to the standards of the adopted Urban Forest Management Plan. These fees must reflect the benefit received while insuring that the burden imposed does not exceed that of neighboring similar households. The fees must be used within the area that generates them.

Business License Fees

An increase in the business license fee can be justified and used in the Tree Services budget if it can be dedicated to the enhancement of the general business community. Since inherent conflicts exist in this area (trees blocking signs for instance) this revenue source must be used in conjunction with implementing the intent of the existing General Plan as it pertains to commercial uses.

New Developments

It is recommended that new developments be included in the City-wide Benefits Assessment District. As pointed out earlier, higher levels of benefit can be assigned to new developments and the charge affixed accordingly, without affecting levels elsewhere in the City.

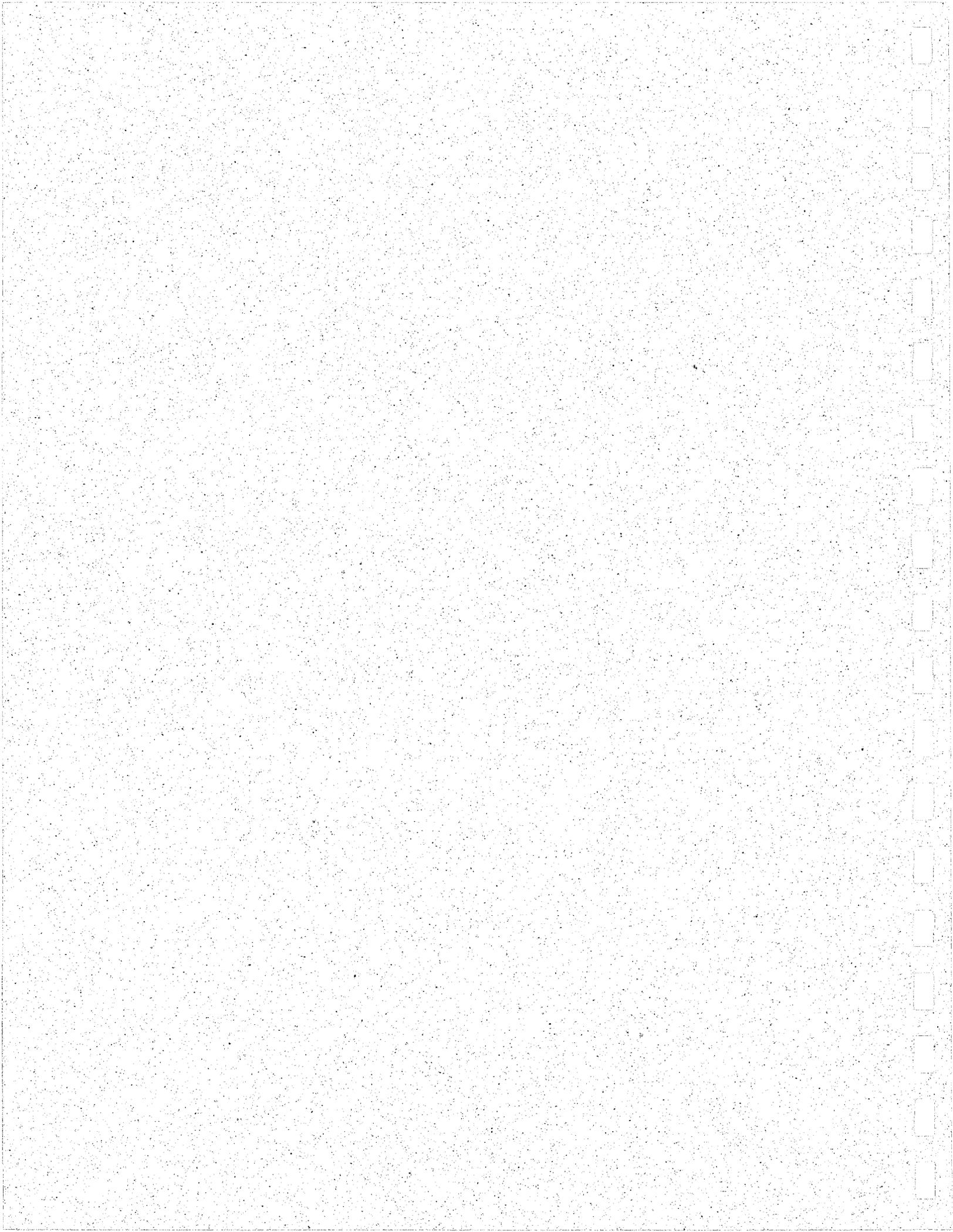
Licensing and Enforcement

The fees derived from a tree contractor business license could be designated for the Tree Endowment Fund and used for special tree projects.



Chapter Eight: Implementation & Phasing

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VIII IMPLEMENTATION AND PHASING OF MANAGEMENT PLAN

The Urban Forestry Management Plan's recommendations will need to be phased-in over time to achieve a smooth transition and work within a realistic budget plan. An eight step outline of phasing sequence is detailed below:

STEP ONE

- City Council to approve the Urban Forest Management Plan and adopt the Comprehensive Urban Forest ordinance resolution statement

- City Council to adopt the Tree Task Force's recommended source of funds. City Council to order an in-house review of the suggested costs of services and adopt a recommended charge for the services under the selected Benefit Assessment District. Follow the procedures for the selected funding option:

Lighting and Landscape District (if separate from the existing district):

1. Adopt a resolution initiating proceedings.
2. Receive an "engineers report" (a map of the district) on the proposal to form the district.
3. Adopt a resolution of intention to form the district.
4. Conduct a public hearing on the engineer's report after notifying the affected property owners.
5. Adopt a resolution ordering the improvements or program. To collect assessments in any fiscal year, the legislative body must complete this procedure by July 1, but the County auditor may authorize an extension of time until the third Monday in August.

Mello-Roos

1. Initiation of proceedings by the legislative body through a noticed hearing, which could include a petition of not less than 10% of the registered voters residing within the proposed district.
2. Adoption of a resolution of intention to establish the district within 90 days after the request is filed. This must describe the boundaries of the district and the benefits to be received, as well as the estimated costs.

3. Notice must be published and a protest hearing is conducted. The district cannot be formed if more than 50% of the registered voters are opposed.

4. Adopt a resolution of formation.

5. Hold election to approve the special tax.

- City Council to annually review the fees charged and the services provided to determine appropriate levels.

- Staff to develop and adopt the Comprehensive Urban Forest ordinance

- Implement a media program to publicize the adoption of the Urban Forest Management Plan

- Publish tree maintenance standards and notify tree contractors of new policy for enforcement

- Publicize and distribute guideline and policy brochure to the public, City departments, T.A.C., Developers, and tree contractors

- STS staff with construction experience to join regularly scheduled plan review meetings with other Departments. STS to be incorporated into a sign-off form for plan review concerning tree issues.

STEP TWO

- Begin financing plan for pro-active tree program

- Establish maintenance zones and re-organize STS Senior Tree Trimmers to take responsibility for geographic zones. Tree crews and equipment are rotated between zones as needed. Senior Tree Trimmers to begin new inspection procedures (e.g. inventory, shade tree compliance, hazard tree assessment etc.). Enforcement for compliance to be phased-in in Year Four.

- Continue to complete backlog work with the goal of completing all previous backlog by the end of the year.

- Assess current computer needs and data base. Upgrade program to accept zone designation, provide staff training and streamline procedures to facilitate the increase in data collection and report generation.

- Establish the position of and hire a Community Education Coordinator. This STS staff position would continue to publicize and distribute

the Management Plan guidelines and Policy brochure. Produce public information handouts pertinent to urban forestry issues. Begin to meet with neighborhood groups to address their specific tree related problems and develop with the STS Arborist management strategies which involve the public. Neighborhood tree profiles are provided in Appendix 3.

- Organize at least one community event this year which addresses neighborhood issues as a joint effort with the Sacramento Tree Foundation.

STEP THREE

- Assess whether the Tree Contractor business licensing Standards with ISA certification is accomplishing the goals of the program.

- Encourage STS staff to become certified with special education study sessions.

- Begin the pro-active maintenance program by implementing 20% of all work (planting, removals and trimming) on a planned zonal basis. The remaining 80% of the work would be accomplished reactively. Every year increase the pro-active program goal and reduce the reactive work by 20%. At this rate, work will be almost all pro-active in eight years from the adoption of the Management Plan. The 20% goal must be evaluated at the end of every year with the actual work accomplished. Adjust the yearly goal as needed.

- During this transition from reactive to proactive maintenance, citizen requests for maintenance in the public ROW will be handled in three ways: a request for service will be evaluated by STS staff. If the tree requires emergency care, a City crew will respond, if the tree is not an emergency the owner will be informed of when the tree is scheduled for service on the pro-active system. If the owner does not want to wait, a referral to private arborists will be given and the owner can handle it privately.

STEP FOUR

- Activate the Tree Contractor business license requirement

STEP FIVE

- Review the Urban Forest Management Plan and update policy and management goals as necessary.

B. PHASING OF FUNDING

As discussed in Chapter 7, under Financing, it is recommended that Tree Services becomes funded through a Benefit Assessment District with a transition away from the General Fund as a base. This is estimated to occur over a 5 to 7 year period following adoption. The transition could be accomplished by utilizing the existing base funding (\$3.2 Million annually) and adjusting this amount with funds from a benefit assessment district, to bring the total up to the desired service level menu.

An example of the funding transition using a \$4.1 million budget is illustrated in Table 12. (Transitional Budgeting).

Table 12. Transitional Budgeting (in Millions)

YEAR	GENERAL FUND	BENEFIT ASSESSMENT	TOTAL
1	3.2	0	3.2
2	3.2	0	3.2
3	2.56	1.54	4.1
4	1.92	2.18	4.1
5	1.28	2.82	4.1
6	.64	3.46	4.
7	0	4.1	4.1

C. INTERDEPARTMENTAL FUNCTIONS

In order to implement the recommendations contained in the Management Plan, various City Departments, other agency and organizations will need to interact with Tree Services. The following table provides an organizational chart of the departments and agencies involved and what their functions would be.

URBAN FOREST PROGRAM

INTERDEPARTMENTAL FUNCTIONS

Department

Function & Tasks

Role

I Design:

A. Plan review for trees in:	STS Arborist w/construction experience	—plan review
1) new development	Building inspection, Engineering	—liaison w/other city agencies at regularly scheduled public meetings
2) existing developments	Public Works, Planning	
B. In house design for public street improvements	Engineering, Landscape Architecture, Planning, STS	—review for Tree Health/Species facilities/street facilities/ Selection
C. Undergrounding Utilities	STS, SMUD	—review for existing tree health and creating adequate future tree spaces

II Maintenance:

A. Routine maintenance for public trees	STS	— provide quality tree care for all public trees, adhering public trees to ISA standards
B. Hardscape modification adjacent to trees	Public Works	—to contact STS whenever roots greater than 2" in diameter are encountered or whenever trees are in conflict with public works projects
C. Utility clearance—inspection and resources to maintain trees along Caltrans right-of-ways. Work accomplished through contracts administered by STS.	SMUD	—mandated by state law to keep legal clearances service for high voltage lines. Accomplish their work under permit from STS which calls for balanced trimming to avoid one-sided trees. Encouraged to grow trees around high voltage rather than drop-crotch below lines.
D. Roadway clearance	CalTrans	
E. Monitoring tree population	STS/Senior Tree Trimmer STF/community foresters CDF/	—inventory of public trees —report tree inventory information to STS —report Elm tree information to STS

III. Inspection & Enforcement

<p>A. Inspection for new tree planting/removal removal/trimming/problems species selection</p>	<p>— arborist and tree supervisor</p>	<p>—inspection of City crews —inspection of contract work —inspection of privately owned facilities (e.g. golf courses, etc.) —possible identification of all trees on site including heritage trees as initial Planning Dept. requirement</p>
<p>B. Ordinance enforcement •Heritage trees •Tree shade canopy •Native trees</p>	<p>Planning Division/Building Inspection</p>	<p>—Require tree protection as condition of development and construction inspection/enforcement</p>
<p>C. Tree professional business</p>	<p>STS</p>	<p>—provide advice and enforcement (eyes & ears of the community) for heritage trees on sites not involved in planning reviews —provide advice/enforcement as needed to Planning Division on project basis</p>
<p>D. New development fees</p>	<p>STS City Revenue Division</p>	<p>—set standards for licensing and issues certificate of compli- ance with City tree licensing standards —issues licenses to operators with certification; collects fees; revokes licenses that are not in compliance</p>
<p>E. New development fees</p>	<p>STS Building Department</p>	<p>—fees used for Tree Endowment Program —collect fees</p>

IV Education & Community

<p>A. Neighborhood tree services —City-negotiated contract matching funds program</p>	<p>STS/Educator STS/Arborist</p>	<p>—liaison with home owners —and administer contract fees & conduct inspections</p>
<p>B. Self-Help Program</p>	<p>STS/Educator</p>	<p>—prepare publications & provide advice to home owners</p>
<p>C. Pro-active Community Planting</p>	<p>STS/Educator STS/Arborist</p>	<p>—outreach to neighborhood groups & business sector, special group planting projects/reforestation —identify reforestation projects —liaison with STF community foresters for joint commu- nity projects —education classes & workshops for privately maintained trees</p>
<p>D. ISA Certification for City Crews and for Contractors</p>	<p>STS/Arborist</p>	<p>—encourage City crews to become certified</p>
<p>E. Liaison with other Tree-related organizations/agencies</p>	<p>STS/Educator</p>	<p>—City representative on the Tree Advisory Committee</p>

V Finance & Budget

A. Tree Endowment Program	STS/Community Education Coordinator	—grant writing, low income assistance
B. Emergency Response Budget result	STS/Community Education Coordinator	—authorize funds for work under emergency conditions as a result of a natural disaster
C. Self-Help/Matching Funds	STS/Community Education Coordinator	—

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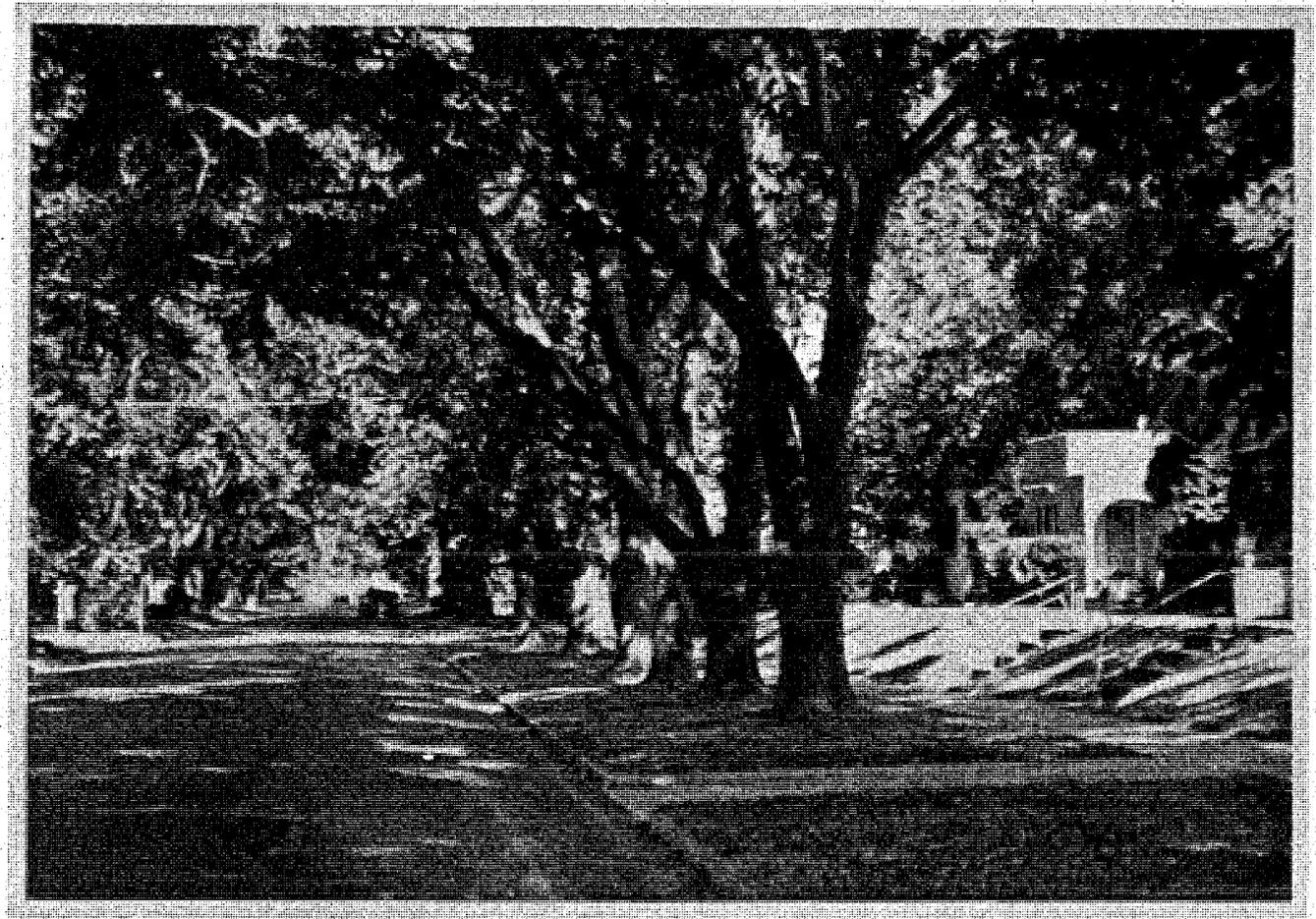
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SACRAMENTO PLANTING & MAINTENANCE MANUAL



**PREPARED FOR
CITY OF SACRAMENTO
NEIGHBORHOOD SERVICES DEPARTMENT
Formerly Parks and Community Services**

**BY
WOLFE MASON ASSOCIATES**

**In association with:
Royston, Hanamoto, Alley & Abey
Michal C. Moore**

April 1994

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INTRODUCTION

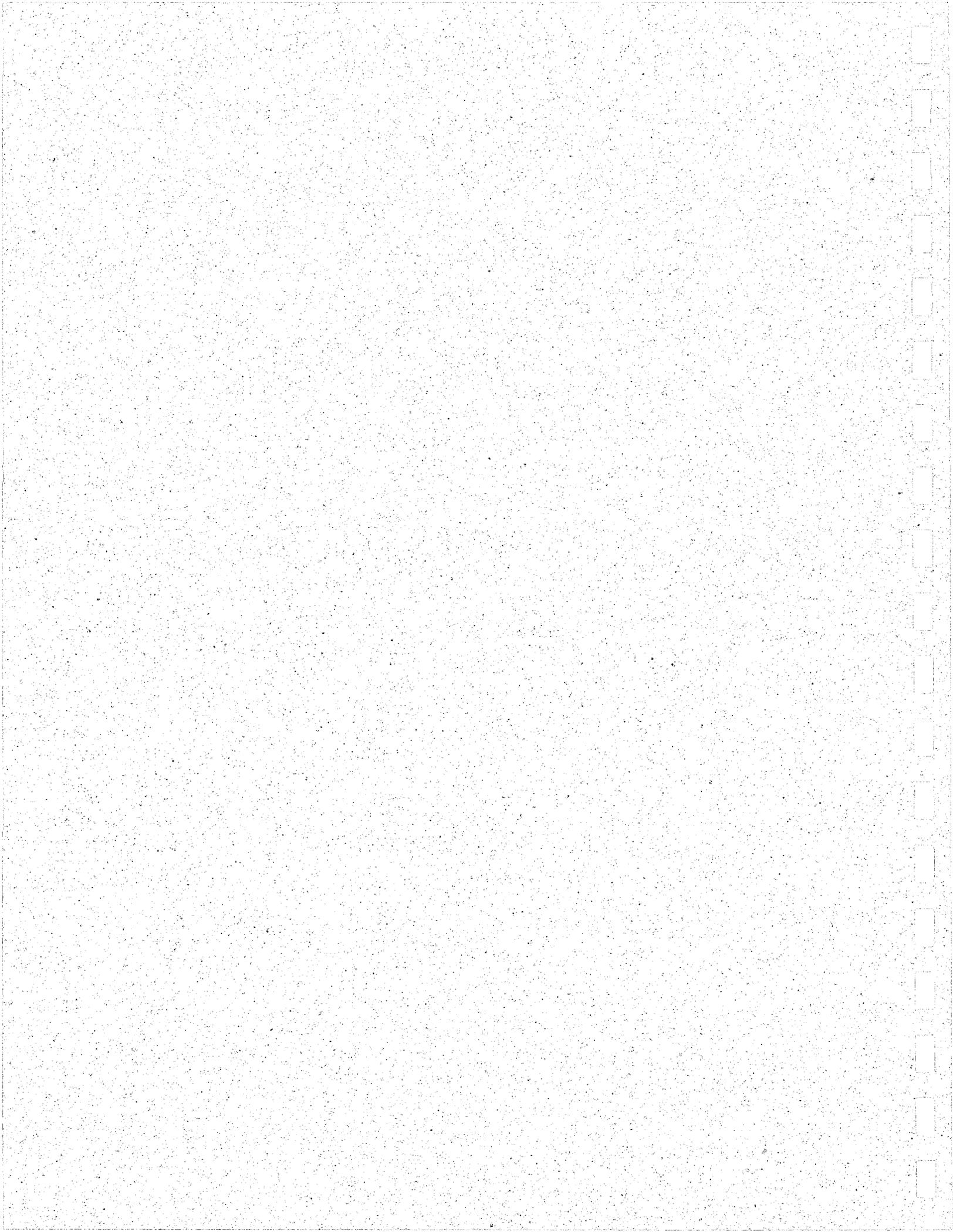
Planting and maintenance standards provide the foundation for the long range health of the urban forest. The following standards were developed from the generally accepted International Society of Arboriculture (ISA) standards, and have been further refined to accommodate the specific conditions in Sacramento, including climate and soil.

This Manual is divided into four sections: Planting Standards, Maintenance Operations, Procedures and Training. It is intended to be used by City staff as reference and resource guide in the overall care of the urban forest, and to eliminate the subjective decision making of many tree care issues.



Chapter One: Planting Standards

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CHAPTER ONE: PLANTING STANDARDS

The City of Sacramento maintains a tree nursery designed to act as a holding facility for new plantings purchased from commercial sources. Nursery personnel plant 1,200 trees annually, approximately 80% of all public trees planted in Sacramento. The following tree standards apply to in-house nursery stock as well as purchased stock.

SECTION 1. TREE QUALITY

A key component in achieving a healthy urban forest is to choose trees which meet specific functional requirements. These requirements are derived from the spatial, horticultural and design constraints of the site. Common denominators for all new trees must be:

- Adaptation to the soils of the microsite in which they are to be planted;
- Ability to survive with minimal soil for root growth;
- Lack of severe insect or disease problems;
- Lack of serious structural problems or tendency to produce surface roots;
- Ability to grow into a structurally sound tree without frequent pruning.

Many commonly used tree species and cultivars can cause serious, expensive problems as they mature. For example, *Liquidambar styraciflua* causes sidewalk damage with its shallow roots, drops round seed pods that can be dangerous on sidewalks, and often loses large limbs in early fall wind storms. *Cinnamomum camphora* is notorious for causing sidewalk damage. In addition, when under stress it is very susceptible to verticillium wilt, a vascular fungus disease. Both of these trees are useful in medians and wide parkways, but should not be used in narrow planting areas.

Planting site conditions create ultimate control of the longevity and health of any plant. Poor conditions cannot always be improved, and trees must be chosen which are as tolerant as possible to the particular problems of the site.

- If tree roots are constrained by a small opening to air and water, as a street tree in a 2 ft. by 2 ft. opening in concrete, the tree cannot be expected to grow as rapidly, be as healthy or live

as long as if it were installed in an open field.

- If the top soil is shallow, and underlain with impervious clay, tree roots may expand adequately when young, but with age, they will be adversely affected by the poor drainage of water below the root system and begin to decline.

- If the top soil or sub-soil is highly alkaline, roots will not be able to absorb the broad range of balanced minerals needed for normal growth and will develop chlorosis, which limits growth and produces unhealthy foliage.

- In saturated soil, root tips are killed by lack of oxygen and excessive water. They no longer carry water to foliage crowns, and plants die.

Some of these problems will cause a tree to fail early in its life. However, many such problems do not appear until the trees have been in the ground for many years, and are serving the function for which they were intended. Removal of troublesome trees at this stage is expensive and unpopular. Citizens often do not want a tree to be removed.

The objective of the Management Plan is to consider the long-term results of tree selection, instead of selecting trees based on such short-term benefits as fast growth rate or ease of availability.

Guidelines for Quality of Stock *Tree Vigor*

- Trees should have green leaf color or other color typical of healthy specimens of the species (if leafed out at the time of inspection).

- Vigorous trees will have larger leaves and denser foliage than weaker specimens of the same species (if leafed out at the time of inspection).

- Shoot growth should be at least 12" per year for faster and 6" per year for slower growing species.

- Bark should be indicative of the species for its age.

- Trunks should taper, with the widest part near the soil level. Trunks with no taper or a reverse taper should be avoided.

Lack of Serious Insect and Disease Pests

■ Knowledge of the pests likely to be found is necessary for this inspection. However, in general, stock showing symptoms of pest or disease problems should be avoided.

Well-formed Root Systems

■ Some white root tips should be visible on the perimeter of the root ball or root mass.

■ Older roots should be firm and healthy, and white or light yellow in color beneath the bark.

■ There should not be any large kinked roots. If a taproot or major branch root is bent more than 90 degrees, and less than 20% of its lateral roots are above the kink, it should be rejected. The root ball will probably not provide good support for the trunk when stakes are removed.

■ Trees with circling or girdling roots which wrap around 60% or more of the root ball mass should also be rejected.

■ Multi-trunk trees should have one root ball. They should not be made up of several trees in the same container.

Well-formed Crown

■ At least half of the branches should arise from points on the lower two-thirds of the trunk.

■ Trees should be grown or purchased with a skirt of foliage to within one foot of the ground, whenever possible. (Most bare root trees are not available in this form.) The skirt is the group of branches between ground level and the permanent scaffold branches. These temporary branches feed the tree, accelerate the growth rate of the tree and produce good trunk taper.

■ Single-trunk trees should have a definite central leader (the highest upright stem, which holds terminal buds extending the growth upward.)

When Bought, Look For:

Lack of shipping damage or other injury

■ Inspect the tree at delivery time for shipping damage to the trunk or branch breakage, or being unstable in the container.

Delivery of the Species Ordered:

■ When ordering, specify that each tree be delivered with a tag indicating the species and cultivar. When the trees are delivered, check the

label to assure that the cultivar or species ordered

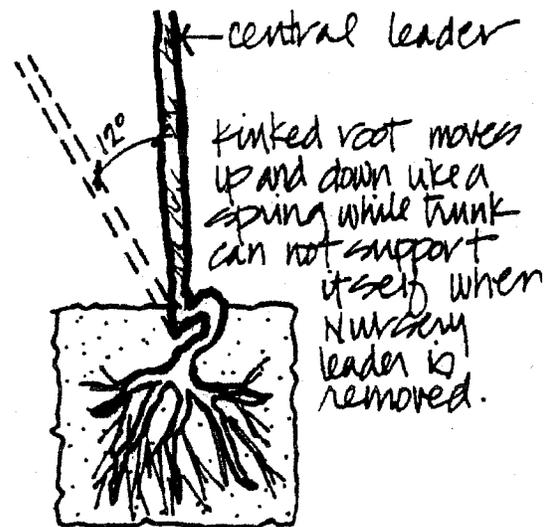


Figure 1. Kinked Root

was actually delivered. This is an item that is not usually checked. Since many nurseries will ship whichever closely related plant they have to fill an order, and different cultivars of the same species often produce quite different growth habits at maturity, this is quite important.

Further Standards for Purchased Stock:

Container Stock.

■ 2% of the trees to be purchased should be carefully removed from their containers, and the root system checked. They should have roots sufficiently developed to the perimeter of the root ball to hold the root ball together, but should not display roots of 1/4" diameter or larger. Once the trees have been received, place them in a predetermined storage area and water.

■ The container grown tree must have produced between 6" to 18" of new growth (depending on species) during the previous growing season. This implies healthy root growth.

■ A tree measured at 6" to 8" above the root ball must have its total height and trunk caliper found in Table 1. Stock Standards for acceptance. These standards are derived from the "American Standard for Nursery Stock", ANSI z60.1, 1980. They do not apply to multi-trunked trees.

CONTAINER STOCK STANDARDS			
Tree Type	Size	Height	Caliper
broadleaf	1 gal.	1 to 2 ft. ht. 2 to 4 ft. ht.	1/4" 1/2"
broadleaf	5 gal.	4 to 6 ft. ht.	1/2" to 5/8"
conifers	5 gal.	to 6 ft. ht.	5/8" to 3/4"
broadleaf	15 gal.	7 to 10 ft. ht. 10 to 12 ft. ht.	3/4" to 7/8" 7/8" to 1"
conifers	15 gal.	6 to 8 ft. ht.	7/8" to 1"
broadleaf	24" box	10 to 12 ft. ht. 12 to 15 ft. ht.	1" to 1-1/4" 1-1/4" to 1-3/4"
conifers	24" box	8 to 12 ft. ht.	7/8" to 1-1/4"

BARE ROOT STANDARDS	
Diameter of Caliper	Root spread
1/2 to 3/4"	12"
3/4 to 1"	16"
1 to 1-1/4"	18"
1-1/2 to 1-3/4"	22"
1-3/4 to 2"	24"
2 to 2-1/2"	28"
2-1/2 to 3"	32"
3 to 3-1/2"	38"

Table 1. Stock Standards

Bareroot Stock.

■ When the trees arrive, cut the bundles apart, separate the trees and check for shipping damage, such as broken major roots or broken main branches. Broken roots should be pruned off at this stage. Reject all trees which do not meet the following standards :

- No more than 20% of major roots may be broken.
- No fungus cankers allowed on the trunk or branches.
- Individual trees should be similar in their vigor and branch structure.
- To store the bareroot stock, dig holes in prepared piles of wet sand, sawdust or mulch and insert each tree's entire root mass in the hole. Backfill the hole the sand, sawdust or mulch and water each tree immediately.
- Bare root stock should meet the following size standards (caliper measured 6" to 8" from the root mass) (Table 1. Stock Standards).

Ball and Burlap

■ When delivered, check for specimens whose trunks move in the root ball. Reject all specimens whose trunks move more than 12 degrees. Reject all specimens whose trunks do not recover to their original position when tested. Check for cracked attachments of main limbs to the trunk. Check for squashed root balls, due to excessive stacking in truck. Check all other relevant guidelines for quality of stock. Provide water.

■ Ball and burlap trees should meet the following standards (caliper measured 6" to 8" from the bottom of the trunk) (Table 2. Ball & Burlap).

Standards for Purchased Stock

Stock which is purchased should be carefully inspected at the site before acceptance. The investment in installation and several years of care far exceed the cost of the plant. It makes no sense to install a severely root bound or genetically inferior specimen if the installation and maintenance costs are not rewarded by excellent growth.

Note: Trees should never be handled by the trunks (except bare root trees). Handle all trees by their containers or root balls.

For purchasing container grown trees, hand-pick trees at a wholesale grower's yard before delivery, or inspect them very carefully upon delivery for the following:

- Correct identification of species and cultivar
- Root binding
- Root health
- Top growth
- Transportation damage
- Insects or diseases

Trees purchased by the developers, contractor or homeowners should meet the same criteria established for the City. Tree should be inspected by a qualified member of the Tree Services Section staff before they are installed. Each tree should have a printed nursery label on it in order to assure that the required species and cultivar has been delivered.

Trees are usually purchased at a wholesale or retail nursery out of available stock. However, the available stock may not include the species desired, and/or the quality and quantity required, especially at fall planting time. If trees are to be purchased out of available stock, it is critical that they be hand picked and tagged at the nursery.

Tree Type	Size	Height	Caliper
broadleaf	1 gal.	1 to 2 ft. ht. 2 to 4 ft. ht.	1/4" 1/2"
broadleaf	5 gal.	4 to 6 ft. ht.	1/2" to 5/8"
conifers	5 gal.	to 6 ft. ht.	5/8" to 3/4"
broadleaf	15 gal.	7 to 10 ft. ht. 10 to 12 ft. ht.	3/4" to 7/8" 7/8" to 1"
conifers	15 gal.	6 to 8 ft. ht.	7/8" to 1"
broadleaf	24" box	10 to 12 ft. ht. 12 to 15 ft. ht.	1" to 1-1/4" 1-1/4" to 1-3/4"
conifers	24" box	8 to 12 ft. ht.	7/8" to 1-1/4"

Diameter of Caliper	Root spread
1/2 to 3/4"	12"
3/4 to 1"	16"
1 to 1-1/4"	18"
1-1/2 to 1-3/4"	22"
1-3/4 to 2"	24"
2 to 2-1/2"	28"
2-1/2 to 3"	32"
3 to 3-1/2"	38"

Table 2. Ball & Burlap Standards

Contract Growing

An alternative to purchasing existing nursery stock is container contract growing. This offers the opportunity for the City to be assured that the species of tree needed will be available in the quantity and quality required. Prior to purchasing the trees, the available stock should be inspected at several wholesale nurseries. Once a selection is made, stock should be:

- tagged and separated from the nursery's other stock;
- grown in the containers in which they are delivered for at least 9 months (for fifteen-gallons) or one year (for 24" boxes).

The City should have the option of selecting five-gallon trees which are transplanted into fifteen-gallons for delivery 9 to 12 months later. (This may not be necessary if the nursery commonly produces only very high quality stock.)

The growing contract should be signed at least one year before the desired delivery date, allowing the grower time to purchase or reserve high quality five-gallon or fifteen-gallon stock for transplanting into the fifteen-gallon or 24" box containers. If the contract is signed less than 9 months from delivery date, stock already in the containers must be used and should be carefully selected for vigorous growth produced during the previous growing season, and for well formed structural limbs. A 20% deposit is commonly required.

It is essential that the City Arborist inspect fifteen-gallon or larger size trees in the nursery at least once during the life of the contract.

Another option is bare root tree contract growing. Bare root plants are to be purchased for planting in containers in the nursery, not for planting directly. Use of bare root rather than container produced trees requires very good planning, since they are dug between the middle of December and the middle of February, and will be delivered by the grower soon after digging.

The benefits of bare-root contract growing are:

- A tree the same size as a fifteen-gallon tree (3/4" to 1-1/4" diameter) can be grown for one-third the price.

- Roots become established in the backfill soil quickly without problems of interface. Planting labor cost is reduced since installation is simpler.

Trees may also be contract-grown in ball and burlap form. Ball and burlap stock of large sizes may be purchased for much less than equivalent container grown trees. Unfortunately, the clay root balls often create the same interface with the surrounding soil seen when containerized stock is used, reducing new growth and often resulting in high losses.

SECTION 2: TREE SIZES

The plant size to use in any given site is often decided when the species is selected. In general, smaller plants will develop more rapidly and be healthier than larger plants, and have a higher

survivability rate if cared for properly. Purchasing larger specimens will create greater impact at planting time and increase the chances of surviving vandalism. However, larger specimens do not adapt to their new environment as well as smaller specimens, and therefore have a lower survivability rate under the normal stressful urban growing conditions. The various sizes available for planting are:

■ **Seed:** Hydromulching of large areas. Hand seeding of acorns or other large seeds can be done; these may be planted in revegetation areas with or without concurrent hydroseeding. The average contractor installed cost (1991) is \$900 to \$1,000 per acre.

difficulty in watering and stabilizing root growth in larger sizes on slopes. The average contractor-installed cost (1991) is \$50-\$90 per container.

■ **Bare Root:** This is a logical substitute for five-gallon or fifteen-gallon trees but must be ordered several months in advance. They would arrive between December 15 and February 15. If bare root trees are properly stored on arrival and the roots are not allowed to dry out before installation, a survival rate of at least 90% should be expected. If City crews are unaccustomed to planting bare root trees, a small number should be ordered at first so that successful procedures can be learned.

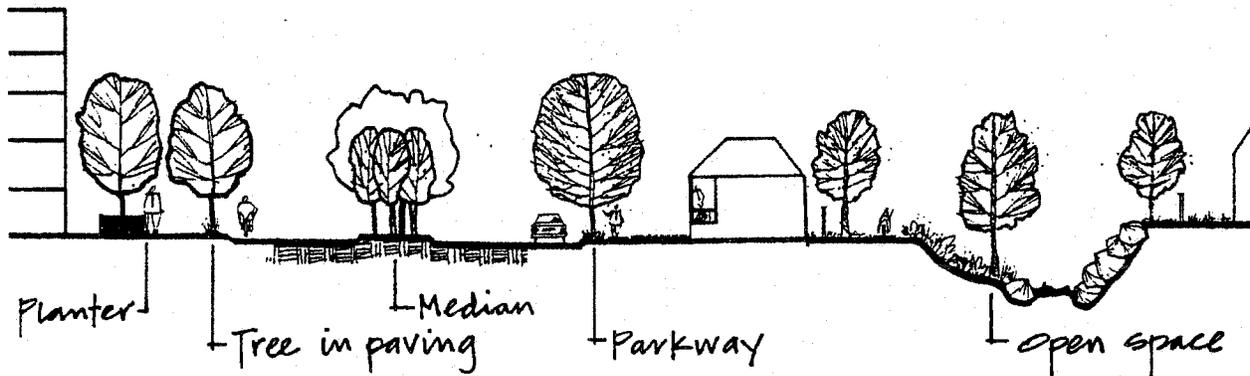


Figure 2. Planting Spaces

■ **Liners:** These are small pots, usually 2" to 4" square, and are used in areas of native plant revegetation.

■ **#1 nursery containers:** Trees can be installed from this size in naturalized and open-space areas, due to rapid establishment by the young plant. Careful inspection of roots must accompany their use. The average contractor-installed cost (1991) is \$10 per container.

■ **#5 nursery containers:** Trees can be installed in this size in naturalized and open space areas, and on the street, if well protected. The average contractor-installed cost (1991) is \$25 per container.

■ **#15 nursery containers:** This size is the most commonly used for street trees, although five-gallon trees can also be used. Where vandalism is especially high, an even larger size than fifteen-gallon is recommended. On steep slopes, this size is the largest that should be planted, due to the

■ **24" Box:** This is a logical substitute for fifteen-gallon street trees in many cases where quick results are necessary, and when there is a sufficiently large pavement opening for the root ball. (A planting area can be enlarged by redesign of the hardscape and/or removal of concrete.) The average contractor-installed cost (1991) is \$350 per box.

■ **Ball and Burlap:** These would be purchased almost exclusively from Oregon and would arrive in March. They would usually be alternatives to fifteen-gallon, 24" box or 36" box trees. (Large ball and burlap trees may be purchased for 30 to 35% of the price of equivalent boxed tree sizes. Much greater care must be taken in the storage, installation and care of ball and burlap trees. A loss factor of 10% is common.

■ **Larger specimens:** These become geometrically more expensive, greater in weight, and more difficult to install as the size increases. They

should only be used where a large, instant impact is essential. The average contractor-installed cost (1991) for a 36" box is \$1,000.

SECTION 3: PLANTING SPACES

The lifespan of a street tree planted in typical urban conditions (i.e., a 36" square planting hole surrounded by extensive paving, with frequent pedestrian traffic) can be as brief as ten years. Providing the largest available amount of uncompacted soil volume for growth is the most important factor in helping a tree grow well beyond this.

Make the planting area as wide as possible. In its natural environment, a tree's root system is broad and flat, covering a wide (but not deep) area. Most tree roots grow horizontally in the first 12" to 30" of soil below finish grade. To successfully grow trees in urban conditions, the optimum growing condition is to give a tree's root system as much room as possible, i.e. 300 cubic feet with a maximum depth of 3 feet (Urban, 1989). The minimum planting area is 4 ft. by 6 ft. wide by 3 ft. deep. Larger planting areas (6 ft. by 6 ft. by 3 ft.) are recommended on major streets and wherever possible. Parkway and tree wells that do not meet these standards must be widened by cutting the concrete, or by using soil shafts under the

pavement (Figure 3. Soil Shafts and Aeration). Soil is purposely compacted in urban areas to facilitate construction of pavement and buildings. In construction work a stable surface which will not settle is desired. Usually soil is compacted to 95% of the possible maximum. When trees grow in compacted soil their access to oxygen is limited, and both percolation and drainage of water are slowed. A tree's roots cannot absorb needed nutrients without sufficient aeration and good moisture levels. In addition, deep rooting is discouraged.

Often trees grown near pavement in compacted soil will put their roots under the hardscape as they seek water and air. (Shallow irrigation can also be a factor in this, and some tree species are naturally shallow rooted and/or aggressive in their rooting habits.) Moisture tends to collect under pavement, and the gravel layer often present there is a source of air. The temperature under pavement is often less vulnerable to extreme changes than the temperature of soil exposed to air.

Some options for tree planting areas include tree wells, parkways, containers and open spaces.

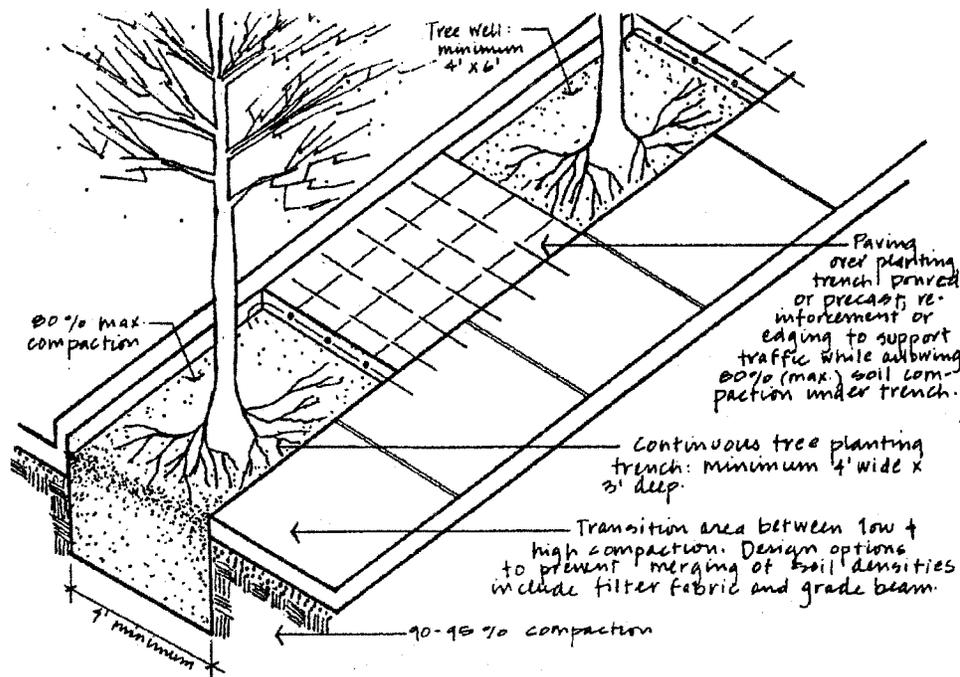


Figure 3. Soils Shafts & Aeration

Tree Wells

Urban trees in commercial and business areas are often planted in tree wells. A tree well is an opening in a paved area, usually a sidewalk.

Cutting existing pavement may be needed to create an adequate tree well. This work requires the use of heavy equipment and should only be done by City crews or an appointed contractor with a permit from the City. A diamond saw cutter, jackhammer, backhoe, loader and dump truck may all be required depending on the situation.

A soil shaft should be used to increase the planting area in tree wells and narrow parkways which cannot be widened. This is an area under the pavement which is filled with loosened backfill. An air space filled with gravel separates the soil from the pavement. The pavement must be reinforced because of the lack of support from below since pavement is usually constructed on compacted soil for stability. If drainage is not adequate, provide drainage pipes throughout the shaft and connect to the existing drainage systems.

Parkways

Trees in residential areas are typically planted in parkways. Parkways may vary in width and are located between the sidewalk and curb. Depending on the width, a parkway can provide adequate growing space for most trees and are not as constricting as most planting wells. Although parkways do not provide as much root space as open space areas, with adequate drainage and aeration they are an excellent planting space option.

Containers

Planting trees in containers can be considered an option only when underground utilities or a lack of soil area prohibit below ground planting. Once the tree's roots fill the available soil space, generally in 6 to 8 years, tree growth will be limited.

Trees in streetscape containers have particular maintenance needs. More frequent watering is necessary — up to once a week, depending on the species, exposure and size of the container (2-3 times per week in the J St. area). Fertilizing will be needed monthly if applied as a top dressing, and quarterly if applied below the surface. Species must be selected which will tolerate living in containers. Drainage out of the containers across

pavement can be a liability problem. The containers should be at least three feet in diameter in order to be in scale with the streetscape.

One method that cities sometimes use is to install a young tree in a large container and use this as a temporary street tree. When the tree begins to outgrow the container, it is planted in the ground. This is a way of buying younger trees at a lower cost but should only be done if trees are planted in the landscape before they become rootbound or show signs of decline. In three years, a bare root or five-gallon tree can reach the size of a 24-inch box specimen. However, the cost of maintenance will be higher for a containerized tree than for the same tree planted in the ground, and the tree will not develop as quickly in the container. In addition, the cost of moving and replanting the tree must be figured in. Concrete containers, probably the best choice aesthetically, can get chipped or broken during transplanting, and then could not be reused. Wood and fiberglass are more vandal-prone than concrete, and tannins from wood containers can stain pavement.

Good choices for planting in containers are:

Acer buergeranum
Acer campestre
Callistemon citrinus
Lagerstroemia indica
Magnolia soulangiana
Pyrus calleryana 'Chanticleer'
Pyrus calleryana 'Redspire'
Pyrus kawakamii

Trees which should be considered experimental in containers are:

Acer campestre 'Queen Elizabeth'
Aesculus carnea 'O'Neal's Red'
Cercis canadensis 'Oklahoma'
Chionanthus retusus

Open Spaces

Trees in open spaces, turf areas: In turf areas, trees must have a minimum 3 x 3 ft. wood header to keep turf away from the tree trunk. Lawn mowers and weed whips cause tremendous destruction of the cambium layer, and must be kept away from tree trunks.

Trees in open spaces, natural areas: Planting trees in natural areas (without turf) greater

increases the range and variety of options for species size and selection and reduces maintenance requirements. Due to the lessened risks of intentional (vandalism) or unintentional (pedestrian traffic) damage, trees can be planted from seedlings or saplings. This the most economical size to plant. Planting as seedlings/saplings also provides the tree with a much better chance of establishment.

Using Root Barriers

Although root barriers are commonly used to prevent or reduce hardscape damage, independent research has not proven that they are effective. In heavy clay soils, root barriers may block most root growth and eventually, the tree will become root-bound. The most effective methods of root control in paved areas are judicious species selection or altering the planting location. Root barriers may be used at the City's discretion with the Arborist's approval.

Grates and Guards

Perforated iron tree grates or precast concrete tree covers with perforations are typically used in situation where additional pedestrian space is desired. Often times they add a decorative (although expensive) element to the streetscape.

Grates are designed to be cut back from the trunk as the tree grows. More times than not, the grate remains uncut. The tree can begin to grow into the grate in as few as 3 to 5 years (Urban, 1989, page 28). If not cut back, the grates can girdle the trees, leading to decline and death. If a wider walking area is desired around trees, interlocking pavers, cobbles, decomposed granite, bricks and gravel all provide a suitable walking surface, and will not inhibit tree growth. Install with as little compaction as is needed to create an even surface and slope materials away from the trunk.

If the situation demands tree grates (i.e., pavers, cobbles, etc. are incompatible with the overall aesthetics of the high pedestrian area), the grates must be perforated to allow air and water to reach the soil, self supporting above the soil, and expandable (by means of knock-out sections) to allow for trunk growth. Periodic inspections and removal of knock-out sections must be scheduled into the maintenance program. Pea gravel is the recommended mulch material when tree grates are used.

SECTION 4: PLANTING GUIDELINES

Scheduling

The time of year when the tree is planted has a major impact on the long term success of a tree. Installation of trees during the months of November and December will facilitate movement of new roots in the surrounding soil before the hot weather arrives, and thereby accelerate the establishment of the tree in its new soil environment. It will also save on maintenance costs since much of the watering during the first four to five months will be taken care of by the winter rains, except in drought years. This timing has such a significant effect on the proportion of success in establishment of new trees that sincere efforts should be made to avoid planting street trees at any other time of the year than late fall, unless adequate irrigation is supplied.

CHECKLIST FOR PLANTING

Items Needed

The Basics

- trees
- source of water
- people-power

Power Tools

- concrete saw cutter
- backhoe
- auger
- dump truck

Hand Tools

- pruning shears
- mattock
- planting bar
- shovel
- stake pounder
- broom
- can snips
- gloves

Materials

- mulch
- backfill
- gravel
- water
- fertilizer
- PVC perforated drainpipe with filter fabric, 36" min. lengths
- tree stakes
- tree ties
- paving materials:
 - interlocking pavers
 - cobbles
 - decomposed granite
 - bricks
 - gravel

By contrast, the worst time to install street trees is mid-spring through summer, when the maxi-

imum demand for moisture is taking place. At this time it is most difficult to resupply moisture to the root mass as fast as it is being used by the foliage canopy of the tree. Transplant success ratios for trees installed during these months are significantly less than for those installed in early winter.

When spring or early summer planting is necessary to meet planting goals or to staff scheduling requirements, the following steps must be taken:

- Fill the planting hole with water and let settle before planting.
- Check rootball moisture at least two times per month for moisture.

Procedure

- Contact utility companies to locate underground utilities.
- Obtain permission from City Tree Services Section.
- Notify nearby property owners if they have not been previously notified.
- Gather tools and materials needed. If the tree is to be planted by City crews, or by a resident during an approved neighborhood planting, tools and materials may be available from the City's corporation yard. A requisition form must be filled out and approved by the department of public works. City personnel must supervise or operate City tools and equipment.
 - Set up safety barricades.
 - Prepare the planting area (min. 4 ft. by 6 ft. by 3 ft. deep).
 - Cut the pavement, if needed
 - Dig the planting area
 - Check for soil and drainage problems
 - Add special materials such as root control barriers or drainage materials
 - Add watering tubes
 - Fill the area with backfill and water to allow settlement overnight.
- Check for drainage problems the next day. If water has not drained, choosing a different planting location is highly recommended.
 - Dig planting holes and plant and water the tree.
 - Install non-wire stakes and tree ties.
 - Add mulch over the planting area.

- Place paving materials, tree guards and tree grates if required.
- Clean up.
- Record the tree planting in the City inventory database.

Preparing the Planting Area

Creating a large uncompacted planting area, providing good drainage and aeration, using deep watering practices, and fertilizing will help create a healthy growing space for trees. Preparing the planting area allows soil compaction to be lowered from the usual 95% to a maximum of 85%. Using a backhoe or power auger greatly eases the task of digging the planting hole. If the hole is dug with an auger, the walls must be roughened with a planting bar to allow roots to penetrate the soil after the tree is planted.

Locate underground utilities

■ Sacramento is served by public utilities: water, wastewater, gas, electric, telephone, and cable television. Wastewater laterals are particularly susceptible to damage and stoppages due to root intrusion by trees and even large shrubs, especially in times of drought. This results in both added and unnecessary costs to the City as well as the individual property owners.

■ City crews and/or property owners must, by law, contact the various utility companies prior to scheduling planting to determine the location of their respective utility laterals prior to digging. Underground service alert is a free service that notifies member utility companies to mark their utilities on your project site. Call 1-800-642-2444 for more information. It is not uncommon to dig or drill directly into a gas main or wastewater lateral. People may not be aware that they have hit a wastewater lateral and unknowingly plant their tree, resulting in possible flooding at a later date. There is also potential danger from cutting into a gas main (resulting in explosions or fire), or electrical conduit (causing shock or electrocution).

Check for soil and drainage problems

■ While digging and preparing the planting area, it is recommended that you check for any adverse or unusual soil conditions such as alkalinity, poor drainage, rocks or debris, or compaction. These conditions must be remedied prior to planting.

■ Alkalinity may be found by looking at color. Gray or white soil usually indicates an alkaline

condition. The use of alkaline-tolerant species is recommended.

- Poor drainage can be identified by filling a planting hole with water and seeing how long it takes to drain. If water in the hole has not settled at least one inch in one hour, do not plant before special drainage preparations are tried. If the water has not drained overnight, a new planting location should be chosen. Also check the species selected to be sure it will grow in poorly drained soil. If not, contact the arborist.

- If compaction is severe, a breaker bar may be needed to loosen the soil or drill through hardpan.

Preparing Planting Holes And Placing the Tree

After the planting areas have been prepared, all needed watering, aeration and drainage, and root barrier systems have been installed, and the backfill has been well settled, the planting holes are dug and the trees planted. For trees planted in paved areas, see Figure 4; for trees planted in medians, see Figure 6; for trees planted in open spaces and parkways, see Figure 5.

Container grown trees

- Avoid planting recently saturated root balls, which can fall apart when handled. Dry root balls should never be planted, since it is very difficult to wet a dry root ball after installation. In those instances, thoroughly wet and allow to drain.

- If the tree is planted in a paved area which requires drainage measure dig the planting hole at least twice as wide as the root ball, and 8" deeper than the container. If the tree is planted in open space or does not require special drainage, set the rootball on undisturbed soil.

- Form a 9" - 10" mound of soil to set the root ball on, and tamp it down firmly.

- Remove the tree from the container, carefully supporting the root ball from below. Trees should never be handled by the trunks (except bare-root trees). Handle all trees by their containers or root balls.

- Check the root ball for signs of being rootbound. Reject any badly rootbound trees, or trees with kinked roots. Otherwise, sever any circling roots 3/16" diameter or more with a sharp shears or a knife.

- Set the tree in the planting hole so that the top

of the root ball is 2" above grade. (The tree will settle to grade when watered.)

- Fill in about half the hole with backfill and soak the soil. When the water has drained away, place slow release fertilizer (3 oz. Osmocote 18-6-12 or equivalent for a fifteen-gallon tree) on the soil. This will provide for the needs of newly emerging roots during the first two years. Fill in the rest of the planting hole.

- Form a watering basin of the same diameter as the root ball, and fill up the basin three times, letting the water drain each time.

Bare root (for City nursery-use only)

- Soak the tree's roots in water or keep them in a moist plastic bag while preparing planting hole.

- Form a mound or cone of soil in the center of the planting hole.

- Place the roots of the tree on this mound, carefully spreading them out at their natural angles. Roots should fit the planting hole without bending or cutting them.

- Plant the tree at the same depth that it had been previously growing. Look for a distinct color change in the bark on the trunk just above the root flare. The mark indicates the former soil level. Position the tree in the planting hole so that this point is about an inch above the soil surface (it will settle down to grade when watered in).

- With the tree positioned on the cone of soil, fill in about half of the hole with backfill soil. Add slow release fertilizer and water-retaining polymer. Use Osmocote (4 oz. per cubic foot of soil in the planting hole) or equivalent; Soak the soil.

- When the water has drained away, fill in the rest of the planting hole with more backfill and water it. If the tree settles too low in the process, you can raise it to the proper position while the soil is moist by grasping it firmly and gently, lifting it up with a side-to-side rocking motion until it is at the proper height.

- Apply more soil and water until the tree remains at the correct level.

- Form a watering basin which is the same diameter as the root system, and fill up the basin three times, letting the water drain each time.

Ball and burlap

- Dig a planting hole twice the diameter of the root ball and 6" deeper than the depth of the root

ball.

- Form a mound of soil to set the root ball on, and tamp it down firmly. Set the still-wrapped root ball on the mound. Do not break the root ball. Check the level of the root ball, making sure that the top of the root ball is 2" higher than the level of the surrounding soil to allow for settling.

- After the tree is properly positioned in the planting hole, fill the hole to half its height with backfill soil and water. Untie the burlap wrapping and pull the burlap to the edge of the root ball. You don't need to remove the burlap from the root ball.

- Finish backfilling with soil and add slow-release fertilizer (4 oz. Osmocote per cubic foot of soil in the planting hole).

- Form a watering basin which is the same diameter as the root ball, and fill up the basin three times, letting the water settle in between soakings.

Adding Backfill

When preparing and planting trees in the good soils typical of Sacramento, the backfill mix should be native soil which has been loosened by excavation of the planting area. River silt is currently used by Tree Services when available. Although river silt is cheap or free, the cost in terms of tree health could be high. To determine whether silt is beneficial, an agricultural analysis should be done. Typically, the silt probably contains around 15% clay and 30% silt, with the rest fine sand. Although it might look like good soil, it hardens into a texture similar to concrete. A better proportion would be no more than 20% clay, no more than 20% silt, and the rest a mixture of grades of sand particles.

Do not add soil amendments unless special conditions require it, such as soils that are highly alkaline or are made up of serpentine subsoil. Although organic materials can improve the structure and permeability of any soil, if you add a large quantity to a planting hole in clay soil you can, in effect create an underground "container" for a new tree's roots. Upon reaching the perimeter of the planting hole and its soft, permeable, conditioned soil, roots will then run into dense native clay and have difficulty penetrating it. Excess water also collects in the amended planting hole, waterlogging the root zone and possibly killing the tree from lack of air in the soil.

Water immediately after placing the backfill in

the planting area to settle the backfill to finish grade.

Import soil should only be used as a last resort, in areas of highly alkaline native soil. Import soil meeting the Soil and Plant Laboratories Import Landscape Soil Specification (#430) should be used as backfill to replace the soil in the entire planting area (minimum 4 ft. by 4 ft. by 3 ft. deep). The soil should be a sandy loam with:

- coarse sand: 15% max. by weight (0.5-2.0 mm)
- silt plus clay: 15-45% by weight (< 0.05 mm)
- gravel: 20% max. by weight (2-13 mm)
- rocks: 1/2-1" 25% max. by volume
- no rocks larger than 1" diameter
- pH should be between 5.5 and 7.5

Improving Drainage

Constantly wet soil prevents active root growth. Trees should never be planted in swales or depressions. Various methods for assuring acceptable drainage in the planting area should be used.

In the very worst cases, where no percolation takes place, and the layer creating the problem is too thick to drill through, planter holes must be thought of as bathtubs. A drainline must run from the bottom of the "bathtub" to a common drain.

Where a hardpan layer is encountered, drill numerous 2" diameter holes through the hardpan.

In clay soils which drain fairly slowly but in which the top soil is at least 6 ft. deep, and continuous, watering tubes are recommended in all cases. Irrigation should be thorough and infrequent. If water does not drain when tested while preparing the planting area, 6" diameter holes augered to a depth of 2 ft. minimum, and filled with gravel, may help keep water away from the roots.

In deeper soils with an uninterrupted soil profile to a depth of 10 ft. or more, no drainage arrangements should be needed other than the watering tubes recommended in all cases.

Watering and Aeration Systems

It is essential that moisture and air reach the feeder roots of the tree. It is recommended that all new trees should be installed with watering tubes

and evaluated for long term benefits. It is also recommended that existing trees under 5 years old be retrofitted with these tubes. Water is supplied to the tree by filling the water basin; any overflow water drains into the tubes. The tubes are also key in providing air to the root system, and will also serve as drainage tubes where no other provisions have been installed.

To properly install:

- Dig holes 3" to 6" in diameter, 2 to 3 feet deeper than the bottom of the planting hole.
- Wrap two 4" diameter perforated PVC drainpipes with a filter fabric sock; tie loose ends together at top.
- Install tubes next to root ball inside the basin. Do not install next to the irrigation bubbler. The top of the pipe should be 1"- 2" above finish grade.
- Place a 2" deep layer of 1 to 1-1/2"-diameter clean, washed gravel at the bottom of the tube to break the velocity of the water (unless a horizontal system is also used at the bottom of the hole, as recommended for major streets).

For tree wells in major streets, an additional system of aeration pipes is recommended in addition to the two aeration tubes recommended for all trees. The pipes are installed horizontally at the bottom of the planting area and connected to the two vertical pipes. When a number of tree wells are installed in a row on a street, a watering system can be set up to water multiple trees at once. A tree watering box is installed which receives water from a hose. Perforated pipe runs from the box to the planting area of the trees. Similarly, if a row of tree wells need drainage lines installed, a common line can be run from one tree well to another and then to one outlet. An irrigation system using either bubblers or drip emitters is another alternative, although unless well-monitored such systems tend to over-water trees and have higher initial capital costs.

Watering basins must be kept free of all turf and ground covers, as they will compete with the tree for nutrients; the tree may also suffer mower- or weed-whip damage. Frequently when trees are planted, ground cover is kept at least 3 or 4 ft. from the tree. However, sometimes the aesthetic benefit of ground cover, or the need to protect or enhance trees in high traffic areas, outweighs the problem of competition for nutrients. This is a design decision that needs to be made for each situation.

Staking

The purpose of staking is to stabilize the root ball until the roots can anchor the tree, supporting the trunk in an upright position, and protecting the trunk from injury. Whenever possible, it is better to not stake a tree if it can stand without one. The tree will develop a good taper and thus a strong trunk in a shorter period without staking. Conifers, upright growing trees, and trees planted bare root may not need staking. However, most nursery-grown trees will need staking for stability and protection from injury.

- If needed at windy sites or areas with high pedestrian traffic, install two 2" diameter (or 2" by 2") support stakes per tree (five-gallon to 24-inch box), tall enough for the particular tree. Install the stakes outside the root ball and a minimum 12" below undisturbed soil to ensure stability.

- Supplemental stakes for anchoring the root ball or for protection should be 3 ft. long, with half the length of the stake below grade.

- Support stakes should be perpendicular to the prevailing wind direction. On windy sites where the wind comes from several directions, a three-stake system may be needed.

- Ties should be flexible to allow for growth of the trunk. Wire ties should never be used. Install ties at one point only, at 6" above the natural bend point of the tree. To find the bend point, remove the nursery stake (the small stake attached to the trunk at the nursery) and pull the top of the crown to one side, holding the trunk with one hand. The point on the trunk where the canopy will snap back to an upright position by itself is the natural bend point. Pruning the tree at planting time, when indicated, will lighten the weight of the canopy and raise the natural bend point.

- Cut the tops of the stakes so that they are only 2" to 3" taller than the point where the ties are placed. This prevents the top of the tree from rubbing against the stakes in strong winds.

- The nursery stake should usually be removed at planting time. However, if the trunk is too weak to stand without the stake, it should be cut and reattached as an auxiliary stake which can move freely from the root ball. The auxiliary stake should be attached 2" above the root ball and no higher than 24" from the tip of the tree's central leader.

1 PREPARE THE PLANTING AREA; CHECK DRAINAGE.

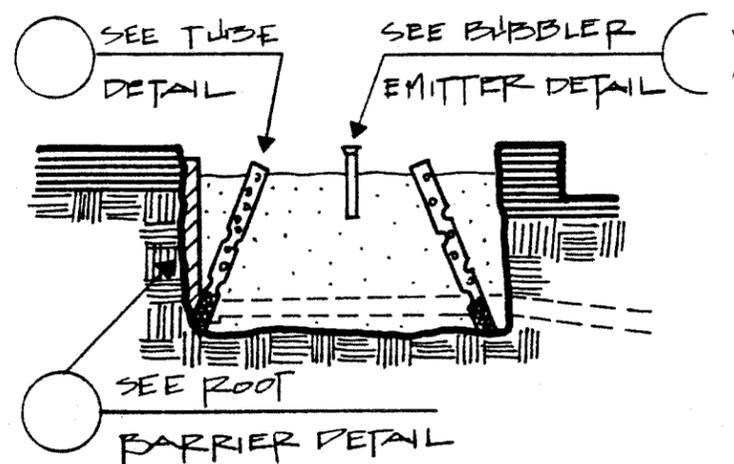
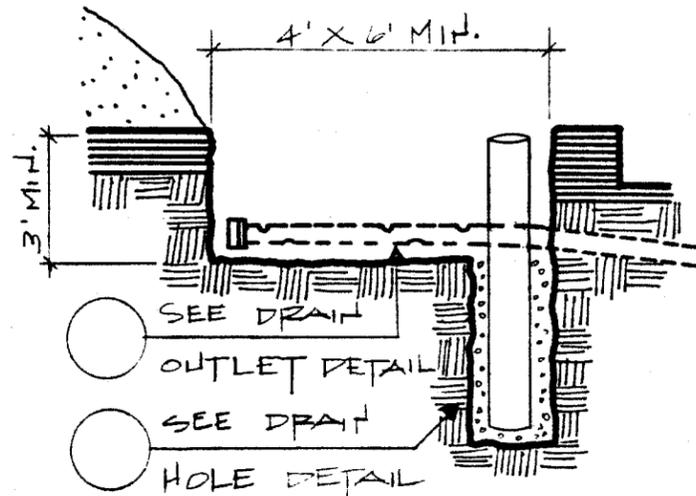
- CUT PAVEMENT AS NEEDED AND DIG MINIMUM 4 X 6 X 3 FT. DEEP PLANTING AREA.
- SCARIFY SIDES.
- CHECK FOR SOIL DRAINAGE PROBLEMS BY FILLING PLANTING AREA WITH WATER. IF WATER DOES NOT DRAIN AT LEAST 1" PER HOUR, ADD TREE DRAIN HOLE THROUGH COMPACTED SOIL OR DRAIN OULET (SEE DETAILS) OR RELOCATE TREE TO A LOCATION WITH GOOD DRAINAGE.

2 INSTALL ROOT BARRIER, AERATION & WATERING TUBES & IRRIGATION, IF SPECIFIED; PREPARE SOIL.

- INSTALL TWO 4" DIAMETER AERATION & WATERING TUBES WRAPPED IN FILTER FABRIC (SEE DETAIL).
- IF SPECIFIED, ADD ROOT BARRIER ON PAVEMENT SIDE ONLY.
- RETURN SOIL WITH CLODS BROKEN UP TO A MAXIMUM COMPACTION OF 70%.
- ADD AMENDMENTS IF REQUIRED BY SOIL TEST.
- IF SPECIFIED, ADD BUBBLER OR EMITTER BETWEEN AERATION TUBE AND ROOT BALL SO THAT ROOT BALL DOES NOT DRY OUT. (TO PROVIDE THE INFREQUENT DEEP WATERING NEEDED FOR TREES, SUPPLY SEPARATE VALVES FOR TREES & FOR SHRUBS.)
- WATER THOROUGHLY AND TAMP.
- ADD SOIL AS NECESSARY TO ACHIEVE FINISH GRADE BEFORE DIGGING PLANTING HOLE.

3 DIG THE PLANTING HOLE AND ADD THE TREE.

- MAKE HOLE TWO TIMES WIDER THAN ROOT BALL.
- FORM A COMPACTED MOUND OF SOIL AT BOTTOM OF HOLE
- FORM A COMPACTED MOUND OF SOIL AT BOTTOM OF HOLE
- PLACE TREE AND FILL HOLE HALF-WAY WITH SOIL.



4 ADD NUTRIENTS & FINISH BACKFILLING.

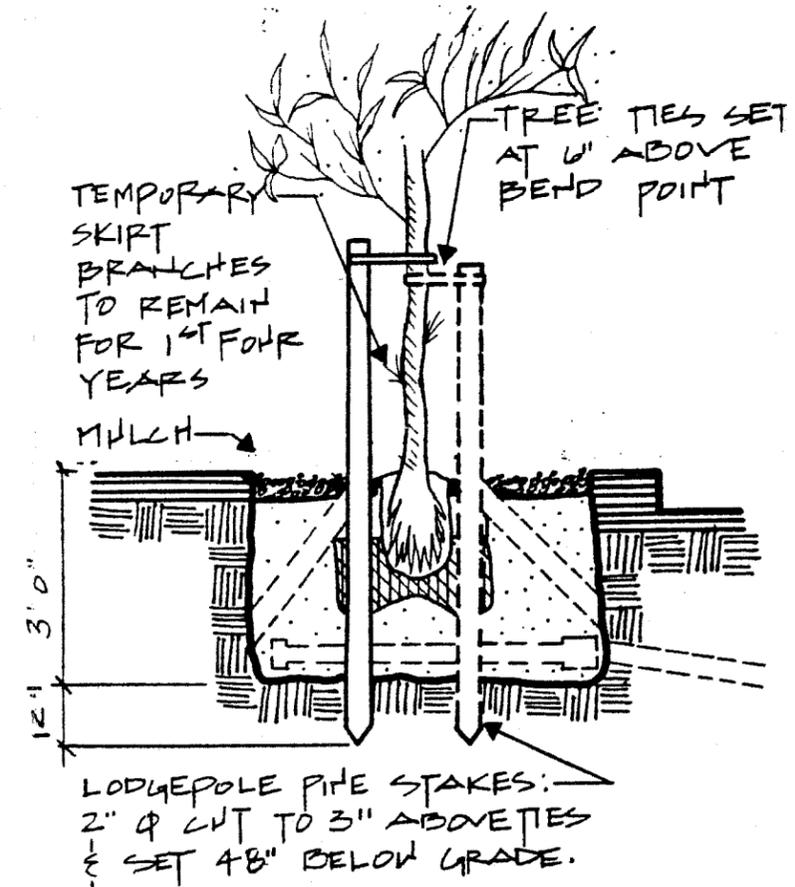
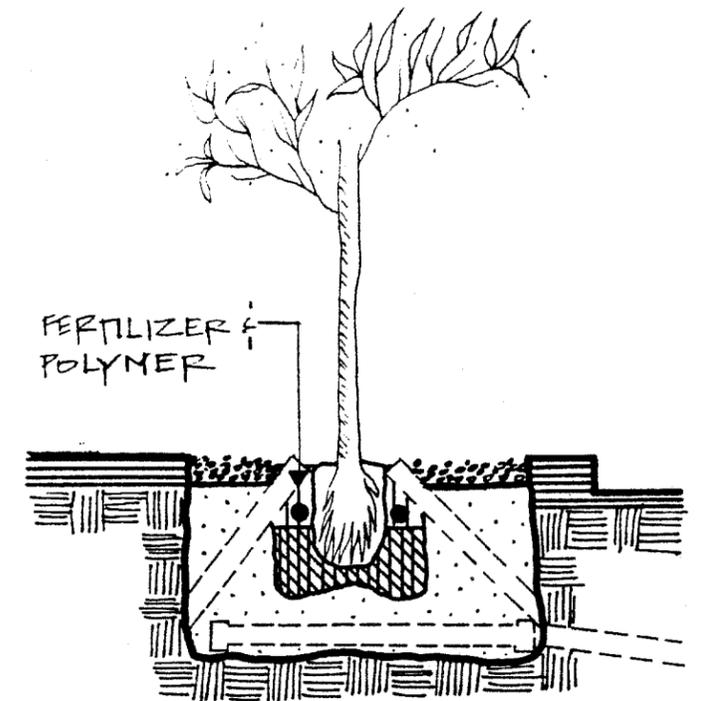
- IF SPECIFIED, INSTALL WATER-RETAINING POLYMER AND SLOW-RELEASE FERTILIZER.
- FINISH BACKFILLING WITH SOIL. TOP OF ROOT BALL SHOULD BE 2" ABOVE FINISH GRADE.
- WATER THOROUGHLY.

5 ADD TREE PROTECTION

- REMOVE NURSERY STAKES.
- STAKE TREE ONLY AS NEEDED IN WINDY SITES OR TO PROTECT FROM PEOPLE AND ANIMALS IN HIGH PEDESTRIAN AREAS. INSTALL STAKE(S) JUST OUTSIDE OF ROOT BALL AND A MINIMUM OF 12" INTO UNDISTURBED SOIL. IF SPECIFIED, ADD PROTECTION SCREEN.
- USE FLEXIBLE WEBBED CORDING TREE TIES, A MINIMUM OF 24" IN LENGTH (NEVER USE WIRE AS IT WILL KILL THE TREE).
- INSTALL A 4" LAYER OF MULCH AROUND, BUT NOT IN, THE BASIN.
- CLEAN UP AREA.

6 PROVIDE REGULAR MAINTENANCE.

- CHECK STAKES AND TIES ANNUALLY; REMOVE WHEN TREE CAN STAND ON ITS OWN, USUALLY WHEN TRUNK CALIPER IS 3" DIAMETER.
- PRUNE TO DEVELOP SCAFFOLD BRANCHES AT APPROPRIATE HEIGHT FOR SURROUNDING USES.
- MONITOR CAREFULLY TO MAINTAIN APPROPRIATE WATER FOR GROWTH. SUPPLY DEEP ROOT WATERING: REGULARLY FOR FIRST TWO YEARS; OCCASIONALLY AS NEEDED AFTER THAT.

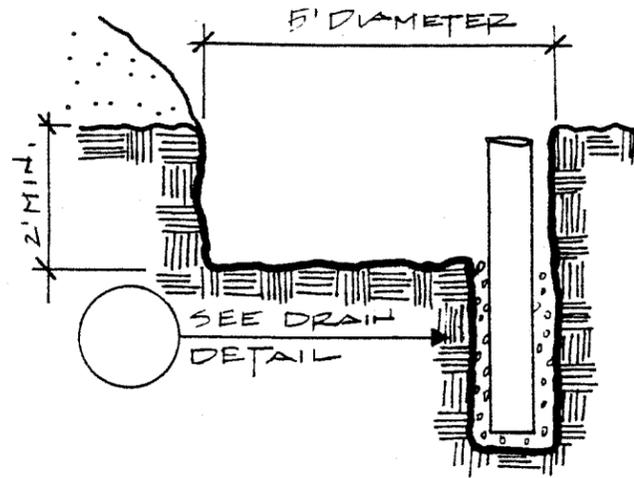


Tree Planting:
Paved Area

Figure 4. Trees Planted in Paved Areas

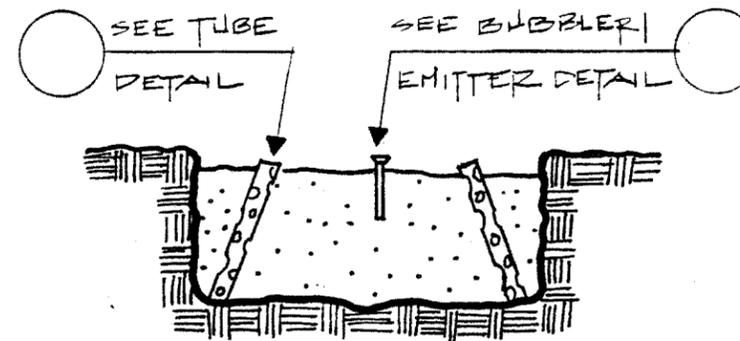
**1 PREPARE THE PLANTING AREA;
CHECK DRAINAGE.**

- DIG MINIMUM 5' DIAMETER X DEPTH OF ROOT BALL.
- SCARIFY SIDES.
- CHECK FOR SOIL DRAINAGE PROBLEMS BY FILLING PLANTING AREA WITH WATER. IF WATER DOES NOT DRAIN AT LEAST 1" PER HOUR, ADD TREE DRAIN HOLE (SEE DETAIL) THROUGH COMPACT SOIL, OR RELOCATE TREE TO A LOCATION WITH BETTER DRAINAGE.



**2 INSTALL TUBES AND IRRIGATION;
PREPARE SOIL.**

- IF SPECIFIED, INSTALL TWO 4" DIAMETER AERATION & WATERING TUBES WRAPPED IN FILTER FABRIC (SEE DETAIL).
- RETURN SOIL WITH CLODS BROKEN UP TO A MAXIMUM COMPACTION OF 70%.
- ADD AMENDMENTS IF REQUIRED BY SOIL TEST.
- IF SPECIFIED, ADD IRRIGATION HEAD BETWEEN AERATION TUBE AND ROOT BALL SO THAT ROOT BALL DOES NOT DRY OUT. (TO PROVIDE THE INFREQUENT DEEP WATERING NEEDED FOR TREES, SUPPLY SEPARATE VALVES FOR TREES AND FOR SHRUBS.)
- WATER THOROUGHLY AND TAMP.
- ADD SOIL AS NECESSARY TO ACHIEVE FINISH GRADE BEFORE DIGGING PLANTING HOLE.

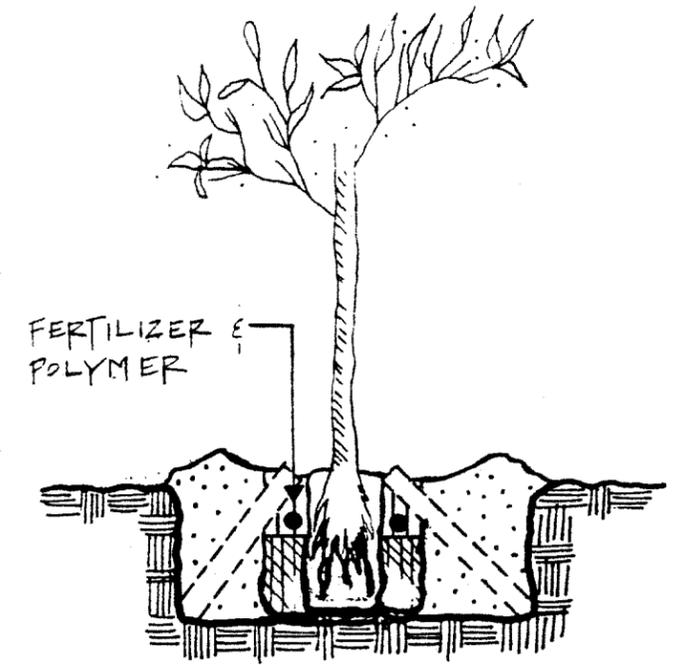


**3 DIG THE PLANTING HOLE AND
ADD THE TREE.**

- MAKE HOLE TWO TIMES WIDER THAN ROOT BALL.
- PLACE TREE AND FILL HOLE HALF-WAY WITH SOIL.

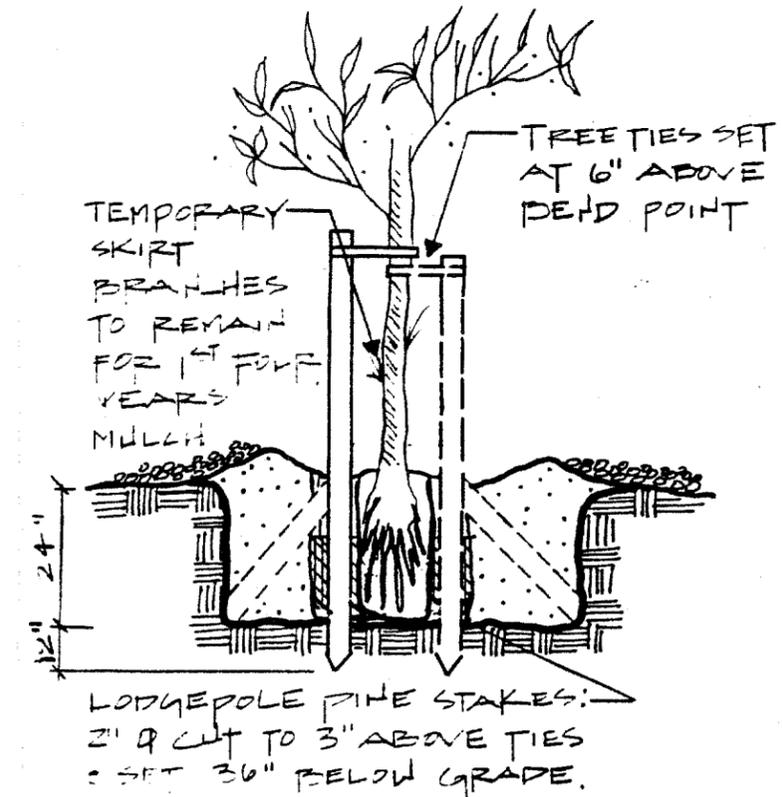
4 ADD NUTRIENTS & FINISH BACK FILLING.

- IF SPECIFIED, INSTALL WATER-RETAINING POLYMER AND SLOW-RELEASE FERTILIZER.
- FINISH BACKFILLING WITH SOIL. TOP OF ROOT BALL SHOULD BE 2" ABOVE FINISH GRADE.



5 ADD TREE PROTECTION.

- REMOVE NURSERY STAKES.
- STAKE TREE ONLY AS NEEDED IN WINDY SITES. INSTALL STAKE(S) JUST OUTSIDE OF ROOT BALL AND A MINIMUM OF 12" INTO UNDISTURBED SOIL. USE ONE STAKE IN OPEN SPACE AREAS. USE TWO WHERE EXTRA PROTECTION IS NEEDED.
- IF SPECIFIED, ADD DEER PROTECTION SCREEN.
- USE FLEXIBLE WEBBED CORDING TREE TIES, A MINIMUM OF 24" IN LENGTH (NEVER USE WIRE AS IT WILL KILL THE TREE).
- INSTALL A 4" LAYER OF MULCH AROUND, BUT NOT IN, THE BASIN.
- CLEAN UP AREA.



6 PROVIDE REGULAR MAINTENANCE.

- CHECK STAKES AND TIES ANNUALLY; REMOVE WHEN TREE CAN STAND ON ITS OWN, USUALLY WHEN TRUNK CALIPER IS 3" DIAMETER.
- PRUNE TO DEVELOP SCAFFOLD BRANCHES AT APPROPRIATE HEIGHT FOR SURROUNDING USES.
- MONITOR CAREFULLY TO MAINTAIN APPROPRIATE WATER FOR GROWTH. SUPPLY DEEP ROOT WATERING: REGULARLY FOR FIRST TWO YEARS; OCCASIONALLY AS NEEDED AFTER THAT.

**Tree Planting:
Parkways &
Open Space**

Figure 5. Trees Planted in Parkways and Openspace

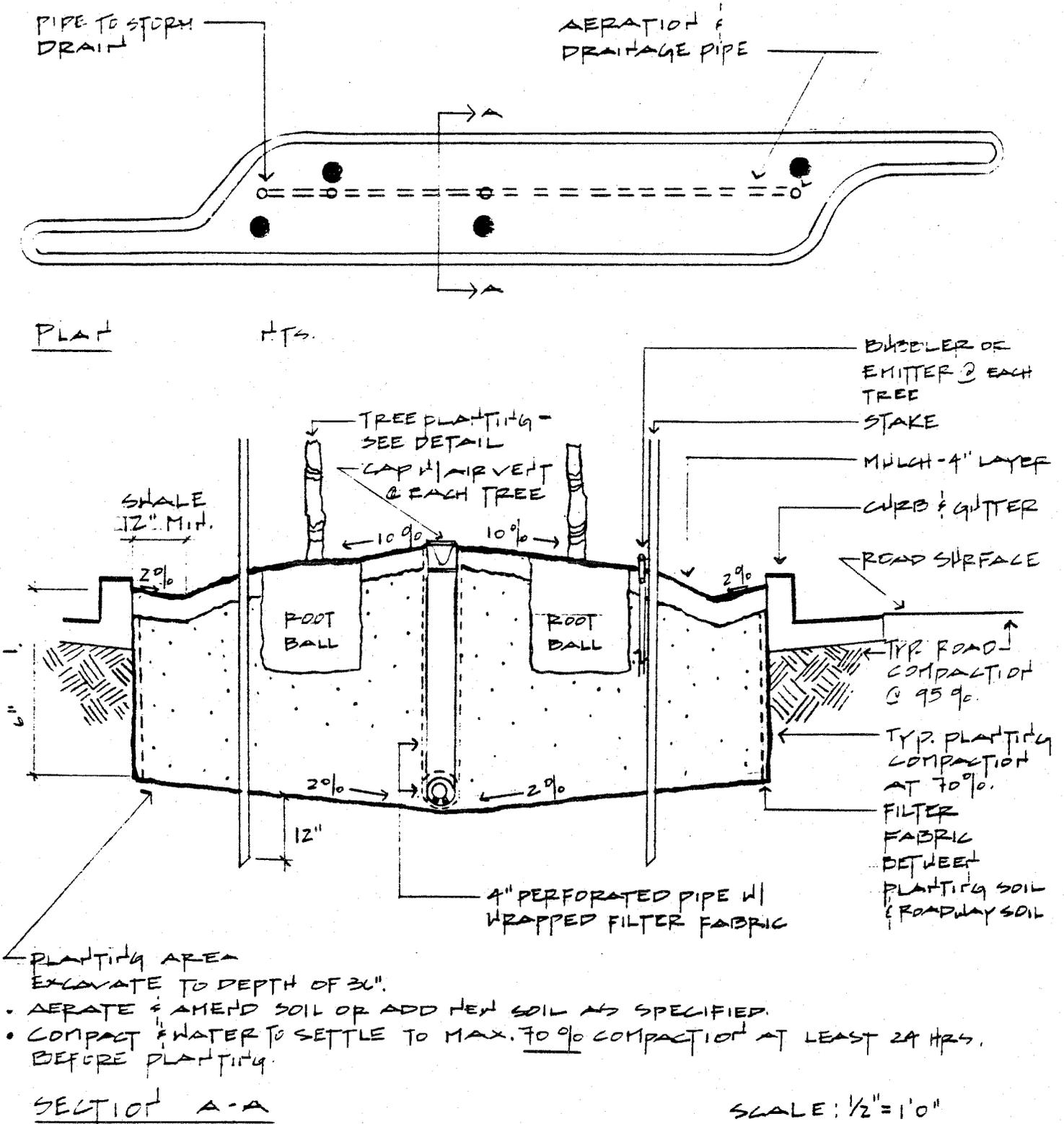
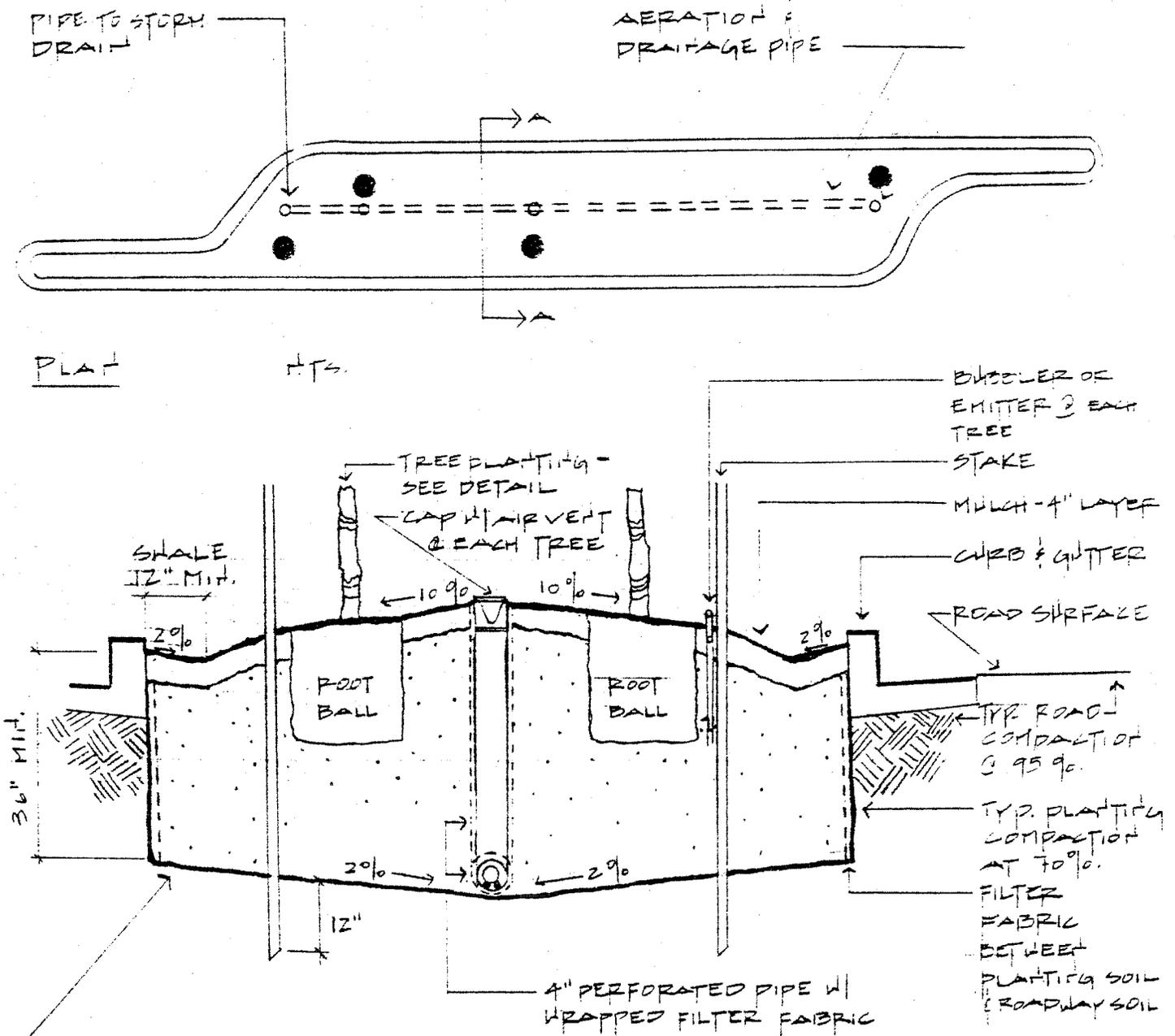


Figure 6. Trees Planted in Street Medians

Tree Planting: Median Strips



- PLANTING AREA
- EXCAVATE TO DEPTH OF 36"
 - AERATE & AMEND SOIL OR ADD NEW SOIL AS SPECIFIED
 - COMPACT & WATER TO SETTLE TO MAX. 70% COMPACTION AT LEAST 24 HRS. BEFORE PLANTING

SECTION A-A

SCALE: 1/2" = 1'0"

Tree Planting: Median Strips

Figure 6. Trees Planted in Street Medians

An even better auxiliary support in this case would be a flexible spring steel rod (or other flexible support stake such as fiberglass or bamboo) extending from 2" above the root ball to 6" above the natural bend point of the tree. The rod should be 1/4" diameter for five-gallon trees and 3/8" diameter for fifteen-gallon trees. Tie the rod to the trunk with one-inch-wide plastic tape at 6" to 10" on center.

Auxiliary stakes do not take the place of support stakes. Their sole purpose is to help strengthen and straighten the trunk while allowing movement.

- Ties should contact the trunk with a broad surface to minimize rubbing or girdling, and should have some elasticity. Wire should never be used. Elastic webbing, tire cording, or heavy polyethylene tape (for small trees) can be used. The tie should be loosely looped around the trunk. Two ties, one from each stake, should be used.

- Larger trees, 36" box or larger, may require a guying system for anchorage. The least hazardous method for pedestrians is an underground auger anchor, such as Duckbill earth anchors. Above-grade guy wires should not be used.

- For small trees which may need protection against weed competition and human and machine damage, tree shelters known as "Tubex tubes" can be installed. These are twin-walled, translucent, photodegradable polypropylene tubes from two to six feet high, which serve as miniature greenhouses for the trees. The use of these tubes can allow a mass planting to be done at a fraction of the cost. The tubes cost about \$2, and allow a seedling or one gallon tree to be used rather than a five or fifteen gallon specimen.

Adding Mulch

A 4"-deep layer of shredded bark or bark chips should be spread over the entire planting area outside the watering basin at planting time wherever possible, to conserve soil moisture, inhibit weed growth, and prevent baking of the soil by the sun. Mulch will also improve soil fertility and soil structure as it degrades into the soil. For trees in tree wells or narrow planting strips, where mulch would tend to spill out on the pavement, it may be necessary to use a thinner layer. Shredded bark is preferable on slopes as it has less tendency to slip than bark chips.

Common Reasons why trees sometimes die after planting:

- Loss of roots from too severe root pruning (roots are often pruned to compensate for a rootbound condition in containers) or from a root ball breaking apart when handled.

- Drying of roots from exposure to sunlight before planting, in bare root trees.

- Air pockets, stones, or hard clumps in the soil which prevent contact of the roots with the soil.

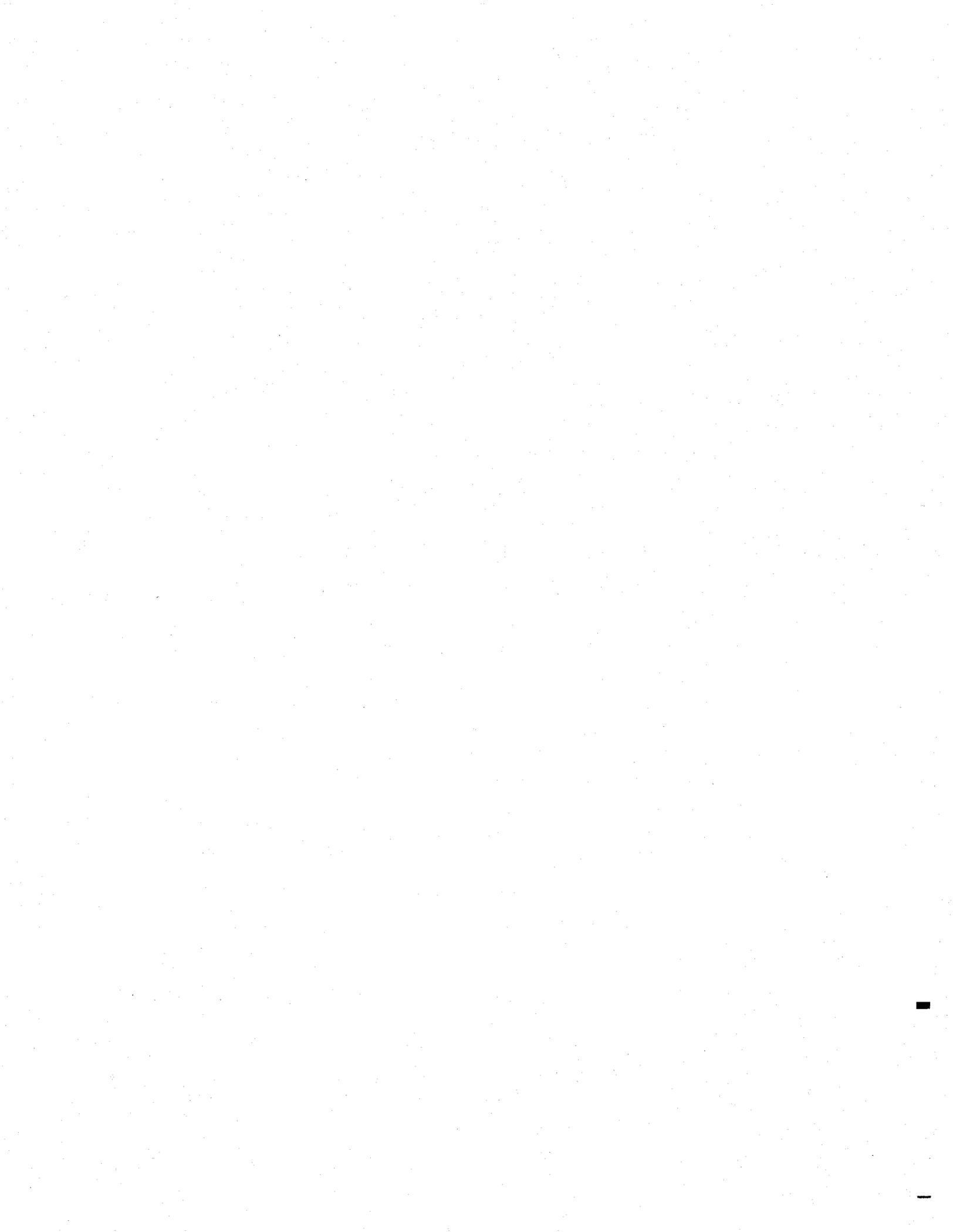
- Insufficient preparation of the planting area, so that soil compaction is not corrected.

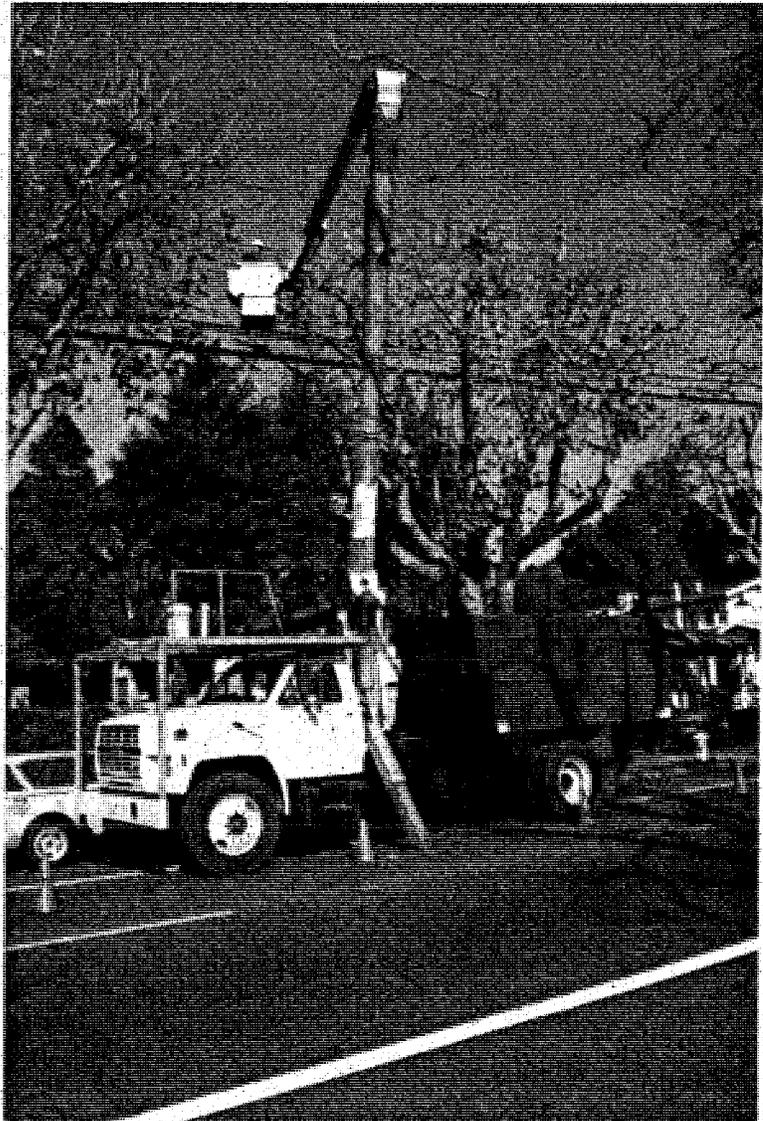
- Crowding of the roots into too small a planting hole.

- Over-watered, soggy soil

- Lack of water

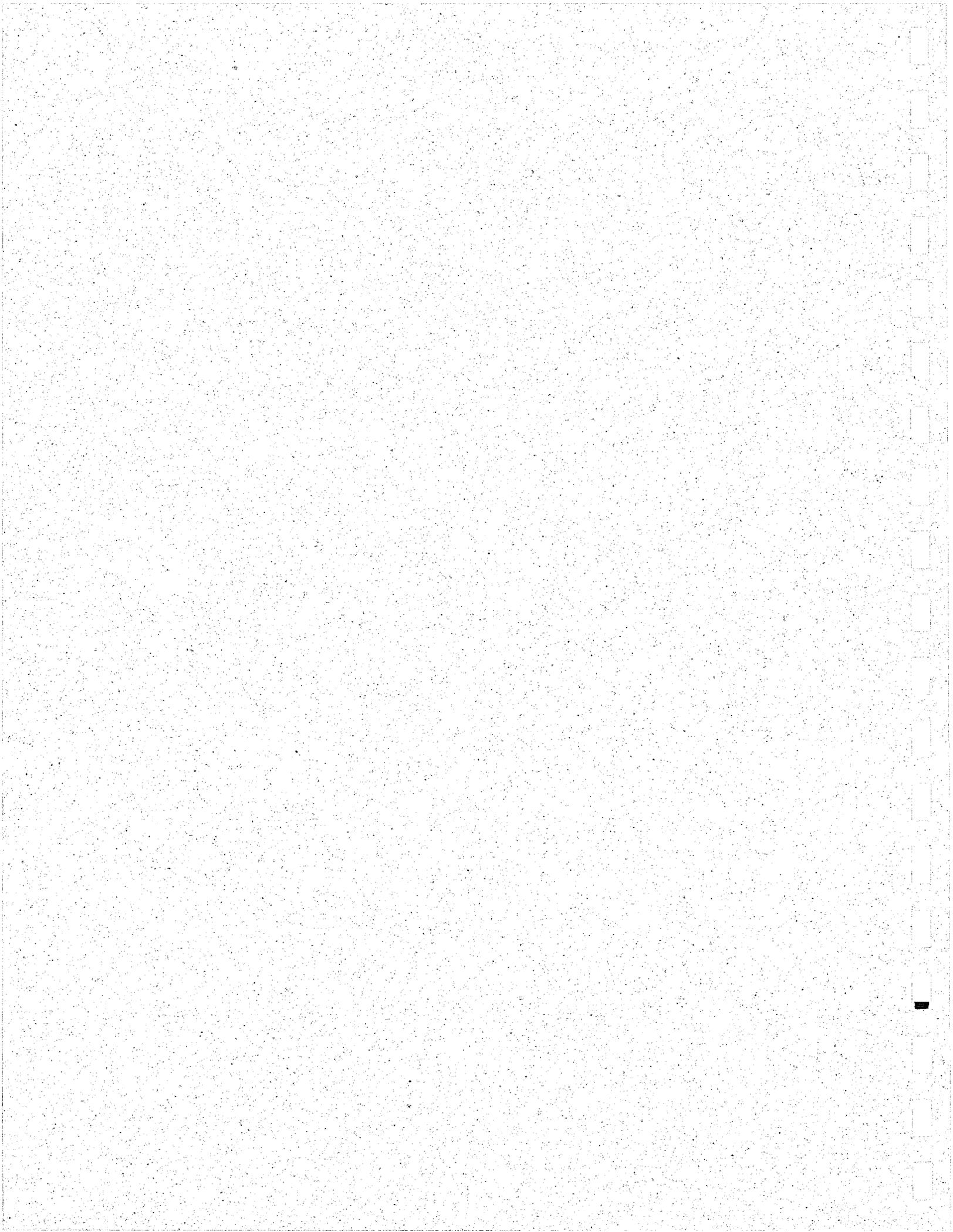
- Failure to check the alkalinity in the soil and to plant an alkaline-tolerant species.





Chapter Two: Maintenance Operations

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CHAPTER TWO: MAINTENANCE OPERATIONS

Planting procedures are just the beginning for healthy tree growth. On-going, regularly scheduled maintenance is as important to the urban forest as location and species selection, and proper planting techniques. Watering, fertilizing, staking, pruning and pest control are all part of a maintenance program. Done properly and regularly, maintenance will contribute to the long range health of the urban forest and minimize long term tree care costs.

The requirements for tree maintenance vary depending on the age and/or status of a tree, categorized as follows:

- Young tree (newly planted to 5 years)
- Mature
- Declining
- Heritage

Section 1. Watering Basics

No absolute rule exists that will tell you precisely how often to water trees. Watering frequency will be influenced by the type of tree, weather conditions, soil type, root competition from other plants, and how well the tree is established.

Plant trees which are compatible with the natural water cycles of this dry central California valley. Most of the trees on the recommended list will survive on normal rainfall once they are established.

Proper tree irrigation creates a root zone that will be moist enough to encourage growth of new roots but not so wet that air is excluded from the soil pore space, which hampers growth. In addition, proper irrigation should encourage deep root penetration that can sustain a tree in dry periods. This also keeps the tree from developing shallow roots which can crack pavement. Infrequent, slowly applied, deep watering is the best way to accomplish these goals. Frequent light sprinklings or surface irrigation, such as turf watering, will discourage deep rooting. Deep watering is facilitated by deep watering tubes installed when planting the tree. A new 15-gallon tree will need to have the soil moistened to a depth of at least 12". This approximates 10 gallons per week during dry months for the first 3 years. A mature tree will need to have the soil moistened to a depth of at least 24" with each irrigation.

Newly installed trees can easily have their root balls dry out, even when the surrounding soil is very wet. Care must be taken to make sure that water is getting to the root ball by making the watering basin of a newly installed tree the same size as the root ball.

As a general rule, clay soils absorb water very slowly. But since clay soils retain water longer, water less frequently than you would in a sandy soil. Let the soil dry between waterings as this allows the soil to take in air as water drains out. The following table explains how soil texture affects water infiltration.

INFILTRATION RATES

Soil Texture	Infiltration Rate (inches/hour)
Sand	1 to 10
Sandy loam	0.5 to 3
Loam	0.3 to 0.8
Clay loam	0.1 to 0.6
Clay	0.01 to 0.4

Using a soil probe to determine the soil moisture content in the root zone is the most effective way to schedule watering. If the soil is wet enough to make a solid, firm ball, the tree should not be watered.

According to the infiltration rate chart, it will take water from 20 to 120 hours to wet a clay loam soil to a depth of one foot (the most important variable is the slope of the soil). Thus the use of watering basins and watering tubes around young trees is very important in order to retain water in place long enough to be absorbed. It is also important to begin irrigating in the spring before the soil has dried out, in order to make use of the reservoir of water from the winter rains. It requires much less irrigating to replace the water lost through a week of evapotranspiration than it does to totally recharge the planting area reservoir.

WATERING FREQUENCY GUIDELINES

These guidelines assume average weather conditions and rainfall.

■ **For the first 2 to 3 weeks after planting:** New trees may require water every 2-4 days, especially in hot weather. In winter, container-grown evergreens need water at least once a month.

AMOUNT OF SOIL MOISTURE

Close to 0% field capacity. Little or no moisture available

50% or less. Approaching time to water. pressure

50-75%. Enough available moisture.

75%. Plenty of available moisture.

At field capacity: Soil is saturated.

Above field capacity: Waterlogged

FEEL OR APPEARANCE OF SOIL

Sandy loam: dry, loose; flows through fingers
Clay loam: Dry clods that break down to powder

Sandy loam: Dry, will not form a ball.
Clay loam: Somewhat crumbly; will hold together with

Sandy loam: Tends to ball under pressure but will seldom hold together
Clay loam: Forms a ball; somewhat plastic; may stick slightly with pressure

Sandy loam: Forms weak ball; breaks easily
Clay loam: Forms a ball, very pliable; may be slick

Sandy loam: When squeezed, moisture is left on hand
Clay loam: Same as sandy loam

Sandy loam: Free water is released after kneading
Clay loam: Can squeeze out fresh water

STATE WATER 'MODEL ORDINANCE'

Due to the current limited supply of water, the State has established an ordinance requiring water use in landscaping that promotes conservation and efficient use of water. The purpose of this Ordinance' is to:

- 1. Promote the values of landscapes while recognizing the need to use water as efficiently as possible. Establish a structure for designing, installing and maintaining water efficient landscapes
- 3. Establish provisions for water management practices and water waste prevention for established landscapes

The method by which the 'Model Ordinance' hopes to achieve this level of water conservation in the landscape is by requiring the submittal of a landscape documentation package for new landscape projects. This package would include the following documentation:

- 1. Water Conservation Concept Statement
- 2. Calculation of the Maximum Water Allowance
- 3. Landscape Design Plan
- 4. Irrigation Design Plan
- 5. Irrigation Schedules
- 6. Maintenance Schedule
- 7. Landscape Irrigation Audits
- 8. Grading Design Plan
- 9. Soils Analysis
- 10. Certification

A city or county may choose to write its own water efficient landscape ordinance using the 'Model Ordinance' as their guideline. The Ordinance' became effective as of January 1993 in cities and counties that do not adopt their own ordinance.

■ **First three years:** 10 gallons per week during dry months

■ **Fourth year and thereafter:** Two waterings during the entire dry season, if needed.

In times of drought, a normal watering program may not be possible, even if the regular program has been a careful, conserving one. It will be most important in these times to give a deep watering at the beginning of the dry season.

Established drought-tolerant trees should be able to survive the dry season with just one watering.

Methods of Watering

It is essential that water reach the root ball of the tree. For any of the following methods, fill the basin (see planting diagram) with water, not the aeration tubes. However, it is acceptable for any overflow water from the basin to drain into the aeration tubes.

- **By hand with a hose:** Insert the hose into the basin. Care should be taken to water long enough to soak the root ball deeply. Flow through the hose should be gentle enough that it does not destroy the watering basin or compact the soil. A mulch helps prevent compaction.

- **With a water truck:** One unit with a one or two person crew can efficiently irrigate many trees. This is the most cost-effective method, since most trees will need only infrequent irrigation once established.

- **Automatic irrigation:** This is expensive to install, and usually results in over-watering. A bubbler head is installed on either side of the tree. If the tree is planted in an area that has sprinkler irrigation, only one bubbler is needed. Bubblers should be on their own valve separate from spray heads. As the tree grows and the root ball expands away from the trunk, the bubblers will eventually be ineffective in watering the feeder roots, which are typically near the dripline of the tree, and should be capped or turned off. Alternatively, a bubbler system may be installed which takes into account the future growth of the tree. Bubblers closer to the trunk are turned off, and those farther out are turned on, as the tree grows. A bubbler system may be cost-effective in areas where an irrigation system is going to be installed for other reasons (for turf, ground cover, or shrubs), or where watering with a water truck is difficult.

- **Manually operated irrigation:** This is similar to an automatic system, but a manually operated valve controls the system. This saves the cost of installing a controller, but labor costs will be higher.

- **Drip irrigation:** Drip irrigation is very conserving of water, and less expensive to install than spray and bubbler systems. It may require more maintenance than bubbler systems. The emitters clog fairly often, so regular inspection of the system and regular cleaning of the filter is impor-

tant. Do not use emitters with a precipitation rate less than one-gallon per hour, as they tend to clog more easily. It is best to use rigid PVC pipe in the system and put multi-emitters on adapters which connect to PVC risers. This is a more effective solution than polyethylene pipe.

Drip irrigation is not practical for lawns or herbaceous ground cover because it does not provide an even enough coverage and requires a greater number of emitters. It is useful for shrubby ground covers, shrubs and trees.

Weeding and cultivating the soil around plants can damage the system. In areas where foot traffic or machinery may be a problem, the emitters need to be installed below ground, with time consuming regular inspection.

On slopes a drip system is often chosen because it will produce the least amount of runoff. Also on slopes there is less danger of damage to the emitters from foot traffic, and so they can be installed above grade, thus being easier to inspect. Emitters on slopes should be installed upslope from the root balls. A drip system can also be effective, since there is little foot traffic there.

It is necessary to change the location and number of emitters as the trees mature, so that water continues to get to the feeder roots around the driplines of the trees. As a tree grows, emitters should be placed so that, at a minimum, an area between the dripline and 3 ft. toward the trunk from the dripline is irrigated (if the tree continues to need irrigation).

SECTION 2: FERTILIZING

Scheduling

- **The First Year:** The first feeding for trees is done when the tree is planted. About 3 ounces of actual nitrogen is needed for the first year. Fertilizer should be a slow release type, Osmocote 18-6-12 or equivalent. In alkaline soils, include iron chelate with the fertilizer.

- **Years Two to Five:** Fertilizing once a year in winter is sufficient.

- **After Five Years:** A fertilizer schedule of one application every five years may be sufficient. Note: "Mature trees need little or no fertilization as long as they exhibit good leaf color and reasonably good color." Harris, 277.

- **During a Drought:** If the watering schedule

is going to be cut back, it is best not to fertilize the trees. New growth stimulated by the fertilizer will need water to survive.

■ **When A Tree Is Weak:** Fertilizing a weak tree can be harmful in some cases, although it may be indicated in others. If there is a pest or disease problem, or any other problem affecting the vigor of the tree other than lack of fertilizer, check with a qualified professional before fertilizing.

How To Apply Fertilizer

For young trees, fertilizer can be spread in the planting basin and watered in thoroughly. The fertilizer can also be split in half, and half of it watered in through a deep watering tube if there is one by the tree. Fertilization is most effective if done in February just prior to bud swell or after the trees leaf out.

For established trees, fertilizing should be done through the deep watering tube (for trees in tree wells), or by drilling small holes in the ground around the tree and applying fertilizer down them (if the soil is exposed). Using a soil auger or sampling tube, make holes 12" to 18" deep, and 3 to 6 ft. apart in a ring in the area around the dripline. One ring of holes should be made for each 2" of trunk caliper. Rings should be 3 to 4 ft. apart. Angle the holes away from the trunk of the tree (Figure 7. Fertilizer Application).

How Much to Apply

The amount of actual nitrogen needed by an established tree is the most important factor.

- Measure the diameter of the trunk at a point 4.5 ft. above the ground.
- The diameter in inches, multiplied by itself, and then divided by 30, equals the pounds of actual nitrogen needed.
- The fertilizer formula, such as 10-6-4, tells the percentages of nitrogen, phosphorous, and potash, respectively, in the fertilizer. For example, a trunk with a diameter of 6" would need 36 [6x6] divided by 30 = 1.2 pounds of nitrogen. If you used a fertilizer with a 10-6-4 formula, you would apply 12 pounds of fertilizer (12 x 10% = 1.2 lbs.).
- A slow release nitrogen source, such as urea, is always preferred because there is less chance of over fertilizing and burning the foliage.

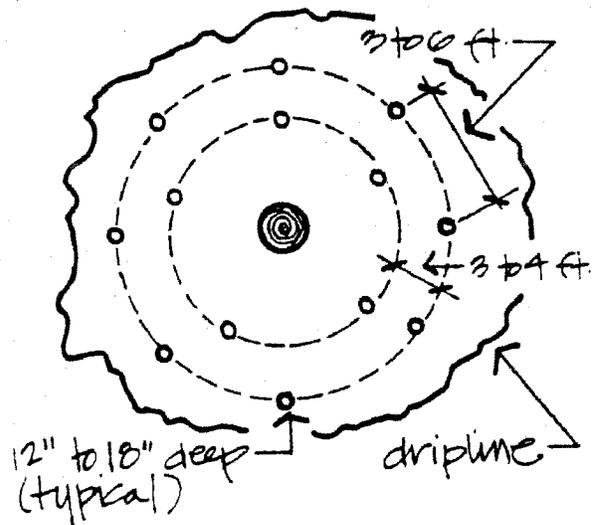


Figure 7. Fertilizer Application

Symptoms of Nutrient Deficiency

Nitrogen: The leaves are yellow-green and small. They have fewer leaves, high fall color, and drop early. Shoots are short, small, and may be reddish to reddish brown. There may be heavy flower bloom.

Phosphorus: Leaves are darker green than usual, and slightly smaller. Veins, petioles, or lower surface may be reddish-purple, especially when young. Shoots are smaller diameter, and bloom is light. In pines, lower needles die.

Potassium: Leaves are crinkled and roll up (older leaves show the problem first). Shoot tips die back late in the season. Lateral buds grow short and bushy, in a zigzag pattern. Herbicide toxicity can also cause these symptoms.

Iron: Leaves are yellow with green veins, showing on young leaves first. Shoots are of small diameter, and can die back if the condition is severe. In Sacramento this may be caused by excessive calcium in the soil (lime induced chlorosis).

Boron: Leaves may be red, bronzed, or scorched, with young leaves showing the problem first. Veins are yellowish. Some species show leaf distortion. New growth dies back. Shoots are zigzag, short, and bushy.

Zinc: Leaves are green with yellow blotches

between the veins. Leaves may have dead spots. Shoots are of small diameter and may have a tuft of leaves at the tips. Twigs may die back.

Sulfur: The entire leaf is pale yellow-green, and may be small in some species.

Magnesium: Thin and brittle leaves which drop early, and look yellow with green veins.

Manganese: Young leaves are yellow with wide green bands along the veins, followed by dead spots.

Symptoms of Excess Minerals In the Soil

Calcium: Leaves develop dead tissue at the tips, and gradually down the margins. It is often accompanied by iron, zinc, and/or manganese deficiency symptoms. Oversupply of calcium combines with iron, zinc, and manganese to make them unavailable to plant roots.

Magnesium: This is usually found when calcium supply is excessive, and the same symptoms are shown.

Boron: The leaves show scorching on the tips and margins. Dark dead spots appear. The condition will look worse at the base of shoots than at the tips. Shoots swell and crack below buds. Excess boron usually occurs together with calcium, magnesium, and sometimes sodium oversupply.

Sodium: Leaves show scorching at the tips and margins.

Chloride: Leaves show scorching at the tips and margins.

SECTION 3: STAKING

- Check stakes and ties to see if they are intact, and if there is any slipping of the ties or girdling of the trunk. Stakes and ties should be checked annually over the first five years. In addition, property owners should be encouraged to check the stake and ties several times throughout the year.

- Ties must be flexible to allow for the trunk of the tree to expand. Ties must not prevent the trunk from being able to move. The tree will develop a much stronger trunk if the trunk is not immobilized. Remove all wire tree ties which may have been used. Replace them with rubber ties if support is still needed. Wire ties should never be used when planting and maintaining trees.

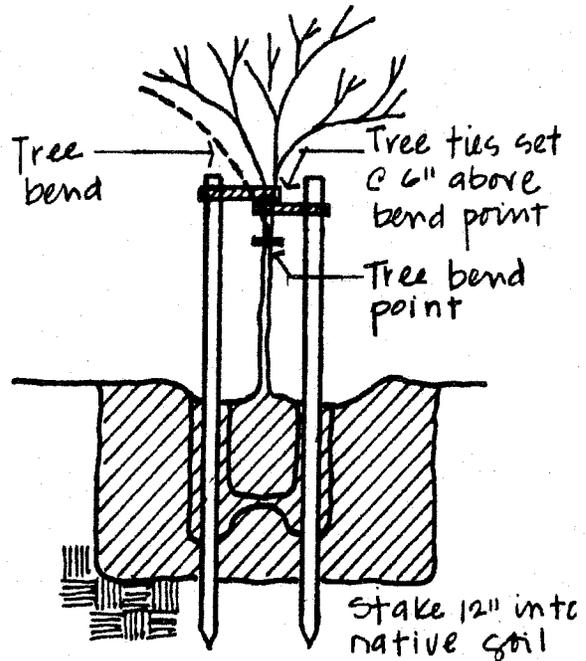


Figure 8. Staking

- Check stakes and ties for possible removal starting at the first year after planting. The stakes should be removed if the tree can stand alone. Auxiliary stakes can usually be removed before the support stakes. In most cases, anchor stakes are unnecessary after the first year. If protection is still needed, the ties can be undone and the anchor stakes left in place.

- Test the tree for its ability to stand without stakes. Grasp the tree 3 to 4 ft. above the ground and move it back and forth at least 12". If the root ball doesn't move but the stem bends, the stake can probably be removed. If the root ball moves, the tree will probably never form a sufficient root system and should be considered for removal. (Figure 8. Staking)

- If trees have blown over they should be replaced rather than salvaged because the root system will have been damaged and will not be able to support a mature tree.

- If trees have pulled out of wet soil without severe damage, they can often be pulled back to an upright position. Thin about one third of the canopy to lighten the weight of the canopy. Anchor the trees.

- Remove stakes and ties when the tree caliper reaches at least 3 inches.

SECTION 4: BASIN CARE

■ **Tree Grates and Paving Materials:** As the tree trunk increases in diameter, it will need a larger opening. Punch out sections of the grate, remove tree well covers or bricks, pavers, etc., as needed to allow adequate trunk space.

■ **Watering Basins:** Usually the basins are needed through the first two growing seasons. If the tree is being watered by a drip system, the basins are only necessary for the initial hand watering at planting time.

■ **Protecting Tree Trunks:** Trees, especially newly planted trees, can be damaged by power weed whips which trim weeds and ground cover right up to the trunk. The trimmer can easily cut the cambium layer of the tree bark and kill the tree. All trees must have trunk protection in sod areas.

Existing trees without headers could benefit from a plastic or rubber tree boot to protect the trunk until the tree is mature, or the soil could be removed and a wood header installed.

■ **Weeding:** Weeds compete with the tree for moisture and nutrients from the soil. It is important to remove all weeds from the basin area. Mulching is the most effective way to discourage weed growth. In cases where weeds are present, hand pulling is the recommended option for removal. In cases where this is not practical, Round-up herbicide may be used as rates specified by manufacturer.

■ **Mulching:** The use of a mulch around the tree is recommended to slow the evaporation of water. Maintaining a 4" layer of shredded bark or bark chips will help retain moisture and discourage weed growth. Mulch should be kept away from the trunk in order to diminish crown rot & fungus damage.

SECTION 5: PRUNING

Pruning is the removal of parts of the tree to protect its health, preserve and enhance its natural form, create and maintain a strong structure, and protect people, property and utilities. In general, a tree should be left to grow into its own natural form. Correct pruning will not destroy the natural form of a tree.

The pruning of trees in the public right-of-way and public service easement is carried out under

City jurisdiction. Contractors performing pruning services must obtain a business license and, as a condition for licensing, must follow the standards set forth in this Manual. For trees on private property that are pruned by the property owner, please refer to the Management Plan chapter on Management for educational and public information materials.

The following are some reasons for pruning.

■ **To train young plants:** Pruning should take advantage of the tree's growth habit, accenting its natural form, seldom modifying its natural form greatly. A few minutes of proper pruning on a young tree can eliminate hours of costly corrective pruning on a mature tree. It is easier and less costly to cut a two-inch diameter branch on a young tree than to wait and have to cut the same branch when it is ten inches in diameter, leaving a space in the tree canopy. Also, when a tree is young, cuts callous over much faster and the likelihood of disease or pest problems at the cut surface are greatly reduced.

■ **To maintain the health and appearance of a tree:** Pruning is used to remove dead, diseased, injured, broken, rubbing and crowded limbs. A dense crown may be thinned lightly to allow for passage of light and air to the interior of the tree and to decrease wind resistance.

■ **To control the size of a tree:** Pruning can reduce shade, interference with utility wires, and prevent obstruction of views and traffic. Safety clearance at signs and corners and pruning of lower branches which obstruct parked cars and street sweepers is particularly important. Choosing a tree that will be an appropriate size for its location will minimize the need for pruning. If a tree must be pruned more than every five to seven years, it is the wrong tree for the location. A tree should not need heading back.

■ **To invigorate a tree:** Pruning the leaf areas and buds is the main way of invigorating a tree. Following pruning, the root system supplies the leaves and buds remaining with more nutrients and water. This results in stimulated shoot growth, larger and greener leaves, and less water transpiration.

■ **To retrain a previously topped tree.**

The following questions should be asked before making pruning decisions (Harris, 1983).

What will the tree do in response to the pruning? Grow taller, or be shorter or narrower? Grow slower or faster? Produce increased new foliage?

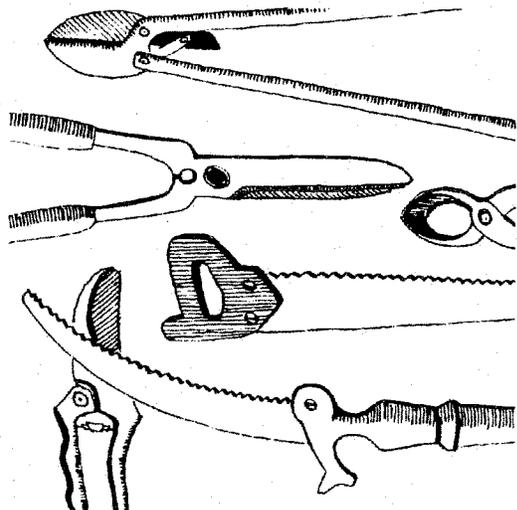
Is the tree healthy enough to respond to the pruning?

Is pruning being done to accentuate the species' natural form and habit?

Is this the time of the year to prune this species?

If the answer to any of the last three questions is "no," do not prune at that time.

Pruning Standards



The latest edition of the Pruning Standards of the Western Chapter of the International Society of Arboriculture (ISA) will serve as the City's specifications manual. The 1988 standards, reproduced here with adaptations, are presented as general working guidelines. The tree pruner will sometimes have to vary slightly from these rules, since individual trees may have unique needs.

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

- Large or heavy cut branches should be lowered on ropes or thrown clear to prevent injury to personnel, the tree, or other property.

- Pruning tools should be kept sharp and rust-

free. When pruning diseased branches, the pruning blade should be dipped in a disinfectant after each cut. A 10% chlorine bleach solution is often used.

- Wound dressings and tree paints have not been shown to be effective in preventing or reducing decay. They are therefore not recommended.

- When pruning a limb which is more than 1" in diameter at the point of the cut, use a three step cutting method to prevent splitting of wood and bark. First make an undercut about six inches away from the branch collar, and then cut the limb off an inch or two farther out from the trunk. Finish by trimming the branch stub just outside the branch collar.

Order of Tasks

- Pruning should start at the top of the tree and proceed downward.

- Remove broken and diseased limbs first.

- Then remove crossing branches and those which grow towards the center of the tree, or which otherwise interfere with the tree's shape and growth, including water sprouts.

- Finally, thin the remaining branches if needed. Root suckers should also be removed at each pruning.

Climbing Techniques

Pruning large trees is a dangerous, specialized task, and requires experience and care if injury to workers, the public, and damage to property are to be avoided. Pruning should always be performed under the supervision of a qualified tree specialist. Tree climbers are encouraged to have an ISA Climber's Certificate and are required to have had on-the-job rope training.

- Climbing and pruning practices should not injure the tree.

- As a general practice, climbing spurs or gaffs are not recommended when pruning, except in the following instances:

1. The branches are more than throw-line distance apart. In such cases, it is recommended that the spurs be removed once the climber is tied in;

2. To reach an injured climber and when removing a tree;
3. At the discretion of the City Arborist in instances where the tree health can be protected (e.g., spur sterilization and skilled use of the spurs) while still maintaining the worker's safety.

Pruning Methods

There are two basic methods of pruning, thinning or heading back. Thinning is the removal of a branch at its point of attachment to the trunk or shortening it to a large lateral branch. Heading back is the shortening of a branch back to a bud or stub.

Thinning, which opens up a tree canopy, is almost always the preferred method of pruning. (Figure 9. Thinning and Heading). Heading back, which stimulates denser growth, should only rarely be used on mature trees.

A form of heading back called stub cut pruning is the removal of branch wood back to stubs (this has often been done, for example, when pruning under utility lines). This is also called topping when used to lower the height of the tree. Stub-cut pruning or topping can cause damage to the tree which is sometimes irreparable, and should not be used. Overthinning can also cause irreparable damage.

Thinning Cuts

- A thinning cut removes a branch at its point

of attachment or shortens it to a lateral branch at least one-half the diameter of the branch which is removed (a 4" diameter branch cut back to a 2"+ diameter branch). Thinning opens the canopy of the 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 central vertical stem of a tree), the lateral to which it is cut should be at least one-half the diameter of the cut being made. Removal of a branch or leader back to a sufficiently large lateral is often called "drop crotching."

The following description of how to make thinning cuts is adapted from Dr. Alex Shigo's research, and the method is called "natural target pruning" because the tree provides visible targets that can be used to locate the appropriate place to make the cut. These targets are the branch bark ridge and the branch collar. The branch bark ridge is a raised ridge on the trunk which begins at the crotch formed between the trunk and the branch. The branch collar is the slightly swollen area at the base of the branch. (Figure 9a. Natural Target Pruning). This is a concept under scientific review; final cut should conform to the most recently accepted arboriculture research conclusions.

- 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. If no collar is visible, the angle of the cut

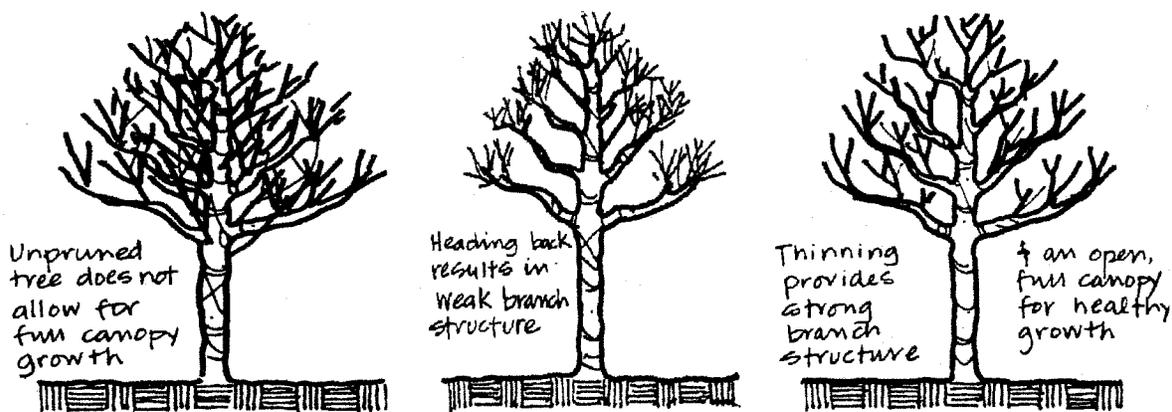


Figure 9. Unpruned, Headed Back and Properly Thinned Trees

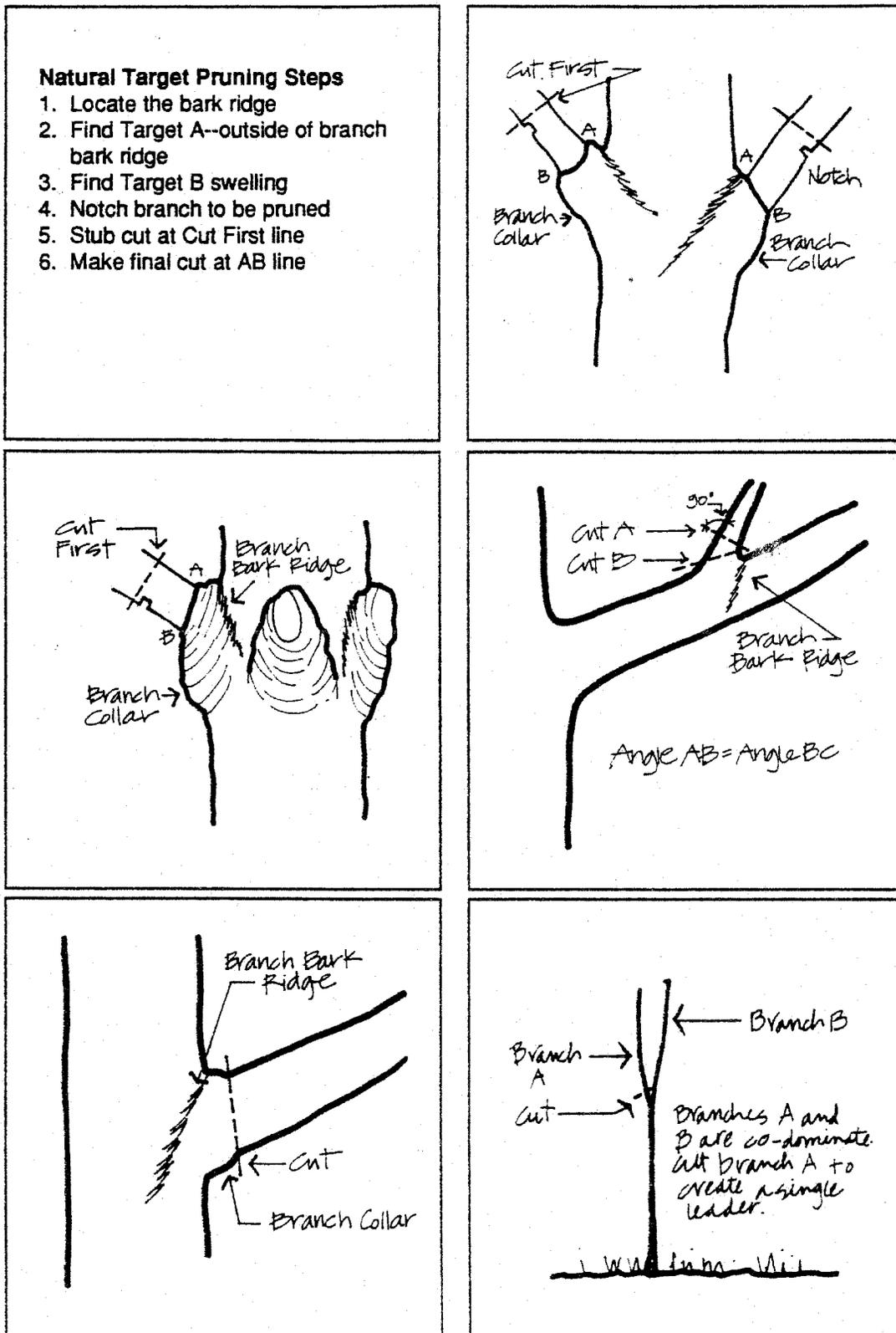


Figure 9a. Natural Target Pruning

should approximate the angle formed by the branch bark ridge and the trunk.

- When removing a dead branch, the final cut should be made outside the collar of live callus tissue. If the collar has grown out along the branch stub, only the dead stub should be removed. The live collar should remain intact and uninjured.

- When a tree has more than one major limb of roughly equal size (co-dominance) thin the foliage of one limb (choose the one which is slightly smaller) to slow its growth and develop a stronger branch attachment. If a limb is more than three-quarters the size of the parent limb, it is said to be co-dominant.

- When thinning a limb back to a large lateral branch, the final cut should be made just beyond the branch bark ridge. The cut should approximately bisect the angle formed by the branch bark ridge and an imaginary line perpendicular to the branch being cut.

Heading Back

A heading cut removes a branch to a stub, a bud or a lateral branch not large enough to assume the terminal role. Heading cuts should seldom be used because vigorous, weakly attached upright sprouts are forced just below such cuts, and the tree's natural form is altered. If weakly attached sprouts are allowed to mature, they become limbs which have a high potential for breaking. In some situations, branch stubs die or produce only weak sprouts. Often these sprouts produce structurally weak branches. Heading back is allowed only under special conditions as approved by the Tree Services staff.

Size of Pruning Cut

Each type of pruning can be done to different levels of 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 Five Tree Groups

The trees in Sacramento fall into one of five groups. These categories form a convenient framework around which a maintenance schedule can be designed for Sacramento. The tasks deal generally with timing required to create a branch structure, prune the temporary skirt, and, later in

the tree's life, promote maximum size and mass of a healthy, structurally sound tree.

Group 1: Round-headed trees (slow to moderate growth rate) Examples: *Cinnamomum camphora*, *Pistacia chinensis*, *Podocarpus gracilior*, *Pyrus calleryana* 'Aristocrat', *Quercus agrifolia*.

Group 2: Round to oval upright (very fast growth rate) Examples: *Eucalyptus* species, *Fraxinus uhdei*.

Group 3: Deciduous pyramidal. Examples: *Acer rubrum* 'Armstrong', *Liquidambar styraciflua*.

Group 4: Vase-shaped. Examples: *Celtis australis*, *Ulmus americana*, *Zelkova serrata*.

Group 5: Conifers and conifer-like. Examples: *Pinus*, *Cedrus*, *Casuarina*.

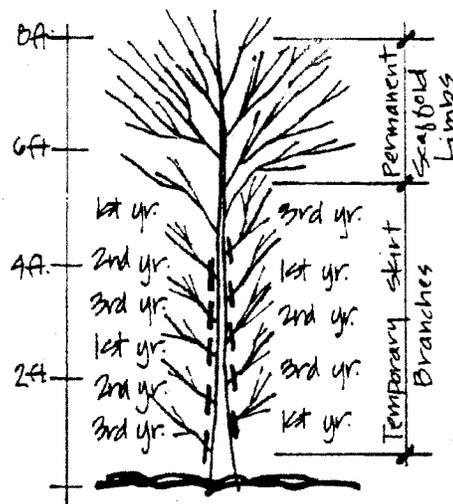
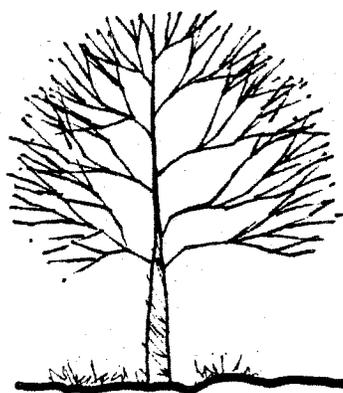


Figure 10. Skirt Branches



Group One: Round Headed Trees

At planting time:

- Remove one-third of the branches in the skirt. (The skirt is the group of branches between ground level and the permanent scaffold branches. These temporary branches feed the tree and speed the growth rate of the tree (Figure 10. Skirt Branches). Select the largest diameter of these to remove (the larger the branch, the more competition with the leader for nutrients).

Leave the balance distributed up and down and around the trunk, and shorten by about 10% of their length, pruning to buds or laterals facing outward from the trunk. This step is essential to proper health and development of the tree.

- Remove or reduce by 50% any branches challenging the leader.

At 2 years:

- Remove half of the remaining branches in the skirt.

- Begin to select the main scaffold limbs, remove competing limbs, and thin the remaining crown up to 20%.

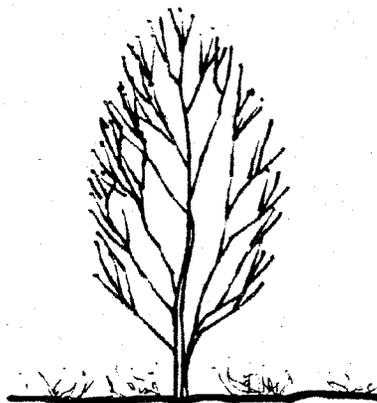
At 3 years:

- Remove the remaining branches in the skirt.

Every 5 to 8 years thereafter:

- Perform crown cleaning or thinning as needed.

- Eventually prune to the legal clearance of 14 feet over street and 8 feet over sidewalk).



Group Two: Round to Oval Upright Trees

At planting time:

- Remove one-third of the branches in the skirt between the permanent branches and the soil. Select the largest diameter of these to remove. Leave the balance distributed up and down and around the trunk, and shorten by about 10% of their length, pruning back to outward-facing buds or laterals.

- Select the main scaffold limbs and remove competing limbs, including any branches challenging the leader.

- Thin balance of crown up to 10% of remaining foliage.

At 1 year:

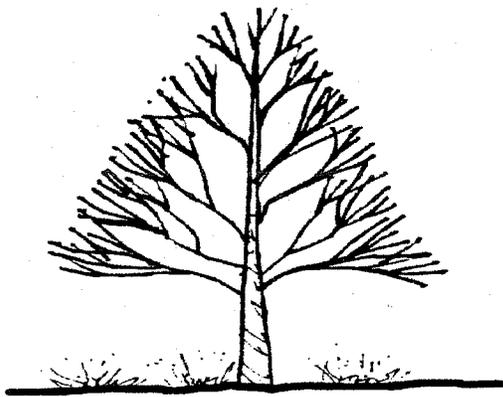
- Remove half of the remaining branches in the skirt to diminish competition with the crown while still promoting caliper growth of the trunk.

- Remove limbs which compete with the main scaffold branches. Branches should be spaced evenly around the trunk, and at least 8" to 12" apart. At 2 years

- Remove the remaining branches in the skirt.

At 2 years and every 5 years thereafter:

- Perform crown cleaning or thinning as needed.



Group Three: Deciduous Pyramidal Trees

At planting time

- Remove one-quarter of the side branches over the full height of the tree. Select the largest diameter branches to remove, leaving the balance well distributed up and down the trunk.

- Remove or reduce by three-quarters any branches competing with the leader.

- Shorten the remaining branches by 10% of their length, pruning back to outward-facing buds or laterals.

At 2 years:

- Remove or reduce branches which compete with the leader.

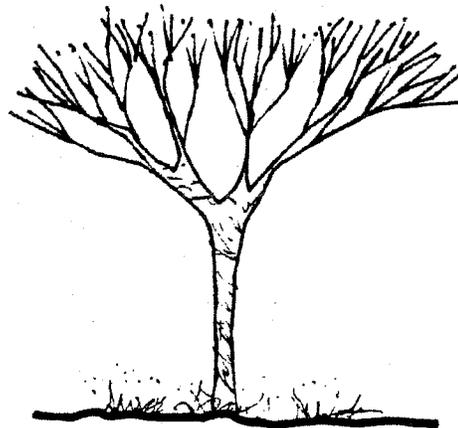
- Shorten the remaining branches by 10%, and shorten limbs which protrude beyond the canopy. Prune back to outward-facing laterals.

At 3 years:

- Remove one-third of the branches in the lower skirt up to the height that will be needed to allow vehicle and pedestrian clearance. Shorten the remaining branches up to this height by 20% of their length.

At 4 to 5 years, and thereafter as needed:

- Remove branches as needed for clearance.



Group Four: Vase Shaped Trees

At planting time

- Select the main scaffold branches, which will all be clustered near one point on the trunk. Remove up to one-third of the main branches, leaving scaffold branches distributed as far apart as possible.

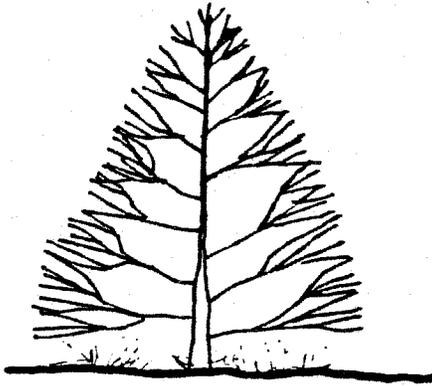
- Shorten branches in the skirt of the tree by 10% of their length. Remove any branches in the skirt which are 50% of the diameter of the trunk or greater.

At 2 years

- Remove half of the remaining branches on the trunk. Remove any crossing limbs.

At 4 years, and every 5 years thereafter:

- Perform crown cleaning or thinning as needed.



Group Five: Conifer and Conifer-Like Trees

At planting time:

- Shorten the side branches by 10% of their length.

At 1 year:

- Remove one-third of the branches over the entire height of the tree if increased height is the goal. Select the largest diameter branches to remove, leaving the remainder evenly distributed along the trunk.

- Shorten the remaining branches by 10% of their length.

At 2 to 3 years, and every 5 years thereafter:

- Conifers do not respond well to heavy pruning. Mature wood will not develop any new needles. Shears or saws can be used on immature growth when the candles have hardened, about six weeks after they have started to elongate in the spring. The central leader on a branch should never be removed, but can be shortened about halfway to keep the distance down between laterals on the branch. Make the cut at an angle, so one of the new buds will dominate.

Pruning Techniques for Young Trees

Prune young trees to keep the tree's growth in balance, to establish a strong scaffold structure (the framework of the trunk and major limbs), and to maintain a dominant leader.

- Branches forming the scaffold should be well spaced and crotches should be wide-angled. Narrow crotches are usually weak and may split out as the tree matures. (In a narrow crotch, more bark can be embedded between the branch and trunk, reducing the proportion of connective wood.)

- Remove crossing and interfering branches, water sprouts (vertical shoots growing from the trunk or main branches) dead and diseased branches, and root suckers (vertical shoots growing from the rootstock).

Pruning Techniques for Mature Trees

These recommendations apply to all of the five tree groups previously described.

Crown cleaning or cleaning out is the removal of dead, dying, diseased, crowded, weakly attached, and low-vigor branches and watersprouts from a tree crown. This should not include removal of live branches other than those mentioned. If there is a problem with sunscald, or with a hole in the canopy because of poor pruning in the past, some watersprouts may be left on the tree to provide shade.

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 provides wind passage through the crown and the weight of heavy limbs. It can emphasize the structural beauty of the trunk and branches as well as improve growth of plants beneath the tree by increasing light penetration.

Crown thinning is the most important pruning procedure in the development of the structure of a young tree, and in the maintenance of a mature tree. The amount of live wood removed depends on the species and the vigor of the tree. It is important at all stages to avoid leaving gaps in the perimeter canopy, to keep a well formed tree and to avoid sun scald on interior branches.

■ Although a young vigorous tree can have as much as 35% of its foliage removed as the scaffold structure is being established, when thinning the crown of mature trees, no more than one-third of the live foliage should be removed.

■ At least half of the foliage should be on branches in the lower two-thirds of the trees.

■ Avoid the practice of removing all interior branches when thinning. Thin lateral branches selectively and evenly throughout the interior of the canopy. Pruning this way will distribute stress more evenly throughout the tree.

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

■ A goal of structural pruning is to maintain the diameter of lateral branches at less than three-fourths the diameter of the branch or trunk to which they are attached. If the branch is co-dominant or nearly the size of the parent branch, thin the branch's foliage by 15% to 25%, particularly near the terminal. Thin the parent branch much 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 may need to be shortened to a large lateral or be completely removed.

■ On large-growing trees, except whorl-branching conifers (such as pines which have branches growing from the same joint on a limb) branches that are more than one-third the diameter of the trunk should be spaced along the trunk at least 18" apart, on center. If this is not possible because of the size of the tree, such branches should have their foliage thinned 15% to 25%, particularly near their terminals, and/or be shortened.

Crown Reduction

Crown reduction is the reduction of the height and/or spread of a tree. Since one of the City of Sacramento's goals is to provide shade canopy, it should be done only as necessary for safety. Crown reduction may be needed when trees interfere with power lines or with other nearby trees. SMUD'S top three objectives for utility line

clearance tree trimming are: customer safety, continuity of power, and to leave trees in the best possible condition after trimming. Before resorting to crown reduction, it is recommended that crown thinning be explored. For some of the lower voltage lines, it may also be possible to window through or work with the natural form of the 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. Conifers do not respond well to crown reduction. If thinning is not possible, then removal may be a better solution than crown reduction. Stub cuts must be avoided in utility line clearance. Thinning cuts will not stimulate as many vertical shoots as stub cuts, and trees will not have to be pruned as often.

■ Crown reduction is most often used for extremely vigorous species such as *Fraxinus uhdei*. This particular species may not produce side branches which can be easily thinned. The tree will produce 4 to 8 ft. long shoots annually, which will need to be headed back in order to effect a crown reduction. Without this pruning the tree will develop a weak structure composed of many long vertical shoots.

■ This procedure is used on less vigorous species such as oaks when individual limbs produce heavy, vigorous branch ends beyond the canopy. It is critical in this case that the cut be made to a side branch of at least half the diameter of the limb being removed (a 4" diameter limb is cut back to at least a 2" branch).

■ With *Eucalyptus* species which have not been previously stub cut, a well formed crown which does not need frequent re-pruning can be created.

Crown Restoration

Crown restoration is the rehabilitation of the structure and appearance of trees that have been topped or severely pruned using heading cuts. Restoration may require several prunings over a number of years.

■ 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.

Crown Raising

Crown raising removes the lower branches of a tree in order to provide clearance for buildings, vehicles, pedestrians, and vistas. The legal limit for clearance is a minimum 14 feet. At the City Arborist's discretion, small trees may be exempted for this limit.

■ 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 insure a well formed, tapered structure and to uniformly distribute stress within the tree. Short side branches may have to be retained temporarily during crown raising.

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

Root Pruning

Root pruning may be needed when trees lift sidewalks and other pavement, destroying hardscape and utilities. Determine when root pruning can be safely done without injuring the tree. Some cases may require removal of the tree. The decision is based on the vigor of the specimen, the proportion of roots which will be cut, and the particular species involved.

Guidelines For Root Pruning

■ A general rule to follow for root pruning is to take the diameter of the trunk 12" above ground, and multiply by seven. This will tell you how close to the tree you can prune. Measure the distance from the face (outside) of the trunk, not the center of the trunk. (Figure 11. Root Pruning).

■ When root pruning is done to trees over 8" in caliper, prune only one-quarter of the tree each year.

■ When a tree 12" in caliper or larger is in a 3 to 4 ft. square cutout, root cutting on all sides in the same year may cause the tree to decline and may reduce its stability. Cutting one side per year for four successive years is a safer procedure. At most, two sides could be cut each winter for two years. If a decision is made to cut all four sides at once, monthly deep waterings for several months should precede the root pruning.

■ If several roots of more than 3" diameter must be cut, removal of the tree should be evaluated.

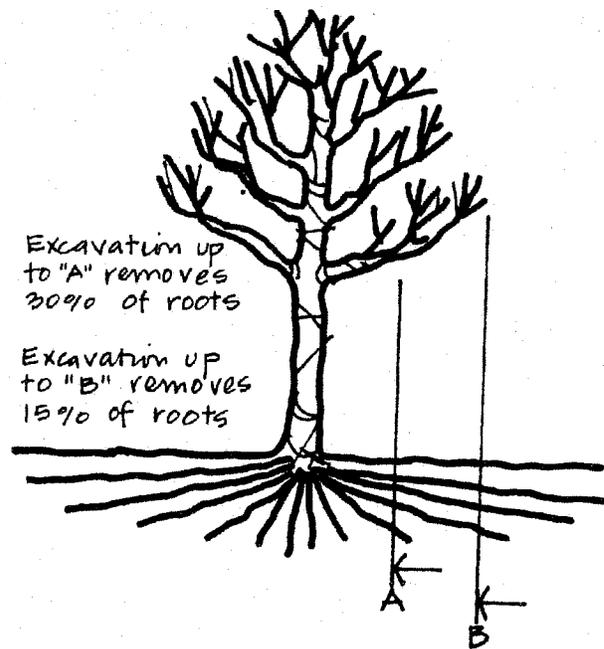


Figure 11. Root Pruning

Trees Which Are Intolerant of Root Pruning

Certain species are intolerant of severe root pruning, which may cause these trees to decline within 3 to 5 years after pruning.

As recommended by Barrie Coate, only very minor root pruning is recommended for the following trees:

Minor
<i>Cinnamomum camphora</i>
<i>Eucalyptus globulus</i> (if trunk is greater than 18" in diameter)
<i>Fraxinus velutina glabra</i>
<i>Liriodendron tulipifera</i>
Moderate
<i>Liquidambar styraciflua</i>
<i>Magnolia grandiflora</i>
<i>Tilia</i> sp.
<i>Ulmus americana</i>
<i>Zelkova serrata</i>

Pruning Techniques - Declining Trees

Trees which have entered a stage of maturity in which there is declining vigor and reduction in annual shoot growth should be pruned somewhat more conservatively than other full grown trees. In any given year, the maximum amount of foliage removed should not exceed 20% of the tree. Avoid limb cuts of more than 8" in diameter if possible.

since healing is slower in these trees.

Cabling and Bracing

Even when trees are properly trained, maintained and pruned, they may develop weak or poor structure and require special care. Horizontal branches, branches weakened by decay or storms, and branches of equal size arising from the same level on the trunk can all create structural problems. Cabling involves attaching a flexible steel cable between branches to limit motion of the limbs. Bracing uses bolts or threaded rods to secure split crotches, trunks or branches, and hold rubbing limbs together or apart.

Cabling or bracing should be undertaken under the direction of a certified arborist. An assessment of the value of the tree and the cost of the work should first be undertaken to determine if the tree is worth the effort. Only trees with heritage tree status or with special value would typically be considered for this special care. However, not all heritage trees would warrant this protection: while cabling and bracing may prolong a tree's life, it does not necessarily reduce the hazard risks. The risk factors must be weighed along with the value and cost of work before deciding to provide cabling and bracing or to remove.

SECTION 6: TREE WOUNDS

Improper pruning or branch breakage may result in branch stubs which do not callus properly and develop wound wood. Wind breakage, maintenance equipment such as lawn mowers, nailing signs to trees, and repeated trunk injection of pesticides may cause trunk wounds which do not close easily. In these cases a cavity may form in the trunk or branch as a result of decay organisms entering the wood. The cavity may weaken the tree structurally, serves as a breeding place for insects, and may reduce the vigor of the tree. In an old tree decay may progress rapidly enough to be a serious threat to the tree.

- Remove dead and loose bark from around the wound with a sharp knife. Leave live attached bark, and form a clean smooth surface of healthy wood and bark.

- Trace loose bark from around wound; do not use nails.

- Trim branch stubs back to the branch collar, leaving the collar intact.

- Proper watering and fertilizing will promote wound closing.

- If the bark is sunburned, it will blister, crack, dry, and peel away from the wood. Carefully remove loose bark with a knife. Paint the wounded bark with light gray latex paint to reflect sunlight. This condition most often occurs when newly installed trees' root balls are not properly watered, resulting in reduced sap flow and decreased resistance to sunscald.

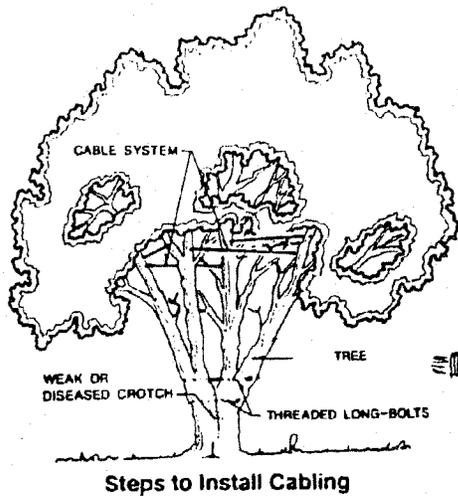
SECTION 7: HAZARDOUS TREE

ASSESSMENT AND TREE REMOVAL

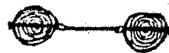
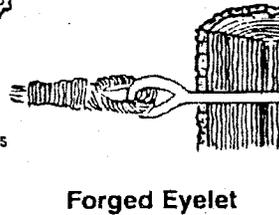
Hazardous Tree Assessment

Each time tree maintenance is performed, personnel should carry out an overall check for hazardous conditions. The Tree Services Section inspector should evaluate a potentially hazardous tree by using the [Guide of Evaluating Tree Condition](#) (Appendix 5.) for public trees. Property owners can evaluate nuisance trees by following the [Nuisance Tree Evaluation](#) (Appendix 6.) These evaluations consider the tree condition, its potential for hitting a target (i.e., person or property), and its intrinsic value as a heritage tree.

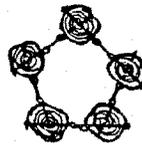
Heritage trees as defined in the Management Plan (see Chapter 2) warrant special protection and should be evaluated for the feasibility of undertaking stability measures such as cabling and bracing. Where cabling is not warranted, tree removal may be required to correct hazardous conditions. Heritage trees will eventually reach a condition where removal will be required.



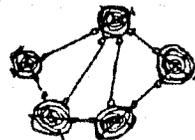
1. Select proper cabling system (i.e. one or more cables) to support weak branching and to minimize twisting.
2. Position cable attachments so as to combine support with flexibility.
3. Attach cables to limbs at 2/3 of their length from crotch. Take care to attach all branches at about the same distance.
4. Attach cables as high as possible on the main supporting branches at about a 45 degree angle.
5. Use drop forged bolts for maximum strength.
6. Use large round or oval washers or amon nuts on threaded bolt ends.
7. Use braided cable with thimbles.
8. Tighten cables securely to eyelets which have been tightened so as to almost touch the bark. Attach only one cable to each eyebolt.
9. Countersink nuts and washers to the cambium layer.
10. Allow some slack to the cable so as to provide for the branches to move with the wind.



Cabling System A



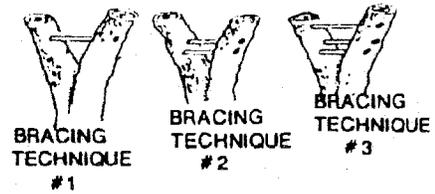
Cabling System B



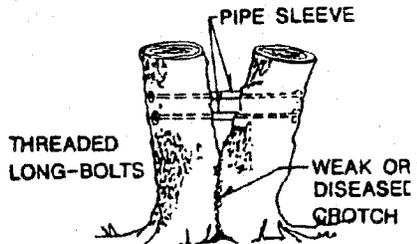
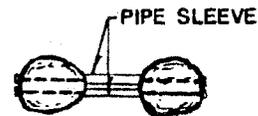
Cabling System C

Bracing of Weak or Damaged Crotches

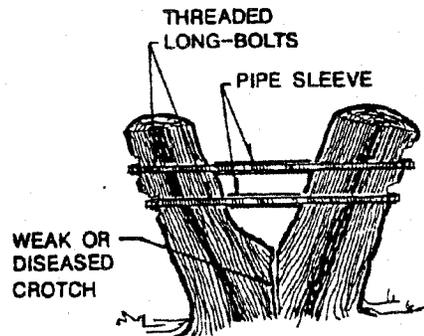
1. Center Holes on trunk.
2. When two rods are used, place just above the crotch and parallel to each other, separate from each other approximately the limb or trunk radius, but no closer than 5 inches. A third rod may be placed just below the crotch.
3. Use self threaded rods. Drill a hole one sixteenth inch smaller than the rod diameter.
4. Counter sink bolt ends to the cambium layer. Install tightly fitting sleeves on exposed rods.



Bracing Techniques



Partial Elevation



Section

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Figure 12. Tree Cabling and Bracing

Checklist for Hazards

- Thinning out foliage and/or branches
- Faults in the branch structure (poor branch attachments, poor spacing of major branches, many water sprouts or suckers)
- Cavities in the trunk or major branches
- Decay in major branches
- Old pruning wounds that haven't closed
- Insect infestation
- Fungus infection
- Cracks in the bark (indicating dead cambium)
- Evidence of hollowness (tap with a wooden mallet) or use a shigometer or increment borer
- Cankers at the root flare or on large roots
- Dead vascular tissue at the root flare or on large roots
- Decay at the root flare or on large roots or conks
- Available targets in the form of people or property

Public Process for Tree Removal

■ Respond to inquiry or field crew observation of a potential hazard tree.

■ Conduct an evaluation of the tree with the Guide for Evaluating Tree Condition

■ If the evaluation recommends removal notify interested parties at least 30 days prior to removal by:

- 1) Letter of notification to property owner
- 2) Door hanger notification to surrounding residences
- 3) Publication of removal lists in the local newspapers

■ If the removal meets opposition that can not be resolved, hold a hearing with Parks and Community Services Director.

■ In the event a tree removal can not be resolved, the action may be referred to the Tree Advisory Committee and then to City Council for final resolution.

Guidelines for Removal of Trees

- For limb and Branch Removal
- Work from the bottom of the tree up to avoid tree limb hang-ups (trimming work is from the top down).

- Remove suckers and small branches.
- Remove larger limbs (any limbs which cannot be safely dropped to the ground) in sections of 6 ft. maximum length. Remove dead limbs first. Leave 12" stubs on tree to facilitate climbing.
- Lower limbs to the ground with ropes to minimize damage to understory plants and property.
- Remove the trunk in sections small enough to be lowered by ropes.
- Cut the trunk and all limbs over 4" in diameter into firewood length. To increase efficiency leave wood in random lengths for wood processor to cut to desired lengths.
- Chip all remaining vegetation into mulch.
- Deliver firewood and mulch to the City yard, or to a designated location.

1. Eucalyptus and elm wood must be handled differently because of insect problems.

2. Eucalyptus is subject to special handling if infected with the long horn beetle which is not currently found in Sacramento.

3. All infected wood is to be chipped, buried, burned or tarped.

4. Tarp with 6 mil thick clear plastic, and leave stored for at least 6 months.

5. Elm wood is subject to DED quarantine requirements and transportation regulations under the California Department of Forestry jurisdiction. It is illegal to transport elm wood into or through quarantined areas.

Stump Removal In Urban Areas

Stumps should be ground out or pulled out even if they aren't in the way of replanting. They provide sites for insect infestations and fungus infections, particularly the fungus *Armillaria mellea* (honey mushroom fungus). Pine stumps are also attractive to the pine bark beetle, and the California turpentine beetle. Eucalyptus stumps can harbor eucalyptus longhorn beetle. These infestations can spread to nearby live trees. For large stumps such as Eucalyptus which can resprout, if grinding is not practical, frill cut around the circumference of the stump and treat with glyphosate (Roundup). However, if a stump is located in a grove of trees of the same species (or even the same genus in the case of poplars,

alders or willows), a herbicide should not be used since the chemical will move through root grafts to nearby trees.

Remove stumps to a depth of 18" for most trees. Holes should be immediately backfilled with clean soil and replanted as soon as practical.

Fallen Trees In Natural Areas

Tree decay is an important part of the life cycle of natural areas. Decaying trees provide wildlife habitats and are a vital part in the regeneration of many plant species. If a tree has fallen in a natural area, do not remove it unless it creates a hazardous condition.

SECTION 8: PEST CONTROL



Most pests are attracted to weakened trees more quickly than to trees in optimum health. For this reason, the most effective pest and disease control measures involve keeping the trees in top health. When a problem is caused by an adverse environmental condition, chemically treating the disease or pest condition will not prevent its recurrence, but will be symptomatic treatment only.

Trees should be chosen for the soils and climatic conditions they prefer. Good watering, fertilizing and pruning programs will help a tree stay healthy. Soils which are too wet or too dry, over-shaded trees, or trees which have been excessively pruned are all examples of conditions which can lead to disease problems, due to weakened vigor

and increased susceptibility of the tree. For example, *Pyrus kawakamii*, if grown in a constantly wet soil, will be very susceptible to fungal leaf spot.

Integrated Pest Management

Sacramento currently monitors for pest levels and practices integrated pest management (IPM). IPM uses a proactive maintenance program combined with a good system of monitoring and record keeping as the first line of defense against pests. Biological controls and relatively safe chemicals are then considered for use, often in combination, with stronger chemicals being a last resort.

When there is a minimal level of infestation or disease, it is often not enough of a problem to warrant treatment. In some cases the pests will disappear on their own. For example, maple aphids will disappear in late May. In some cases, however, such as plum leaf aphids, it is known that a minimal infestation is likely to expand rapidly.

As the name implies, IPM uses combination of maintenance and control measures to forestall the use of chemicals, while trying to correct the underlying environmental problems. Important factors in the success of an IPM program include:

- Knowledge of the existing site, with its typical vegetation and prevalent problems.
- Planting vegetation best suited to the site.
- Having an active monitoring program
- Proactive maintenance to keep plants in vigorous condition.
- A control and sanitation program when necessary.
- Adequate record keeping.

Integrated pest management may have a higher initial cost than just using a spraying program, but in the long term it is often cost-effective, and results in healthier trees and wildlife and lower spraying costs. Frequent spraying can result in a chemical dependent situation, where an insect comes back stronger than it was before. Increasing doses and frequency of spraying are then needed for control of the pest. For example, pesticides which kill aphids also kill aphid predators. Since aphids reproduce more quickly than their predators, when they return to the tree, their

natural enemies will be gone, and they may also become resistant to the pesticide. The following lists some non-toxic methods used in the IPM method.

Non-toxic Insect Controls

- Biological controls: lacewing larvae, ladybugs. Useful for aphids. Lacewings are effective against mites.

- Mechanical controls: Tanglefoot tree barrier. Can keep ants from carrying aphids onto a tree.

- *Bacillus thuringiensis* (Thuricide, Dipel, Biotrol): Effective against various caterpillars, including red hump caterpillar.

- Insecticidal soap (Safer's): Effective against aphids, whiteflies, scale crawlers, cottony cushion scale, leafhoppers, others.

- Oil spray (Some trees are sensitive to oil sprays, including maples): Effective against scale, mites and aphids. Usually applied in the winter to deciduous trees, when it kills eggs overwintering on the trees. Can be used in the summer in a more dilute form.

Chemical Insect Controls

Any planned use of chemicals registered as "Restricted" must be reported to the Sacramento County Agricultural Commissioner's office. In

California such chemicals require a permit for their use. This list is not intended to be a complete list of available controls, but is selected for the various problems most likely to appear in Sacramento. Recommendations for each specific situation in the field can only be made by a Licensed Pest Control Applicator (LPCA). The directions on the product label must be followed strictly. All City personnel should be trained in safe use of chemicals. Certain chemicals used by the Tree Services Section, such as the Bidrin injection program require specific permits, training and disposal procedures. (The specifications for Bidrin use are listed in the Appendix.) Clothing and apparatus for respiratory, eye and skin protection should be used. Spraying operations should be performed when there is no wind, and at times when the site is not being used by the public.

Chemical controls that are currently available for landscape use are listed below and grouped into categories by frequency of use in Sacramento. Each chemical lists a LD-50 rating number, which is the number of milligrams of chemical per kilogram of body weight needed to cause death in 50% of laboratory animals tested. The larger the number, the safer the chemical. This list requires periodic review and updating by the Licensed Pest Control Applicator to comply with state regulations and to keep abreast of new products available for use.

Frequently used in Sacramento

- Bidrin (Inject-A-Cide) LD-50=13.5. An organo-phosphate used by injection to control elm leaf beetle and drip-producing insects that attack the genus. Requires special permit and use techniques (see Appendix 7).

- Carbaryl (Sevin) LD-50=700. Toxic to bees and earthworms (Sevin XLR liquid is somewhat less toxic to bees). Effective against variety of insects, frequently used as basal spray for elm leaf beetle. This chemical is on the restricted list in California and requires a permit from the Sacramento County Agricultural Commission.

- *Bacillus thuringiensis* (M-One) LD-50=5,000. Derived from bacteria. Effective against red hump caterpillar. Can also be used to control elm leaf beetle.

Occasionally used in Sacramento

- Acephate (Orthene). LD-50=900. Effective against a variety of insects. A systemic (it is absorbed into the leaf tissue, which makes it effective for a long period of time).

- Benomyl. LD-50=10,000. A systemic fungicide.

Seldom used

- Pyrethrins. LD-50=2500. Toxic to fish and swine. Effective against many insects.

- Fenbutatin-oxide (Vendex or Hexakis). LD-50=2361. Effective against spider mites.

- Diazinon. LD-50=350. Toxic to birds. Effective against a variety of insects.
- Fluvalinate (Mavrik). LD-50=261. Effective against spider mites, whitefly and aphids.
- Rotenone. LD-50=132. Toxic to fish and mammals, especially swine. Effective against a variety of insects. Usually combined with pyrethrins, which do not persist as long, and are less toxic.

IDENTIFICATION AND CONTROL OF PEST AND DISEASES

This list is not intended to be exhaustive, but describes the most common and serious problems likely to be found in Sacramento. Specific situa-

tions in the field must be treated under the supervision of a Licensed Pest Control Applicator. Additional help is available from the Sacramento County Agricultural Inspector.

Alder borer

Trees affected: *Alnus rhombifolia*

Symptoms: 1/2" long metallic-colored beetle feeds on leaf margins and petioles. Eggs deposited on bark in round, white masses. White larvae tunnel through bark and consume cambium tissue. Infected tree parts swell and often exude sap.

CONTROLS: Use Dursban Elmusifiable concentrate applied on or about April 25th and May 30th. All woody portions must be treated after infested branches are removed. Chemical must be present before the egg masses are deposited on the bark.

Aphid

Trees affected: *Tilia* species, *Acer* species, *Liriodendron tulipifera* and *Ulmus* species.

Symptoms: Sucking insect with pale green soft body; produces a honeydew that drips.

CONTROLS: Non-toxic: insecticidal soap (Safer's). Chemical control: Orthene, Bidrin.

Ash anthracnose

Trees affected: *Fraxinus 'Modesto'*, *F. velutina*, occasionally *F. uhdei*

Symptoms: Large brown blotches appear on leaves, which drop; twigs may die back.

CONTROLS: Use copper spray or benomyl. Spray benomyl when buds break, then again two weeks later. Additional applications may be needed as new growth appears, or if rain washes the spray off.

Anthracnose diseases can cause cankers (other diseases can also cause them), which are oval discolored areas on branches or the trunk. Cut infected branches below the canker, or trace out and remove trunk cankers. Disinfect tools after each cut. If treatment would seriously affect the tree's appearance, consult a tree specialist.

Ash white fly

Trees affected: *Fraxinus* species, stone fruit trees, apple, pear and pomegranate.

Symptoms: White dusting of wax on leaf surface from 1/8" long winged adults; white wax stripe on dorsal surface of nymphs; defoliates leaves of tree.

CONTROLS: Biological control: Encarsian stingless wasps (imported from the Mediterranean) and a predaceous ladybird beetle, both of which feed on ash white fly nymphs. Pesticides not effective on individual trees since reinfestation can occur quickly.

Ash curl aphid

Trees affected: *Fraxinus 'Modesto'*, *Fraxinus velutina*, *Fraxinus uhdei*

Symptoms: Leaves at branch tips are curled, twisted and galled. Pale green or grey insects.

CONTROLS: Non-toxic: Use lacewings or ladybugs. Chemical control: Rotenone-pyrethrum mixture,

malathion, acephate or carbaryl. Spray before foliage curls up. Once foliage has curled, a systemic such as acephate would be necessary for control.

California oak leaf caterpillar (oak moth)

Trees affected: *Quercus agrifolia*, *Q. ilex*, *Q. lobata*

Symptoms: Moths emerge in May or June, and then again in October and November. Damage is not usually severe, but can defoliate trees.

CONTROLS: Spray in spring after deciduous trees have leafed out, and again in summer when the second brood of caterpillars emerge. Non-toxic: Use *Bacillus thuringiensis* when caterpillars are young. Chemical controls: Rotenone-pyrethrum, acephate, or carbaryl. Restrict use of acephate or carbaryl to the summer brood. Honeybees may be present in the spring if the oaks are flowering, and these chemicals will kill bees on contact. Carbaryl will kill bees as a residual.

California turpentine beetle

Trees affected: *Pinus radiata*, *P. muricata*, *P. canariensis*, *P. thunbergiana*

Symptoms: Beetle is a cinnamon brown, about 1/4" long. Attacks the base of the trunk, rarely above 6 to 8', and can cause moderate damage. Turpentine beetles cause 1" long bronze pitch tubes to appear near ground level, accompanied by white or pink granular droppings. It may weaken the tree and invite attack by more aggressive species, such as pine bark beetle. Pine bark beetles are attracted by the pheromones of turpentine beetles.

CONTROLS: Use carbaryl if more than one pitch tube or dust pile is found per foot of trunk circumference; apply to tree base where beetles attack. Spray the basal 6 ft. of trunk with a high pressure sprayer. Spray in April.

Coryneum canker fungus

Trees affected: *Cupressocyparis leylandii*

Symptoms: Cankers on trunk at 4 to 6 ft. high, leading to decline and eventual death.

CONTROLS: None practical.

Dutch elm disease

Trees affected: *Ulmus* species and *Zelkova serrata*

Symptoms: Wilted foliage in summer, then leaves turn yellow and fall, tree declines and dies over a period of years. This disease is a fungus disease spread by the elm bark beetle. Beetles are brown to black, 1/8" long. Larvae are white legless grubs which overwinter in bark.

CONTROLS: Remove infected trees and dispose of the wood. Do not prune trees when beetles are active (March to September.) Report all elms showing yellowing or wilting in the spring to the County Agricultural Commissioner. Do not plant this species unless the new resistant cultivar 'Centennial' is used.

Elm anthracnose

Trees affected: *Ulmus parvifolia*

Symptoms: Brown spots on leaves; leaves turn brown in early spring and drop off.

CONTROLS: Copper spray or benomyl may be effective. Spray in spring as new leaves unfold. Anthracnose diseases can cause cankers (other diseases can also cause them), which are oval discolored areas on branches or the trunk. Cut infected branches below the canker, or trace out and remove trunk cankers. Disinfect tools after each cut. If treatment would seriously affect the tree's appearance, consult a tree specialist. *Ulmus parvifolia* 'Drake' is resistant.

Elm leaf beetle

Trees affected: Many *Ulmus* species

Symptoms: Orange eggs, black larvae, yellow-green adults with a black stripe on wings, 1/4" long. They live on underside of leaves. In late spring or early summer, they cause skeletonizing of leaves, which turn brown and often drop.

CONTROLS: Use Bidrin injection or carbaryl, 1 pound per 100 gals. of water, or 6 tbs. of 50% carbaryl in 3 gals. of water. Apply to the undersides of foliage in spring when new larvae appear, and again if a second crop of larvae appear. Acephate is also effective.

Eucalyptus longhorn borer

Trees affected: *Eucalyptus* species

Symptoms: Dying or dead limbs appear on trees, or entire trees die. Broad tunnels are found beneath bark, and sawdust can sometimes be seen outside the bark. Adult beetles are 3/4" to 1-1/4" long, reddish brown, and are found under loose strips of bark during the day in spring. Larvae beneath bark are off white, 1"-1-1/2" long when mature, found spring to fall.

CONTROLS: No chemical controls are available.

Keep the trees in a good state of vigor. Give the trees infrequent deep watering, and avoid fertilizer if adequate watering cannot be done. Avoid changes in watering patterns, grading and drainage. Quick detection of infestation, and removal and disposal of infested trees is important to keep the insects from spreading. Report all infested trees to the County. If trees are removed, grind the stumps; if this is not practical, cut as close to the ground as possible. Frill cutting around the circumference of the stump and applying glyphosate (Roundup) will prevent regrowth. Chip, bury, tarp or burn all infected wood. Avoid heavy pruning, and prune only in winter and spring (beetles are least active then).

It is illegal to transport infected eucalyptus fire wood. Tarp all firewood with 6 mil thick clear plastic, and leave stored for at least 6 months.

Fungal leaf spot

Trees affected: *Pyrus kawakamii*, some *Malus* cultivars

Symptoms: Red, brown, or yellow spots appear on the leaves.

CONTROLS: Use copper, sulfur, benomyl or chlorothalonil. Spray the trees in the spring as soon as flower buds open. Clean up dead leaves and other refuse under the tree. Avoid over-watering trees, which creates saturated soil conducive to this problem.

Fruit tree leafroller

Trees affected: *Quercus agrifolia*, *Q. lobata*, *Q. ilex*, *Platanus*, *Fraxinus*

Symptoms: One generation of moths per year; green caterpillars in spring, hanging on threads; mottled brown and tan moths in late spring. Leaves are rolled together with silken threads and tender new leaves are chewed. Defoliation may occur in severe cases.

CONTROLS: Non-toxic—*Bacillus thuringiensis* is effective if caterpillars are less than 1/4" long. Chemical controls—Pyrethrum-rotenone mixture, carbaryl or diazinon (also more effective on young caterpillars than older ones.)

Honey mushroom fungus

Trees affected: *Quercus agrifolia*, *Q. lobata*, most fruit trees, *Cinnamomum camphora*, *Ulmus* sp.

Symptoms: Also known as oak root fungus. Symptoms may start as dull or yellowed leaves, or sparse foliage. Leaves may wilt, and branches die. Beneath the bark of the tree near ground level there will be a mat of white fungus. In late autumn or early winter, a cluster of tan mushrooms may appear at the tree's base.

CONTROLS: No chemical control is available. If infection sites can be cleaned of diseased tissue with

hammer and chisel, and the cuts painted with denatured alcohol, the disease can sometimes be arrested. Remove soil from the base of the tree to find these sites. If the tree must be replaced, choose a resistant species. Trees on the recommended list which are resistant are Eucalyptus, Ginkgo, Liquidambar, Melaleuca styphelioides, Pistacia, Prunus cerasifera, Pyrus calleryana, Sapium, Sequoia, Ulmus.

Lime-induced chlorosis

Trees affected: Any tree exposed to high levels of calcium.

Symptoms: Leaves are yellow or brown, and veins may remain green. This is a deficiency disease caused when trace minerals like iron, zinc and manganese form compounds with calcium and magnesium, which make the true minerals unavailable to plant roots.

CONTROLS: Treat with iron and zinc chelate.

Oak anthracnose fungus

Trees affected: *Quercus agrifolia*, *Q. lobata*, *Q. ilex*

Symptoms: Brown leaves on dead twigs appear in rainy spring weather. Leaves remain on the tree.

CONTROLS: Non-toxic—Prune out infected twigs and branches if feasible. Chemical controls—A fixed copper and light oil mixture can be used in late winter. Benomyl can be applied in spring. Treatments are not reliably effective.

Oak mildew

Trees affected: *Quercus agrifolia*, *Q. lobata*

Symptoms: Leaves are covered with a white powder, new leaf shoots are shortened and excessively branched and leaves are small and distorted. New growth is stimulated, and will be infected, with a typical "witches broom" look.

CONTROLS: Non-toxic—Avoid excessive pruning, irrigation and fertilizing. Remove diseased young growth. Chemical control—use copper spray or benomyl. Treatments are not reliably effective.

Oak pit scale

Trees affected: *Quercus lobata*; occasionally *Q. agrifolia*

Symptoms: Brown or green scales are found in small volcano-like depressions on twigs. They may cause dieback of twigs in mid to late summer; dead leaves stay on twigs over the winter.

CONTROLS: Non-toxic—Use a 2% oil spray in the winter, 22 gals. oil to 100 gals. of water. Large oaks will need a high pressure sprayer to reach the tops of the trees. Chemical control—If necessary, use a summer oil mixture with malathion or carbaryl, applied once in late April to July.

Oak treehopper

Trees affected: *Quercus lobata*; occasionally *Q. agrifolia*

Symptoms: 1/4" long incisions in a spiral pattern appear on twigs. Adults are 1/4" long, olive green to brown with red dots. Larvae tunnel in the phloem tissue of the twigs.

CONTROLS: Pyrethrin-rotenone mix or carbaryl in May

Oak twig borers

Trees affected: *Quercus agrifolia*

Symptoms: Look for tunnels under the bark of twigs which have patches of dead leaves. In May and June, 1/4" long brown beetles are outside the bark.

CONTROLS: Non-toxic—If practical, prune out infested wood. Chemical control—carbaryl

Pear blight (fireblight)

Trees affected: *Pyrus kawakami*, some *Malus* cultivars

Symptoms: The blossoms will first look as if they had been water-soaked. They wilt and turn dark

brown. Flowering shoots die suddenly and look as if they had been scorched. Cankers can also form. Young terminal shoots are occasionally infected in moist spring weather.

CONTROLS: Prune out and burn diseased wood in June. Cut 6" below infected wood on small branches; 12" on larger ones. Disinfect tools between cuts in 10% bleach solution. Spray the next spring with agricultural streptomycin, every 4 to 5 days during flowering. Spray when temperatures are between 65 and 86 degrees, which is when the bacterium is active.

If the tree dies, replace it with a species that is not susceptible to the disease. (*Pyrus kawakamii* is the only tree on the recommended plant list which is susceptible, but shrubs growing near the tree which may become infected include *Cotoneaster*, *Pyracantha*, *Chaenomeles*, *Heteromeles arbutifolia*.) Cultural practices which can lead to fireblight include planting in poorly drained sites, heavy pruning of the tree, too heavy fertilizing or fertilizing too late in the year. Root suckers and water sprouts are especially susceptible to infection and should be removed each dormant season. Cankers should also be removed.

Peppertree Psyllid

Trees affected: *Schinus molle*.

Symptoms: Doughnut-like pits in leaflets, petioles, and young twigs. Leaves appear grayish-green, stunted and distorted, and trees are sparsely foliated. Adult insects are green, 1/16" long.

CONTROLS: Acephate. Use 1 lb. Orthene Tree and Ornamental Spray (75% soluble powder) to 100 gallons of water. Apply twice per spring (March and June).

Pine bark aphids and pine needle aphids

Trees affected: *Pinus radiata*, *P. muricata*, *P. sylvestris*, *P. thunbergiana*, *P. pinea*

Symptoms: Cottony white material appears on bark, twigs and needles.

CONTROLS: Non-toxic—Lacewings and ladybugs are biological controls. Dormant oil spray in winter. Chemical controls—Rotenone-pyrethrin, malathion, or carbaryl in the spring, and add a miticide such as sulfur, fenbutatin-oxide, or fluvalinate if needed. A high pressure spray will improve control.

Pine bark beetle

Trees affected: *Pinus radiata*, *Pinus muricata*

Symptoms: Some beetle species are benign, but the California five-spined engraver beetle is very destructive. Adults are brown to black, 1/8 to 1/4" long. Trees may die quickly. Boring dust will be found in crotches of the tree or surface of bark. Pine bark beetles are attracted by the pheromones of turpentine beetles. Turpentine beetles cause 1" long bronze pitch tubes to appear in trunks near ground level, accompanied by white or pink granular droppings.

CONTROLS: Spray with carbaryl, and add sulfur, hexakis, or fluvalinate as spider mites are often a secondary problem. For turpentine beetles, spray the basal 6 ft. of the trunk with a high pressure spray of carbaryl mixed with a wetting agent. Spray in Feb. to protect pines for the entire season. Prune trees in winter when beetles are not active. Chip, bury or burn all pruned wood, or store under a 6 mil. clear plastic tarp for at least six months. Avoid any wounds to bark, including nailing signs to trees. Avoid stressing trees by cutting or filling near trunks. Give occasional deep watering.

Pink rot

Trees affected: *Washingtonia*, *Archontophoenix* species, *Phoenix canariensis*

Symptoms: Plant appears weakened with many dead sheaths. Often pink spore masses appear on the surfaces of infected tissues at the base of the plant.

CONTROLS: Use benomyl. Disinfect pruning tools after each cut. Do not overwater.

Plum leaf aphid

Trees affected: *Prunus blieriana*.

Symptoms: These aphids can be a serious problem, quickly becoming a severe infestation.

CONTROLS: If trees have been infested in previous years, treatment should be preventative. The timing is important. In early March, as the new leaves unfold, spray with acephate or carbaryl.

Pseudomonas canker

Trees affected: *Olea europaea*.

Symptoms: Gray galls on twigs and branches.

CONTROLS: Remove galls by pruning where practical. They seldom kill trees.

Red hump caterpillar

Trees affected: *Liquidambar styraciflua*

Symptoms: Leaf-chewing caterpillar that causes tree defoliation.

CONTROLS: *Bacillus thuringiensis*, 2 to 3 tablespoons per gallon of water.

Scale

Trees affected: *Liquidambar styraciflua* and *Ulmus* species.

Symptoms: Sucking insect with a stationery waxy shell; exudes a honeydew sticky substance.

CONTROLS: Bidrin injection

Sequoia pitch moth

Trees affected: *Pinus radiata*, *P. muricata*

Symptoms: This moth causes 1 to 2" diameter masses of white, yellow or pink pitch to form on the branches. Although messy looking, little harm is done to the tree.

CONTROLS: Non-toxic—If control is needed for aesthetic reasons, scrape away the pitch masses and kill the larvae, which are found just below the surface of the bark. No insecticide is useful. Avoid pruning pines in the summer, as the moths are laying eggs then, and they are attracted to pruning cuts and other mechanical injuries to the tree.

Shot hole fungus

Trees affected: *Prunus* species

Symptoms: Red, brown, or yellow spots form on leaves, and drop out, leaving holes in the leaves.

CONTROLS: Use copper, sulfur, benomyl or chlorothalonil. Spray when blossoms open in the spring. Clean up dead leaves under the tree.

Spider mites

Trees affected: A broad range of trees

Symptoms: Leaves have yellow stippling on them, and may have fine webbing and silvery coloring on the undersides. Mites are tiny specks of red, yellow, or green.

CONTROLS: Non-toxic: Predator mites and Lacewing larvae are a biological control. Light oil spray is an option.

Chemical control: Pyrethrin-rotenone mixture, sulfur, fenbutatin oxide, fluvalinate; respray 7 to 10 days later. If a miticide is needed more than occasionally, alternate two or more chemicals, as mites adapt rapidly to any one chemical.

Sycamore anthracnose**Trees affected:** *Platanus* species

Symptoms: Leaves, buds and shoots are blighted in the spring. Irregular dead areas appear along the veins of leaves.

CONTROLS: Non-toxic: Prune out infected twigs and branches. Fertilize trees after the rainy season is over. Chemical control: Spray when leaves first begin to unfurl in the spring with chlorothalonil. Repeat two weeks later. This has limited efficacy. Control by spraying will be more effective on young trees, as it is difficult to spray large trees as thoroughly. Variety 'Bloodgood' is resistant. Sycamore anthracnose can cause cankers (as can other diseases), which are oval discolored areas on twigs.

Sycamore mildew**Trees affected:** *Platanus* species

Symptoms: A white or gray powdery coating forms on young leaves and stems in May or later.

CONTROLS: Non-toxic: Do not prune trees severely. Variety 'Yarwood' is resistant. Chemical control: Sulfur, copper, benomyl. In May and June, mix 1/2 lb. benomyl and 6 lbs. agricultural sulphur per 100 gallons.

Sycamore scale**Trees affected:** *Platanus* species

Symptoms: White dots on leaves and white wooly bits under bark in severe cases.

CONTROLS: Non-toxic: Spray with dormant oil in winter. Chemical control: If infestation is severe mix a light oil with malathion or diazinon; spray in May-June.

Tent caterpillar**Trees affected:** A broad range of species.

Symptoms: Will defoliate tree in severe cases.

CONTROLS: Non-toxic: Use *Bacillus thurengiensis*. Cut off branches containing nests.

Chemical control: Use carbaryl in severe cases.

Tulip poplar aphid**Trees affected:** *Liriodendron tulipifera*

Symptoms: Leaves will be sticky and black. Aphids are green, and form colonies on the undersides of leaves. Ground may be sticky from aphid secretions.

CONTROLS: Non-toxic: If ants are present, use Tanglefoot tree barrier applied over a band of plastic taped to the trunk. Chemical control: Rotenone-pyrethrin mixture, malathion, acephate or diazinon. These are seldom effective over a long period.

Tulip poplar scale**Trees affected:** *Liriodendron tulipifera*

Symptoms: 1/4" to 1/2" brown, round scale insects accumulate in rows on twigs.

CONTROLS: Non-toxic: In winter, use dormant oil. When scales are young in spring, before hard shells have developed, use light oil. Chemical control: Severe infestations may need carbaryl, malathion, diazinon, or acephate. Apply in May.

Verticillium wilt**Trees affected:** *Acer*, *Cinnamomum*, *Schinus*, and many others

Symptoms: In late spring one side of the tree may wilt. The leaves turn yellow and the wood just under the bark turns dark brown, olive green or black.

CONTROLS: Give deep infrequent irrigation and fertilize with a low-nitrogen formula. If replacement of the tree is necessary, choose a species that is resistant to the disease. Resistant trees on the recommended list are Eucalyptus, Liquidambar, Pinus, Platanus, Quercus, and Pyrus. Those which are susceptible to verticillium wilt are Acer, Cinnamomum, Cupaniopsis, Fraxinus, Olea, Prunus, Robinia, Schinus, and Ulmus. There is no chemical control available

Western pine rust galls

Trees affected: Pinus radiata, P. halapensis

Symptoms: Swellings surround small branches. In spring, yellowish orange powdery spores are produced in fissures on the galls.

CONTROLS: Prune out infected branches before spores form in the spring.

Water mold fungus

Trees affected: Any species in very wet soil.

Symptoms: Leaves may die or look scorched, and there will be little or no new growth.

CONTROLS: Non-toxic: Correcting drainage and irrigation problems is the best control.

Chemical control: Metalaxyl (LD 669) or aliette (LD 5800) are two chemicals for control.

Whitefly

Trees affected: Betula species, Liquidambar, Platanus acerifolia, others.

Symptoms: A cloud of tiny white insects fly around frantically when disturbed. Yellow spots appear on undersides of leaves where chlorophyll has been removed by them. Usually caused by over-watering.

CONTROLS: Non-toxic: Put lacewing eggs in cups tied to affected trees. Reduce frequency of watering. Chemical: If severe, spray alternately with Mavrik and Vendex in April-May.

Insect and Disease Problems in Sacramento

Analysis and identification of tree problems is important, and if there is doubt about a diagnosis a tree specialist should be consulted. Some root problems cause foliage symptoms which look like those caused by insects. For example, Pythium water molds, which kill absorbing root tips, may cause foliar symptoms which are similar to

nitrogen deficiency symptoms. Pythium can also increase susceptibility of the tree to fungal leaf spot.

The following table lists the most common problems associated with tree species found in Sacramento or those recommended for future planting. If a tree is not listed, it does not have any significant pest or disease problem in Sacramento at this time.

<u>Tree</u>	<u>Problem</u>
Acacia species	chlorosis in alkaline soils
Acer campestre, Hedge maple	occasional aphids
Acer rubrum 'Armstrong' Armstrong red maple	aphids
Acer rubrum 'October Glory' October Glory red maple	caterpillars in May (ignore aphids in April)
Alnus rhombifolia, California white alder	alder aphid, tent caterpillar, borer, mistletoe
Alnus cordata, Italian alder	alder aphid, borers
Betula alba, White birch	aphids, root disease
Callistemon species, Bottlebrush	chlorosis in alkaline soils
Ceratonia siliqua, Carob	root crown rot if watered frequently, squirrel damage to branches, frost damage
Carpinus Betulus 'Fastigiata', Upright European hornbeam	occasional black scale
Cedrus atlantica, Atlas cedar	oak root fungus in heavily watered turf
Cedrus deodara, Deodar cedar	oak root fungus in heavily watered turf
Celtis australis	caterpillars
Celtis occidentalis, Common hackberry	caterpillars
Cinnamomum camphora, Camphortree	honey mushroom fungus, verticillium wilt
Cupressocyparis leylandii, Leyland cypress	serious coryneum canker fungus
Eriobotrya deflexa, Bronze loquat	fireblight, black scale
Eucalyptus species	lime-induced chlorosis in alkaline soil, Eucalyptus longhorn borer
Fraxinus uhdei, Evergreen ash	ash curl aphid ash whitefly; ash lygus bug a minor problem.
Fraxinus 'Moraine', Moraine ash	ash whitefly, ash lygus bug a minor problem, ash lilac borer
Fraxinus velutina glabra, Modesto ash	ash anthracnose, ash curl aphid, honey fungus, mistletoe
Geijera parviflora, Australian willow	occasional black scale
Jacaranda mimosifolia, Jacaranda	caterpillars in the spring
Lagerstroemia indica, Crape myrtle	mildew (new hybrids are resistant)
Liriodendron tulipifera	tulip poplar aphid, tulip poplar scale
Ligustrum lucidum, Glossy privet	black scale
Liquidambar styraciflua, American sweetgum	brown softshell scale, calico scale
Magnolia grandiflora, Southern magnolia	aphids in spring
Maytenus boaria, Mayten	thrips in late May, carrying a virus. Cottony cushion scale.
Olea europaea, Olive	black scale, Pseudomonas syringa canker
Phoenix canariensis	fusarium oxysporum
Pinus canariensis, Canary Island pine	pine bark aphid, pine needle aphid
Pinus halapensis, Aleppo pine	pine bark aphid, pine needle aphid, western pine rust gall, Sequoia pitch moth, severe spider mite
Pinus pinea, Italian stone pine	pine bark aphid, pine needle aphid, Sequoia pitch moth, occasional spider mite
Pinus thunbergiana, Japanese black pine	pine bark aphid, pine needle aphid
Pinus radiata, Monterey pine	pine bark beetle, California turpentine beetle, pine bark aphid, pine needle aphid, western pine rust galls, sequoia pitch moth, very severe spider mite
Platanus acerifolia, London plane tree	sycamore mildew, syc. scale, syc. anthracnose
Platanus racemosa, Western sycamore	sycamore anthracnose, sycamore scale
Prunus caroliniana, Carolina cherry laurel	chlorosis in alkaline soil
Prunus cerasifera, Purple plum	shot hole fungus, water mold fungi (in over-wet soils), plum leaf aphid (in variety 'Blieriana')
Pyrus kawakamii, Evergreen pear	aphid, ash whitefly, pear blight, fungal leaf spot
Quercus agrifolia, Coast live oak	fruit tree leaf roller, oak leaf caterpillar, oak twigborer, oak tree hopper, honey mushroom fungus
Quercus ilex, Holly Oak	fruit tree leaf roller, oak leaf caterpillar, oak tree hopper, oak mildew
Quercus lobata, Valley Oak	fruit tree leaf roller, oak leaf caterpillar, oak tree hopper, honey mushroom fungus, oak pit scale, oak anthracnose fungus
Quercus robur, English oak	fruit tree leaf roller, oak mildew
Quercus rubra, Red oak	oak leaf caterpillar
Quercus palustris 'Village Green', Pin oak	oak leaf caterpillar
Robinia ambigua 'Idahoensis', Pink locust	aphids, pod gall midge
Robinia pseudoacacia 'Umbraculifera'	aphids, pod gall midge

<i>Tree</i>	<i>Problem</i>
Schinus molle, California pepper	pepper tree psyllid
Schinus terebinthifolius, Brazilian pepper	verticillium wilt
Tristania conferta, Brisbane box	chlorosis
Ulmus americana, American elm	elm bark beetle (Dutch elm disease), scale, aphids
Ulmus parvifolia, Evergreen elm	elm anthracnose,
Ulmus sp., Elm species	Dutch elm disease, elm leaf beetle, scale, aphids
Washingtonia robusta, Mexican fan palm	pink rot

Tips for diagnosing tree problems caused by pests (Koehler, UC Berkeley Cooperative Extension):

1. More than half of the problems brought to your attention will be attributable to factors other than insects and mites.

2. The cause of poor plant performance may not be evident on the plant sample given to you for diagnosis. The cause may lie farther down the plant.

3. The mere presence of insects or mites does not always mean that they are the real cause of poor plant performance. (Improper maintenance or poor plant selection also contribute.)

4. If the entire tree is dead, the chances are great that insects or mites were not the cause of death. Insects and mites seldom kill their host plants.

5. Most insects and mites show specificity in their choice of plants. Some are general feeders, but most are not. Knowing the name of the affected plant is therefore extremely helpful in determining the identity of the offending insect or mite, because lists of pests and other references are often organized by host plant.

6. The application of a pesticide is not the solution to every pest problem.

7. By the time many people notice a pest problem and seek your advice, it is often too late that season to take corrective action.

8. Especially when reporting by telephone, people tend to magnify the actual size of an insect.

9. Insects and mites must feed in order to survive and reproduce. Evidence of their feeding will nearly always remain on the plant even after the pest is gone. Most signs and symptoms of pest activity fit into one or more of the following categories:

Symptom or Sign
Probable Pest Responsible

I. Chewed leaves, blossoms	Caterpillars, beetles, sawflies, snails, slugs. Also leafminers (chewing is inside leaf)
II. Stippled, bleached, yellowed or bronzed leaves	Leafhoppers, aphids, psyllids, thrips, lace bugs, spider mites
III. Distortion (twisting, cupping, swelling of plant parts)	Thrips, aphids, blister (bud) mites, gallmakers
IV. Dieback of plant parts	Borers, scales, gallmakers
V. Presence of excrement, sooty mold, flocculence, froth, cast skins, tents, pitch tubes, or other insect product	Aphids, soft scales, mealybugs, whitefly, adelgids, thrips, lace bugs, spittlebugs, certain caterpillars, etc.

DIAGNOSING OTHER TREE PROBLEMS, PESTS AND DISEASES

Symptoms

Probable Cause

Leaf or stem spotting with necrosis (dead areas), chlorosis (absence of pigment).	Bacterial, viral or fungal infection, or damage or areas), from chemical spray.
Marginal burning of leaves and stunted growth.	Excess salts in soil or water, excess fertilizer
Mottling or mosaic patterns of yellow green or light and dark green, often with leaf distorting and stunting.	Virus infection, chemical injury, or genetic variegation.
Discoloration in the vascular system of roots and stem, often with one-sided yellowing or wilting.	Wilt fungi, wilt bacteria
Galls (irregular overgrowths) on stems, leaves, roots or crown.	Aerial galls are most often insect problems. Galls on roots may be bacteria or nematodes.
Stippled, bleached, yellowed, or bronzed leaves	Leafhoppers, aphids, psyllids, thrips, lace bugs, spider mites
Intervinal or uniform chlorosis mainly on new growth	Mineral deficiency of iron, zinc or other mineral
Poor growth, general weakening, yellowing of leaves	Nitrogen deficiency, over-watering, virus, lack of water, soil compaction, chemicals in soil (oil, salt, soap, dog urine) change of grade around tree, change in water table
Chewed leaves or blossoms	Caterpillars, beetles, snails, slugs
Dieback of plant parts	Borers, scales, gallmakers, over-watering
Distortion (twisting, cupping, swelling) of plant parts	Thrips, aphids, mites, gallmakers, mineral imbalance in soil
Whitish powdery growth on leaves	Powdery mildew-rake and burn infected leaves
Foul smelling liquid exudes from tree; dark brown, water-soaked bark, often with oozing sap.	Slime flux bacteria. This may not affect the tree adversely. Consult an arborist to see if treatment is needed.
Twigs, branches, new growth killed after cold spell.	Frost damage
Spindly growth and death of lower limbs and inner branches of tree.	Lack of sunlight
Yellowing, browning, and withering of one side of the tree. Starts on tips and margins of leaves.	Sun scorch-caused by high temperature on leaves combined with drought; over-watering
Bark tissues dry, crack and curl on limbs and trunk, where bark was smooth or previously shaded.	Sudden exposure of bark to sun and wind through poor pruning, or by planting young trees in hot weather. Paint bark with white latex paint.
Discoloration and browning of foliage, often with mottling of foliage and browning between veins. sodium street lights.	Air pollution from nearby factories. Increased susceptibility to pollution damage can be caused by high-intensity
General weakening and death of part or all of tree; often one side of tree will show lighter green foliage, which drops earlier in fall on deciduous trees.	Girdling roots. Cut root and remove.
Localized, rough open wounds, sometimes with death of limbs.	Contact with power lines in wet weather causes short circuit. Mechanical injury can be caused by chafing.
Wilting of foliage, often with trunk abrasions, shattering of limbs or trunk, burned bark	Lightning (rare in Sacramento)
Curling of twig tips, and distortion of leaves	Herbicide; over-watering

SECTION 9: PROTECTION AROUND CONSTRUCTION

No tree in the City on public property or heritage (protected) tree on private property, may be re-

moved without authorization from the City. Where permission is granted for tree removal, a replacement tree is required, except where, in the judgement of the City Arborist, surrounding trees preclude planting space.

Before construction work is undertaken near existing trees, procedures for protection of the trees should be understood. Specific procedures for protection during and after construction should be agreed upon and approved by the City arborist. It is important to realize that the result of damage to the root system of the tree may appear anywhere from five to fifteen years after the work has been done.

The following guidelines are basic tree protection practices. The City may require additional conditions as part of the plan review or permit process.

Protection of Existing Trees: Erect adequate barriers (Figure 13. Protection around Construction) around existing trees which are to remain, as identified on the plan. All existing trees to remain are to be protected during construction:

a. A chain-link six-foot high fence with T stakes at six feet-eight inches on center shall be installed at a minimum distance of the dripline of the tree. The fence must be visible to equipment operator at all times.

b. Hay bales may be required for trunk protection at critical trees in addition to the fencing.

c. No equipment or materials may be stored inside the fence.

d. The fence will remain in place until final inspection and acceptance by the City.

e. If grade changes approach the fence line and a 2:1 return slope cannot be constructed, then appropriate retaining walls will be constructed along this drip line area.

f. All drain water will be directed away from the drip line area.

g. Trees which are excessively damaged due to inadequate protection or negligence by the Contractor are to be replaced at Contractor's expense.

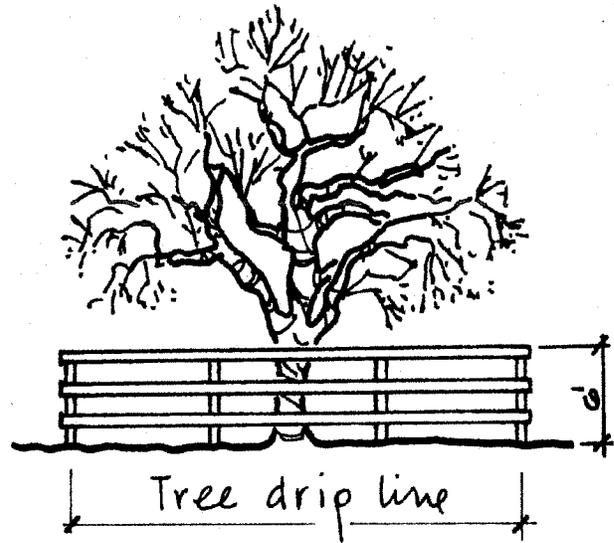


Figure 13. Protection Around Construction

Compaction: Do not compact the soil any closer than five feet out from the dripline (defined as the tree's protection zone) of any tree during construction.

Cut and Fill: Use extreme care when cutting and filling. Tree roots quickly dry out when a soil cut is made. Promptly apply a 4 to 6 inch layer of mulch to preserve soil moisture. Remove excess soil immediately when fill is added because roots are otherwise smothered. No fill may be placed near the base of a tree at any time. If an oak tree lacks natural flair at the trunk, promptly remove any fill material to expose the trunk's natural flair at original grade.

Trenching: Design utilities to minimize disturbance to trees. The first rule is to reposition the trench further from trees whenever feasible. No utility lines should traverse any portion of a dripline unless the trenches are hand dug and roots are treated as they are exposed. Sensitive trenching areas may require that the Landscape Architect be present to monitor root damage and repair measures. Review with inspector before beginning any work within dripline of trees.

Root Protection: Root system protection is essential. Most feeder roots are found near the outer edge of the dripline. Any construction within this zone should be carefully considered and avoided whenever possible. Never pull roots

when contacted by construction equipment. This breaks off the rootlets which are needed for tree vigor. This must be explained to the backhoe operator before beginning the work. A laborer should be present for hand excavation as needed. Also, a couple yards of shredded mulch and wet burlap sacks should be on hand for covering damaged roots. Trim clean and immediately cover cut roots so they do not dry out. If major roots (over 2" in diameter) are encountered, assess them for structural impacts.

Impervious Paving and Aeration: Roots need air to grow. The compaction required to install most paving (90-95%) will kill the roots. At a minimum, paving should be kept outside the dripline of the tree. If paving is allowed, maximum allowable cut or fill is 6 inches. In addition, paving modifications including gap graded gravel, pier and grade beam footings, steel reinforcement, or aeration breaks in the paving may be required.

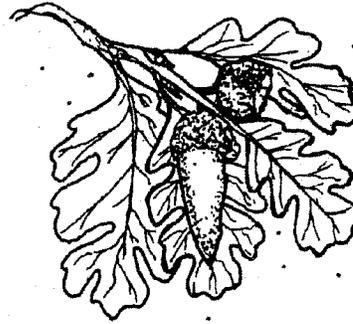
Limb Pruning: Make pruning cuts clean and as close to the limb's shoulder as possible. If painting is desired for cosmetic reasons, do it immediately and with a light colored latex paint.

Watering: Watering during construction to minimize tree stress is crucial. Water when 1/4 or more of a tree's roots have been disturbed. Slowly apply water to irrigate down to a minimum depth of 12 inches for the full outer half of the canopy/dripline area. Don't soak area immediately adjacent to a tree trunk. Water once a month during the dry season (May, June, July, August, September). Give all trees near asphalt additional watering because asphalt paving absorbs heat which in turn raises nearby soil temperature and increases moisture loss.

Drainage/Erosion Control: Do not alter drainage patterns. Keep the natural flow on the site, if possible. If it is altered, keep water directed away from the trunks of the trees to prevent fungal infections.

Paving: If paving is to be laid over a tree's roots within 5 ft. out from the dripline, one solution is to install vertical drain tubes in a circle near the dripline, 3 to 4 ft. apart. Use perforated PVC pipe 18" deep, and fill with 3/4" gravel. Cap with an open grate. If the tree will need watering, install an adjustable bubbler head in each drain tube, and connect a soil sensor (tensiometer) to the system to

regulate the watering. The sensor should be placed 18" deep midway between the two most accessible drain tubes. Paving or other structures under oaks, and paving under historic (or landmark) trees requires the approval of the City Arborist or Landscape Architect.



Planting Under Oaks: Native oaks adapt to dry summers and will be susceptible to fungus diseases if they are exposed to summer water. Either frequent irrigation or altered drainage patterns can cause problems. Other specimens may have grown up with summer water and are better adapted to it. With specimens which have grown up without summer water, no planting should be done inside the protected zone, defined as five feet out from the dripline of the tree. In all cases irrigation creates the danger of infection by honey mushroom fungus or water mold diseases.

The following plants are suitable for planting under oaks (from [Living Among the Oaks: A Management Guide for Landowners](#), UC Cooperative Extension, Natural Resources Program, 163 Mulford Hall, Berkeley):

Shrubs (Partial Shade)

Carpenteria californica, Carpenteria
 Ceanothus sps., Wild Lilacs:
 C. griseus, C. thyrsiflorus, C. maritimus, C. 'Joyce Coulter', C. 'Ray Hartman'
 Cercis occidentalis, Western redbud
 Cercocarpus betuloides 'blancheae', Mountain mahogany
 Eriogonum arborescens, Santa Cruz Island Buckwheat
 Garrya elliptica, Silk-tassel Bush
 Heteromeles arbutifolia, Toyon
 Mahonia sps, Barberries and Mahonias:
 M. amplexans, M. dictyota, M. fremontii, M.
 Haematocarpa, M. higginsiae, M. pinnata
 Prunus ilicifolia, Holly-leaf Cherry
 Rhamnus californica, Coffeeberry
 Ribes sps., Gooseberries:
 R. aureum gracillimum, R. malvaceum, R. sanguinum, R.
 speciosum, R. viburnifolium
 Rosa californica, California Wild Rose

Rosa californica "Plena", Double California Rose
Salvia clevelandii, San Diego Wild Sage
Salvia leucophylla, Coastal White Sage

Shrubs (Full Sun)

Fremontodendron spp., Flannel Bush:
 F. "California glory", *F. californicum*, *F. mexicanum*
 and F. "Pacific Sunset"
Galvesia speciosa, Island Bush-snapdragon
Lupinus albifrons, Silver Bush Lupine
Lupinus chamissonis, Chamisso Bush Lupine
Mimulus aurantiacus, Bush Monkeyflower
Mimulus pumiceus, Red Monkeyflower
Penstemon clevelandii, Cleveland's penstemon
Romneya coulteri, Matilija Poppy

Groundcovers

Baccharis pilularis, Dwarf Coyote Brush
Ceanothus griseus horizontalis, Carmel Creeper
Ceanothus maritimus, Hoover Ceanothus
Ribes viburnifolium, Catalina Currant

Herbaceous Plants

Clarkia sp., Clarkias
Collinsia sp., Chinese Houses
Dodecatheon clevelandii, Shooting Stars
Dryopteris arguta, Wood Fern
Eriogonum umbellatum polyanthum, Buckwheat
Eschscholzia sp., Poppies
Heuchera maxima, Giant Alum Root
Iris douglasiana, Iris
Montia perfoliata, Miners lettuce
Nemophila menziesii, Baby Blue Eyes
Oenothera sp., Evening Primroses
Sisyrinchium bellum, Blue-eyed Grass
Viguiera deltoidea parishii
Viola pedunculata, Yellow Pansey
Zauschneria californica, California Wild Fuchsia

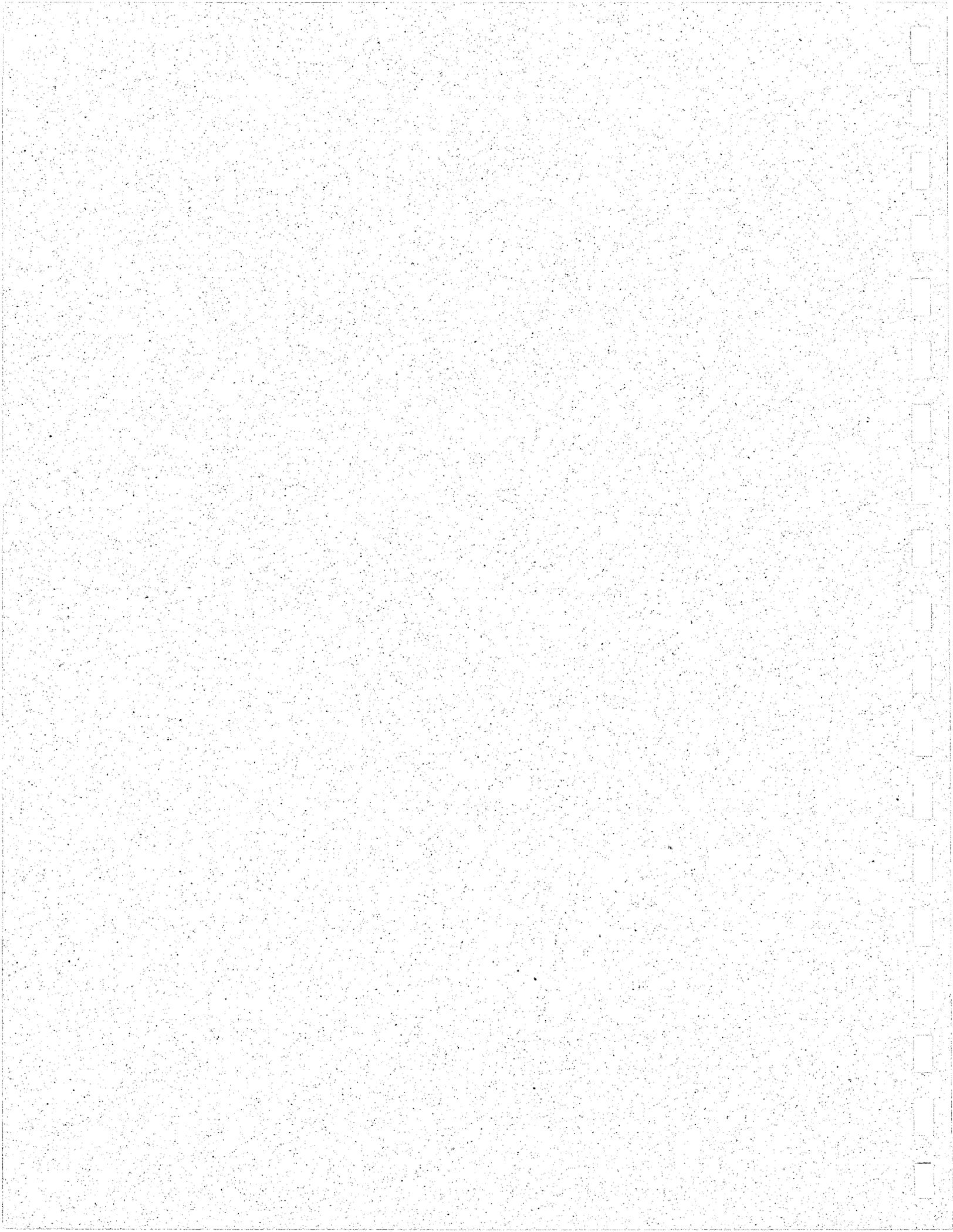
Bulbs

Brodiaea sp., and related genera:
Dichelostemma pulchellum
Triteleia laxa
Calochortus sp., Mariposa Lilies
Chlorogalum pomeridianum, Soap Plant
Lilium pardalinum, Leopard Lily
Trillium chloropetalum, Common Trillium



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CHAPTER THREE: PROCEDURES

This chapter outlines procedures used by the Tree Services Section, including maintaining the data base for on-going tree inventory, maintenance scheduling and emergency operations. All procedures are to be reviewed and updated periodically.

For a discussion of proactive management, please refer to Management, Chapter 3 of the Urban Forest Management Plan.

SECTION 1: INVENTORY PROCEDURES

Trees in the City right-of-way, public open spaces and public facilities should be inventoried and included in the current data base. In addition, trees under public jurisdiction, even if not publicly maintained should be inventoried. This includes trees within the private maintenance strip (12.5 feet behind the curb). All tree inventory information from the Sacramento Tree Foundation and from Caltrans planting projects should be accessible and shared with Tree Services for planning purposes.

The data base shall be kept current by updating information on all work performed. Additional software, hardware and training is required to implement a usable inventory system. Once these needs are met, inventory recording will be accomplished as part of their "zonal" inspection by the Senior Tree Trimmers. Under a proactive system, each Senior Tree Trimmer will visit every tree within their zone on a regular basis and record baseline information if needed. As work is scheduled and accomplished, all inspection notes will be recorded on STS Tree Inventory Forms. This information will then be turned over to designated STS data entry staff so work history can be updated in the database.

SECTION 2. MAINTENANCE SCHEDULING PROCEDURES

Reactive scheduling procedures:

Service request call is received.

- Service request call is recorded into data base and a Work Request Form is generated by the Tree Services administrative support staff.

- Work Request Form is given to Tree Inspectors to evaluate work.

- If work is approved after inspection, data base is updated and work is placed in a back log

according to the month the call was received.

- Work crews accomplish work from the monthly back log. Work is updated on form.

- Information stored into data base under work history. Form is filed under work history.

Proactive scheduling procedures:

- Senior Tree Trimmers are assigned by City Arborist/Parks Superintendent/trimmer Supervisors to a specific geographic zone. They are familiar with general problems and goals for the specific neighborhoods within the zone (refer to Appendix 3 of the Urban Forest Management Plan). They must be familiar with general City-wide proactive maintenance goals.

- Yearly and quarterly work goals are established with City Arborist/Parks Superintendent.

- Senior Tree Trimmers assemble and schedule work crews based on work goals, available staff and equipment for proactive planting, training and other maintenance tasks.

- Senior Tree Trimmers and Community Education Coordinator identify specific community issues (mistletoe control, removal of declining trees, planting natives, etc.) and coordinate public involvement programs and events which address these problems.

- Senior Tree Trimmers update data base as work is scheduled and completed. Quarterly and yearly reports are prepared to evaluate efficiency of work crews, work accomplished, budget and whether stated goals were accomplished. Information is used to plan future work goals.

To realize the goal of creating a healthy, balanced community forest for Sacramento, a proactive schedule for tree planting, maintenance, and removals is essential. Quantifiable yearly allocations for each of these three areas must be planned, budgeted, and implemented so that a stable forest of uneven age and diverse species is attained.

The City of Sacramento has been divided into maintenance districts to facilitate these tasks. Requirements for tree planting, maintenance, and tree removal have been developed from maintenance goals developed for each planning unit (see Management Plan).

As work is completed, the information updated in the data base will enable a yearly schedule of

tasks to be worked out for each planning unit, and these schedules can be used to draw up a budget. The actual work performed can be checked against the program goals and budget to plan for the next year. If the work falls short of the goals or budget, one or both can be adjusted. A data base should adjust the scheduled work to reflect the changes (i.e., change from a 3-6-9 maintenance cycle to a 4-8-12 cycle) then print out an adjusted schedule based on these revised goals. The proactive system builds a justification for increasing the budget, if need be. Subjective scheduling and budgeting is thus eliminated.

Scheduling of Planting and Maintenance Tasks

Planting is most successful when done at the time of year when rapid rooting can occur. Installing plants in Nov.-Dec. is optimum, because new roots can expand rapidly into soil at a time when moisture demand is at a minimum. This produces a tree which is ready to produce rapid new growth in spring, supported by active new roots.

In order to make this planting schedule work efficiently, the appropriate trees must be on hand at the right time. Since fall planting is becoming an industry-wide goal, competition for the best nursery stock is strong, resulting in poor availability of desired species or of high quality stock. Thus, getting good stock requires two to three month advance ordering from the wholesale nurseries. If bare root or ball and burlap stock of less common species is to be used, it should be ordered by June. (Bare root and ball and burlap are usually ordered from Oregon nurseries.) This advance planning also encourages advance ordering of materials needed for planting and efficient scheduling of work crews.

Tree maintenance must be performed on a regular basis. The scheduling of maintenance is critical because plants may be disfigured, severely damaged or even killed by pruning performed at the wrong time. Pruning should be done in a timely fashion if the most beneficial results are to be obtained. For example, the best time to prune is just before new growth appears, while fertilizing should be done during the fall or early spring.

In addition, fertilizer, or even water, may be partially or wholly wasted if it is not applied at the time of year when the plant is most able to absorb it. Advance scheduling can prevent this.

Although seasonal scheduling of planting and maintenance tasks is optimal for plant growth, this goal must be balanced with annual work goals. When year-round planting and pruning is required to meet annual goals, special provisions must be made to insure tree health. For example, accommodate dry season tree planting by providing supplemental irrigation. Accommodate year-round pruning goals by scheduling species that may be particularly susceptible to pests and diseases if pruned at the wrong time of the year. Elms, for example, should not be pruned in the spring and summer.

SECTION 3: EMERGENCY OPERATIONS PROCEDURES

Currently, the Tree Services staff provides a 24 hour on-call emergency service. In the event of an emergency, the on-call crew is dispatched to provide assistance.

Procedures Used in Response To Calls

■ Between 7:00 AM and 3:30 PM: Call is received at Tree Services Section office. "Hanger" designated crew or Trimmer Supervisor is dispatched. N or S is called depending on location; crew is in turn dispatched.

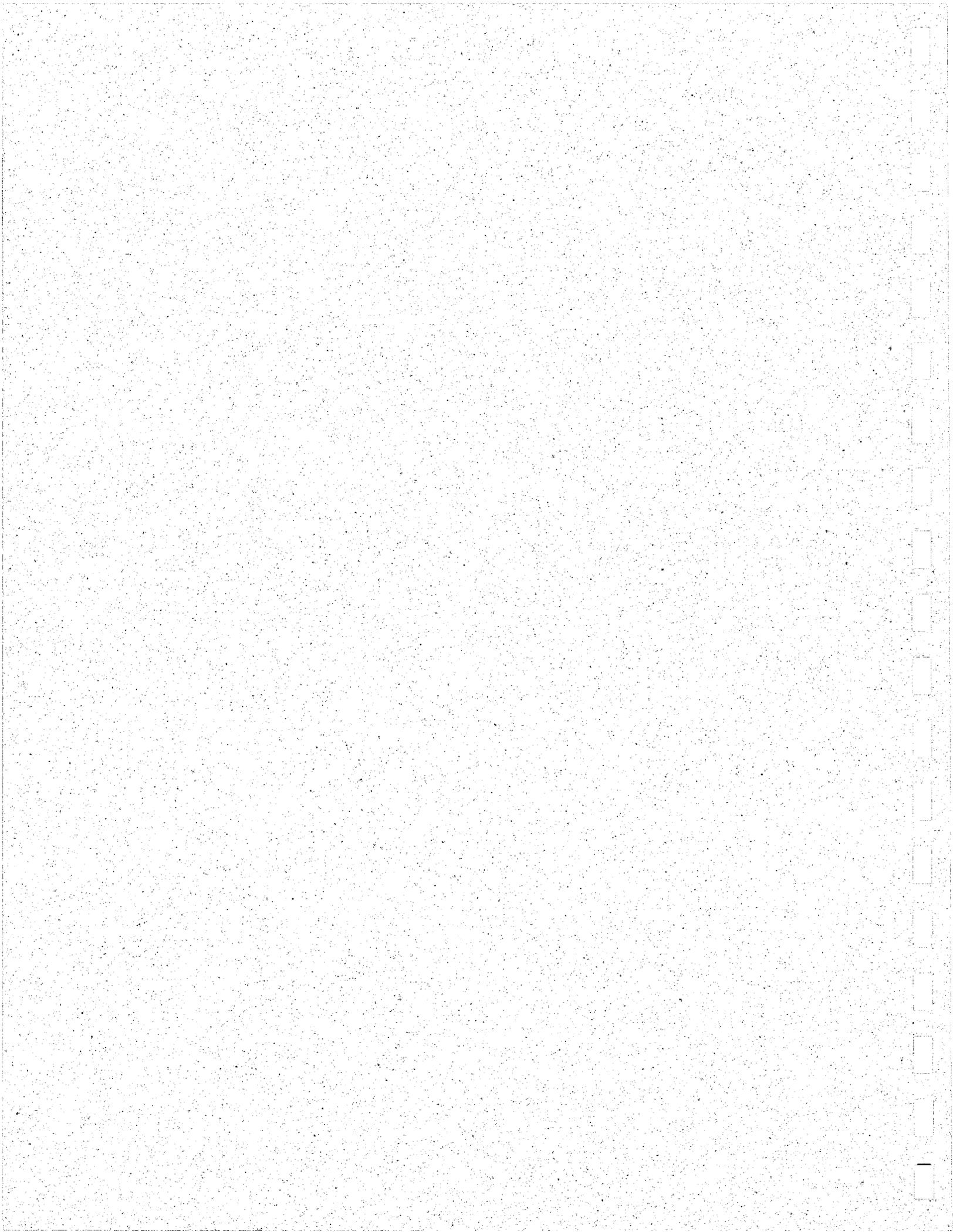
■ Between 3:30 PM and 7:00 AM: A two person crew is on-call at 1 week intervals. A beeper and a radio equipped City vehicle are available. Call is received by City operator at 264-5011; operator contacts crew members, both respond. If a major storm occurs, back-up on-call staff are scheduled.

The Tree Services Section chain of supervisory command to support emergency operations is:

1. Supervisors
2. Superintendent
3. Manager
4. Deputy Director
5. Assistant Director
6. Director



Chapter Four: Training



CHAPTER FOUR: TRAINING

It is ultimately the maintenance person's responsibility to acquire the necessary knowledge and skills to perform his or her job. However, the City should encourage and support attendance at pertinent college classes and seminars. Attendance at a minimum level of such seminars should be encouraged to seek certification for each job classification. A pay raise upon certification is recommended. All personnel are encouraged to take the International Society of Arboriculture (ISA) examination for Certified Tree Climber or Certified Arborist.

Outside contractors working either for the City, other agencies, or for private citizens are encouraged to comply with the Western Chapter ISA Pruning Specifications. The responsibility for providing crew members with this expertise lies with the individual contractor.

This Maintenance Manual should be used as part of the training process along with continuing education (college or junior college, University of California Cooperative Extension Service classes); and by training sessions conducted on a regular basis by City staff. Tests should be given and graded after these sessions. Training should also be provided by outside consultants, with tests given periodically. Whether conducted by in-house staff or outside consultants, these sessions should be a combination of classroom instruction immediately followed by field practice. Information regarding landscape maintenance subjects will be understood and retained far more successfully using this technique.

Qualifications of Trimming Personnel

The person responsible for leading and training the forestry crew is a trained arborist who is encouraged to achieve certification from the Western Chapter, International Society of Arboriculture (ISA), and has at least five years field experience. He or she should also be capable of supervising and managing the crew. If outside contractors are to be used, a list should be prepared of companies who have demonstrated competence in pruning some of the important large trees in Sacramento, such as *Ulmus* sp., *Quercus agrifolia*, *Quercus lobata*, and *Platanus acerifolia*. Outside contractors working either for the City, other agencies, or for private citizens must have a City business license (see Policy

chapter, Enforcement, in the Management Plan) in order to provide tree pruning services in the City. Companies that practice stub cutting techniques (heading back large limbs) should not be allowed to work for the City on public trees.

Safety Procedures

Landscape maintenance, particularly tree maintenance, involves dangers to personnel which exceed those of most professions. Sharp cutting instruments, many of them powered, are used in rough terrain or above ground in trees; heavy lifting is often required; and activities are often carried out near car traffic. Specific attention must be given to safety considerations to ensure the greatest protection for the public, employees and the trees.

Proper safety procedures serve as examples to the general public of how to carry out maintenance tasks, while improper procedures not only serve as bad examples, but are dangerous to the health and safety of the City crews, and can create liability problems for the City. Each employee must be trained to do his or her job safely. It is human nature to fall into habits where all procedures aren't followed, or where cutting corners gets the job done a little faster. Following good safety procedures is also a habit, and must be encouraged. Common sense will go a long way toward preventing accidents.

Following are guidelines, some of which are adapted from the Cal OSHA Tree Works Safety Regulations, Title 8: Article 12 - Tree Work, Maintenance or Removal (see Appendix) and the American National Standards Institute handbook for tree care operations (ANSI Z133.1-1982, 1430 Broadway, New York, NY 10018). The landscape supervisor and all members of the tree crews should have copies of these standards, which are only excerpted here.

Checklist for Safety

General

- Observe all provisions of applicable laws.
- Be trained in and follow procedures for the proper use of all equipment.
- All equipment to meet existing standards, and be properly maintained.
- Never exceed the manufacturer's rated capacity for lifting loads.
- Never let unqualified personnel use a piece of

machinery or perform a task.

- Inspect all equipment each day before use.
- Always use personal protective equipment. This includes helmets, safety belts or saddle belts and climbing ropes in tree work, and safety belts in aerial-lift equipment; hearing protection equipment for noisy machinery; and respiratory, eye and skin protection when spraying.
- Do not use ropes which are being used for climbing for lowering limbs or raising and lowering equipment. Use separate ropes for these tasks.
- Provide a first-aid kit on the job site. Employees are to be trained in first-aid procedures, and in rescue procedures for tree workers.
- Be able to identify poison oak and other common poisonous plants.

Electrical Hazards

- Always assume that an electrical wire or cable is energized and dangerous.
- If an electrical hazard exists in a tree, only a qualified line-clearance tree trimmer should do the work. A second specialist may have to be present (see ANSI standards for details). All other workers must remain at least ten feet from the power lines (and in some cases more—see ANSI standards).
- If a branch is hanging on a power line, call the utility company. Insulated equipment must be used to remove it.
- Rubber footwear is not to be considered protection from electrical hazards.
- When ladders, platforms and aerial devices contact a live wire, consider them energized and dangerous.
- Suspend work when an emergency condition develops involving electrical conductors.
- Only properly trained persons familiar with electrical hazards are to attempt emergency rescue. Sacramento Municipal Utility District (SMUD) offers classes cooperatively with the City.
- Use pole pruners and pole saws made of non-conducting poles and cords. Use ladders made of nonconducting materials near power lines.

Vehicle Safety

- Always set out safety cones when working near traffic, and use a flagger if needed to direct traffic.
- When trucks with obscured rear vision must back up, outside guidance is necessary.
- Store all materials carried on vehicles so as not to fall off during transit.
- Do not ride outside or on top of a truck unless this is required by the job, such as in roadside spraying.
- Do not leave vehicles unattended while running, or leave ignition keys in the vehicles.
- Do not leave wood chips in truck beds for extended periods, as spontaneous combustion may result.

Gasoline-powered machinery

- Do not refuel gasoline-powered equipment while the engine is running.
- Do not smoke around gasoline-powered machinery.
- Store gas only in approved safety cans.
- Refuel machinery at least ten feet away from where the equipment is being used.

Hand Power Tools

- All portable electric hand tools should be equipped with a grounded three-prong cord, be double-insulated, or be connected to the power source through an isolated transformer.

Lifting

- Be sure clear ground is available if the weight is to be carried from one place to another.
- Decide exactly how the object is to be grasped.
- Make a preliminary lift to be sure the load can be safely handled.
- Place feet solidly.
- Crouch as close to the load as possible with the legs bent at an angle of about 90 degrees.
- Keep the back as straight as possible. It may be far from vertical but should not be hunched. Lift with the legs, not the back.

Other Guidelines

See the Cal OSHA and ANSI standards for

other specific rules concerning aerial lifts, brush chippers, sprayers, stump cutters and grinders, hoists, trucks, portable power tools, chainsaws, backpack power units, hand tools, electrical hazards, mobile equipment, safe work procedures in tree pruning and removal, and general safety requirements.

SACRAMENTO URBAN FOREST MANAGEMENT PLAN APPENDICES



**PREPARED FOR
CITY OF SACRAMENTO
NEIGHBORHOOD SERVICES DEPARTMENT
Formerly Parks and Community Services**

**BY
WOLFE MASON ASSOCIATES**

**In association with:
Royston, Hanamoto, Alley & Abey
Michal C. Moore**

April 1994

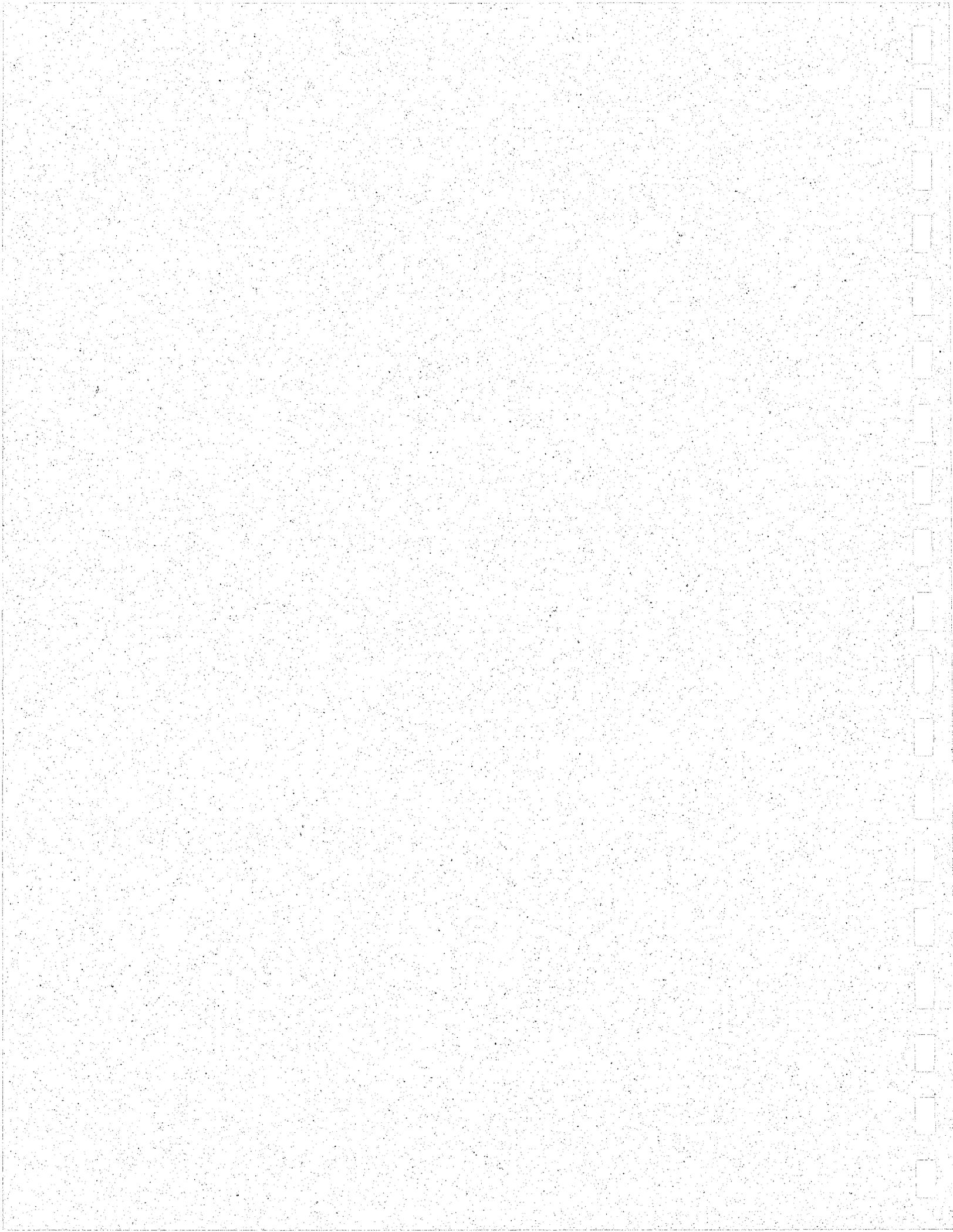
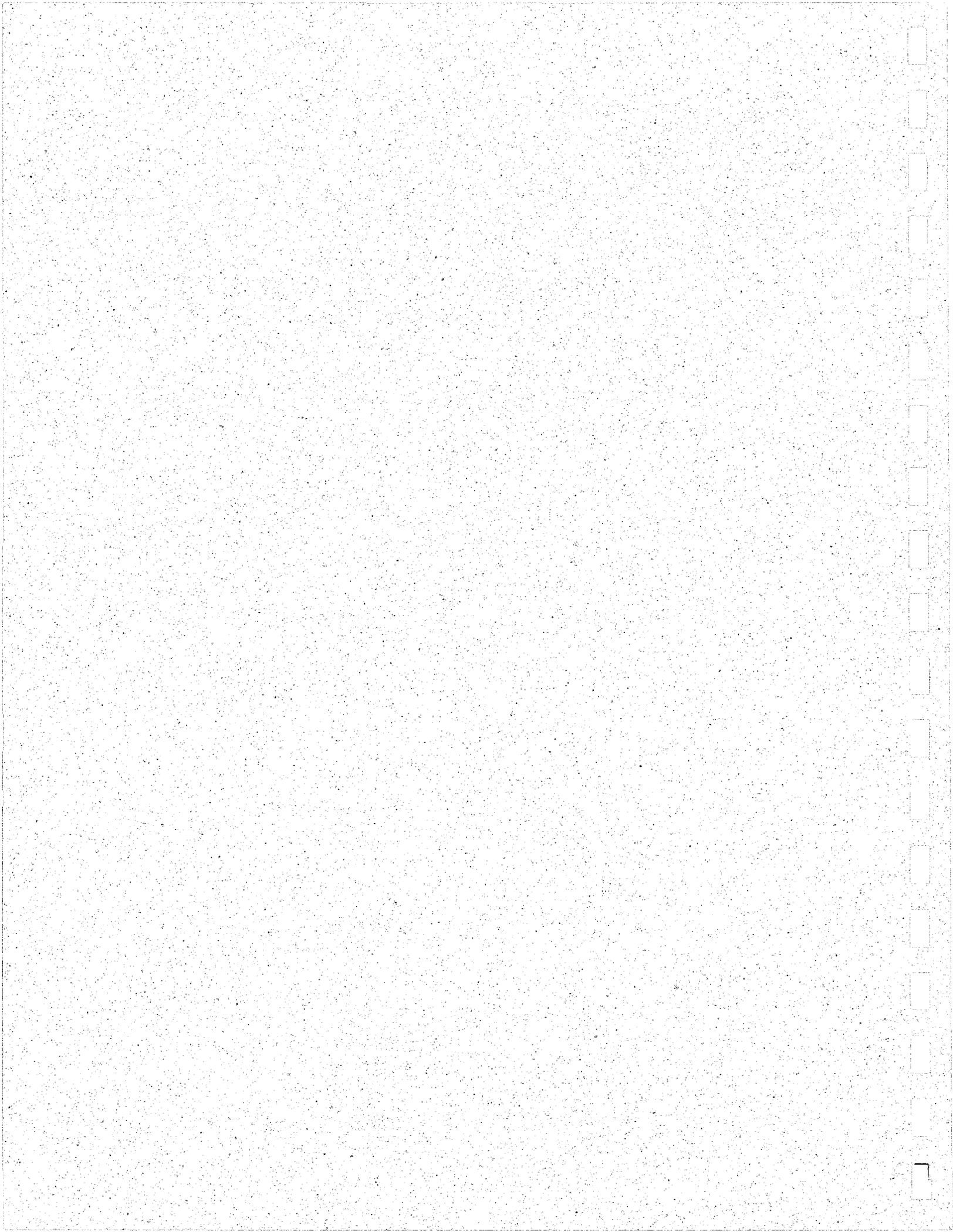


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RELATIVE FREQUENCY OF PRUNING NEEDED FOR SPECIES	9
SACRAMENTO PUBLIC INFORMATION BROCHURE	10
DESIGN ANALYSIS OF EXISTING PLANS	11
LIGHTING AND LANDSCAPE OVERVIEW	12



Appendix 1: Public Urban Forestry Survey



6. HOW ACTIVE SHOULD CITIZENS BE IN THEIR COMMUNITY URBAN FOREST?
 (Circle one of the following: 3=citizen responsibility only, 2=citizen and municipality shared responsibility, 1=municipality responsibility only)
 Note: Costs increase with the level of municipal care.

	<u>#1 Municipality</u>	<u>#2 Shared</u>	<u>#3 Citizen Only</u>
■ Setting Policies/Procedures	3/65 = 5%	57/65 = 88%	5/65 = 8%
■ Planting & Caring for Trees...	6/60 = 10%	46/60 = 77%	8/60 = 13%
■ Caring for Trees...	11/58 = 19%	43/58 = 74%	4/58 = 7%
■ Removing Trees	31/58 = 53%	22/58 = 38%	5/58 = 9%
■ Organizing Events	4/60 = 7%	45/60 = 75%	11/60 = 18%

7. IF THE TREE IN YOUR FRONT YARD HAS BEEN TRIMMED/SPRAYED IN THE PAST 5 YEARS, WHO PROVIDED THIS MAINTENANCE?:

■ a) Homeowner	31/49 = 63%
■ b) City Tree Services	7/49 = 14%
■ c) Private Tree Company	11/49 = 22%

8. THE CITY CURRENTLY HAS A MORATORIUM ON PROVIDING MAINTENANCE/TRIMMING TO PRIVATE PROPERTY FRONT YARD TREES. PRIOR TO THIS MORATORIUM WHICH WAS SET IN JULY, 1990, TREES COULD EXPECT TRIMMING BY THE CITY APPROXIMATELY ONCE EVERY 23 YEARS. URBAN FORESTERS RECOMMEND ONCE EVERY 7 YEARS FOR HEALTHY TREES.

- | | |
|----------------|-------------|
| ■ a) \$5/year | 17/54 = 31% |
| ■ b) \$15/year | 37/54 = 69% |
- c) Other suggestions include:
- Direct charge for service.
 - Flat fee based on lot size for single and multiple family residences.
 - Would be willing to pay more for more frequent trimming.
 - Increase property transfer tax.
 - \$10 for 7-year city tree rotation plus fee for service for other trees; program for low income.

URBAN FOREST MASTER PLAN COMMUNITY WORKSHOP QUESTIONNAIRE

The Sacramento Department of Parks and Community Services would like your views and ideas on trees in the city in order to develop a tree master plan that preserves our "City of Trees." Please take a few minutes to respond to the following questions and feel free to add any other comments that would help us in the planning process.

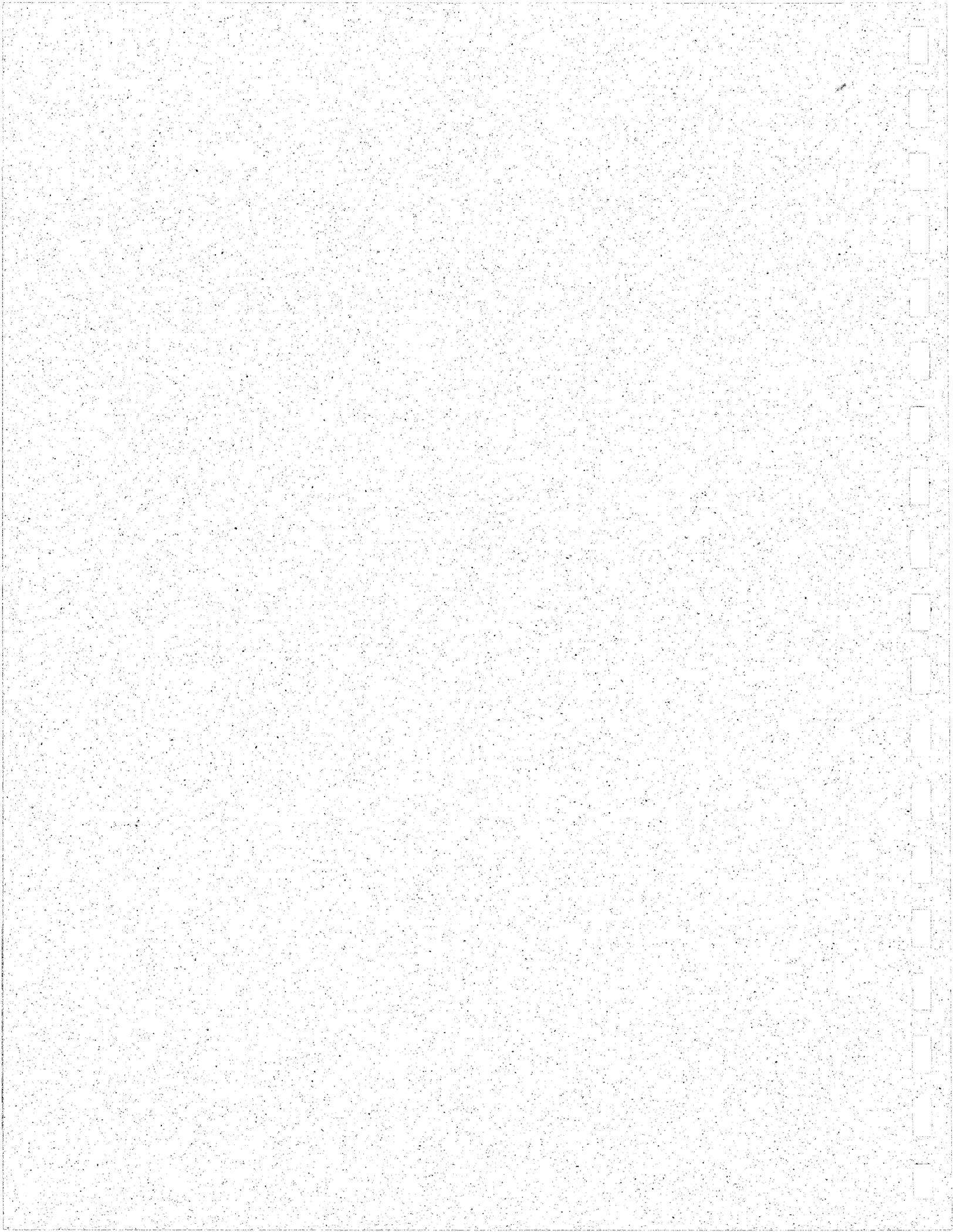
1. WHICH OF THE FOLLOWING ELEMENTS IN YOUR NEIGHBORHOOD MAKE IT DISTINCTIVE FROM OTHERS IN SACRAMENTO? (Circle one of the following, 5=very distinctive and 1=not distinctive)

	<u>Not Distinctive (1-2)</u>	<u>Distinctive (4-5)</u>
■ Architecture	16/68 = 24%	30/68 = 44%
■ "Sense of Community"	11/66 = 17%	36/66 = 55%
■ Trees	12/68 = 18%	50/68 = 76%
■ Open Spaces	18/64 = 28%	34/64 = 53%
■ Shopping Areas	30/65 = 46%	14/65 = 22%
■ Beauty	10/63 = 16%	39/63 = 62%
■ Views	29/75 = 39%	24/75 = 32%
■ Prominent Thoroughfares	28/65 = 43%	21/65 = 32%

2. WHICH ELEMENTS IN SACRAMENTO MAKE IT DISTINCTIVE FROM OTHER CITIES IN CALIFORNIA? (Circle one of the following, 5=very distinctive and 1=not distinctive)

	<u>Not Distinctive (1-2)</u>	<u>Distinctive (4-5)</u>
■ History/State Capital	5/64 = 8%	56/64 = 88%
■ "Sense of Community"	9/61 = 15%	29/61 = 48%
■ Trees	4/63 = 6%	58/63 = 92%
■ Open Spaces	7/62 = 11%	35/62 = 56%
■ Downtown Area/Midtown	16/61 = 26%	25/61 = 41%
■ River/Park Ways/Bikeways	5/59 = 8%	41/59 = 69%
■ Indiv. & Distinctive...	4/64 = 6%	44/64 = 69%
■ E'ways/G'ways/Thoroughfares	19/61 = 31%	23/61 = 38%

**Appendix 2: Evaluation of Existing Ordinances
and Revised Tree Ordinance**



EVALUATION OF EXISTING ORDINANCES

The City of Sacramento has several ordinances in the City Code and numerous departmental policies which affect trees. This section provides an analysis of the existing ordinances and recommends ways in which the ordinances can be strengthened.

Sacramento City Code

The Sacramento City Code consists of numerous ordinances which incorporate, among other things, all rules and regulations regarding planning and development in Sacramento. They are derived from various recommendations and goals.

Chapter 40: Subdivision Regulation

- 40.318 - Utility easement of 12.5 feet from back of curb (maintenance strip)
- 40.811i - Specific Improvement Requirements, Street Trees:

a. Gives control to Director of Parks and Community Services

b. Fee required from each new development at a rate established by the City Council. The fee was recently raised to \$100 per tree for subdivision tree planting

Recommended:

1. Establish a fee requirement based on the true cost to preserve existing trees, plant and maintain all trees for the first five years of growth to achieve a 50% canopy coverage at 15 years for the total subdivision area. That total figure is then used to determine a prorated figure for each lot.

Chapter 45: Trees (1987)

Article I. General: Overall benefits of trees; City's commitment to the preservation and increase of trees.

- 45.1 - Findings: Benefits of trees

- 45.2 - Definitions:

a. A City street tree is any tree growing on City owned real property or easement dedicated to the public per Sec. 40.318.

b. Director

c. Maintenance

d. A maintenance strip is the 12.5 foot strip of land parallel and adjacent to a public street as measured from the back of curb or edge of pave-

ment.

e. Planting list

f. Property owner

g. Public utility

h. Street tree is any tree growing within the maintenance strip

Recommended:

1. Expand Planting List to include all trees shown in the Tree Matrix, Design chapter in Management Plan, including experimental, conditional, and not-to-use trees. Redefine planting space as stated in Management chapter in Management Plan.

2. Planting List recommendations to include specific street trees for streets that provide large canopy and shade.

- 45.3 - Planting List: all new and replacement street trees must come from this list.

■ 45.4 - Inspection, maintenance, removal and replacement: "Within budgetary limitations, the Director of Parks and Community Services may provide the following tree-related services":

a. hazardous tree or limb removal: for non-emergency tree removal, property owners must have 30 days written notice.

b. maintenance of trees within the private maintenance strip.

c. no maintenance provided on privately-owned trees beyond the maintenance strip or within the maintenance strip if impeded by obstructions such as fences and landscaping.

d. tree root pruning causing damage to public sidewalks; if the first pruning fails to alleviate the problem, the City may remove the tree when a future recurrence arises.

e. allows access to private property to perform necessary tree services.

- 45.5 - Duties of property owner/tenant and public utilities:

a. requires owner to maintain maintenance strip on private property including watering for up to 3 years "whenever landscaping of the property is changed to deprive the tree of its normal source of water."

b. requires pruning by owner

- 45.6 - Protection of Trees: A permit is required for pruning or removal of any street tree other

This is calculated and reviewed per project by the Landscape Architect and/or Building Inspector from the approved species list. The species list includes categories of trees estimated to achieve 35', 30', 25' and 20' of canopy spread after 15 years of growth.

d. All surfacing upon which a vehicle can drive is subject to the shade calculation, i.e., stalls, driveways, and all maneuvering areas. The exceptions are truck loading and maneuvering areas and paved areas which are not accessible to vehicles.

e. Encourages 20% of the trees at each site to be native oak trees.

f. All projects that require building permits are to include site grading, planting and irrigation plans, and a tree survey showing the location and size of existing trees and identifying those to be removed

g. No tree over 2 feet in diameter can be removed without specific approval.

Recommended:

1. Modify planter size requirements to 6' (5' acceptable with plan review approval).

Section 2: Different Land Uses

a. Landscape perimeter standards: 10 feet typically

b. Special Permit for Flea Markets calls for 25 foot wide landscape area around the entire perimeter of the site to be planted with a mixture of evergreen and deciduous trees .

Section 3: Height and Area Regulations

a. Tree setback for roots and canopy

Recommended:

a. Revise to state requirements as listed in Design chapter of the Management Plan.

Section 4, 5, 6: Not applicable to trees.

Section 6: Tree Shade Canopy reference.

than for mistletoe removal.

Recommended:

1. Modify: "A permit is required for pruning or removal of any street tree"

■ 45.7 - Maintenance and Removal of Street Tree:

a. City has the authority to determine if work is needed and to grant a permit for work.

b. Owner is responsible for payment, etc.

■ 45.8 - Removal Work: Requires street tree removal permittee to fill hole, replant and repair damages after removing tree.

■ 45.9 - Replacement Trees:

a. Size

Recommended:

1. Modify to include discussion of species as well as size, as detailed in Management Plan Design Chapter.

■ 45.10 - Mistletoe

■ 45.11 - Dutch Elm Disease: States that Article II shall take precedence over any other regulation.

■ 45.12 - No street tree can be removed to facilitate the moving of a house, except for designated historic structures.

■ 45.13 - Appeals

a. Appeal sent to Director

b. Appeal may go to the City Council after review by Director

Recommended:

a. Modify to provide an intermediary reviewing body, such as the Sacramento Tree Foundation, with the formation of new committee if the demand develops for such a need.

■ 45.14 - Liability

■ 45.15 - Violations

a. Violation is considered an infraction.

Recommended:

a. Modify as stated in the Comprehensive Tree Ordinance.

ARTICLE II. DUTCH ELM DISEASE

Recommended:

1. Integrate into the Comprehensive Tree Ordinance.

ARTICLE III. SOLAR SHADE CONTROL

Provides City exemption to State Solar Shade Control Act.

Recommended:

1. Integrate into the Comprehensive Tree Ordinance.

ARTICLE IV. HERITAGE TREES:

a. Defined as a tree of any species having a trunk circumference of 100 inches or more measured at 4.5 feet above ground level, which are of good quality in terms of health, vigor and shape as designated by the Director of Parks and Community Services, Tree Services Section.

b. Notification of designation to property owner.

c. Tree Register.

Recommended:

1. Extend the definition to include:

a. Any native *Quercus* species, *Aesculus californica* or *Platanus racemosa*, having a circumference of 36 inches or greater when a single trunk, or a cumulative circumference of 36 inches or greater when a multi-trunk.

b. Any tree 36 inches in circumference or greater in a riparian zone. The riparian zone is measured 30 feet beyond the high water line.

c. Any tree, grove of trees or woodland trees designated by resolution of the city council to be of special historical or environmental value or of significant community benefit.

2. Eliminate the requirement for an official tree register. The tree register will be for educational and reference purposes only.

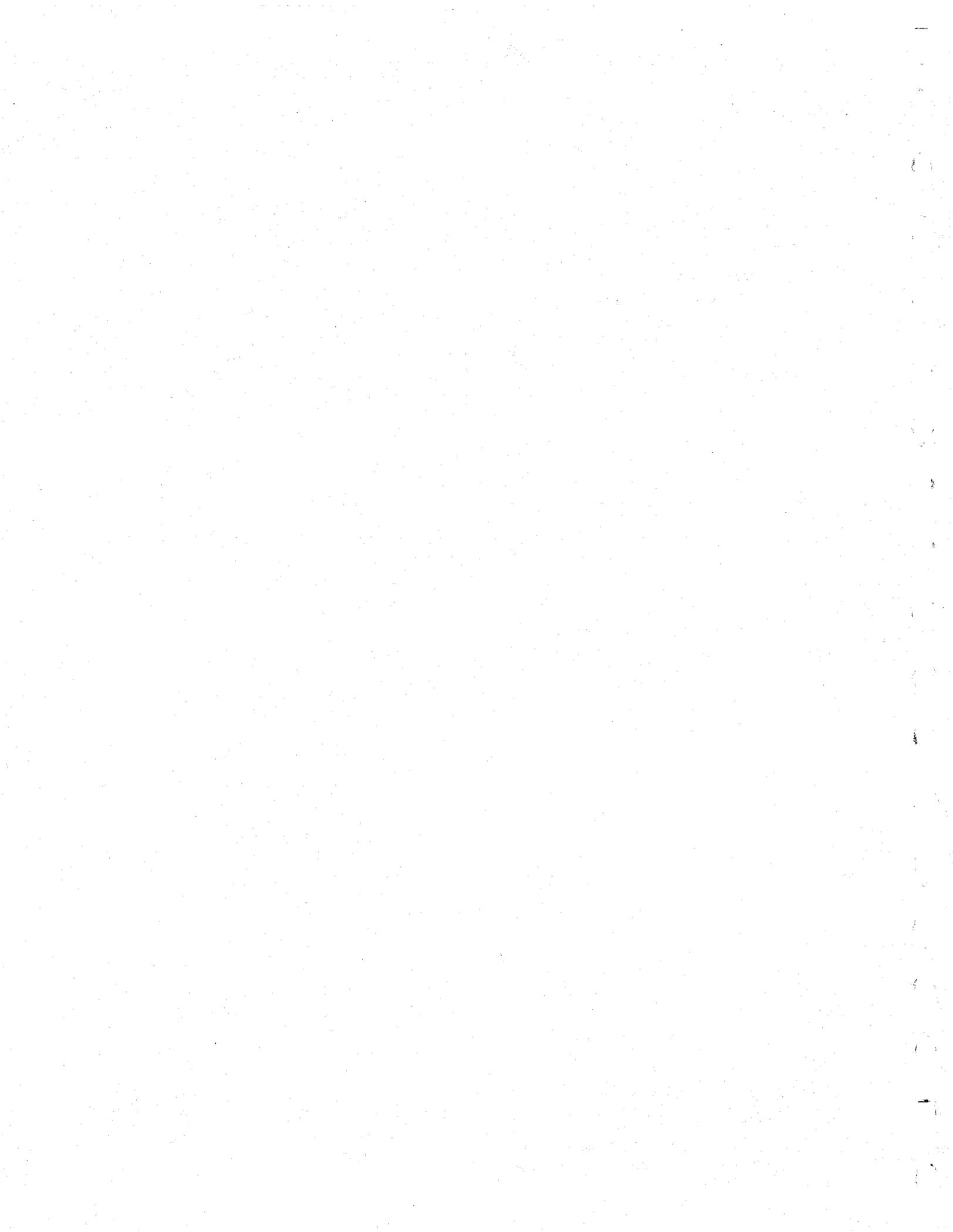
Zoning Ordinance (1989-90)

Section 1. Tree Shade Canopy in Parking Lot (amendment to ordinance 1983)

a. Required landscaping in the Highway/ Commercial Zone and in parking lots to be 10 foot wide planter adjacent to the property line abutting a public street.

b. Four foot wide planter against the street everywhere else.

c. Tree shading of 50% of the paved area after 15 years of growth is required in all parking lots.



TITLE 45. TREES

- Chapter 45.01. In General
- Chapter 45.02. Dutch Elm Disease
- Chapter 45.03. Solar Shade Control
- Chapter 45.04. Heritage Trees

Chapter 45.01. In General

- 45.01.001 Findings.
- 45.01.002 Definitions.
- 45.01.003 Planting list; tree planting.
- 45.01.004 Inspection, maintenance, removal and replacement.
- 45.01.005 Duties of property owner/tenant and public utilities.
- 45.01.006 Protection of trees.
- 45.01.007 Maintenance and removal permits.
- 45.01.008 Removal work.
- 45.01.009 Replacement trees.
- 45.01.010 Reserved.
- 45.01.011 Dutch Elm disease.
- 45.01.012 House moving.
- 45.01.013 Appeals.
- 45.01.014 Liability.
- 45.01.015 Violations.
- 45.01.016 Registration of persons maintaining street trees.
- 45.01.017 Suspension and reinstatement.
- 45.01.018. to 45.01.099 Reserved.

45.01.001 Findings.

The city council finds and determines that the planting and preservation of trees enhances the natural scenic beauty, increases life-giving oxygen, promotes ecological balance, provides natural ventilation, air filtration, and temperature, erosion, and acoustical controls, increases

property values, improves the lifestyle of residents, and enhances the identify of the city.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.002 Definitions.

When used in this chapter, the following words and phrases shall apply:

- (a) **City street tree.** "City street tree" shall mean and include any tree growing on a public street right-of-way. City street trees are maintained by the city.
- (b) **Director.** "Director" shall mean the director of the department of neighborhood services or the director's designated representative.
- (c) **Maintain or maintenance.** "Maintain" or "maintenance" shall mean and include trimming, pruning, spraying, injecting, fertilizing, cabling, treating for disease or injury, and any other similar acts which promote the life, growth, health or beauty of trees, excepting only watering, unless specifically so stated.
- (d) **Maintenance easement.** "Maintenance easement" shall mean a strip of land parallel to a public street right-of-way and adjacent thereto, which is six and one-half feet wide, measured from the front property line, (and the side

property line if a corner lot), except that a maintenance easement shall not be deemed to exist on any parcel where the adjacent public street right-of-way provides space for a city street tree.

- (e) **Maintenance easement private street tree.** "Maintenance easement private street tree" shall mean and include any tree growing within a maintenance easement. No parcel contains more than one maintenance easement private street tree per forty (40) feet of street frontage. If there is more than one tree in the maintenance easement per forty (40) feet of street frontage, only the one closest to the street is a maintenance easement private street tree, and the other(s) are private trees.
- (f) **Planting list.** "Planting list" is the list of trees which is approved by the director for planting as street trees.
- (g) **Private tree.** "Private tree" shall mean and include any tree on private property outside of the maintenance easement. The owner of the parcel is responsible for maintenance of private trees.
- (h) **Property owner.** "Property owner" shall mean and include the person listed as the owner

of the property on the then current assessor's roll.

- (i) **Public tree.** "Public tree" shall mean and include any tree on public property, excepting trees growing on a public street right-of-way.
- (j) **Public utility.** "Public utility" shall mean and include every pipeline corporation, gas corporation, electrical corporation, telephone corporation, telegraph corporation, water corporation, sewer system, and heat corporation, where the service is performed for or the commodity delivered to the public or any portion thereof.
- (k) **Street tree.** "Street tree" shall mean and include both city street trees and maintenance easement private street trees.
(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.003 Planting list; tree planting.

- (a) The director shall promulgate a planting list. Such list shall consist of shade and ornamental trees suitable for areas adjacent to sidewalks, streets, utility lines, etc. All new and replacement city street tree plantings shall be confined to trees listed on the then current planting list.
- (b) The director shall provide for the planting of maintenance easement private street trees

within the maintenance easement of any new subdivision in conformity with Title 40 of the City Code, Sections 40.10.1017 and 40.12.1211(8).

- (c) A maintenance easement, as defined in Section 45.01.002(d), shall be established for any new development which is not subject to Section 40.10.1017 of the city code. The director shall provide for the planting of maintenance easement private street trees within the maintenance easement of the development.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.004 Inspection, maintenance, removal and replacement.

The director may provide the following tree-related services:

- (a) The removal of street trees or limbs therefrom, which are a hazard to public safety, or a public nuisance; provided however, that the director shall not cause the removal of any tree other than a city street tree without giving thirty days written notice to the property owner on whose property the tree is located, except in the case of an emergency requiring immediate action. If the owner objects to said tree's removal, the owner may, within said thirty days, file objection in

writing with the director, and shall thereafter be given an opportunity to be heard in support of the objection. If such objection is not sustained, the removal may then occur, but only by written order of the director, and only following expiration of the period for appeal pursuant to Section 45.01.013, or upon denial of such appeal.

- (b) The inspection, maintenance, removal, and replacement of city street trees.
- (c) The inspection, maintenance, removal, and replacement of maintenance easement private street trees.
- (d) If there is more than one street tree in the maintenance easement on a lot or parcel of land adjacent to a structure, it is the policy of the city to maintain only the city street tree, or if there is no city street tree on that parcel, the street tree closest to the street. No maintenance service shall be provided to any tree standing on private property beyond the maintenance easement or standing in such a position that the use of mechanized equipment is impeded, or where fences and landscaping beneath the tree might be damaged by the work; provided however, an exception to this

policy may be made if the condition of the tree presents a hazard to public safety or if such service is necessary to control insects or diseases which threaten the health of a significant number of street trees.

In order to perform the services listed in this section, the director shall have authority to enter upon any part of the maintenance easement, and where necessary the properties adjacent thereto.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.005 Duties of property owner/tenant and public utilities.

(a) It shall be the duty and responsibility of all property owners/tenants to maintain the grounds of maintenance easements on the owner's/tenants' property, and any unpaved portion of the adjacent public street right-of-way where space is provided for a city street tree or other plantings, regardless of whether such property is developed. This maintenance shall include watering as needed and keeping such easements and unpaved areas free from weeds or any obstructions contrary to public safety. Property owners shall be responsible for watering mature city street trees whenever landscaping of the property is changed in such a

manner as to deprive the tree of its normal source of water. Such watering shall be continued during dry weather until the city street tree becomes acclimated to the new environment, but need not exceed three years. All watering requirements shall be waived to the extent inconsistent with governmental restrictions on water use.

- (b) It shall be the duty and responsibility of every person owning or occupying any real property within the City of Sacramento, at his or her own expense, to keep all trees on that property, including trees located in an easement dedicated to the public, trimmed in such a manner that there is a clearance of at least fourteen feet above any street or alley, and a clearance of at least eight feet over any sidewalk. It shall also be the duty and responsibility of every person owning or occupying any real property within the City of Sacramento, at his or her own expense, to keep all trees on that property trimmed in such a manner that they do not obstruct the view of any traffic sign or device for vehicle traffic in the direction controlled by that traffic sign or device.
- (c) Nothing in this chapter shall be construed to limit the duty or

right of a property owner to remove or perform maintenance at the property owner's own expense on any tree other than a city street tree.

- (d) Whenever the director determines that removal of a private tree, or limbs therefrom, is necessary to eliminate a hazard to public safety or a public nuisance, the director may issue a written notice to the property owner specifying the work to be done.
- (e) If, in the opinion of the director, any maintenance easement private street tree or private tree is in such a condition as to be imminently hazardous to public safety, the director may arrange to have accomplished such work as is necessary to eliminate the imminent hazard.
- (f) Nothing contained in this section authorizes any person to remove, trim, prune, cut or otherwise perform any maintenance on any city street tree without first obtaining a permit as required by Section 45.01.006.
- (g) It shall be the duty and responsibility of any public utility installing or maintaining any overhead wires or underground pipes or conduits in the vicinity of a public street

right-of-way or maintenance easement, to obtain permission from the director before performing any maintenance on said wires, pipes, or conduits, which would cause injury to city street trees or maintenance easement private street trees. Said public utility shall in no way injure, cut roots, deface, prune, or scar any city street tree or maintenance easement private street tree until their plans and procedures have been approved by the director.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.006 Protection of trees.

- (a) No person shall remove, trim, prune, cut or otherwise perform any maintenance on any city street tree without first obtaining a permit from the director pursuant to Section 45.01.007.
- (b) No person shall interfere or cause any person to interfere with any tree related work being done pursuant to this chapter by any employee of the City of Sacramento or any person or firm doing work for the city.
- (c) No person shall injure or destroy any city street tree by any means, including but not limited to the following:
 - (1) Constructing a concrete,

asphalt, brick or gravel sidewalk, or otherwise filling up the ground area around any tree so as to shut off air, light or water from its roots, unless ordered or authorized to do so by the city.

- (2) Piling building material, equipment or other substance around any tree so as to injure the tree.
- (3) Pouring any deleterious matter on or around any tree or on the surrounding ground, lawn or sidewalk.
- (4) Posting any sign, poster, notice, or similar device on any tree, tree stake or guard, or by fastening any guy wire, cable, rope, nails, screws, or other device to any tree, tree stake or guard for any purpose other than supporting the tree.
- (5) Causing any fire or burning near or around any tree.
- (6) Cutting roots with a diameter of two inches (2") or greater for sidewalk repair or any other purpose; provided, however, that roots with a diameter of two inches (2") or greater may be cut if authorized in advance by the director.

- (d) The director of public works and the planning director shall notify the director of any applications for new subdivisions, curb, gutter, sidewalk, street light or driveway installations, or other proposed improvements which might require the removal of or cause injury to, any city street tree, or interfere with the fulfillment of the maintenance easement private street tree plantings.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.007 Maintenance and removal permits.

- (a) The director shall issue permits to perform maintenance on or to remove city street trees, only if the following conditions are met:
 - (1) The applicant has established, to the director's satisfaction, that there is need for the proposed work on the tree; and
 - (2) The applicant has established, to the director's satisfaction, that the persons who are to perform the work are qualified to do so; and
 - (3) The director, in his sole discretion, has determined that any potential detriment to the city street tree

population entailed by the proposed work, is justified in the individual case. In making this determination, the director shall consider factors such as the probability that the proposed work will destroy or seriously injure the tree, the tree's health, the desirability of that species as a street tree, whether the tree's condition and size threaten serious damage to property, the condition and number of other city street trees in the vicinity, whether there are other less onerous means of accomplishing the applicant's goals, and other related criteria.

- (b) All work performed on city street trees pursuant to a permit issued by the director under this section shall be done within a sixty day period from the issuance of said permit, or within such longer period as the director shall specify.
- (c) The director shall condition any permit granted pursuant to this section for the removal of a city street tree, on the permittee removing, and where the director determines it to be appropriate, replacing the tree. In such case, the full cost of removal and replacement shall be borne by the permittee and such service shall not be

provided by the city.

- (d) The director may condition any permit granted pursuant to this section on any conditions as the director determines to be necessary.
- (e) The provisions of Section 45.01.012 shall be complied with whenever an applicant seeks a permit to remove or trim a city street tree to facilitate moving any building or other structure.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.008 Removal work.

Where the director has granted a permit to remove a city street tree, removal work shall include removal of the tree stump and nearby roots to a depth of twelve inches, and filling of the hole with clean topsoil. If no replacement tree is required by the director, then lawn, groundcover, or paving to match the adjacent area shall be provided by the permittee. The permittee shall also repair any damages to the street, curb or sidewalk caused by the tree's removal.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.009 Replacement trees.

Where the director has granted a permit to remove a city street tree, and conditioned said permit on the permittee replacing the tree, the permittee shall provide the replacement tree of a size and species determined by the director, and plant said tree in the location specified by

the director. The minimum replacement tree size shall be as follows:

- (a) If the city street tree being removed is six inches or larger in diameter, measured four and one-half feet above ground, then the permittee shall cause to be replanted a tree of at least twenty-four inch box size.
- (b) If the city street tree being removed is smaller than six inches diameter, measured four and one-half feet above ground, then the replacement tree shall be a minimum of fifteen gallon can size.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.010 Reserved.

45.01.011 Dutch Elm disease.

In the event of discovery of the Dutch Elm disease fungus, *ceratocystus ulmi*, infecting any tree in the City of Sacramento, the regulations of Chapter 45.02 of this title shall prevail over any conflicting regulation contained in this chapter.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.012 House moving.

- (a) The director of public works shall consult with the director prior to issuing a permit for moving any building or other structure along any city street.

- (b) The director may require the person moving any structure to furnish a bond in an amount sufficient to cover the anticipated damage or destruction of any city street trees or maintenance easement private street trees, if the route over which the structure is to be moved potentially entails damage to city street trees or maintenance easement private street trees.

- (c) No person shall remove a city street tree to facilitate the moving of a house or other structure, without first complying with the permit provisions of Section 45.01.007. Similarly, if a permit is issued and the tree removed, the person moving the structure shall comply with all other provisions of Sections 45.01.007 through 45.01.009, including stump and root removal, planting an appropriate replacement tree, and repairing any damage to the street, sidewalk, or curb which the tree's removal entails.

- (d) In connection with the relocation of an historically significant structure as identified by the historic preservation board or city council, the director shall give greater consideration to the removal of street trees if there is no alternative way to

preserve the structure. Factors to be considered by the director include the historical significance of the structure, whether it could be preserved in its present location, the condition, size, and species of the trees to be removed, and other related factors.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.013 Appeals.

Any person who is denied a permit to remove or maintain a city street tree or who objects to the removal of a tree pursuant to Section 45.01.004 or Section 45.01.007, shall be entitled to meet personally with the director, assistant director, or deputy director of neighborhood services to review the permit application. Any person aggrieved by the director's decision may appeal such decision to the city council by filing a written notice of appeal with the city clerk within ten days of the date of the director's final decision. The notice shall clearly specify the action or determination appealed from, and the reasons for which a hearing is requested.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.014 Liability.

Nothing in this chapter shall be deemed to impose any liability upon any member of the city council or the City of Sacramento, or any of its officers, agents, or employees, or to relieve the owner or occupant of any private property from the duty to keep their private property, sidewalks, and adjacent public street right-

of-way planting area in a safe condition and so as not to be hazardous to public use.

(Ord. No. 3829, §1; Ord. No. 93-066, §1)

45.01.015 Violations.

Any person violating any provision of this chapter is guilty of an infraction.

(Ord. No. 83-153, §40; Ord. No. 93-066, §1)

45.01.016 Registration of persons maintaining street trees.

Any person, firm, or corporation desiring to perform maintenance on any city street tree or maintenance easement private street tree shall register with the director on a form to be provided by the director.

Nothing contained herein exempts any registrant from obtaining required permits for maintenance or removal of street trees.

(Ord. No. 93-066, §1)

45.01.017 Suspension and reinstatement.

In the event that the director determines that any registrant has performed substandard maintenance work on one or more street trees, the director shall issue an order suspending the registrant's privilege to maintain street trees. The privilege shall be reinstated when the registrant provides evidence, through further education or training, or certification by a recognized national organization, that the registrant can perform tree maintenance work in accordance with acceptable industry

standards. Any registrant who contests suspension of his/her/its privilege to maintain street trees shall be entitled to meet personally with the director, assistant director, or deputy director of neighborhood services to review the suspension. The registrant may appeal the director's decision to the city council by filing a written notice of appeal with the city clerk within ten (10) days of the date of the director's final decision. The notice shall clearly specify the determination appealed from and the reasons for which a hearing is requested.

(Ord. No. 93-066, §1)

45.01.018. to 45.01.099 Reserved.

Chapter 45.02. Dutch Elm Disease

- 45.02.100 Finding.
- 45.02.101 Definitions.
- 45.02.102 Public nuisance.
- 45.02.103 Inspections and entry on private property.
- 45.02.104 Declaration of public nuisance.
- 45.02.105 Contents of resolution.
- 45.02.106 Number of streets which may be included in the resolution.
- 45.02.107 Notices; Manner of Posting.
- 45.02.108 Notices; heading.
- 45.02.109 Form of notice.
- 45.02.110 Time of notice of posting.
- 45.02.111 Hearing of objections.
- 45.02.112 Decision on objections; acquiring jurisdiction.
- 45.02.113 Decision of council is final.
- 45.02.114 Order to abate nuisance; form of order.
- 45.02.115 Urgency - cut and stored elm wood.

45.02.116 Entry upon private property to abate nuisance.

45.02.117 Removal of elm wood by property owner.

45.02.118 to 45.02.199 Reserved.

45.02.100 Finding.

The council of the City of Sacramento has determined that there are many elm (and zelkova) trees growing on public and private premises within the City of Sacramento, the loss of which would substantially depreciate the value of public and private premises, and impair the safety, good order, general welfare, and convenience of the public. The council has determined that the health and life of such trees is threatened by a fatal disease known as Dutch Elm disease. The council hereby declares its intention to control and prevent the spread of such disease and the insect pests and vectors which carry such disease and declares the Dutch Elm Disease and the Elm Bark Beetles which carry such disease to be public nuisances.

(Ord. No. 3681, §1)

45.02.101 Definitions.

(a) "Director" shall mean the director of recreation and Parks of the City of Sacramento, his assistants, deputies, or authorized employees or agents.

(b) "Commissioner" shall mean the agricultural commissioner of Sacramento County, his assistants, deputies or authorized employees or agents.

(c) **Elm Tree**" shall include any of the following: Any living or standing elm (or zelkova) tree or part thereof or any dead elm (or zelkova) tree or dead part of any elm tree, including logs, branches, stumps, firewood or other elm material from which the bark has not been removed.

(d) **"Administrative Regulations"** shall mean regulations promulgated jointly by the director and commissioner, and approved by the city council and the Board of Supervisors of Sacramento County, specifying procedures for the removal and destruction of elm trees or portions thereof.

(Ord. No. 3681, §1)

45.02.102 Public nuisance.

The following things are public nuisances whenever they may be found within the City of Sacramento:

(a) Any living or standing elm tree or part thereof infected to any degree with the Dutch Elm Disease fungus, *Ceratocystis Ulmi* (Buisman) Moreau; or which harbors any of the elm bark beetles, *Scolytus Multistriatus* (Eich.) or *Hylurgopinus Refipes* (Marsh.);

(b) Any dead elm tree or dead part of any elm tree, including logs, branches, stumps, firewood or other elm material from which the bark has not been removed.

(Ord. No. 3681, §1)

45.02.103 Inspections and entry on private property.

(a) The director and the commissioner shall inspect all premises and places within the City of Sacramento as often as practicable to determine whether any condition described in Section 42.02.102 exists therein. They may enter upon private property at any reasonable time for the purposes of carrying out any of the duties assigned to them under this chapter. If entry is refused, the director and commissioner shall have recourse to every remedy provided by law to secure lawful entry.

(b) Whenever necessary to determine the existence of Dutch Elm Disease or elm bark beetles in any tree, the person inspecting such tree may remove or cut specimens from the tree.

(Ord. No. 3681, §1)

45.02.104 Declaration of public nuisance.

The city council may declare by resolution as public nuisance, and abate, those conditions set forth in Section 45.02.102 wherever those conditions are found upon public or private property in the City of Sacramento.

(Ord. No. 3681, §1)

§ 45.02.105

Sacramento City Code

45.02.105 Contents of resolution.

The resolution shall refer to the property upon which or in front of which the nuisance exists by giving its lot and block number according to the official or city assessment map. If only a portion of the elm tree is to be removed, the resolution shall so indicate.

(Ord. No. 3681, §1)

45.02.106 Number of streets which may be included in the resolution.

Any number of private or public parcels of property may be included in one resolution.

(Ord. No. 3681, §1)

45.02.107 Notices; Manner of Posting.

After passage of the resolution, the Director or Commissioner shall cause notices to be conspicuously posted on or in front of the property on which the nuisance exists.

(Ord. No. 3681, §1)

45.02.108 Notices; heading.

The heading of the notices shall be "NOTICE TO DESTROY ELM TREE" or "NOTICE TO DESTROY ELM WOOD," whichever is appropriate, in letters not less than one inch in height.

(Ord. No. 3681, §1)

45.02.109 Form of notice.

The notice shall be substantially in one of the following forms:

"NOTICE TO DESTROY ELM TREE

Notice is hereby given that on the ___ day of _____, 19___ the

Sacramento city council passed a resolution declaring that an elm (or zelkova) tree or trees existing upon or in front of the property in the City of Sacramento, and more particularly described in the resolution, and that they constitute a public nuisance which must be abated by being removed and destroyed. Otherwise they will be removed and destroyed by the City of Sacramento. Reference is hereby made to the resolution for further particulars. A copy of said resolution is on file in the office of the city clerk.

All property owners having any objections to the proposed removal of the elm tree or trees are hereby notified to attend a meeting of the Sacramento city council to be held _____, when their objections will be heard and given due consideration.

Dated: _____

Director of Recreation & Parks"

or, if applicable:

"NOTICE TO DESTROY ELM WOOD

Notice is hereby given that on the ___ day of _____, 19___ the Sacramento city council passed a resolution declaring that an elm (or zelkova) tree or trees existing upon or in front of the property in the City of Sacramento,

and more particularly described in the resolution, and that they constitute a public nuisance which must be abated by the removal and destruction of dead wood contained therein in accordance with administrative regulations promulgated by the director of recreation and parks and agricultural commissioner of Sacramento County. Otherwise, such wood will be removed and destroyed by the City of Sacramento. Reference is hereby made to the resolution for further particulars. A copy of said resolution is on file in the office of the city clerk.

All property owners having any objections to the proposed removal of the dead elm wood are hereby notified to attend a meeting of the Sacramento City Council to be held _____, when their objections will be heard and given due consideration.

Dated: _____

Director of Recreation & Parks"

(Ord. No. 3681, §1)

45.02.110 Time of notice of posting.

The applicable notices shall be posted at least three days prior to the time for hearing objections by the city council.

(Ord. No. 3681, §1)

45.02.111 Hearing of objections.

At the time stated in the notices, the city council shall hear and consider all objections to the proposed removal and destruction of elm trees or dead wood contained therein, whichever is applicable. It may continue the hearing from time to time.

(Ord. No. 3681, §1)

45.02.112 Decision on objections; acquiring jurisdiction.

By motion or resolution at the conclusion of the hearing, the city council shall allow or overrule any objections. At that time the city council acquires jurisdiction to proceed and perform the work of removal and destruction of dead wood contained therein.

(Ord. No. 3681, §1)

45.02.113 Decision of council is final.

The decision of the city council is final.
(Ord. No. 3681, §1)

45.02.114 Order to abate nuisance; form of order.

If objections have not been made or after the city council has disposed of those made, it shall order the director or commissioner, or both, to abate the nuisance by having the elm tree or trees removed and destroyed or by having the dead wood contained therein removed and destroyed. The order shall be made by motion or resolution.

(Ord. No. 3681, §1)

45.02.115 Urgency - cut and stored elm wood.

Wherein the director or commissioner shall during their inspection discover elmwood that has been cut, or cut and stored, which is infected or may be infected by Dutch Elm Disease fungus, said director or commissioner may, in order to prevent the storage, movement, or sale of said elmwood and thereby the spread of the fungus causing Dutch Elm Disease, act to cause the disposal of said wood in as expeditious manner as practical.

For purposes of this section of this Chapter, other sections contained herein commencing with Section 45.02.104 through and including Section 45.02.114 are not applicable as the procedural delay that may occur may cause eminent spreading of the fungus to other trees within the vicinity.

(Ord. No. 3681, §1)

45.02.116 Entry upon private property to abate nuisance.

The director or commissioner may enter upon private property to abate the nuisance. It shall be unlawful and an infraction for any person to interfere with or in any way impede the abatement of a nuisance.

(Ord. No. 3681, §1)

45.02.117 Removal of elm wood by property owner.

Before the director or commissioner arrives, any property owner may remove and destroy the elm trees, wood or elm material at their own expense. The method of removal and destruction must

be approved in advance by the Director and Commissioner as being in accordance with administrative regulations.

(Ord. No. 3681, §1)

45.02.118 to 45.02.199 Reserved.

Chapter 45.03. Solar Shade Control

45.03.200 Solar Shade Control Act.

45.03.201 to 45.03.209 Reserved.

45.03.200 Solar Shade Control Act.

The City of Sacramento is hereby exempt from the provisions of the Solar Shade Control Act, Chapter 12 (commencing with Section 25980) of Division 15 of the Public Resources Code.

(Ord. No. 4202, §1)

45.03.201 to 45.03.209 Reserved.

Chapter 45.04. Heritage Trees

45.04.210 Intent and purpose.

45.04.211 Definitions.

45.04.212 Identification and inventory of heritage trees.

45.04.213 Repealed by Ord. No. 93066, §5.

45.04.214 Repealed by Ord. No. 93066, §5.

45.04.215 Repealed by Ord. No. 93066, §5.

45.04.216 Protection of heritage trees during construction activity.

45.04.217 Maintenance responsibility; permits for activities affecting heritage trees.

45.04.218 Same--Appeal of decision.

45.04.219 Penalty for violation.

45.04.210 Intent and purpose.

It is the intent and purpose of this chapter to promote the health, safety, and welfare of present and future residents of the City of Sacramento by providing for the protection of significant specimen trees existing in the City of Sacramento. The protection of heritage trees will promote scenic beauty, enhance property values, reduce soil erosion, improve air quality, abate noise and provide shade to reduce energy consumption.

(Ord. No. 4317, §1; Ord. No. 93-035, §1; Ord. No. 93-052, §1)

45.04.211 Definitions.

(a) "Director" shall mean the director of the department of neighborhood services or the director's authorized representative.

(b) "Heritage tree" shall mean:

(i) any tree of any species with a trunk circumference of one hundred (100) inches or more, which is of good quality in terms of health, vigor of growth and conformity to generally accepted horticultural standards of shape and location for its species.

(ii) any native quercus species, aesculus californica or platanus racemosa, having a circumference of 36 inches or greater when a single

trunk, or a cumulative circumference of 36 inches or greater when a multi-trunk.

(iii) any tree 36 inches in circumference or greater in a riparian zone. The riparian zone is measured from the center line of the water course to 30 feet beyond the high water line.

(iv) any tree, grove of trees or woodland trees designated by resolution of the city council to be of special historical or environmental value or of significant community benefit.

(c) "Drip line area" shall mean the area measured from the trunk of the tree outward to a point at the perimeter of the outermost branch structure of the tree.

(d) "Circumference" shall mean circumference measured four and one-half (4 1/2) feet above ground level.

(Ord. No. 4317, §1; Ord. No. 93-035, §1; Ord. No. 93-052, §1; Ord. No. 93-066, §2)

45.04.212 Identification and inventory of heritage trees.

The director is authorized to identify and prepare an inventory of heritage trees within the City of Sacramento.

(Ord. No. 4317, §1; Ord. No. 93-035,

§1; Ord. No. 93-052, §1)

45.04.213 Repealed by Ord. No. 93-066, §5.

45.04.214 Repealed by Ord. No. 93-066, §5.

45.04.215 Repealed by Ord. No. 93-066, §5.

45.04.216 Protection of heritage trees during construction activity.

During construction activity on any property upon which is located a heritage tree, the following rules shall apply. Unless the express written permission of the director is first obtained, no person shall:

- (a) Change the amount of irrigation provided to any heritage tree from that which was provided prior to the commencement of construction activity;
- (b) Trench, grade or pave into the drip line area of a heritage tree;
- (c) Change, by more than two (2) feet, grade elevations within thirty (30) feet of the drip line area of a heritage tree;
- (d) Park or operate any motor vehicle within the drip line area of any heritage tree;

- (e) Place or store any equipment or construction materials within the drip line area of any heritage tree;
- (f) Attach any signs, ropes, cables or any other items to any heritage tree;
- (g) Cut or trim any branch of a heritage tree for temporary construction purposes;
- (h) Place or allow to flow into or over the drip line area of any heritage tree any oil, fuel, concrete mix or other deleterious substance.

Where written permission of the director is sought under this section, the director may grant such permission with such reasonable conditions as may be necessary to effectuate the intent and purpose of this chapter.

(Ord. No. 4317, §1; Ord. No. 93-035, §1; Ord. No. 93-052, §1)

45.04.217 Maintenance responsibility; permits for activities affecting heritage trees.

- (a) A property owner shall be responsible for maintaining all heritage trees on the property owner's property.
- (b) None of the following activities shall be performed unless a permit therefore is first applied for by the property owner or person authorized by the property owner and granted by

the director, subject to appeal provisions in Section 45.04.218:

- (1) The removal of any heritage tree;
 - (2) Pruning of any heritage tree segment greater than twelve (12) inches in circumference or the placement of any chemical or other deleterious substance by spray or otherwise on any heritage tree;
 - (3) Disturbing the soil or placing any chemical or other deleterious substance or material on the soil within the drip line area of any heritage tree.
- (c) The permit shall be granted by the director if he finds:
- (1) In the case of removal, (a) that the heritage tree must be removed in order for the applicant to use the property for any use permitted as of right or by special permit under the City of Sacramento zoning ordinance for the zoning district in which the property is located and that such use could not be made of the property unless the tree is removed; or (b) that the condition of the tree with respect to disease, danger of falling or

interference with utility services is such that the public health, safety or welfare require its removal; or (c) that the tree or tree roots are causing, or threatening to cause, damage to any main structure on the owner's property; or (d) that the tree no longer meets the criteria for a heritage tree set forth in Section 45.04.211(b);

- (2) In the case of any other activity for which a permit is required, that such activity is necessary either to preserve the heritage tree or to engage in construction activity on the property.
- (d) In the case of removal of any heritage tree under Subsection (c)(1) above, the director shall not act on such an application until a hearing is held thereon. Notice of the time and place of the hearing shall be posted in a conspicuous place on the real property upon which the heritage tree is located and shall be mailed to the applicant and to all owners of real property located within a five hundred (500) foot radius of the real property upon which the heritage tree is located. Notices shall be posted and mailed at least ten (10) days in advance of the hearing. As

used herein, owner means the person to whom the property was assessed in the latest equalized assessment roll of the County of Sacramento unless the director has knowledge of a person other than such assessee claiming record ownership of the property.

- (e) The director shall not act on any permit application unless the director has first given the permit applicant an opportunity to be heard thereon. Notice of the time and place at which the applicant may be heard shall be given to the applicant by mail, postage prepaid, at the address shown for the purpose in the application at least ten (10) days in advance thereof.

- (f) The decision of the director may be to grant, grant with conditions or deny any permit applied for and shall be rendered within fifteen (15) days after the application is filed. It shall be in writing and shall state the reasons therefor. Such decision shall be mailed postage prepaid to the property owner.

(Ord. No. 4317, §1; Ord. No. 93-035, §1; Ord. No. 93-052, §1; Ord. No. 93-066, §3)

45.04.218 Same--Appeal of decision.

Any person dissatisfied with the decision of the director taken under this chapter may appeal such decision to the city council. Such appeal shall be in

writing, stating the reasons therefore, and shall be filed with the city clerk not later than ten (10) days after the date of the director's decision. The city clerk shall set the appeal for hearing within forty-five (45) days after the appeal is filed. Notice of time and place of the hearing shall be given to the appellant at least ten (10) days in advance thereof by mail, postage prepaid. The decision of the city council shall be final.

(Ord. No. 4317, §1; Ord. No. 93-035, §1; Ord. No. 93-052, §1)

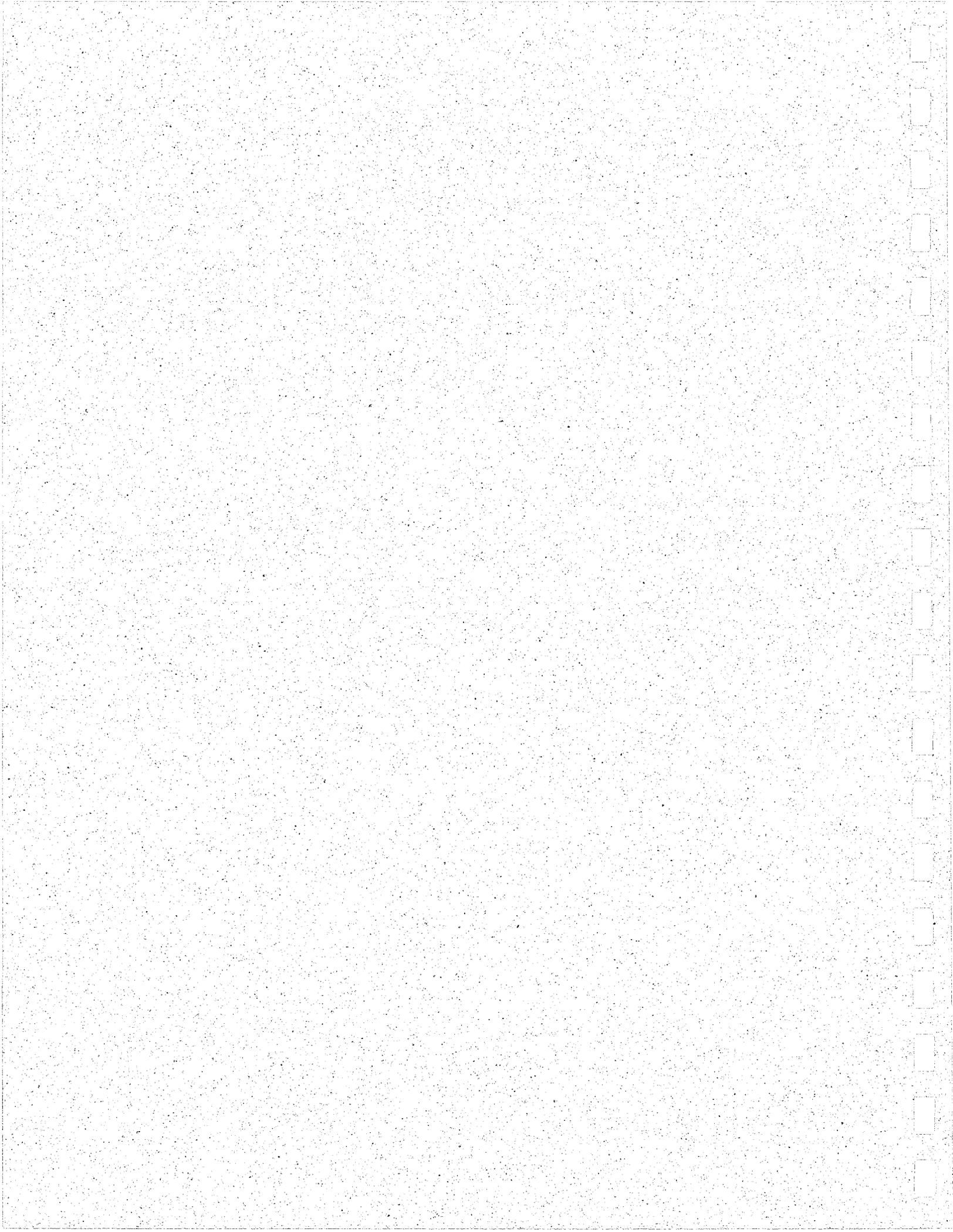
45.04.219 Penalty for violation.

Any person who violates any provision of this chapter is guilty of a misdemeanor which shall be punished by a fine of not less than five hundred (\$500) and not more than one thousand (\$1,000) or imprisonment in the county jail for a term not exceeding six months, or by both such fine and imprisonment.

(Ord. No. 93-066, §4)

Appendix 3: Neighborhood Profiles & Recommendations

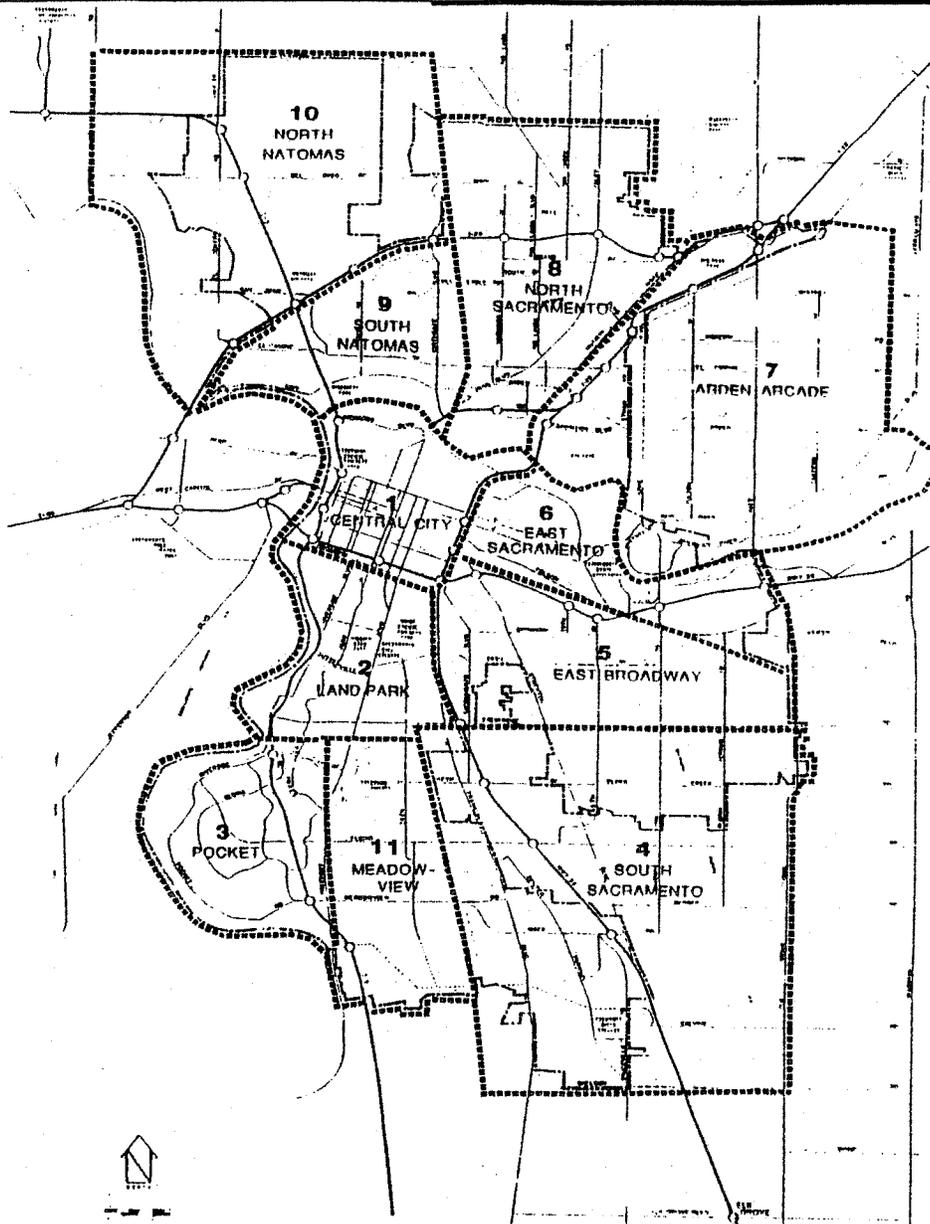
Potential Residential Tree Population.....	3 - A
Community Plan Area Maps.....	3 - B
Community Profiles.....	3 - C



POTENTIAL TREE POPULATION BY AREA

AREA	POT SPACE TREE CANOPY IN %	POT TREES NEW	RATIO FY:12.5 FT.	POT TREES IN 12.5 FT.
CENTRAL CITY	36%	14945	1.7	9052
LAND PARK	34%	15240	3.9	3938
POCKET	34%	17905	4.5	3961
SO SACTO	46%	20952	4.7	4452
EAST BROADWAY	47%	15727	1.7	9069
EAST SAC.	31%	12095	3.2	3825
ARDEN ARCADE	41%	4805	3.2	1487
NORTH SACTO	49%	22897	2.4	9679
SOUTH NATOMAS	39%	7462	2.4	3142
NORTH NATOMAS	39%	333	2.2	152
MEADOWVIEW	44%	18850	3.2	5839





Sacramento Community Plan Areas
DIRECTORY OF NEIGHBORHOODS

- 1. CENTRAL CITY
 - A. Boulevard Park
 - B. Poverty Ridge
 - C. Southside
 - D. Alkali Flat
 - E. Richards Boulevard

- 2. LAND PARK
 - A. Land Park
 - B. Curtis Park
 - C. South Land Park
 - D. City Farms

- 3. POCKET

- 4. SOUTH SACRAMENTO
 - A. Glen Elder
 - B. South Sacramento - Valley High

- 5. EAST BROADWAY
 - A. T Street - Medical Center
 - B. Tahoe Park
 - C. Oak Park

- 6. EAST SACRAMENTO
 - A. River Park
 - B. College Green
 - C. East Sacramento

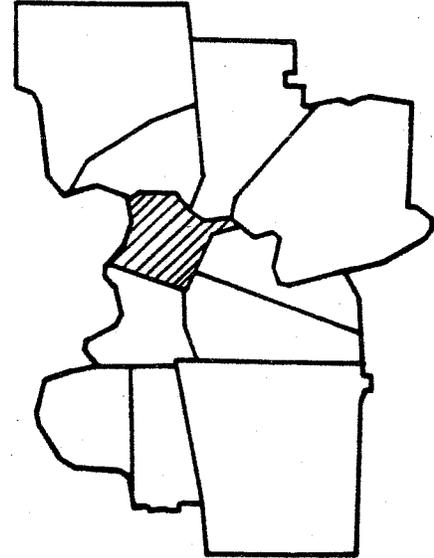
- 7. ARDEN-ARCADE
 - A. Campus Commons
 - B. Arden-Arcade

- 8. NORTH SACRAMENTO
 - A. Del Paso Heights
 - B. East del Paso Heights
 - C. Noralto
 - D. Woodlake
 - E. Robla

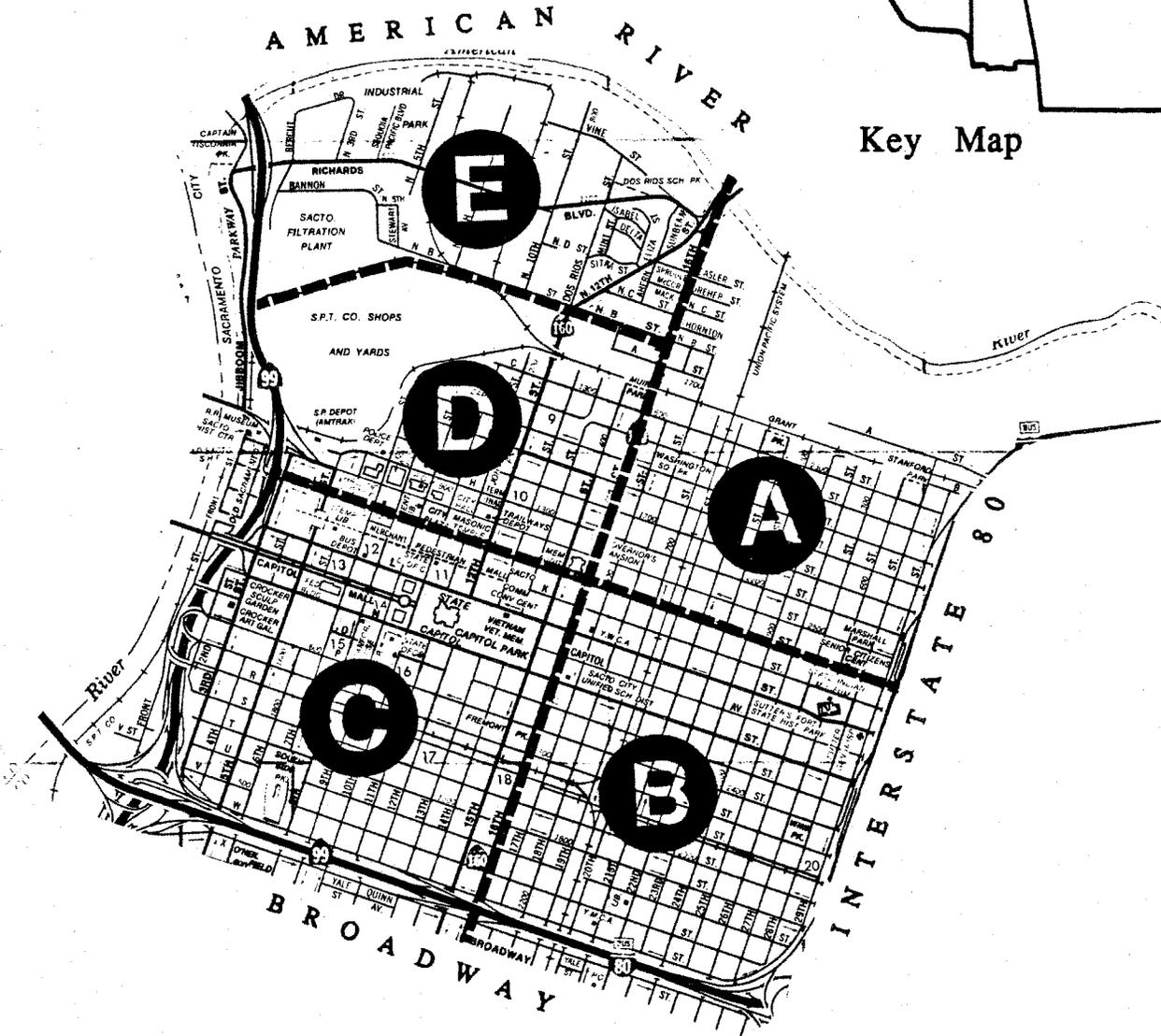
- 9. SOUTH NATOMAS

- 10. NORTH NATOMAS

- 11. MEADOWVIEW
 - A. Meadowview - Florin



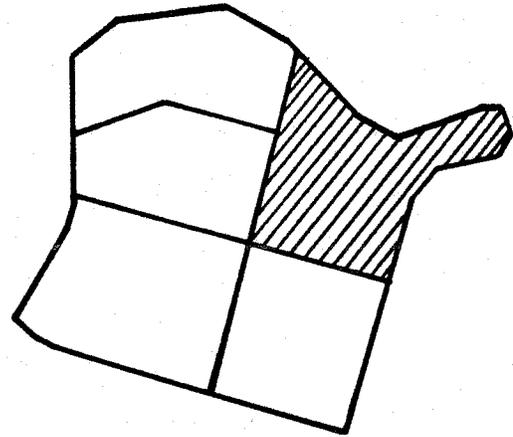
Key Map



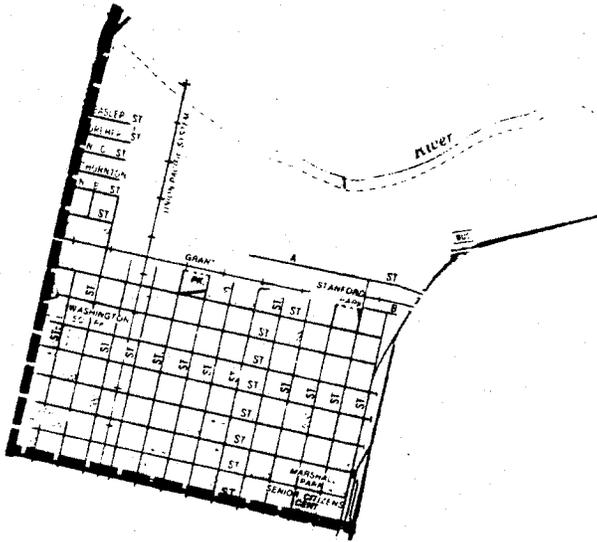
Neighborhood Legend

- A** Boulevard Park
- B** Poverty Ridge
- C** Southside
- D** Alkali Flat
- E** Richards Boulevard

Community Plan Area 1
Central City



Key Map



Type

Description

Recommendations

Elm Dominant

Dominated by Elm Species and Zelkova Trees susceptible to Elm leaf beetle, no Dutch Elm disease Detected. Dominant trees are mature to overmature.

Short-term: Continue Elm leaf control program.
Long-term: Rotational replacement of declining elms with other species. Select species that are resident or not susceptible. Monitor for Dutch Elm disease.

Even-age Declining Trees

Higher maintenance required to prolong removals to avoid clear-cutting.

Begin rotational replacement to replace the declining trees. This should be done so as to increase the age diversity over time. Anticipate more frequent trimming of declining trees.

Central City
Boulevard Park

1A

**CENTRAL CITY
BOULEVARD PARK**

EXISTING CONDITIONS

SIZE (in acres): 789 acres DEVELOPMENT AGE (approximate): 1890's

LAND USE (by percentage):

Single Family Residential:	55 %	Parks:	1 %
Multi-Family Residential:	4 %	Wild/vacant:	5 %
Commerical/Industrial:	29 %	Transportation:	2 %
Institutional:	4 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood:

Grant Park, Stanford Park, Marshall Park, Washington Square Park

MAJOR STREETS: 'I' & 'J' Streets, 16th Street, 21st Street

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,500

AGE (by percentage):	Young:	2 %
	Mature:	96 %
	Declining:	2 %

SPECIES:

Dominant: *Ulmus Spp*-Elm species, *Zelkova serrata*-Sawtooth Zelkova, *Platanus acerifolia*-London Plane Tree

Accent:

Liquidambar styraciflua-Sweetgum, *Ginkgo biloba*-Maidenhair Tree, *Magnolia grandiflora*-Southern Magnolia, *Washingtonia spp.*-Fan Palm, *Phoenix carniensis*-Date Palm, *Acer spp.*-Maple, *Populus spp.*-Poplar, *Morus*-Mulberry, *Lagerstroemia indica*-Crape Myrtle, *Quercus rubra*-Red Oak, *Cedrus spp.*-Cedar

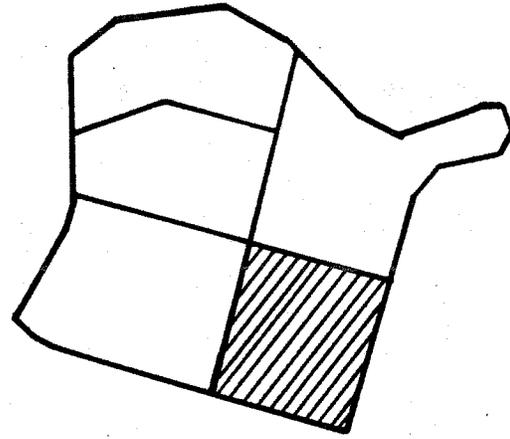
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*-Valley Oak

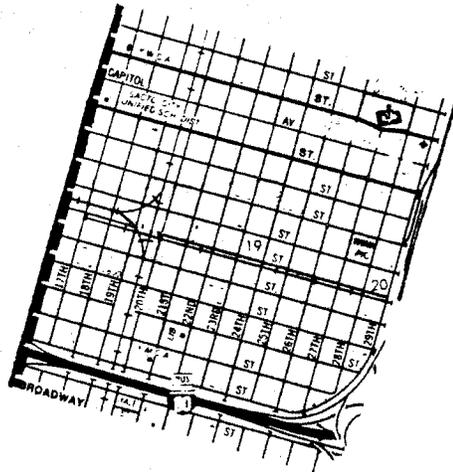
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	99 %
Private maintenance easement (6.5 ft back from prop. line)	0 %
Hardscape:	0 %
Medians:	1 %



Key Map



Type

Description

Recommendations

Elm Dominant

Dominated by Elm Species and Zelkova Trees susceptible to Elm leaf beetle, no Dutch Elm disease Detected. Dominant trees are mature to overmature.

Short-term: Continue Elm leaf control program.
Long-term: Rotational replacement of declining elms with other species. Select species that are resident or not susceptible. Monitor for Dutch Elm disease.

Ash Dominant

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

Central City
Poverty Ridge

1B

CENTRAL CITY POVERTY RIDGE

EXISTING CONDITIONS

SIZE (in acres): 594 acres DEVELOPMENT AGE (approximate): 1901-1911

LAND USE (by percentage):

Single Family Residential:	28 %	Parks:	1 %
Multi-Family Residential:	12 %	Wild/vacant:	2 %
Commerical/Industrial:	42 %	Transportation:	11 %
Institutional:	4 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood:

State Indian Museum, Winn Park, Sutter's Fort State Historic Park, Sutter General Hospital

MAJOR STREETS: 'L' Street, 'N' Street, 15th Street, 'R' Street

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,500

AGE (by percentage):	Young:	2 %
	Mature:	97 %
	Declining:	1 %

SPECIES:

Dominant: *Platanus acerifolia*—London Plane Tree, *Ulmus parvifolia*—Chinese Elm, *Ulmus procoia*—English Elm, *Fraxinus velutina 'glabra'*—Modesto Ash, *Pistacia chinensis*—Chinese Pistache, *Zelkova serrata*—Sawtooth Zelkova

Accent: *Cinnamomum camphora*—Camphor Tree, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Quercus agrifolia*—Live Oak, *Acer buergeranum*—Trident Maple, *Catalpa-Catalpa*, *Morus*—Mulberry, *Sequoia sempervirons*—Coast Redwood, *Juglans regia*—English Walnut, *Magnolia grandiflora*—Southern Magnolia, *Ailanthus altissima*—Tree of Heaven, *Quercus suber*—Cork Oak, *Ceratonia siliqua*—Carob, *Olea europaea*—Olive, *Celtis sinensis*—Chinese Hackberry, *Juglans nigra*—Black Walnut, *Ginkgo biloba*—Maidenhair Tree

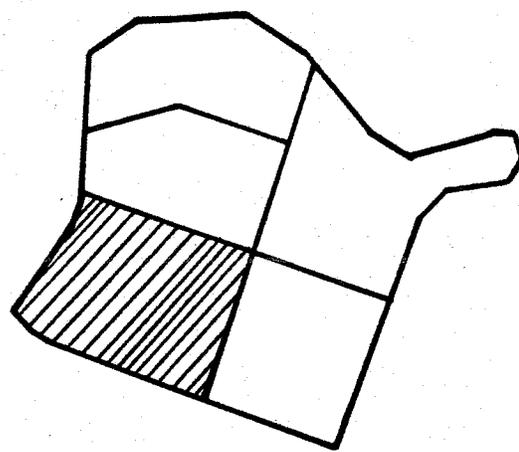
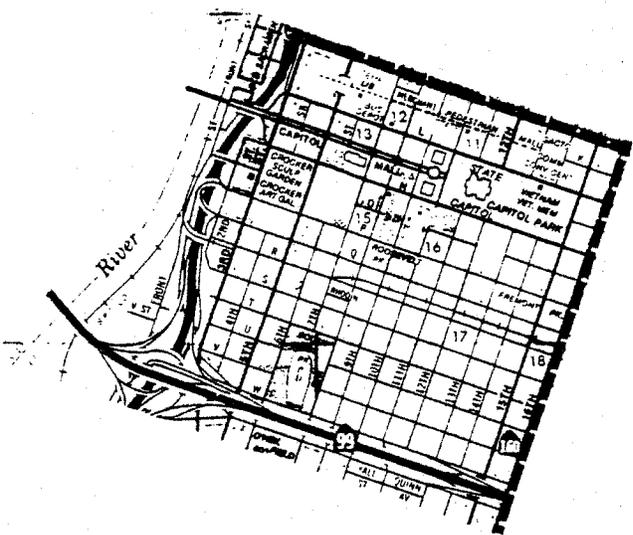
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*—Valley Oak

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	100 %
Private maintenance easement (6.5 ft back from prop. line)	0 %
Hardscape:	0 %
Medians:	0 %



Key Map

Type	Description	Recommendations
Elm Dominant	Dominated by Elm Species and Zelkova Trees susceptible to Elm leaf beetle, no Dutch Elm disease Detected. Dominant trees are mature to overmature.	Short-term: Continue Elm leaf control program. Long-term: Rotational replacement of declining elms with other species. Select species that are resident or not susceptible. Monitor for Dutch Elm disease.
Platanus Dominant	50+ years old. Slowly declining population with frequent accumulations of small dead wood. Low overall maintenance required. Frequent but not severe problems with Anthracnose and powdery mildew. Problems may cause trees to be visually unsightly. American Plum borer, mite, and scale are more sporadic and more seriously affect tree health.	The species requires dead wood trimming and opening up canopies. Replace with disease-resistant varieties of P. 'Bloodgood' and P. 'Yarwood'.

Central City
Southside

1C

CENTRAL CITY SOUTHSIDE

EXISTING CONDITIONS

SIZE (in acres): 695 acres DEVELOPMENT AGE (approximate): 1901-1911

LAND USE (by percentage):

Single Family Residential:	17 %	Parks:	16 %
Multi-Family Residential:	6 %	Wild/vacant:	2 %
Commerical/Industrial:	46 %	Transportation:	18 %
Institutional:	5 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood: Southside Park, Fremont Park, Roosevelt Park, State Capitol, Old Sacramento, Crocker Sculpture Garden and Art Gallery, Convention Center, Federal Building, State Offices, Merchant Pedestrian Mall, Capitol Mall

MAJOR STREETS: Capitol Mall, 15th Street, 'L' Street, 3rd Street, 5th Street, 'N' Street, 'J' Street

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,500

AGE (by percentage):

Young:	2 %
Mature:	96 %
Declining:	2 %

SPECIES:

Dominant: *Platanus acerifolia*—London Plane Tree, *Pistacia chinensis*—Chinese Pistache, *Fraxinus velutina 'glabra'*—Modesto Ash, *Ulmus parvifolia*—Chinese Elm, *Ulmus procera*—English Elm

Accent: *Acer spp.*—Maple, *Liquidambar styraciflua*—Sweetgum, *Pyrus calleryana*—Bradford Pear, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Magnolia grandiflora*—Southern Magnolia, *Quercus agrifolia*—Live Oak, *Cinnamomum camphora*—Camphor Tree, *Ginkgo biloba*—Maidenhair Tree, *Celtis sinensis*—Hackberry, *Quercus lobata*—Valley Oak

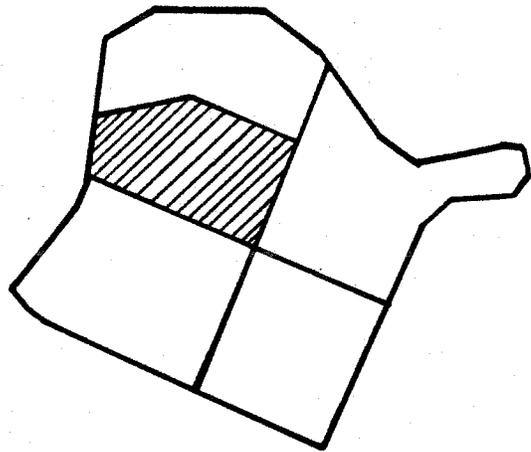
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Platanus racemosa*—California Sycamore, *Quercus lobata*—Valley Oak, *Juglans nigra*—Black Walnut

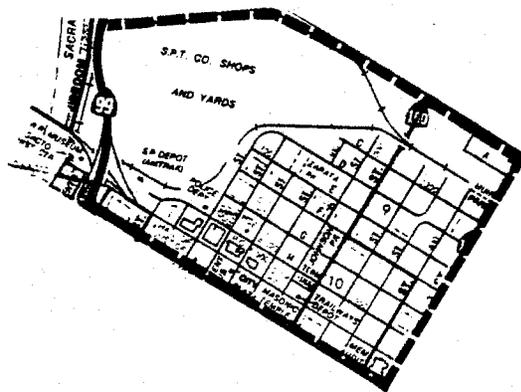
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	100 %
Private maintenance easement (6.5 ft back from prop. line)	0 %
Hardscape:	0 %
Medians:	0 %



Key Map



Type

Elm Dominant

Description

Dominated by Elm Species and Zelkova Trees susceptible to Elm leaf beetle, no Dutch Elm disease Detected. Dominant trees are mature to overmature.

Recommendations

Short-term: Continue Elm leaf control program.
 Long-term: Rotational replacement of declining elms with other species. Select species that are resident or not susceptible. Monitor for Dutch Elm disease.

Central City
Alkali Flat

1D

CENTRAL CITY ALKALAI FLAT

EXISTING CONDITIONS

SIZE (in acres): 475 acres DEVELOPMENT AGE (approximate): 1890's

LAND USE (by percentage):

Single Family Residential:	2 %	Parks:	0 %
Multi-Family Residential:	3 %	Wild/vacant:	0 %
Commerical/Industrial:	79 %	Transportation:	9 %
Institutional:	7 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood: Captain Tiscornia Park, City Plaza, American River Parkway, Zapata Park, Johnson Park, Muir Park, Hall of Justice, County Building, Post Office, City Hall, Federal Building, County Courthouse, Central Library, Memorial Auditorium

MAJOR STREETS:

N. 'B' Street, N. 16th Street, 12th Street, 'J' Street, Jibboom Street

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,500

AGE (by percentage):	Young:	2 %
	Mature:	96 %
	Declining:	2 %

SPECIES:

Dominant: *Zelkova serrata*–Sawtooth Zelkova, *Fraxinus velutina 'glabra'*– Modesto Ash, *Ulmus campestris*–English Elm, *Platanus acerifolia*–London Plane Tree, *Ulmus parvifolia*–Chinese Elm

Accent: *Liquidambar styraciflua*–Sweetgum, *Quercus rubra*–Red Oak, *Magnolia grandiflora*–Southern Magnolia, *Sparmannia spp.*–Linden, *Acer spp.*–Maple, *Washingtonia spp.*–Fan Palm, *Phoenix canariensis*–Date Palm, *Nyssa sylvatica*–Tupelo, *Cedrus spp.*–Cedar, *Quercus suber*–Cork Oak, *Pistacia chinensis*–Chinese Pistache, *Pyrus kawakamii*–Evergreen Pear, *Ginkgo biloba*–Maidenhair Tree

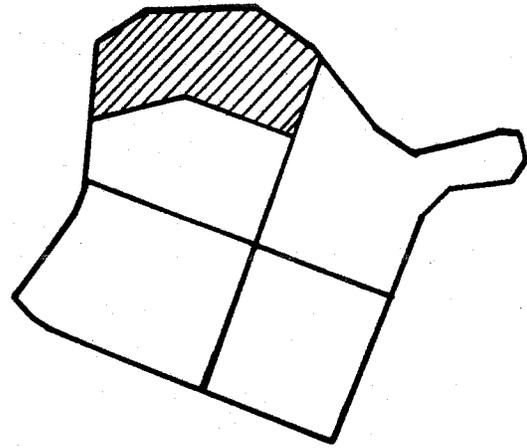
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*–Valley Oak, *Platanus racemosa*–California Sycamore

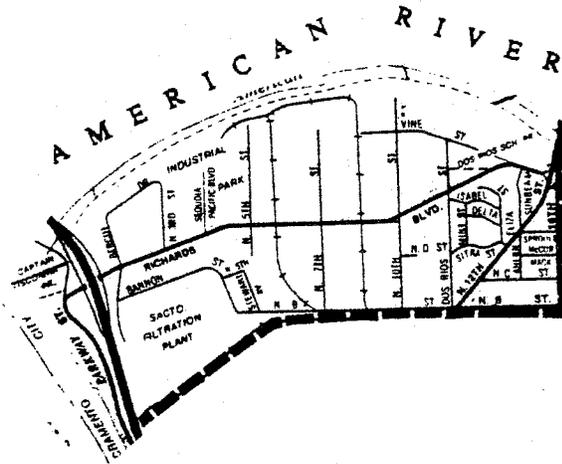
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	99 %
Private maintenance easement (6.5 ft back from prop. line)	0 %
Hardscape:	1 %
Medians:	0 %



Key Map



Type

Mixed Species,
underplanted

Description

Trees are a desirable mixed age and species. Area has been dominated by industrial land use and therefore is underplanted.

Recommendations

More tree planting is needed. Co-ordinated with Richards Boulevard Master Plan.

Central City
Richards Boulevard

1E

CENTRAL CITY RICHARDS BOULEVARD

EXISTING CONDITIONS

SIZE (in acres): 506 acres DEVELOPMENT AGE (approximate): 1941

LAND USE (by percentage):

Single Family Residential:	19 %	Parks:	2 %
Multi-Family Residential:	1 %	Wild/vacant:	25 %
Commerical/Industrial:	37 %	Transportation:	23 %
Institutional:	2 %	Other (incl. agriculture):	5 %

Major Public Facilities within this neighborhood:

Dos Rios School Park, American River Parkway

MAJOR STREETS: Richards Blvd., N. 12th Street, N. 'B' Street

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 1,000

AGE (by percentage):

Young:	5 %
Mature:	94 %
Declining:	1 %

SPECIES:

Dominant: *Platanus acerifolia*—London Plane Tree, *Ailanthus altissima*—Tree of Heaven, *Fraxinus velutina 'glabra'*— Modesto Ash

Accent: *Juglans nigra*— Black Walnut, *Juglans regia*—English Walnut, *Catalpa*—Catalpa, *Quercus suber*—Cork Oak, *Quercus lobata*—Valley Oak, *Pistacia chinensis*—Chinese Pistache, *Alnus rhombifolia*—White Alder, *Pinus spp.*—Pine, *Washingtonia spp.*—Fan Palm, *Eucalyptus spp.*—Eucalyptus, *Liquidambar styraciflua*—Sweetgum, *Morus*—Mulberry, *Zelkova serrata*—Sawtooth Zelkova, *Fraxinus velutina 'glabra'*— Modesto Ash, *Sequoia sempervirens*—Redwood,

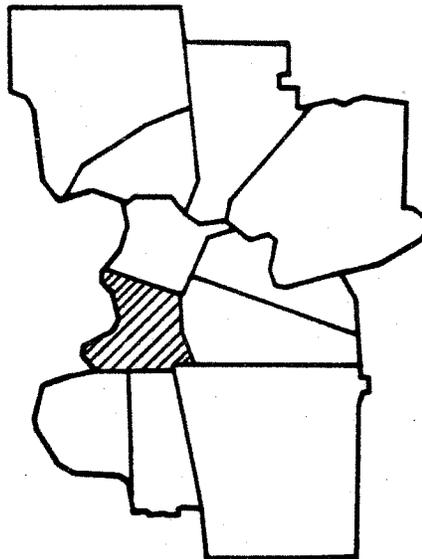
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*—Valley Oak, *Platanus racemosa*—California Sycamore, *Populus trichocarpa*—Black Cottonwood, *Juglans nigra*— Black Walnut

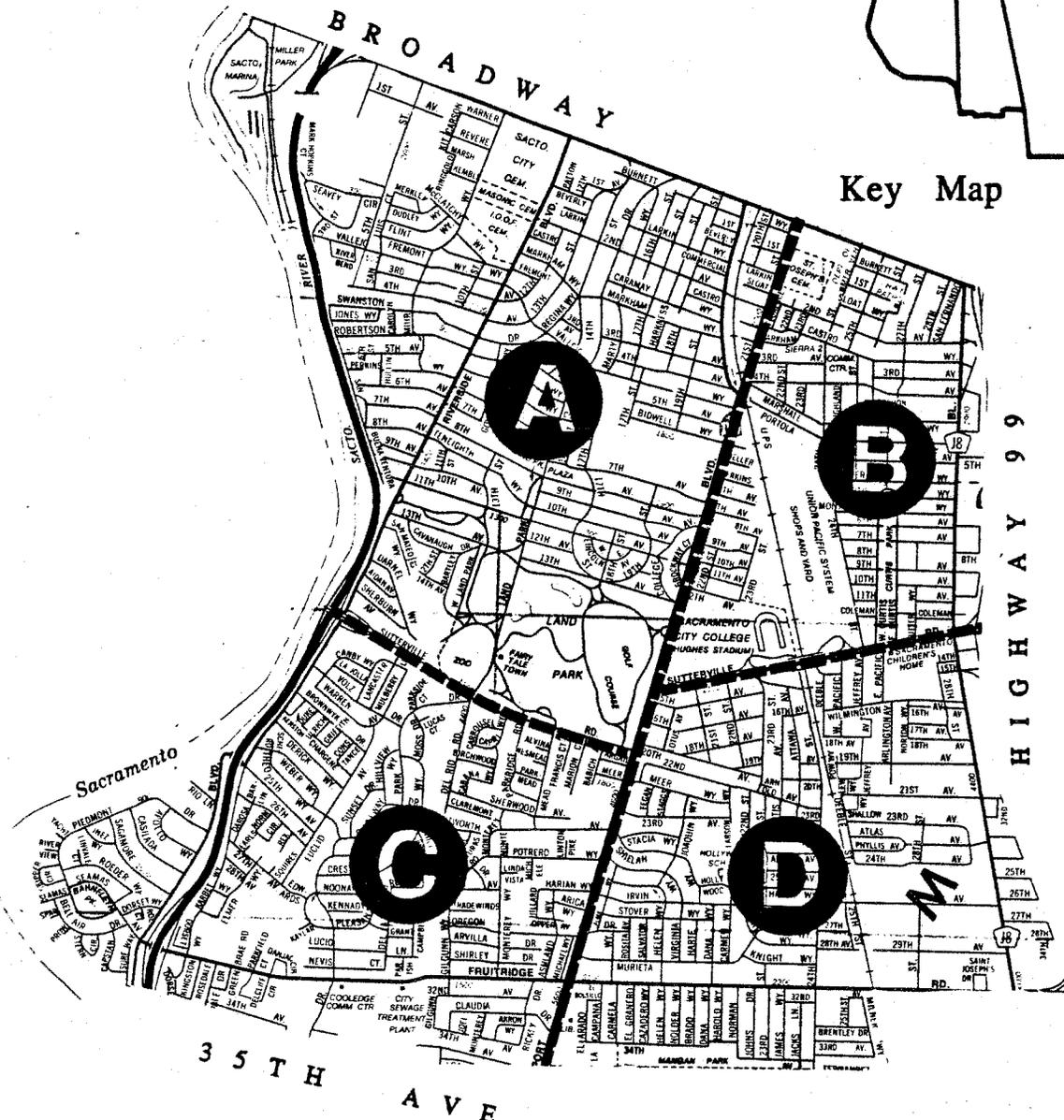
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft back from prop. line)	99 %
Hardscape:	0 %
Medians:	0 %



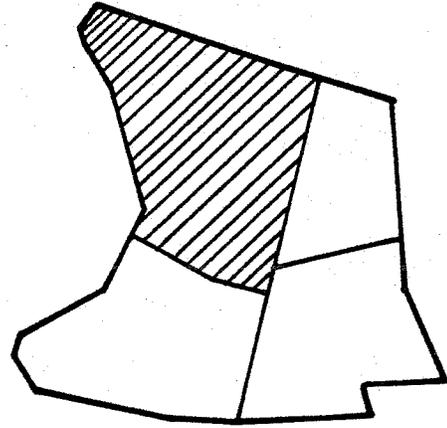
Key Map



Neighborhood Legend

- A** Land Park
- B** Curtis Park
- C** South Land Park
- D** City Farms

**Community Plan Area 2
Land Park**



Key Map



Type

Platanus Dominant

Description

50+ years old. Slowly declining population with frequent accumulations of small dead wood. Low overall maintenance required. Frequent but not severe problems with Anthracnose and powdery mildew. Problems may cause trees to be visually unsightly. American Plum borer, mite, and scale are more sporadic and more seriously affect tree health.

Recommendations

The species requires dead wood trimming and opening up canopies. Replace with disease-resistant varieties of P. 'Bloodgood' and P. 'Yarwood'.

Land Park
Land Park

2A

LAND PARK LANDPARK

EXISTING CONDITIONS

SIZE (in acres): 1,459 acres DEVELOPMENT AGE (approximate): 1911-1916

LAND USE (by percentage):

Single Family Residential:	47 %	Parks:	7 %
Multi-Family Residential:	5 %	Wild/vacant:	4 %
Commerical/Industrial:	8 %	Transportation:	6 %
Institutional:	23 %	Other (incl. agriculture):	.4 %

Major Public Facilities within this neighborhood: Land Park, Plaza Cervantes, Sacramento City Cemetery, Sacramento River Parkway, Miller Park, Sacramento Marina, O'Neil Field

MAJOR STREETS: Hwy. 160 or Freeport Blvd., Riverside Blvd., Broadway, I-80

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 5,000

AGE (by percentage):

Young:	1 %
Mature:	98 %
Declining:	1 %

SPECIES:

Dominant: *Platanus acerifolia*—London Plane Tree, *Ulmus spp.*—Elm species, *Fraxinus velutina 'glabra'*—Modesto Ash, *Zelkova serrata*—Sawtooth Zelkova

Accent: *Cedrus spp.*—Cedar, *Magnolia grandiflora*—Southern Magnolia, *Morus*—Mulberry, *Sequoia sempervivens*—Coast Redwood, *Lagerstroemia indica*—Crape Myrtle, *Cinnamomum camphora*—Camphor Tree, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Acer buergerianum*—Trident Maple, *Liquidambar styraciflua*—Sweetgum, *Picea pungens 'glauca'*—Blue Spruce, *Betula pedula*—White Birch

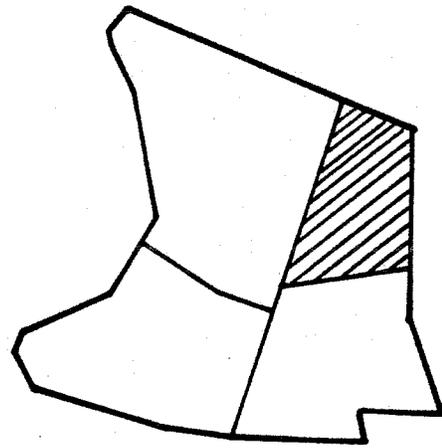
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*—Valley Oak

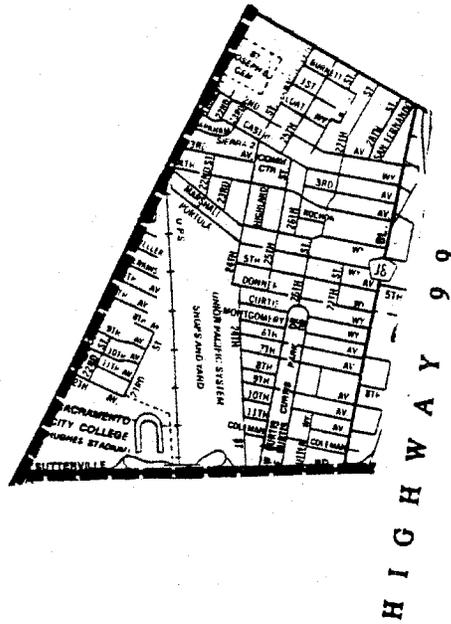
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	10 %
Private maintenance easement (6.5 ft back from prop. line)	89 %
Hardscape:	0 %
Medians:	1 %



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

Land Park
Curtis Park

2B

LAND PARK CURTIS PARK

EXISTING CONDITIONS

SIZE (in acres): 594 acres

DEVELOPMENT AGE (approximate): 1911-1916

LAND USE (by percentage):

Single Family Residential:	65 %	Parks:	4 %
Multi-Family Residential:	0 %	Wild/vacant:	1 %
Commerical/Industrial:	6 %	Transportation:	16 %
Institutional:	8 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood: St. Joseph's Cemetery, Sacramento City College, Curtis Park, Community Center, Plaza Cervantes

MAJOR STREETS: Broadway, Franklin Blvd., Highway 160 or Freeport Blvd., I-80

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 4,500

AGE (by percentage):	Young:	2 %
	Mature:	97 %
	Declining:	1 %

SPECIES:

Dominant: *Platanus acerifolia*—London Plane Tree, *Ulmus americana*—American Elm, *Ulmus procera*—English Elm, *Fraxinus velutina 'glabra'*—Modesto Ash

Accent: *Albizia julibrissin*—Silk Tree, *Pistacia chinensis*—Chinese Pistache, *Liquidambar styraciflua*—Sweetgum, *Lagerstroemia indica*—Crape Myrtle, *Cedrus spp.*—Cedar, *Quercus rubra*—Red Oak, *Betula pedula*—White Birch, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Acer saccharinum*—Silver Maple, *Ulmus parvifolia*—Chinese Elm

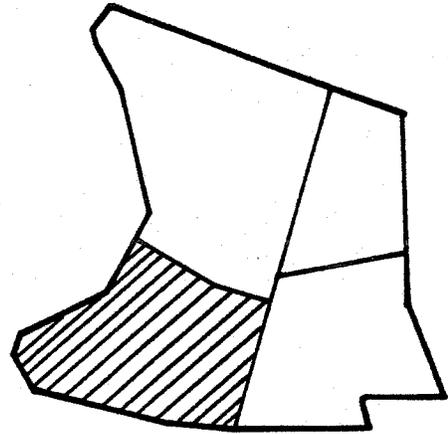
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*—Valley Oak

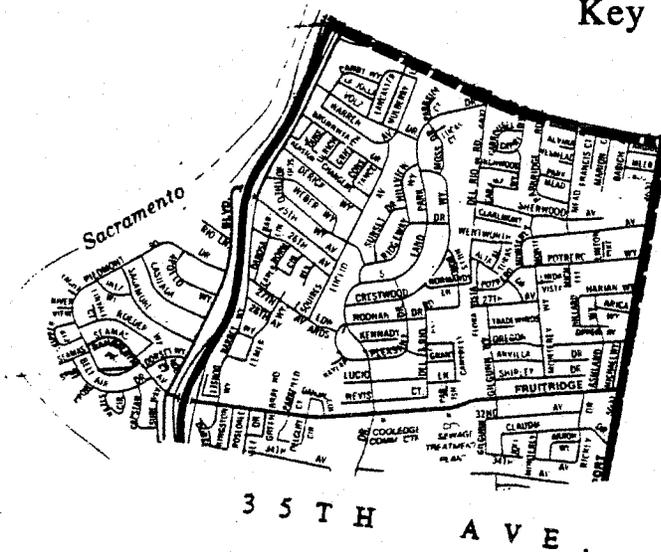
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	45 %
Private maintenance easement (6.5 ft back from prop. line)	54 %
Hardscape:	0 %
Medians:	1 %



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

Land Park
South Land Park

2C

LAND PARK SOUTH LAND PARK

EXISTING CONDITIONS

SIZE (in acres): 1,018 acres DEVELOPMENT AGE (approximate): 1950's

LAND USE (by percentage):

Single Family Residential:	70 %	Parks:	7 %
Multi-Family Residential:	1 %	Wild/vacant:	5 %
Commerical/Industrial:	5 %	Transportation:	5 %
Institutional:	6 %	Other (incl. agriculture):	2 %

Major Public Facilities within this neighborhood:

Sacramento River Parkway, Bahnfleth Park

MAJOR STREETS: I-5, Fruitridge Road, Riverside Blvd.

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 5,000

AGE (by percentage):

Young:	3 %
Mature:	96 %
Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'—Modesto Ash, *Ulmus parvifolia*—Chinese Elm, *Platanus acerifolia*—London Plane Tree, *Ulmus campestris*—English Elm, *Acer saccharinum*—Silver Maple, *Zelkova serrata*—Sawtooth Zelkova

Accent: *Catalpa speciosa*—Western Catalpa, *Morus*—Mulberry, *Magnolia grandiflora*—Southern Magnolia, *Pistacia chinensis*—Chinese Pistache, *Liquidambar styraciflua*—Sweetgum, *Cinnamomum camphora*—Camphor Tree, *Cedrus spp.*—Cedar, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Sequoia sempervirens*—Coast Redwood, *Pinus spp.*—Pine species, *Quercus lobata*—Valley Oak, *Alnus*—Alder, *Robinia pseudoacacia*—Black Locust, *Betula pedula*—White Birch, *Pyrus calleryana*—Bradford Pear, *Liriodendron tulipifera*—Tulip Tree

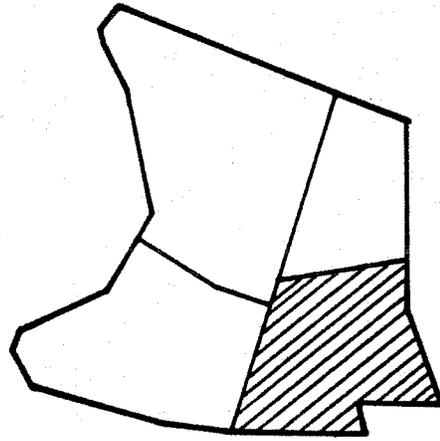
Heritage (as a percentage of neighborhood population): 1 %

Significant species: None

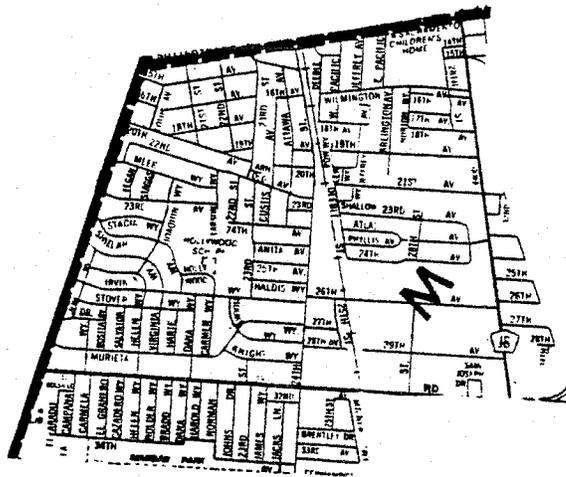
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	1± %
Private maintenance easement (6.5 ft. back from prop. line):	98 %
Hardscape:	0 %
Medians:	1± %



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

Land Park
City Farms



**LAND PARK
CITY FARMS**

EXISTING CONDITIONS

SIZE (in acres): 865 acres DEVELOPMENT AGE (approximate): 1941

LAND USE (by percentage):

Single Family Residential:	71 %	Parks:	2 %
Multi-Family Residential:	1 %	Wild/vacant:	3 %
Commerical/Industrial:	14 %	Transportation:	2 %
Institutional:	5 %	Other (incl. agriculture):	1 %

Major Public Facilities within this neighborhood:
Mangan Park, Hollywood School Park

MAJOR STREETS: Sutterville Road, I-80, Fruitridge Road

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 4,500

AGE (by percentage):

Young:	1 %
Mature:	98 %
Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina 'glabra'*– Modesto Ash, *Platanus acerifolia*–London Plane Tree, *Ulmus parvifolia*–Chinese Elm, *Ulmus pumila*–Siberian Elm, *Ulmus campestris*–English Elm, *Zelkova serrata*–Sawtooth Zelkova

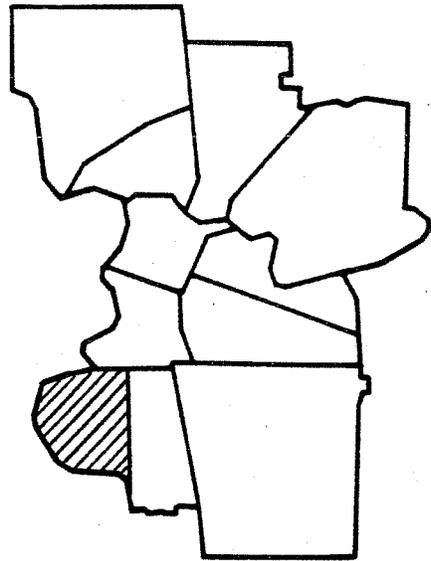
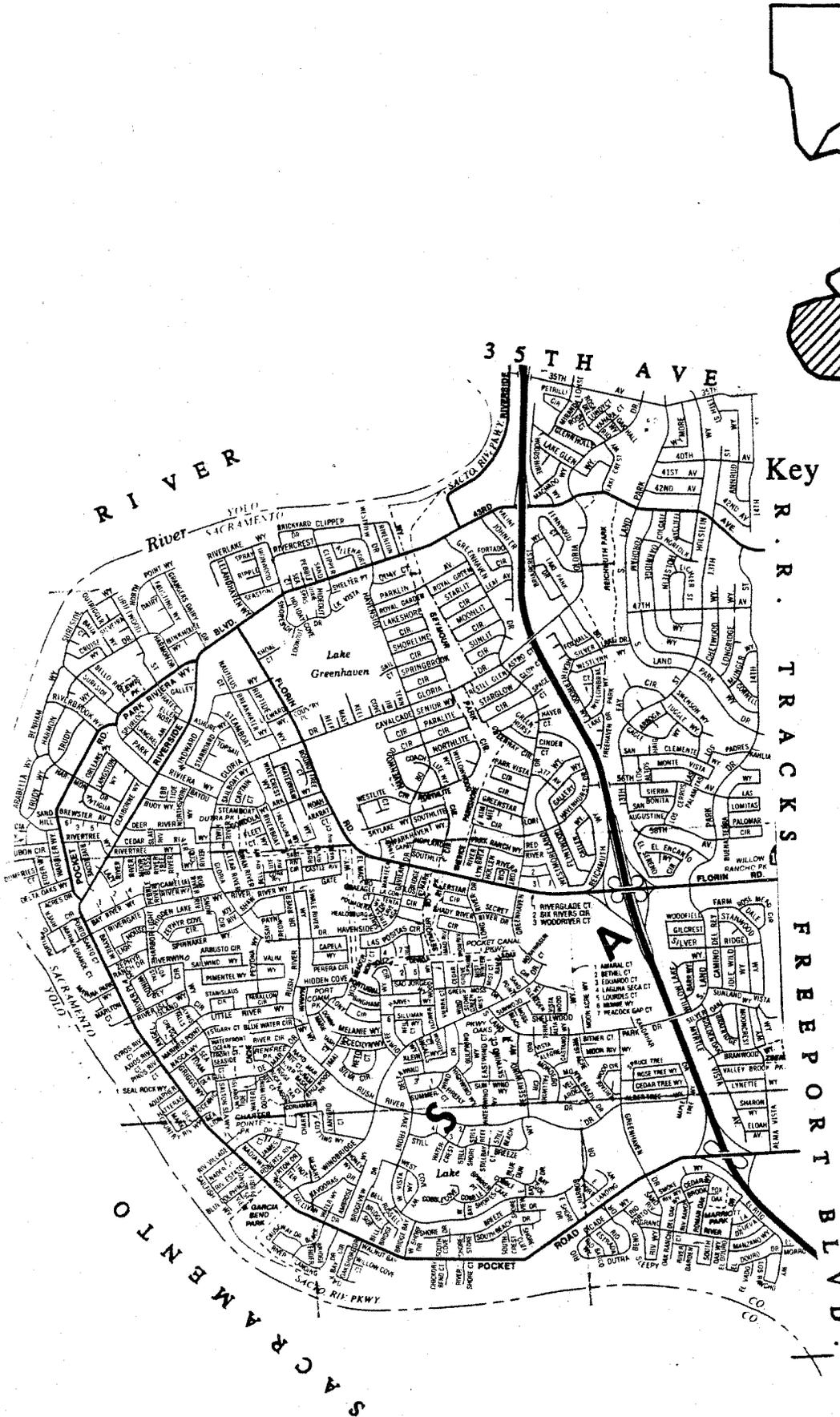
Accent: *Catalpa speciosa*–Western Catalpa, *Tilia cordata*–Little Leaf Linden, *Cinnamomum camphora*–Camphor Tree, *Cedrus spp.*–Cedar, *Washingtonia spp.*–Fan Palm, *Salix spp.*– Willow, *Morus*–Mulberry, *Acer rubrum*–Red Maple, *Lagerstroemia indica*–Crape Myrtle, *Acer saccharinum*–Silver Maple, *Liquidambar styraciflua*–Sweetgum, *Magnolia grandiflora*–Southern Magnolia

Heritage (as a percentage of neighborhood population): 0 %
Significant species: None

PLANTING CONFIGURATION:

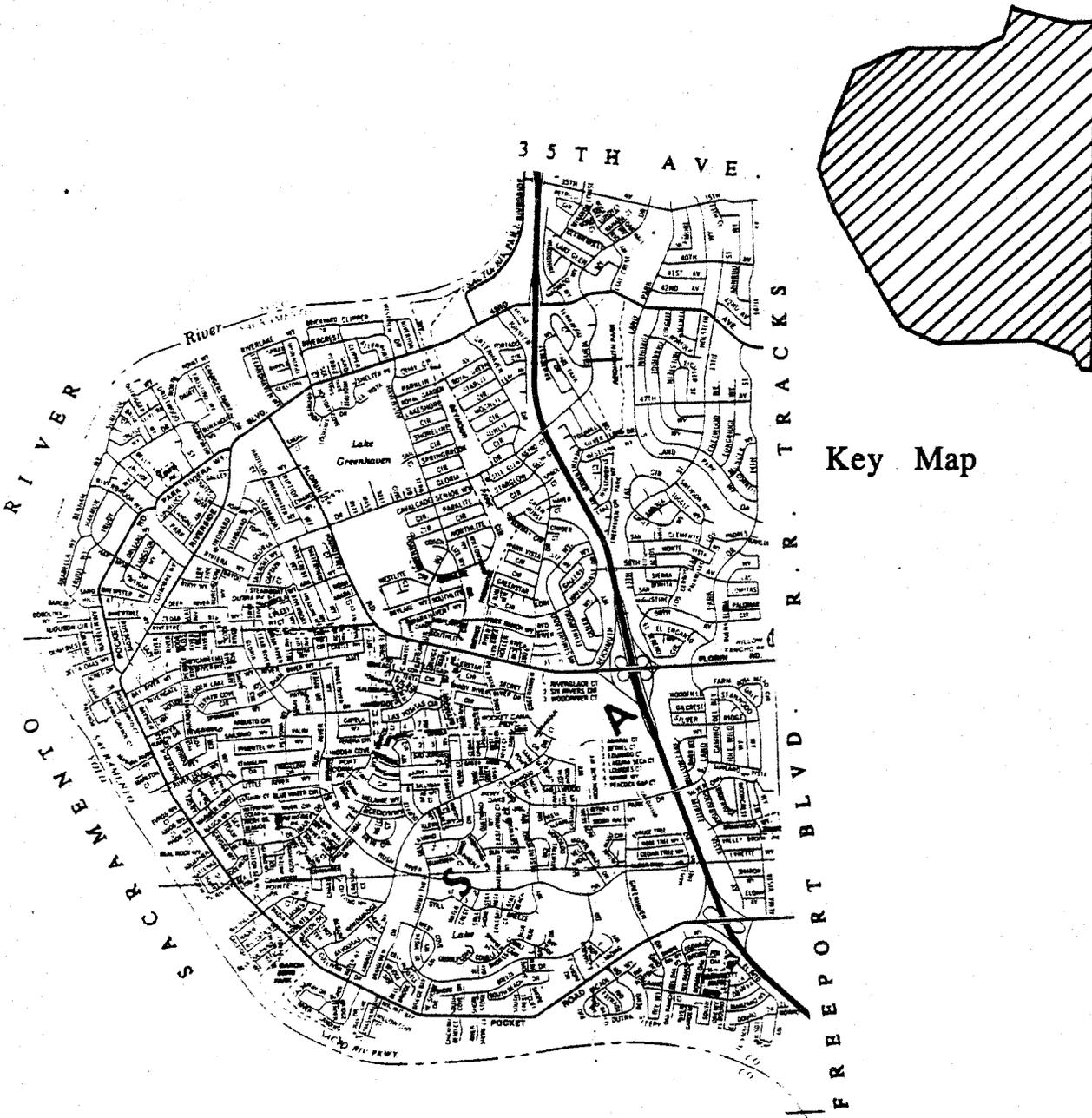
(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft.back from prop.line):	98 %
Hardscape:	0 %
Medians:	1 %



Key Map

Community Plan Area 3
Pocket



Type

Description

Recommendations

Young Tree Population

Characterized by less than 15 years-old. In most cases, this population has a better species mix than older monoculture neighborhood.

Attention to additional planting in new developments, following policies on planting goals. Attention to be given to pruning.

Pocket

POCKET POCKET

EXISTING CONDITIONS

SIZE (in acres): 3,986 acres DEVELOPMENT AGE (approximate): 1961-1991

LAND USE (by percentage):

Single Family Residential:	64 %	Parks:	3 %
Multi-Family Residential:	2 %	Wild/vacant:	10 %
Commerical/Industrial:	9 %	Transportation:	6 %
Institutional:	5 %	Other (incl. agriculture):	1 %

Major Public Facilities within this neighborhood: Marriott Park, Zberg Park, Parkway Oaks Park, Garcia Bend Park, Charter Point Park, Renfree Park, Dutra Park, Seymore Park, Lewis Park, Reichmuth Park, Sacramento River Parkway, Lake Greenhaven

MAJOR STREETS: I-160 or Freeport Blvd., Florin Road, 43rd Avenue, Riverside Blvd., Pocket Road, Park Rivera Road, I-5

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 10,000

AGE (by percentage):	Young:	45 %
	Mature:	54 %
	Declining:	1 %

SPECIES:

Dominant: *Pyrus calleryana*—Bradford Pear, *Liquidambar styraciflua*—Sweetgum, *Fraxinus velutina 'glabra'*—Modesto Ash, *Lagerstroemia indica*—Crape Myrtle, *Pistacia chinensis*—Chinese Pistache, *Platanus acerifolia*—London Plane Tree

Accent: *Ulmus parvifolia*—Chinese Elm, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Prunis cerasifera*—Purple-leaf Plum, *Quercus suber*—Cork Oak, *Sequoia sempervirens*—Coast Redwood, *Quercus agrifolia*—Live Oak, *Betula pedula*—White Birch, *Acer spp.*—Maple, *Morus*—Mulberry, *Nyssa sylvatica*—Tupelo, *Cedrus deodara*—Deodar Cedar, *Alnus spp.*—Alder, *Salix spp.*—Willow

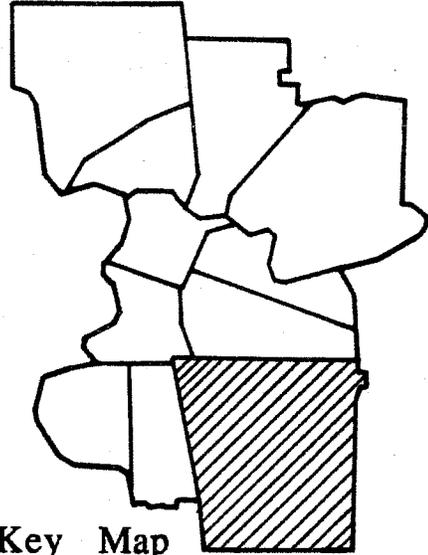
Heritage (as a percentage of neighborhood population): 2 %

Significant species: *Quercus lobata*—Valley Oak, *Juglans nigra*—Black Walnut, *Platanus racemosa*—California Sycamore, *Populus trichocarpa*—Black Cottonwood

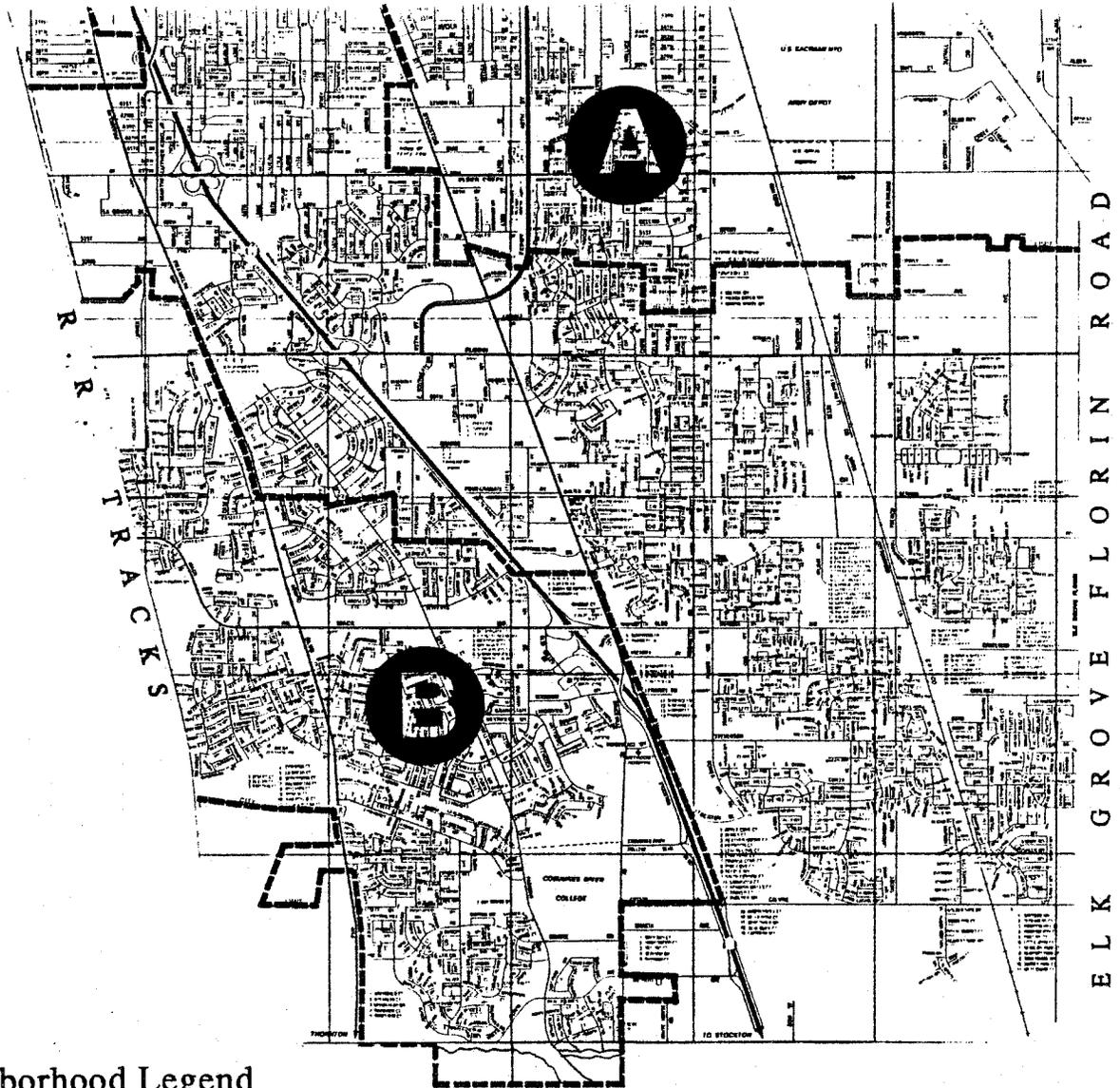
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)	Parkway:	1.5 %
	Private maintenance easement (6.5 ft. back from prop. line):	97 %
	Hardscape:	0 %
	Medians:	1.5 %





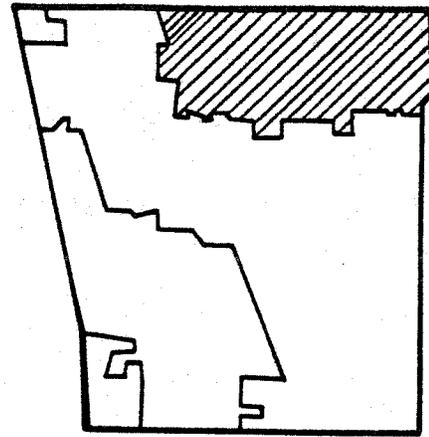
FRUITRIDGE RD. Key Map



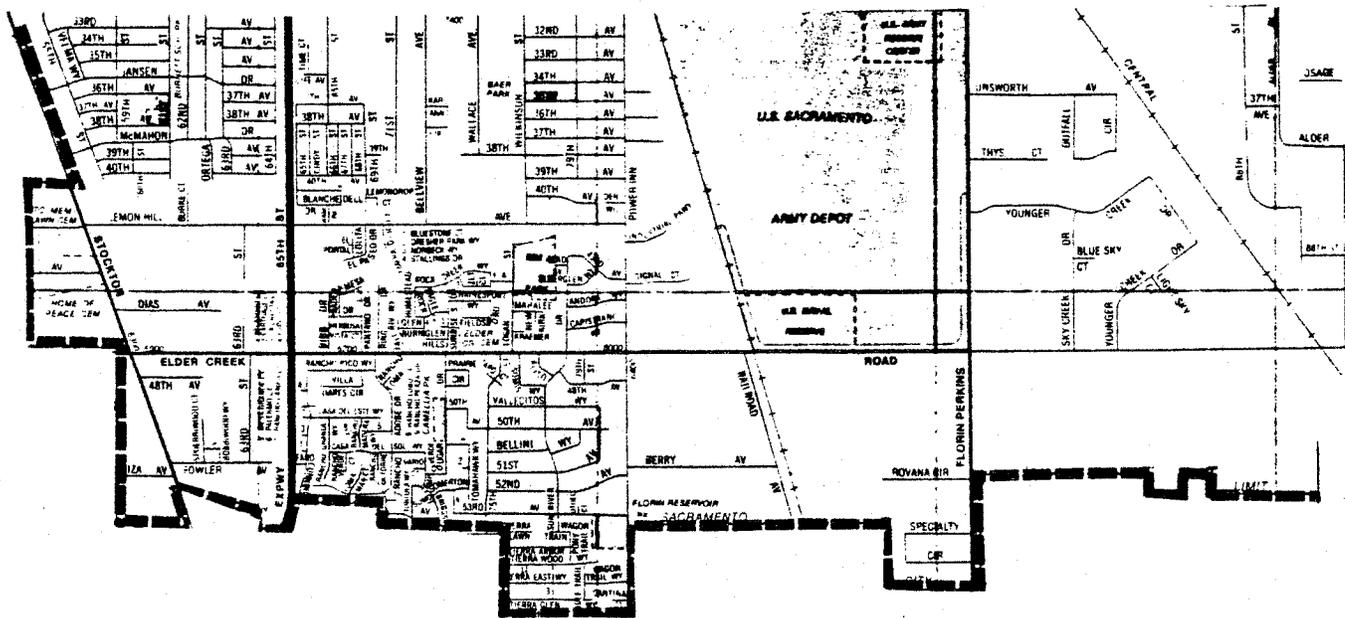
Neighborhood Legend

- A Glen Elder
- B South Sacramento-Valley High

Community Plan Area 4
South Sacramento



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

**South Sacramento
Glen Elder**



**SOUTH SACRAMENTO
GLEN ELDER**

EXISTING CONDITIONS

SIZE (in acres): 3,010 acres DEVELOPMENT AGE (approximate): 1946

LAND USE (by percentage):

Single Family Residential:	64 %	Parks:	2 %
Multi-Family Residential:	3 %	Wild/vacant:	13 %
Commerical/Industrial:	6 %	Transportation:	0 %
Institutional:	8 %	Other (incl. agriculture):	3 %

Major Public Facilities within this neighborhood:

Burnett School Park, Baer Park, Elderglen Park, Camellia Park, Florin Reservoir Park, U. S. Scaramento Army Depot

MAJOR STREETS: Fruitridge Road, Elder Creek Road, 65th Street Expressway, Florin Perkins Road, Elk Grove Florin Road, Stockton Blvd.

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 6,500

AGE (by percentage):	Young:	25 %
	Mature:	74 %
	Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina 'glabra'*—Modesto Ash, *Zelkova serrata*—Sawtooth Zelkova

Accent: *Cinnamomum camphora*—Camphor Tree, *Cedrus spp.*—Cedar, *Platanus acerifolia*—London Plane Tree, *Morus*—Mulberry, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Pinus spp.*—Pine species, *Betula pedula*—White Birch, *Olea europaea*—Olive, *Albizia julibrissin*—Silk Tree, *Quercus borealis*—Red Oak, *Quercus agrifolia*—Live Oak, *Catalpa speciosa*—Western Catalpa, *Liquidambar styraciflua*—Sweetgum, *Ulmus pumila*—Siberian Elm, *Eucalyptus spp.*—*Eucalyptus species*, *Robinia pseudoacacia*—Black Locust, *Magnolia grandiflora*—Southern Magnolia, *Ulmus pumila*—Chinese Elm, *Juglans nigra*—Black Walnut

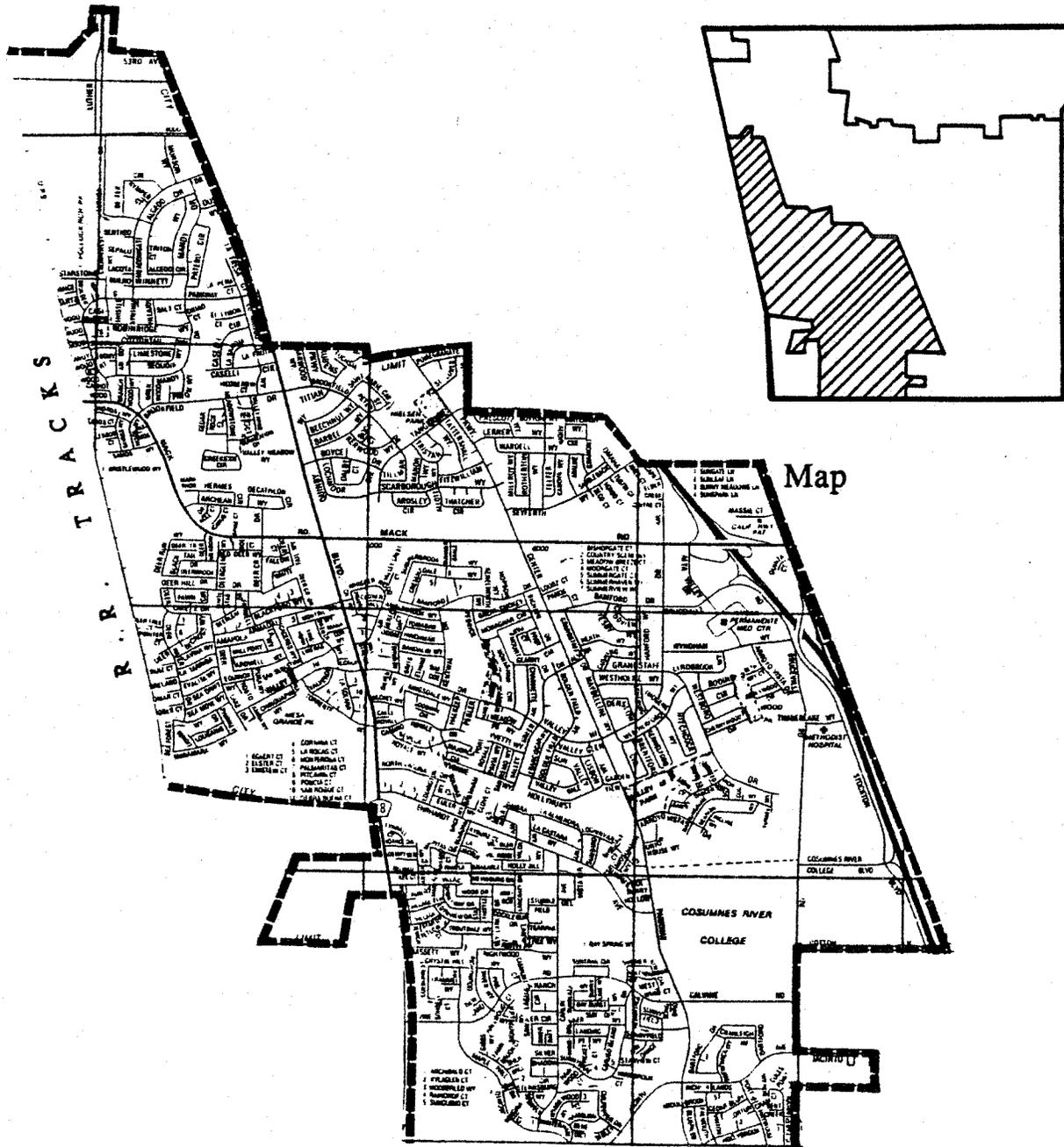
Heritage (as a percentage of neighborhood population): 0 %

Significant species:

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft.back from prop.line):	98 %
Hardscape:	0 %
Medians:	1 %



<u>Type</u>	<u>Description</u>	<u>Recommendations</u>
Ash Dominant	Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.	Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

South Sacramento
South Sacramento - Valley High

4B

SOUTH SACRAMENTO VALLEY HIGH

EXISTING CONDITIONS

SIZE (in acres): 4308 acres DEVELOPMENT AGE (approximate): 1951-1991

LAND USE (by percentage):

Single Family Residential:	62 %	Parks:	2 %
Multi-Family Residential:	2 %	Wild/vacant:	18 %
Commerical/Industrial:	8 %	Transportation:	3 %
Institutional:	5 %	Other (incl. agriculture):	1 %

Major Public Facilities within this neighborhood: Neilsen Park, Mesa Grande Park, Valley High Park, Reith Park, Mesa Grande, Wood Park, Cosumnes River College, Hite Park, Pollock Ranch Park, Maple School Park

MAJOR STREETS: Florin Road, Mack Road, Franklin Blvd., I-99 or I-80, Stockton Blvd., Center Parkway, Fruitridge Road

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 8,500

AGE (by percentage):	Young:	27 %
	Mature:	72 %
	Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'— Modesto Ash, *Morus*—Mulberry, *Zelkova serrata*—Sawtooth Zelkova, *Platanus acerifolia*—London Plane Tree, *Quercus lobata*—Valley Oak, *Quercus suber*—Cork Oak, *Liquidambar styraciflua*—Sweetgum, *Pistacia chinensis*—Chinese Pistache, *Ulmus parvifolia*—Chinese Elm

Accent: *Pinus spp.*—Pine species, *Liriodendron tulipifera*—Tulip Tree, *Betula pedula*—White Birch, *Acer spp.*—Maple species, *Picea spp.*—Spruce species, *Sequoia sempervirens*—Coast Redwood, *Cedrus deodara*—Deodar Cedar, *Washingtonia spp.*—Fan Palm, *Albizia julibrissin*—Silk Tree, *Cinnamomum camphora*—Camphor Tree, *Eucalyptus spp.*—Eucalyptus species, *Magnolia grandiflora*—Southern Magnolia, *Prunus cerasifera*—Purple-leaf Plum, *Schinus molle*—California Pepper, *Phoenix canariensis*—Date Palm, *Tilia cordata*—Little Leaf Linden, *Lagerstroemia indica*—Crape Myrtle, *Sapium sebiferum*—Chinese Tallowtree, *Pyrus calleryana*—Bradford Pear, *Sophora japonica*—Japanese Pagoda Tree

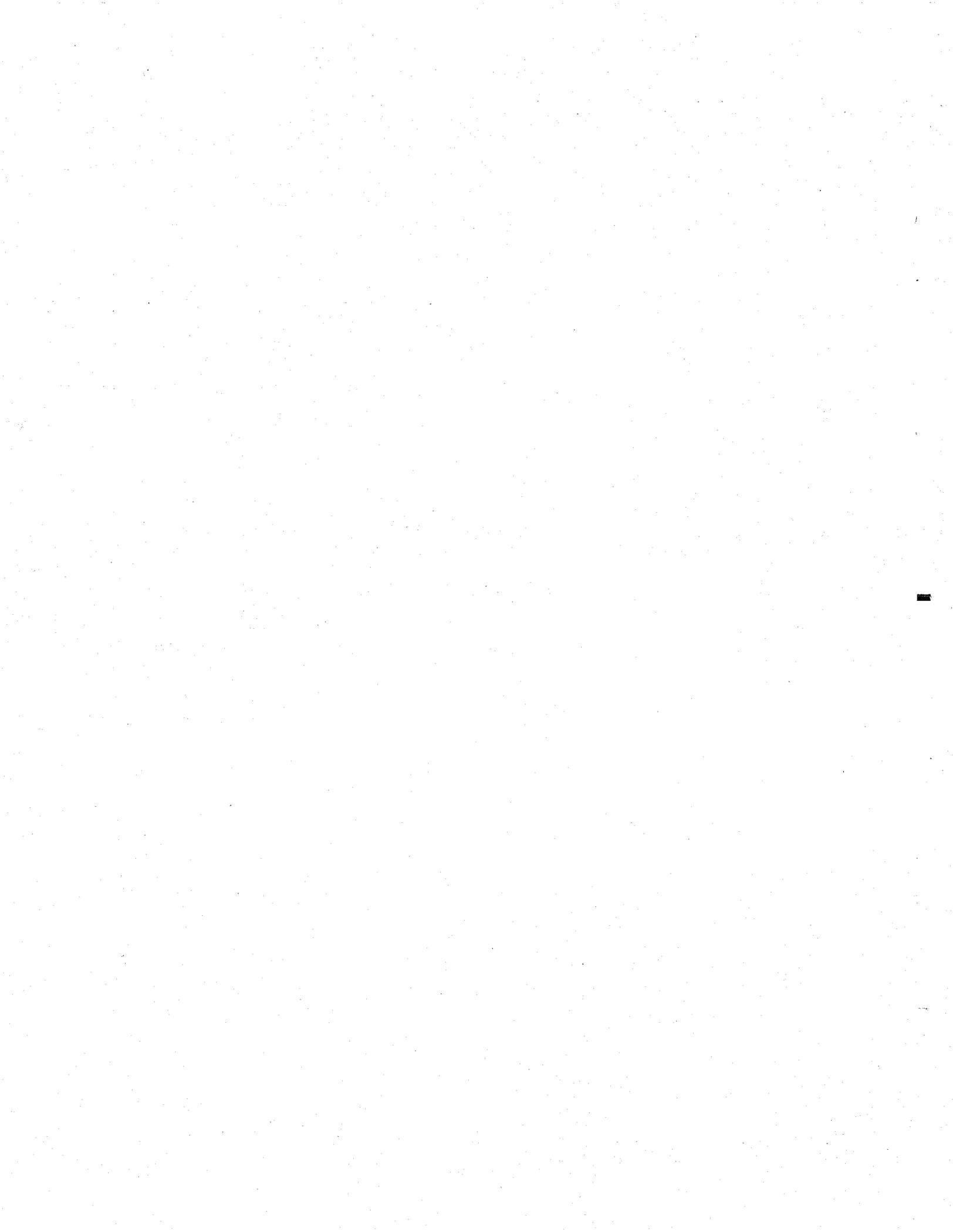
Heritage (as a percentage of neighborhood population): 1 %

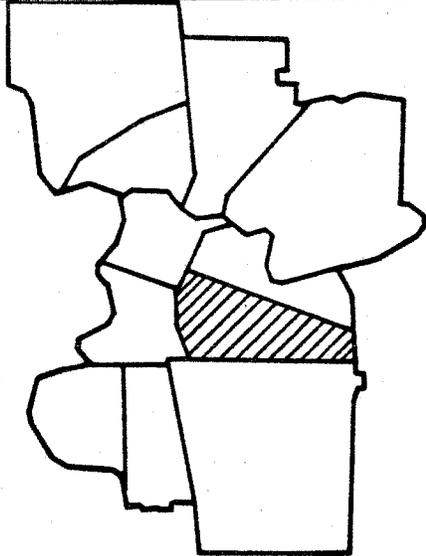
Significant species: None

PLANTING CONFIGURATION:

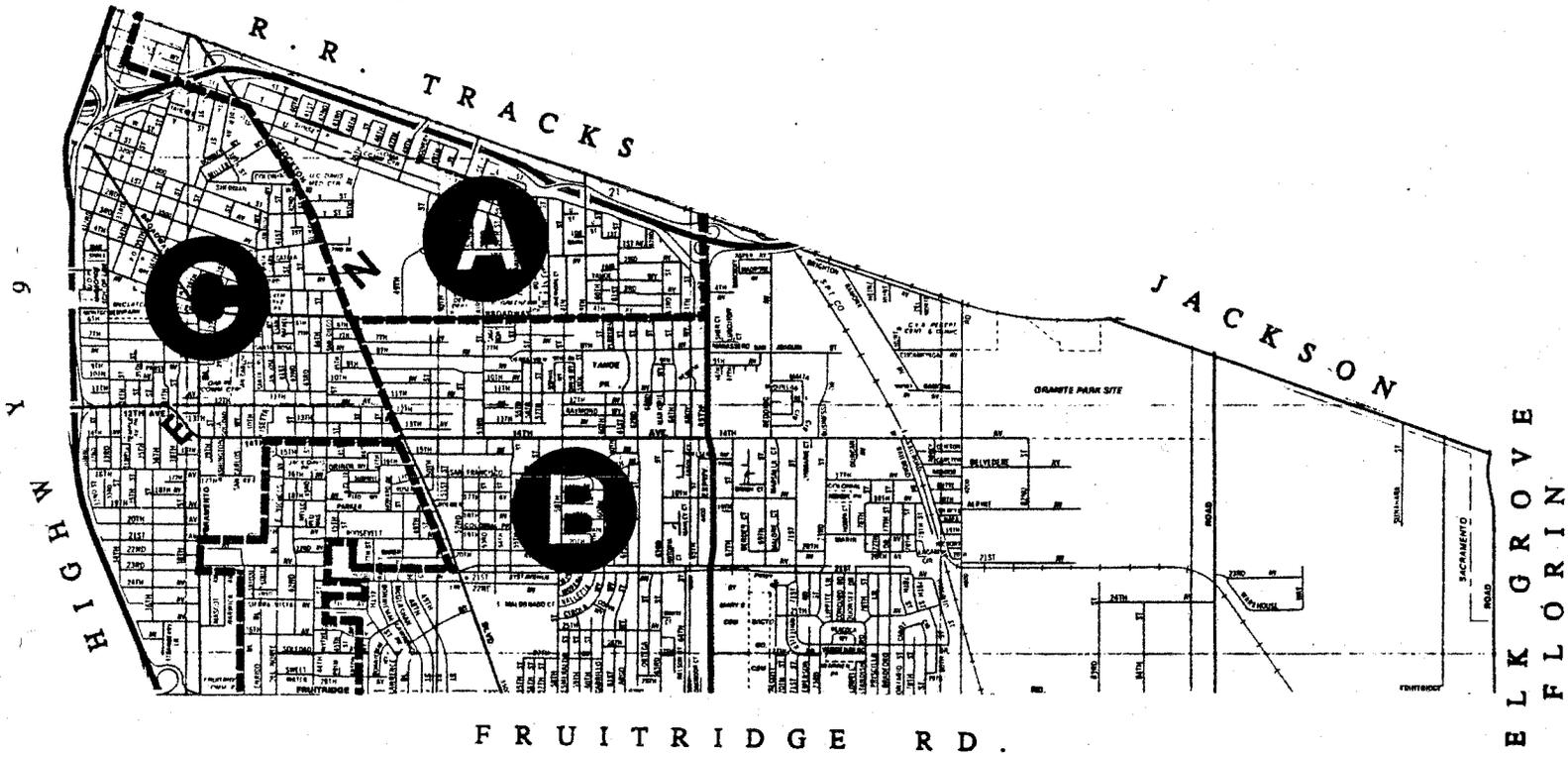
(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft. back from prop. line):	98 %
Hardscape:	0 %
Medians:	1 %





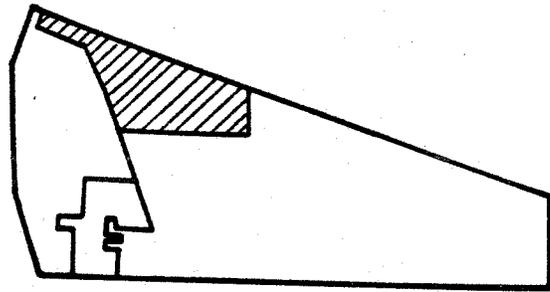
Key Map



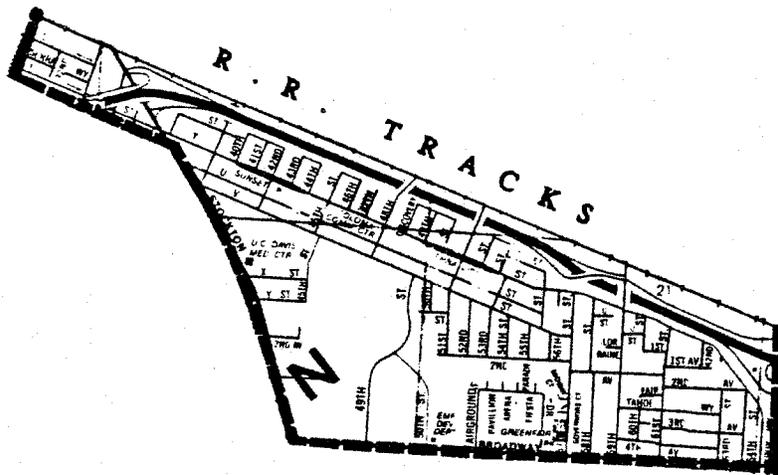
Neighborhood Legend

- A T Street - Medical Center
- B Tahoe Park
- C Oak Park

Community Plan Area 5
East Broadway



Key Map



<u>Type</u>	<u>Description</u>	<u>Recommendations</u>
Ash Dominant	Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.	Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

East Broadway
T Street - Medical Center

5A

EAST BROADWAY T STREET-MEDICAL CENTER

EXISTING CONDITIONS

SIZE (in acres): 636 acres DEVELOPMENT AGE (approximate): 1921-1951

LAND USE (by percentage):

Single Family Residential:	44 %	Parks:	2 %
Multi-Family Residential:	4 %	Wild/vacant:	12 %
Commerical/Industrial:	21 %	Transportation:	10 %
Institutional:	7 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood:

Greenfair Park, Coloma Community Center, Sierra Vista Park, Sunset Park,
U.C. Davis Medical Center

MAJOR STREETS: Stoditon Blvd., Broadway Avenue, 65th Street Expressway, I-50

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 4,000

AGE (by percentage):	Young:	2 %
	Mature:	97 %
	Declining:	1 %

SPECIES:

Dominant: *Ulmus americana* & *procera*—American & English Elm, *Fraxinus velutina* 'glabra'—Modesto Ash, *Platanus acerifolia*—London Plane Tree, *Zelkova serrata*—Sawtooth Zelkova, *Liquidambar styraciflua*—Sweetgum, *Quercus lobata*—Valley Oak, *Ulmus parvifolia*—Ch. Elm, *Celtis sinensis*

Accent: *Robinia pseudoacacia*—Black Locust, *Acer buergerianum*—Trident Maple, *Pistacia chinensis*—Chinese Pistache, *Eucalyptus spp.*—Eucalyptus species, *Cinnamomum camphora*—Camphor Tree, *Pistacia chinensis*—Chinese Pistache, *Washingtonia spp.*—Fan Palm, *Phoenix canariensis*—Date Palm, *Sequoia sempervirens*—Coast Redwood, *Cedrus spp.*—Cedar, *Albizia julibrissin*—Silk Tree, *Magnolia grandiflora*—Southern Magnolia, *Olea europaea*—Olive, *Acer saccharinum*—Silver Maple, *Lagerstroemia indica*—Crepe Myrtle, *Pyrus kawakamii*—Evergreen Pear, *Pyrus kawakamii*—Evergreen Pear, *Morus alba*—Fruitless Mulberry, *Prunus cerasifera*—Purple-leaf Plum, *Quercus borealis*—Red Oak, *Nyssa sylvatica*—Tupelo, *Ulmus pumila*—Siberian Elm

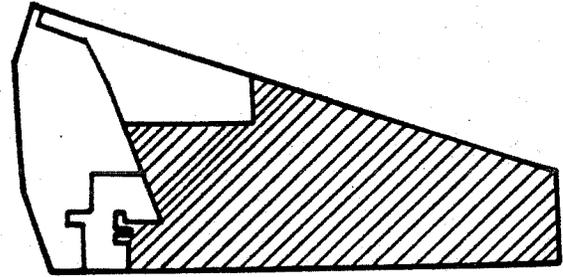
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*—Valley Oak, *Ginkgo biloba*—Maidenhair Tree, *Quercus agrifolia*—Live Oak

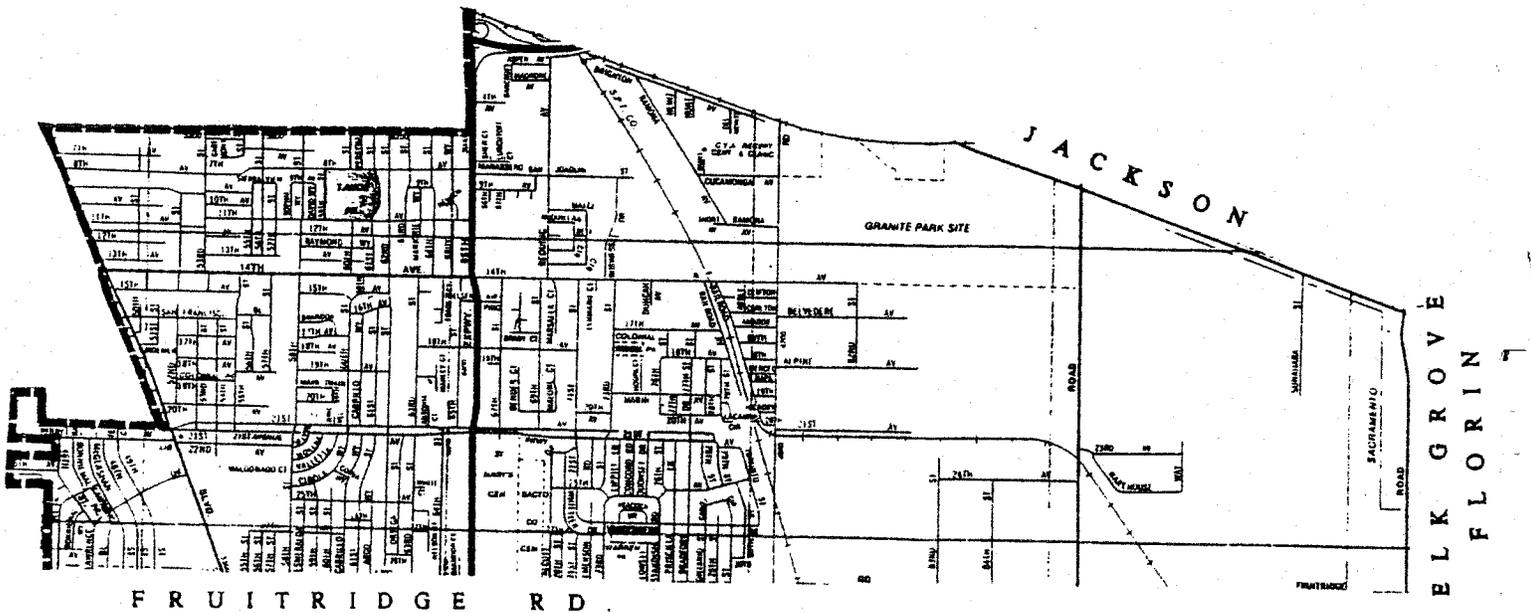
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	5 %
Private maintenance easement (6.5 ft. back from prop. line):	94 %
Hardscape:	0 %
Medians:	1 %



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

**East Broadway
Tahoe Park**

5B

EAST BROADWAY TAHOE PARK

EXISTING CONDITIONS

SIZE (in acres): 3494 acres DEVELOPMENT AGE (approximate): 1931-1951

LAND USE (by percentage):

Single Family Residential:	69 %	Parks:	1 %
Multi-Family Residential:	1 %	Wild/vacant:	8 %
Commerical/Industrial:	9 %	Transportation:	0 %
Institutional:	11 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood: St. Mary's Cemetery, Sacramento Community Cemetery, Warren Park, 21st Avenue Parkway, Colonial Park, Lawrence Park, Tahoe Park, Granite Park Site, Colonial Neighborhood Park

MAJOR STREETS: Stockton Blvd., Broadway, 14th Avenue, 21st Avenue, Fruitridge, Jackson Blvd., I-50, 65th Street Expressway, Florin Perkins Road, Sacramento Blvd., Power Road

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 9,500

AGE (by percentage):

Young:	3 %
Mature:	96 %
Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina* 'modesto'—Modesto Ash, *Ulmus parvifolia*—Chinese Elm, *Zelkova serrata*—Sawtooth Zelkova, *Pistacia chinensis*—Chinese Pistache, *Platanus acerifolia*—London Plane Tree

Accent: *Nyssa sylvatica*—Tupelo, *Pyrus kawakamii*—Evergreen Pear, *Sapium sebiferum*—Chinese Tallowtree, *Lagerstroemia indica*—Crape Myrtle, *Betula pedula*—White Birch, *Washingtonia spp.*—Fan Palm, *Prunus cerasifera*—Purple-leaf Plum, *Liquidambar styraciflua*—Sweetgum, *Pistacia chinensis*—Chinese Pistache, *Phoenix canariensis*—Date Palm, *Sequoia sempervirens*—Coast Redwood, *Juglans regia*—English Walnut, *Alnus spp.*—Alder, *Morus alba*—Fruitless Mulberry, *Magnolia grandiflora*—Southern Magnolia, *Ulmus pumila*—Siberian Elm, *Pinus species*—Pine species, *Cedrus spp.*—Cedar, *Cinnamomum camphora*—Camphor Tree, *Acer buergerianum*—Trident Maple, *Sequoia giganteum*—Giant Sequoia, *Acer saccharinum*—Silver Maple, *Celtis sinensis*—Hackberry, *Picea pungens*—Colorado Blue Spruce, *Catalpa speciosa*—Western Catalpa

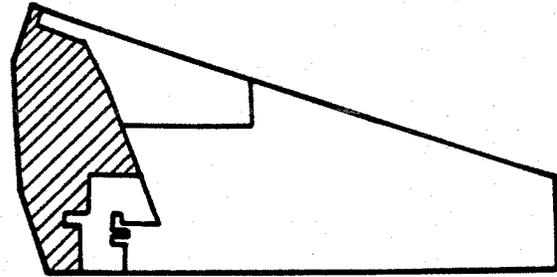
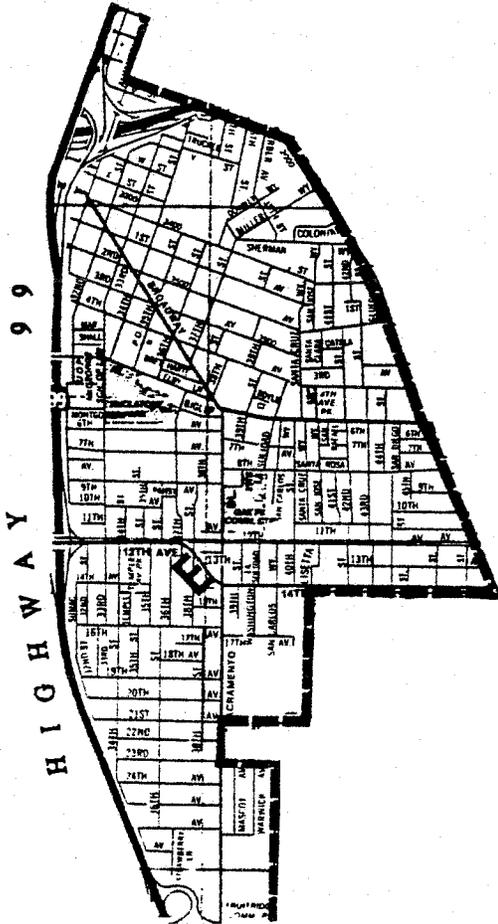
Heritage (as a percentage of neighborhood population): 1 %

Significant species: None

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft. back from prop. line):	98 %
Hardscape:	0 %
Medians:	1 %



Key Map

Type

Description

Recommendations

Elm Dominant

Dominated by Elm Species and Zelkova Trees susceptible to Elm leaf beetle, no Dutch Elm disease Detected. Dominant trees are mature to overmature.

Short-term: Continue Elm leaf control program.
Long-term: Rotational replacement of declining elms with other species. Select species that are resident or not susceptible. Monitor for Dutch Elm disease.

Ash Dominant

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

Platanus Dominant

50+ years old. Slowly declining population with frequent accumulations of small dead wood. Low overall maintenance required. Frequent but not severe problems with Anthracnose and powdery mildew. Problems may cause trees to be visually unsightly. American Plum borer, mite, and scale are more sporadic and more seriously affect tree health.

The species requires dead wood trimming and opening up canopies. Replace with disease-resistant varieties of P. 'Bloodgood' and P. 'Yarwood'.

**East Broadway
Oak Park**

5C

EAST BROADWAY OAK PARK

EXISTING CONDITIONS

SIZE (in acres): 1085 acres DEVELOPMENT AGE (approximate): 1901-1951

LAND USE (by percentage):

Single Family Residential:	67 %	Parks:	3 %
Multi-Family Residential:	1 %	Wild/vacant:	6 %
Commerical/Industrial:	7 %	Transportation:	9 %
Institutional:	7 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood:

Temple Avenue Park, Oak Park 4th Avenue Park, McClatchy Park,
McGeorge School of Law

MAJOR STREETS: I-50, 12th Avenue, Sacramento Blvd., Broadway, Stockton, I-80

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 5,500

AGE (by percentage):

Young:	1 %
Mature:	97 %
Declining:	2 %

SPECIES:

Dominant: *Ulmus campestris*–English Elm, *Ulmus parvifolia*–Chinese Elm, *Platanus acerifolia*–London Plane Tree, *Zelkova serrata*–Sawtooth Zelkova, *Celtis sinensis*–Hackberry, *Fraxinus velutina 'glabra'*–Modesto Ash

Accent: *Acer spp.*–Maple species, *Sequoia sempervirens*–Coast Redwood, *Quercus lobata*–Valley Oak, *Quercus suber*–Cork Oak, *Cedrus spp.*–Cedar species, *Washingtonia spp.*–Fan Palm, *Betula spp.*–Birch species, *Olea europaea*–Olive, *Phoenix canariensis*–Date Palm, *Pistacia chinensis*–Chinese Pistache, *Acer saccharinum*–Silver Maple, *Albizia julibrissin*–Silk Tree, *Melia azedarach*–Chinaberry, *Robinia pseudoacacia*–Black Locust, *Acacia melanoxylon*–Black Acacia, *Magnolia grandiflora*–Southern Magnolia

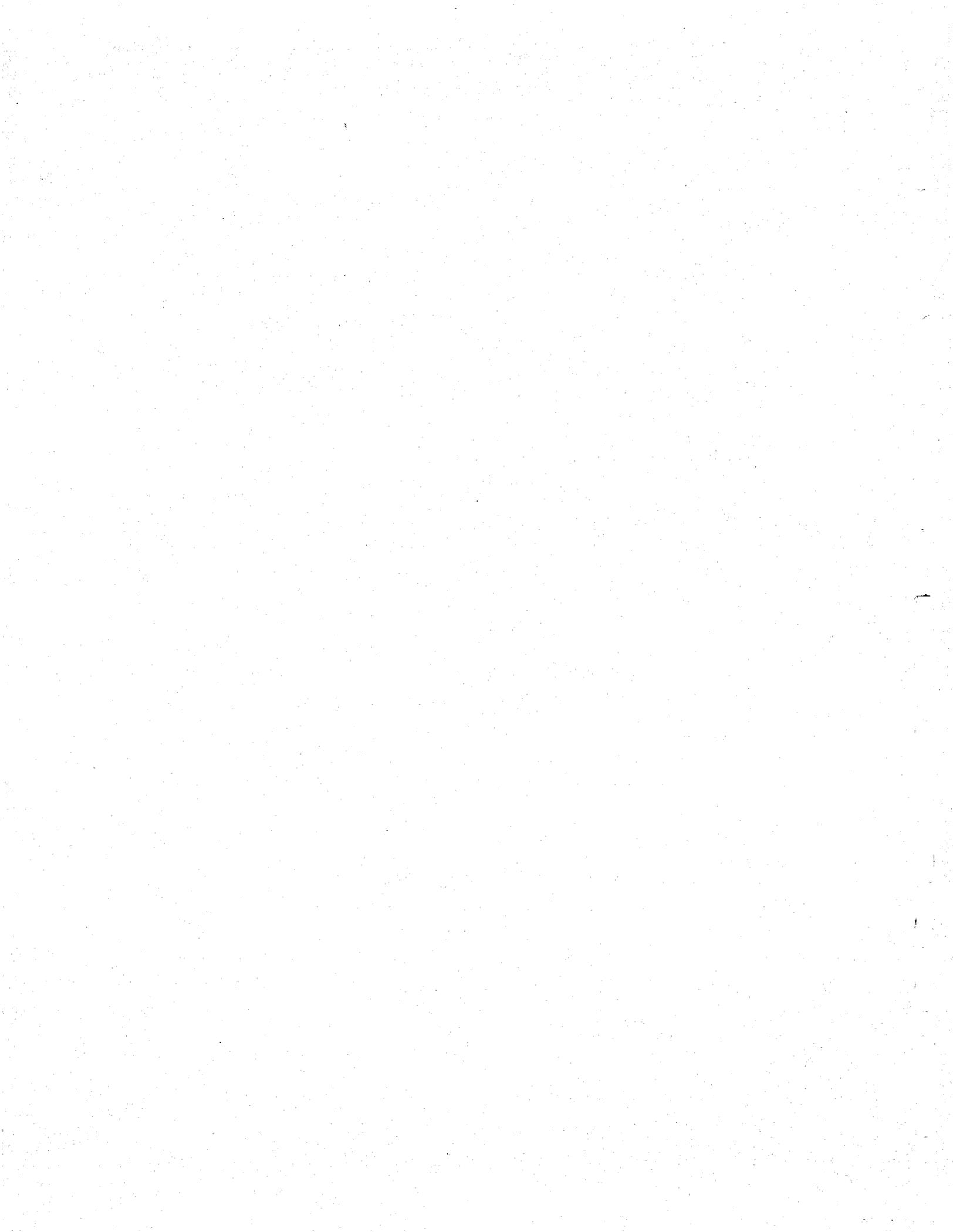
Heritage (as a percentage of neighborhood population): 1 %

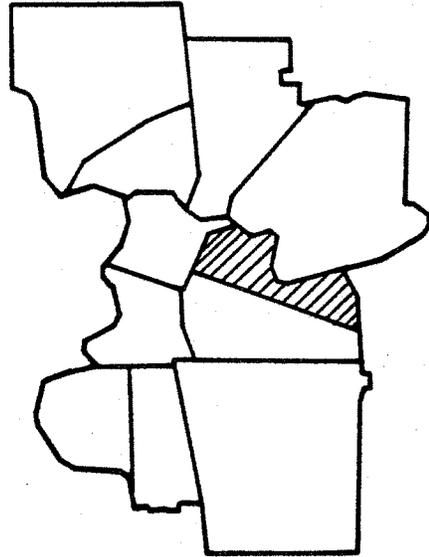
Significant species: *Quercus lobata*–Valley Oak

PLANTING CONFIGURATION:

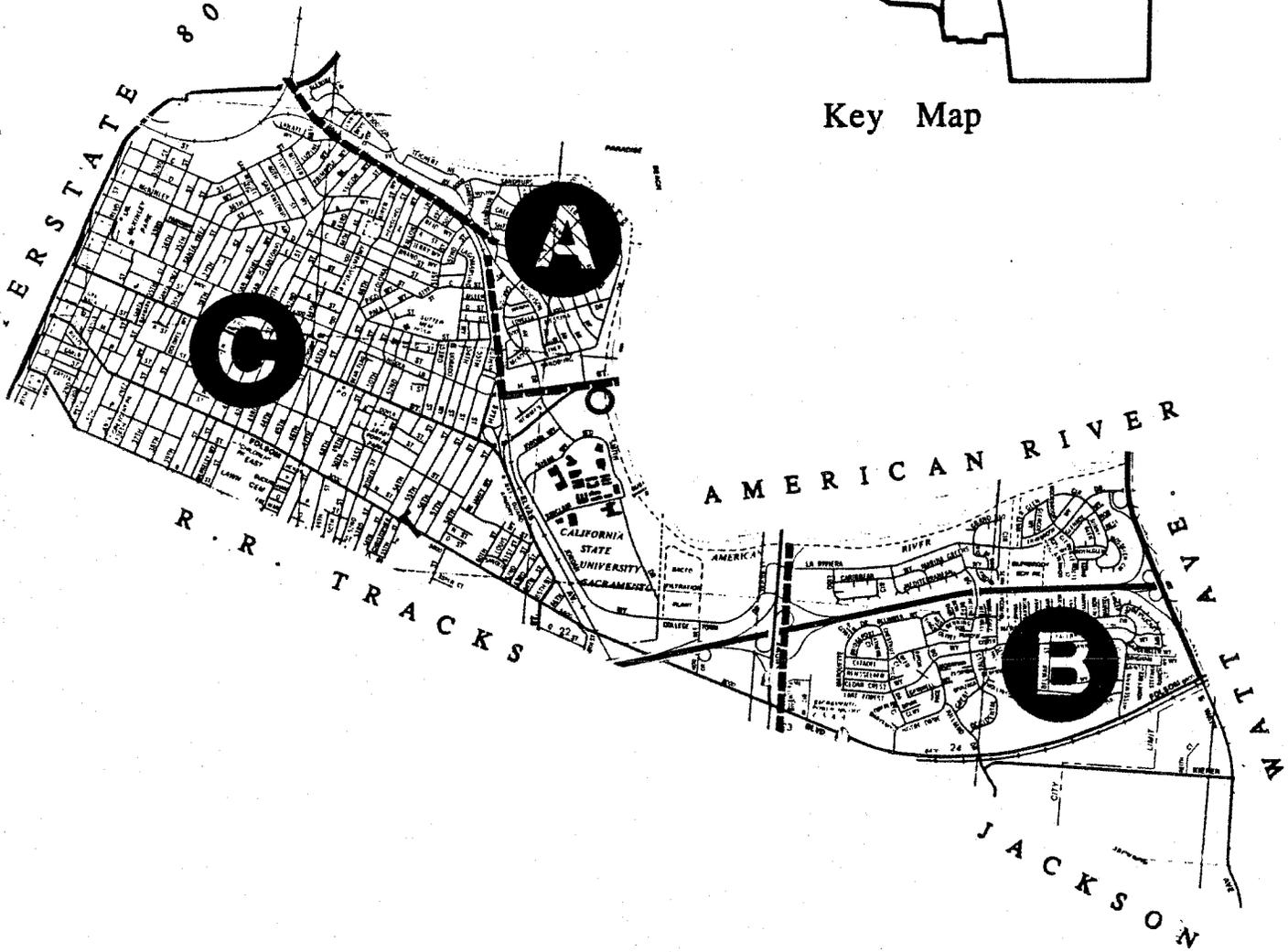
(by percentage of available growing space within city jurisdiction)

Parkway:	49	%
Private maintenance easement (6.5 ft.back from prop.line):	51	%
Hardscape:	0	%
Medians:	1	%





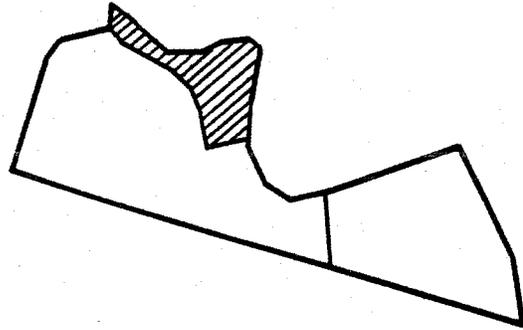
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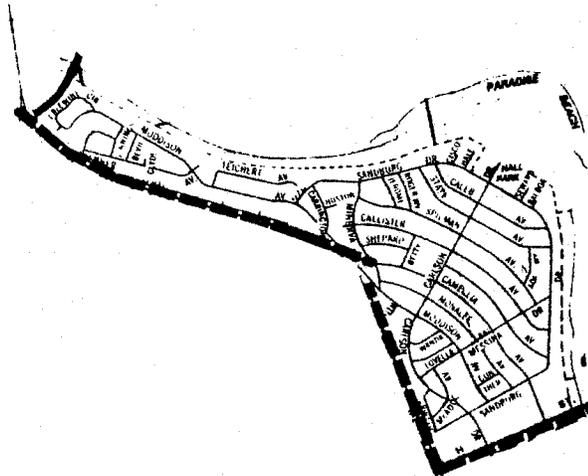
Neighborhood Legend

- A River Park
- B College Green
- C East Sacramento

Community Plan Area 6
East Sacramento



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

**East Sacramento
River Park**

6A

**EAST SACRAMENTO
RIVER PARK**

EXISTING CONDITIONS

SIZE (in acres): 483 acres DEVELOPMENT AGE (approximate): 1946

LAND USE (by percentage): No data available

Single Family Residential:	%	Parks:	%
Multi-Family Residential:	%	Wild/vacant:	%
Commerical/Industrial:	%	Transportation:	%
Institutional:	%	Other (incl. agriculture):	%

Major Public Facilities within this neighborhood:
American River Parkway, Glen Hall Park

MAJOR STREETS: 'H' Street

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 4,000

AGE (by percentage):

Young:	5 %
Mature:	94 %
Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina 'glabra'*– Modesto Ash, *Liquidambar styraciflua*–Sweetgum, *Ulmus parvifolia*–Chinese Elm, *Zelkova serrata*–Sawtooth Zelkova

Accent: *Liriodendron tulipifera*–Tulip Tree, *Juglans nigra*– Black Walnut, *Crataegus laevigata*–Hawthorn, *Magnolia grandiflora*–Southern Magnolia, *Cinnamomum camphora*–Camphor Tree, *Pistacia chinensis*–Chinese Pistache, *Betula pedula*–White Birch, *Acer saccharinum*–Silver Maple, *Ginkgo biloba*–Maidenhair Tree, *Prunus cerasifera*–Purple-leaf Plum

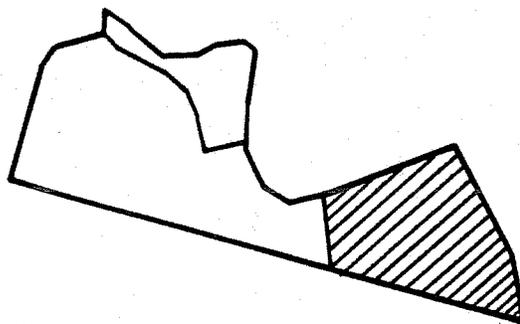
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Juglans nigra*– Black Walnut

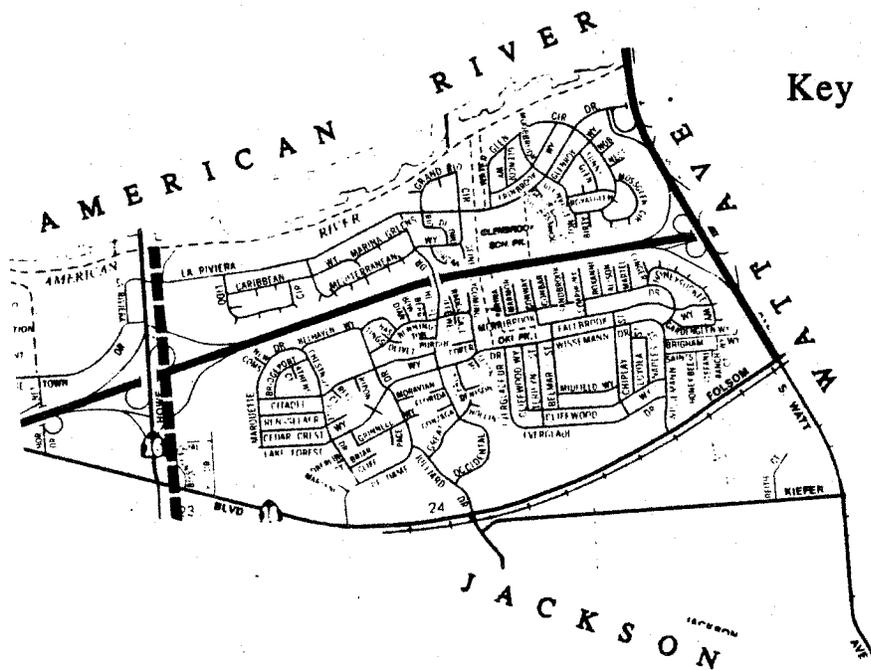
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	0 %
Private maintenance easement (6.5 ft. back from prop.line):	99 %
Hardscape:	0 %
Medians:	1 %



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

East Sacramento
College Green

6B

EAST SACRAMENTO COLLEGE GREEN

EXISTING CONDITIONS

SIZE (in acres): 1009 acres DEVELOPMENT AGE (approximate): 1961

LAND USE (by percentage):

Single Family Residential:	43 %	Parks:	0 %
Multi-Family Residential:	0 %	Wild/vacant:	43 %
Commerical/Industrial:	0 %	Transportation:	5 %
Institutional:	8 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood:

Jedediah Smith National Recreation Area, Oki Park, Glenbrook School Park

MAJOR STREETS: Folsom Blvd., I-50, Watt Avenue, Kiefer Blvd., Howe Avenue

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 6,500

AGE (by percentage):

Young:	5 %
Mature:	94 %
Declining:	4 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'—Modesto Ash, *Morus alba*—Fruitless Mulberry

Accent: *Pyrus calleryana*—Bradford Pear, *Ginkgo biloba*—Maidenhair Tree, *Olea europaea*—Olive, *Liriodendron tulipifera*—Tulip Tree, *Tilia spp.*—Linden, *Cinnamomum camphora*—Camphor Tree, *Liquidambar styraciflua*—Sweetgum, *Pinus species*—Pine species, *Picea pungens*—Colorado Blue Spruce, *Populus trichocarpa*—Black Cottonwood, *Lagerstroemia indica*—Crape Myrtle, *Magnolia grandiflora*—Southern Magnolia, *Betula pedula*—White Birch, *Cedrus spp.*—Cedar, *Platanus acerifolia*—London Plane Tree, *Eucalyptus spp.*—Eucalyptus species, *Zelkova serrata*—Sawtooth Zelkova, *Pistacia chinensis*—Chinese Pistache, *Prunus cerasifera*—Purple-leaf Plum, *Washingtonia spp.*—Fan Palm, *Ulmus parvifolia*—Chinese Elm, *Robinia pseudoacacia*—Black Locust, *Quercus lobata*—Valley Oak

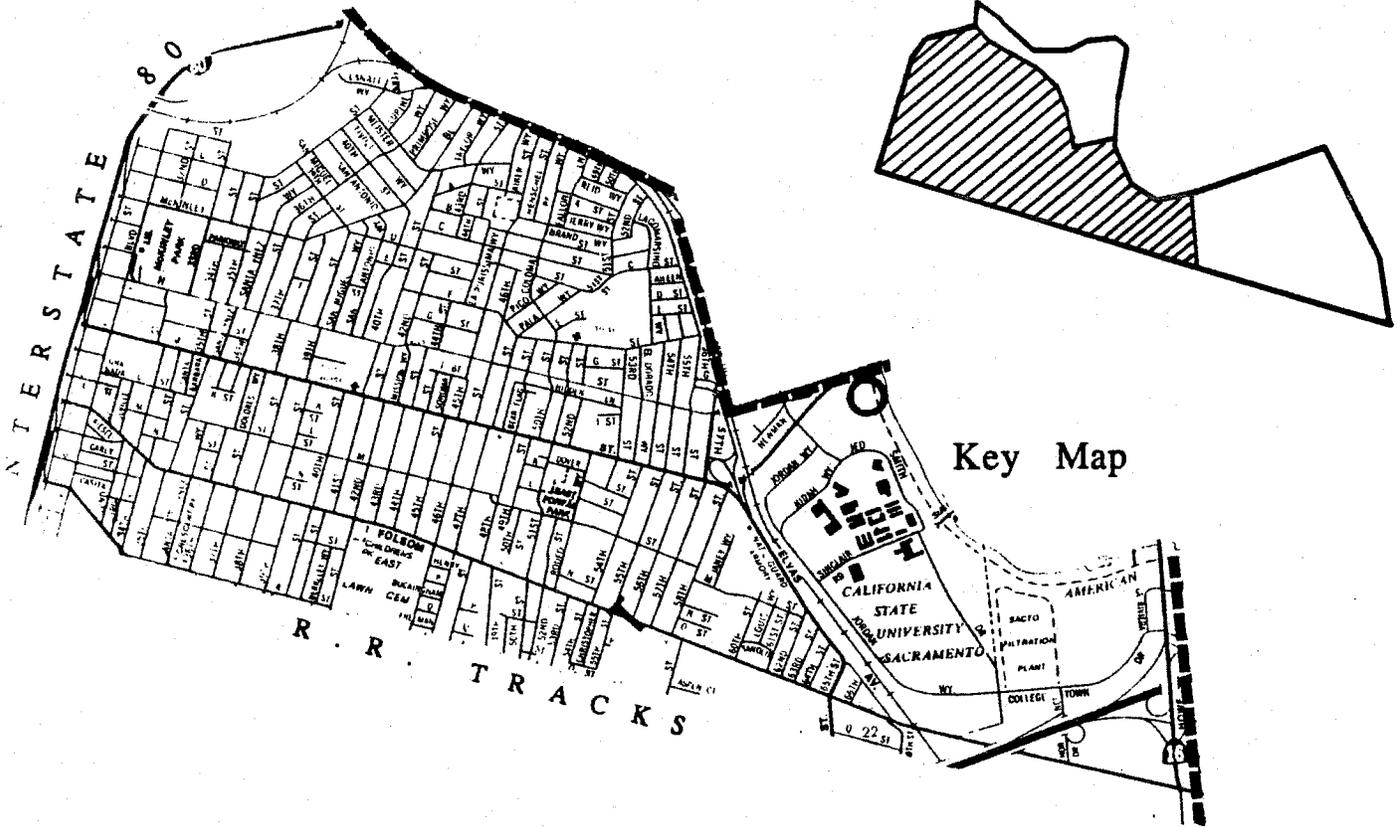
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus lobata*—Valley Oak

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	0 %
Private maintenance easement (6.5 ft. back from prop.line)	100 %
Hardscape:	0 %
Medians:	0 %



Type

Platanus Dominant

Description

50+ years old. Slowly declining population with frequent accumulations of small dead wood. Low overall maintenance required. Frequent but not severe problems with Anthracnose and powdery mildew. Problems may cause trees to be visually unsightly. American Plum borer, mite, and scale are more sporadic and more seriously affect tree health.

Recommendations

The species requires dead wood trimming and opening up canopies. Replace with disease-resistant varieties of P. 'Bloodgood' and P. 'Yarwood'.

Ash Dominant

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

East Sacramento
East Sacramento

6C

EAST SACRAMENTO EAST SACRAMENTO

EXISTING CONDITIONS

SIZE (in acres): 2289 acres DEVELOPMENT AGE (approximate): 1921-1931

LAND USE (by percentage):

Single Family Residential:	54 %	Parks:	0 %
Multi-Family Residential:	1 %	Wild/vacant:	4 %
Commerical/Industrial:	14 %	Transportation:	9 %
Institutional:	18 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood: California State University-Sacramento, East Lawn Cemetery, Children's Park, East Portal Park, McKinley Park, Sutter Memorial Hospital, Mercy Hospital, Jeddediah Smith National Recreation Area

MAJOR STREETS:

'J' Street, 57th Street, 'H' Street, Evans Avenue, Folsom Blvd., I-80, Howe Avenue

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 9,500

AGE (by percentage):

Young:	3 %
Mature:	96 %
Declining:	1 %

SPECIES:

Dominant: *Platanus acerifolia*—London Plane Tree, *Fraxinus velutina* 'glabra'—Modesto Ash, *Ulmus spp.*—Elm species

Accent: *Magnolia grandiflora*—Southern Magnolia, *Liquidambar styraciflua*—Sweetgum, *Cedrus deodara*—Deodar Cedar, *Acer japonicum*—Japanese Maple, *Cornus spp.*—Dogwood, *Lagerstroemia indica*—Crape Myrtle, *Washingtonia spp.*—Fan Palm, *Liriodendron tulipifera*—Tulip Tree, *Quercus lobata*—Valley Oak, *Quercus robur*—English Oak, *Quercus virginiana*—Southern Live Oak, *Quercus rubra*—Red Oak, *Pistacia chinensis*—Chinese Pistache, *Juglans spp.*—Walnut species

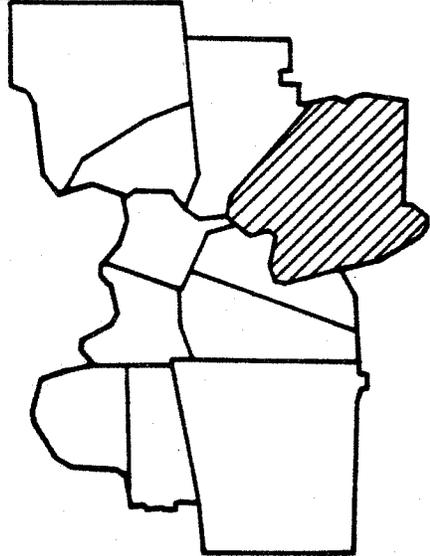
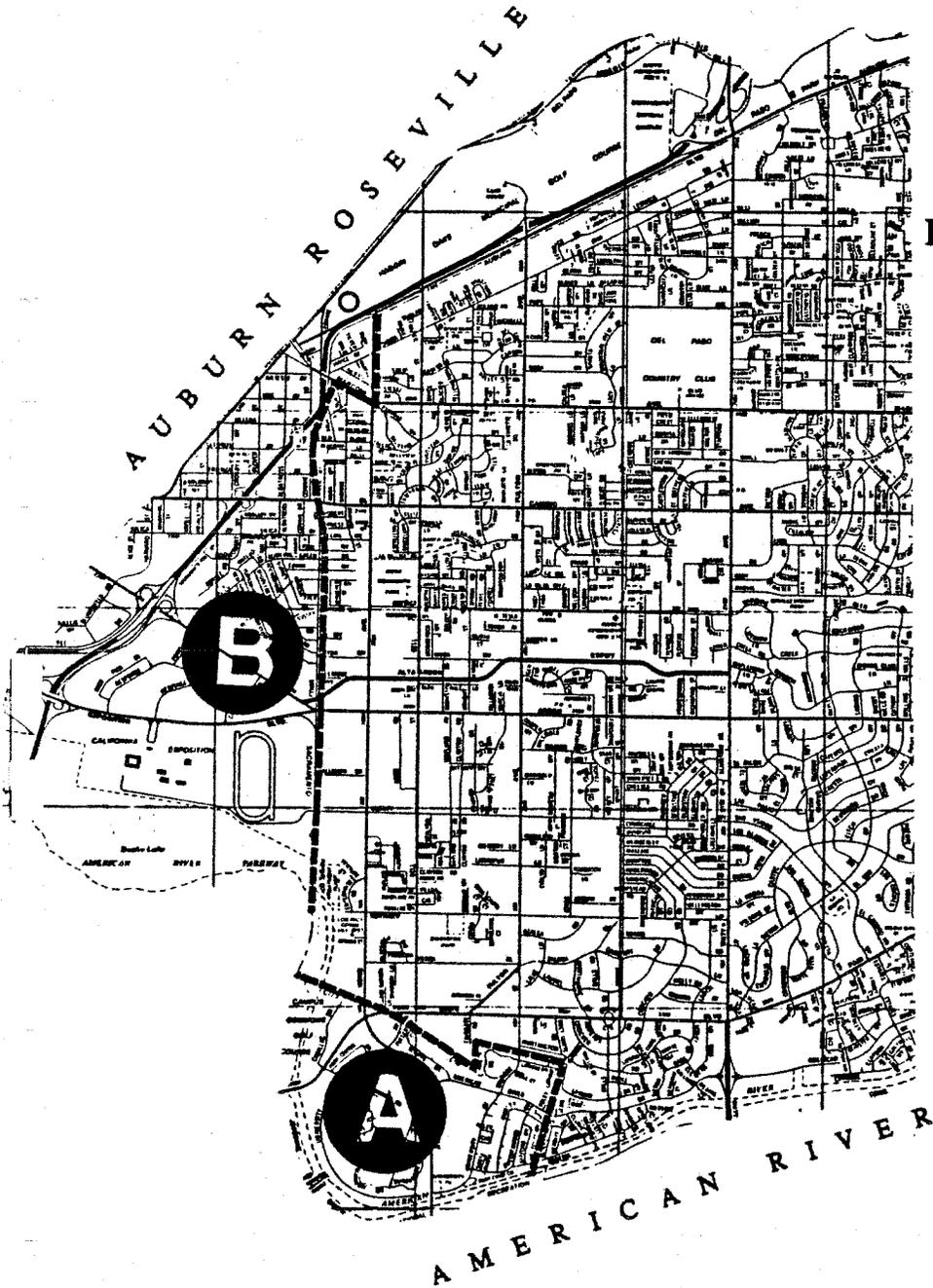
Heritage (as a percentage of neighborhood population): <1 %

Significant species: None

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	10 %
Private maintenance easement (6.5 ft. back from prop.line):	89 %
Hardscape:	%
Medians:	1 %

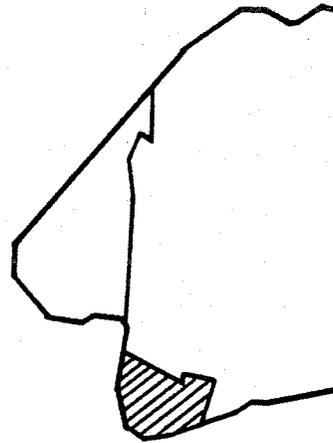


Key Map

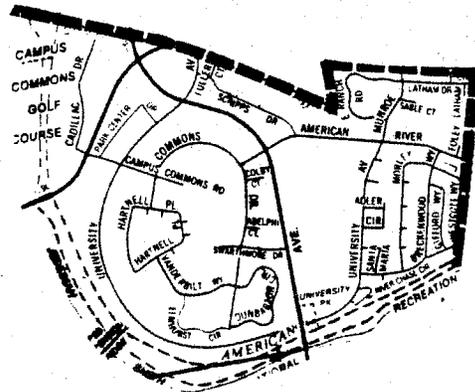
Neighborhood Legend

- A Campus Common
- B Arden Arcade

Community Plan Area 7
Arden-Arcade



Key Map



Type

Mixed Species, overplanted

Description

Trees dominated by Purple Plum, Liquidambar and Alder. These species have been overplanted and spaced too closely.

Recommendations

Need to reduce number of trees for available planting space. Select more appropriate species which are disease resistant.

Arden - Arcade
Campus Commons

7A

**ARDEN ARCADE
CAMPUS COMMONS**

EXISTING CONDITIONS

SIZE (in acres): 602 acres DEVELOPMENT AGE (approximate): 1966

LAND USE (by percentage): No data available

Single Family Residential:	%	Parks:	%
Multi-Family Residential:	%	Wild/vacant:	%
Commerical/Industrial:	%	Transportation:	%
Institutional:	%	Other (incl. agriculture):	%

Major Public Facilities within this neighborhood:

University Park, American River Parkway, Campus Commons Golf Course

MAJOR STREETS: Fair Oaks Blvd., Howe Avenue

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 5,000

AGE (by percentage):	Young:	10 %
	Mature:	89 %
	Declining:	1 %

SPECIES:

Dominant: *Cinnamomum camphora*—Camphor Tree, *Liquidambar styraciflua*—Sweetgum, *Pyrus calleryana*—Bradford Pear, *Fraxinus velutina 'glabra'*— Modesto Ash, *Prunus cerasifera*—Purple-leaf Plum, *Robinia pseudoacacia*—Black Locust, *Magnolia grandiflora*—Southern Magnolia, *Pistacia chinensis*—Chinese Pistache, *Platanus acerifolia*—London Plane Tree

Accent: *Cedrus spp.*—Cedar species, *Liriodendron tulipifera*—Tulip Tree, *Sequoia sempervirens*—Coast Redwood, *Maytenus boaria*—Mayten Tree, *Prunus cerasifera*—Purple-leaf Plum, *Ginkgo biloba*—Maidenhair Tree, *Alnus spp.*—Alder, *Robinia pseudoacacia*—Black Locust, *Rhus lancea*—African Sumac, *Nerium oleander*—Oleander, *Olea europaea*—Olive, *Pinus species*—Pine species, *Lagerstroemia indica*—Crape Myrtle, *Betula pedula*—White Birch

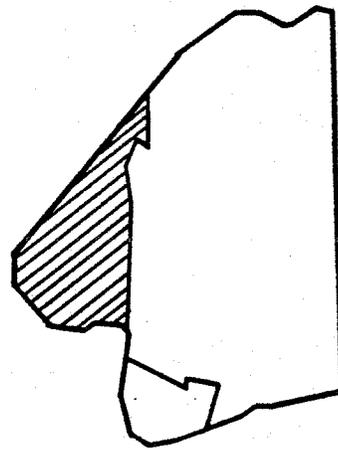
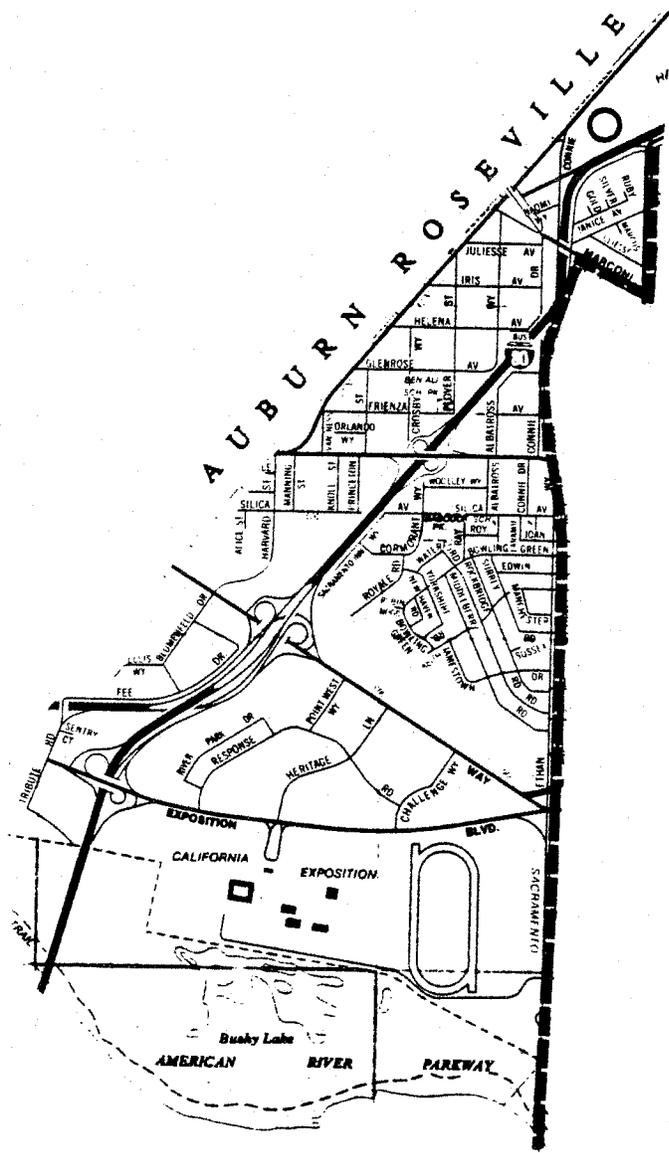
Heritage (as a percentage of neighborhood population): 0 %

Significant species: None

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	30 %
Private maintenance easement (6.5 ft. back from prop.line):	60 %
Hardscape:	0 %
Medians:	10 %



Key Map

Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

Arden - Arcade
Arden - Arcade

7B

ARDEN ARCADE ARDEN ARCADE

EXISTING CONDITIONS

SIZE (in acres): 2374.5 acres DEVELOPMENT AGE (approximate): 1951

LAND USE (by percentage):

Single Family Residential:	12 %	Parks:	30 %
Multi-Family Residential:	4 %	Wild/vacant:	9 %
Commerical/Industrial:	16 %	Transportation:	9 %
Institutional:	20 %	Other (incl. agriculture):	0 %

Major Public Facilities within this neighborhood: American River Parkway, Bushy Lake, California Exposition, Babrock Park, Ben Ali School Park

MAJOR STREETS: I-80, Arden Way, Exposition Blvd., I-160 and U.S. I-99, Marconi Avenue, Huggin Oates Municipal Garden Center

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 4,500

AGE (by percentage):	Young:	5 %
	Mature:	94 %
	Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina 'glabra'*—Modesto Ash, *Platanus acerifolia*—London Plane Tree, *Ulmus pumila*—Siberian Elm, *Zelkova serrata*—Sawtooth Zelkova

Accent: *Sequoia sempervirens*—Coast Redwood, *Pinus species*—Pine species, *Cinnamomum camphora*—Camphor Tree, *Washingtonia spp.*—Fan Palm, *Liriodendron tulipifera*—Tulip Tree, *Phoenix canariensis*—Date Palm, *Lagerstroemia indica*—Crape Myrtle, *Schinus molle*—California Pepper, *Eucalyptus spp.*—Eucalyptus species, *Morus alba*—Fruitless Mulberry, *Liquidambar styraciflua*—Sweetgum, *Prunus yedoensis*—Akabano Flowering Cherry

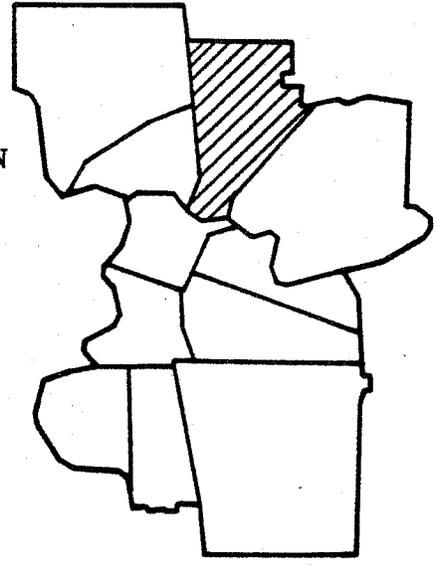
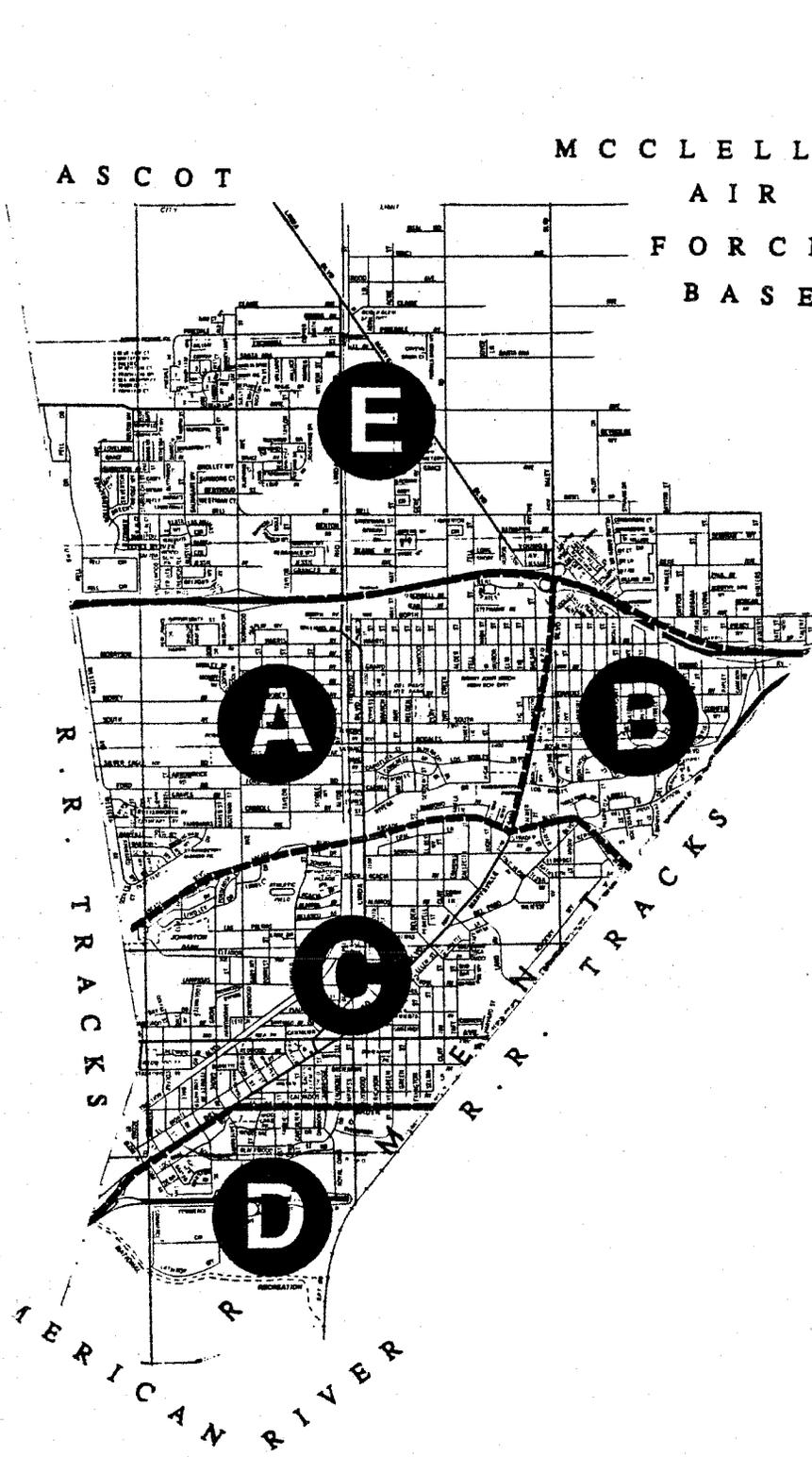
Heritage (as a percentage of neighborhood population): 0 %

Significant species: None

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	40 %
Private maintenance easement (6.5 ft. back from prop.line):	59 %
Hardscape:	0 %
Medians:	1 %

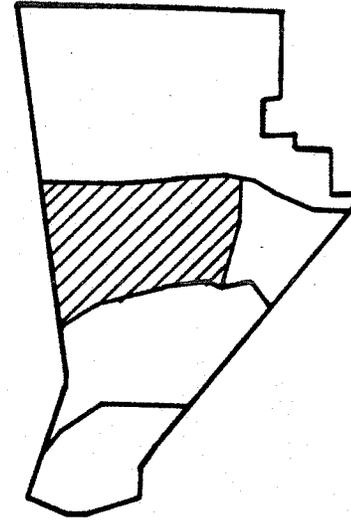


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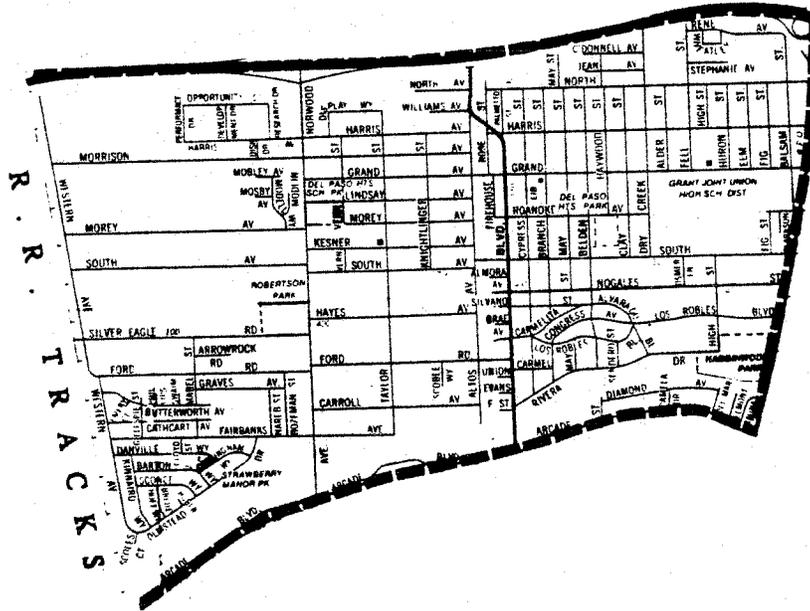
Neighborhood Legend

- A Del Paso Heights
- B East Del Paso Heights
- C Noralto
- D Woodlake
- E Robla

Community Plan Area 8
North Sacramento



Key Map



Type

Mixed Species,
poor care

Description

Desirable mix of species, but under-
planted. Existing trees not cared for.

Recommendations

Increase planting and community
education for providing tree care.

**North Sacramento
Del Paso Heights**

8A

NORTH SACRAMENTO DEL PASO HEIGHTS

EXISTING CONDITIONS

SIZE (in acres): 1441 acres DEVELOPMENT AGE (approximate): 1946

LAND USE (by percentage):

Single Family Residential:	36 %	Parks:	5 %
Multi-Family Residential:	1 %	Wild/vacant:	43 %
Commerical/Industrial:	6 %	Transportation:	3 %
Institutional:	4 %	Other (incl. agriculture):	6 %

Major Public Facilities within this neighborhood: Strawberry Manor Park, Robertson Park, Del Paso High School Park, Del Paso Heights Park, Hagginwood Park

MAJOR STREETS: I-80, Rio Linda Blvd., Marysville Blvd.

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,000

AGE (by percentage):

Young:	2 %
Mature:	96 %
Declining:	2 %

SPECIES:

Dominant: *Fraxinus velutina 'glabra'*– Modesto Ash, *Platanus acerifolia*–London Plane Tree

Accent: *Ailanthus altissima*–Tree of Heaven, *Pinus species*–Pine species, *Lagerstroemia indica*–Crape Myrtle, *Quercus lobata*–Valley Oak, *Robinia pseudoacacia*–Black Locust, *Washingtonia spp.*–Fan Palm, *Phoenix canariensis*–Date Palm, *Juglans spp.*–Walnut species, *Albizia julibrissin*–Silk Tree, *Acer saccharinum*–Silver Maple, *Ulmus spp.*–Elm species, *Quercus suber*–Cork Oak, *Morus alba*–Fruitless Mulberry, *Liquidambar styraciflua*–Sweetgum, *Cedrus spp.*–Cedar species, *Acer negundo*–Box Elder, *Carya illinoensis*–Pecan

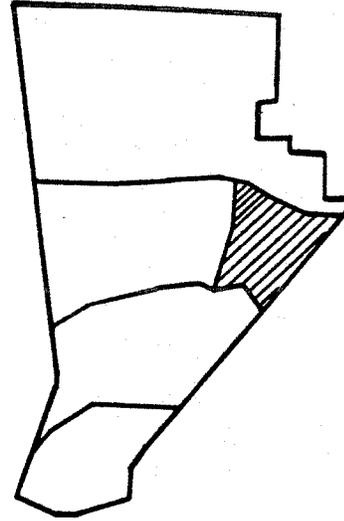
Heritage (as a percentage of neighborhood population): 2 %

Significant species: *Quercus lobata*–Valley Oak, *Quercus douglasii*–Blue Oak

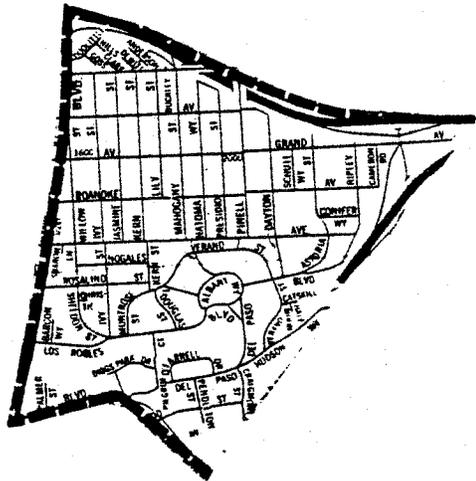
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft. back from prop.line) ⁹⁹	99 %
Hardscape:	0 %
Medians:	0 %



Key Map



Type

Mixed Species with Native Species Character

Description

Desirable mix of species including heritage trees on private property.

Recommendations

Increase planting. Encourage native species to owners who will remove turf and avoid summer irrigation. Offer other species to owners who desire summer irrigation.

**North Sacramento
East del Paso Heights**

8B

NORTH SACRAMENTO EAST DEL PASO HEIGHTS

EXISTING CONDITIONS

SIZE (in acres): 534 acres DEVELOPMENT AGE (approximate): 1946

LAND USE (by percentage):

Single Family Residential:	48 %	Parks:	12 %
Multi-Family Residential:	3 %	Wild/vacant:	12 %
Commerical/Industrial:	15 %	Transportation:	5 %
Institutional:	3 %	Other (incl. agriculture):	2 %

Major Public Facilities within this neighborhood:

MAJOR STREETS: Marysville Road, I-80, Roseville Road

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,000

AGE (by percentage):

Young:	2 %
Mature:	97 %
Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'— Modesto Ash, *Platanus acerifolia*—London Plane Tree

Accent: *Eucalyptus spp.*—Eucalyptus species, *Washingtonia spp.*—Fan Palm, *Robinia pseudoacacia*— Black Locust, *Acer saccharinum*—Silver Maple, *Morus alba*—Fruitless Mulberry, *Quercus lobata*—Valley Oak, *Lagerstroemia indica*—Crape Myrtle, *Magnolia grandiflora*— Southern Magnolia, *Cedrus spp.*—Cedar, *Picea pungens*—Colorado Blue Spruce, *Phoenix canariensis*—Date Palm, *Carya illinoensis*—Pecan, *Ulmus spp.*—Elm species, *Acer negundo*—Box Elder, *Prunus domestica*—Plum, *Melia azedarach* 'umbraculifera'— Umbrella Tree, *Cinnamomum camphora*—Camphor Tree

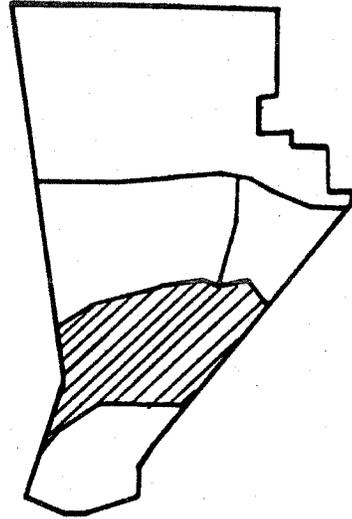
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus douglasii*—Blue Oak, *Quercus lobata*—Valley Oak

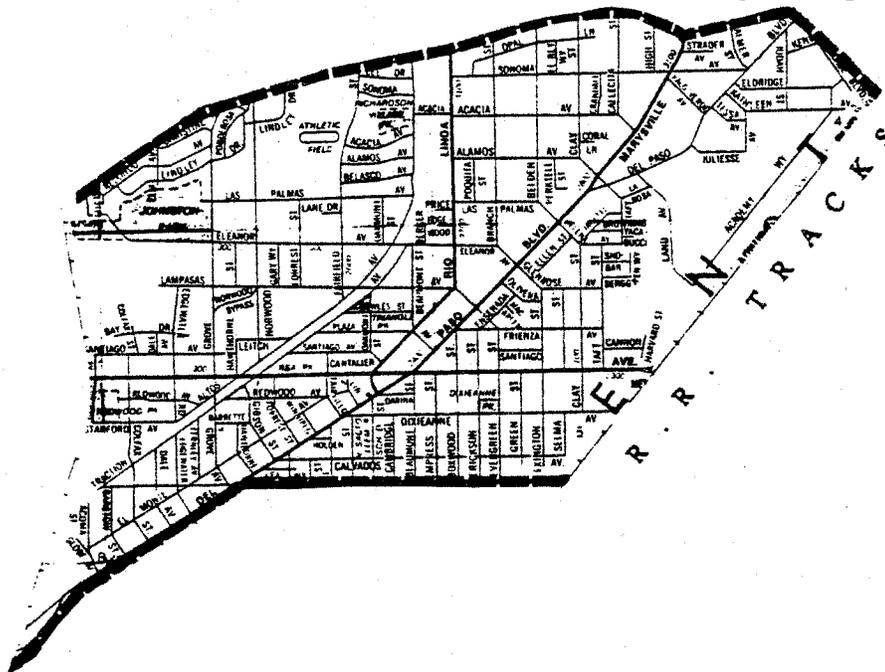
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft. back from prop.line):	98 %
Hardscape:	0 %
Medians:	1 %



Key Map



Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

North Sacramento
Noralto

8C

NORTH SACRAMENTO NORALTO

EXISTING CONDITIONS

SIZE (in acres): 1357 acres DEVELOPMENT AGE (approximate): 1931

LAND USE (by percentage):

Single Family Residential:	48 %	Parks:	12 %
Multi-Family Residential:	3 %	Wild/vacant:	12 %
Commerical/Industrial:	15 %	Transportation:	5 %
Institutional:	3 %	Other (incl. agriculture):	2 %

Major Public Facilities within this neighborhood: Johnston Park, Redwood Park, Rea Park, Dixieanne Park, Triangle Park, Richardson Village Park

MAJOR STREETS:

Del Paso Blvd., Arden Way, El Camino Avenue, Rio Linda Blvd., Auburn Blvd.

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,000

AGE (by percentage):	Young:	2 %
	Mature:	97 %
	Declining:	1 %

SPECIES:

Dominant: *Pistacia chinensis*—Chinese Pistache, *Platanus acerifolia*—London Plane Tree, *Fraxinus velutina 'glabra'*—Modesto Ash, *Ulmus spp.*—Elm species

Accent: *Washingtonia spp.*—Fan Palm, *Lagerstroemia indica*—Crape Myrtle, *Pyrus calleryana*—Bradford Pear, *Liquidambar styraciflua*—Sweetgum, *Morus alba*—Fruitless Mulberry, *Robinia pseudoacacia*—Black Locust, *Cedrus spp.*—Cedar, *Quercus lobata*—Valley Oak, *Cinnamomum camphora*—Camphor Tree

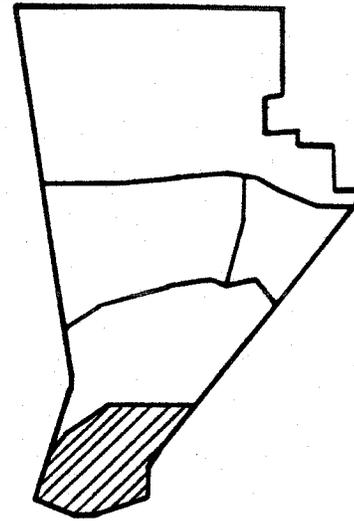
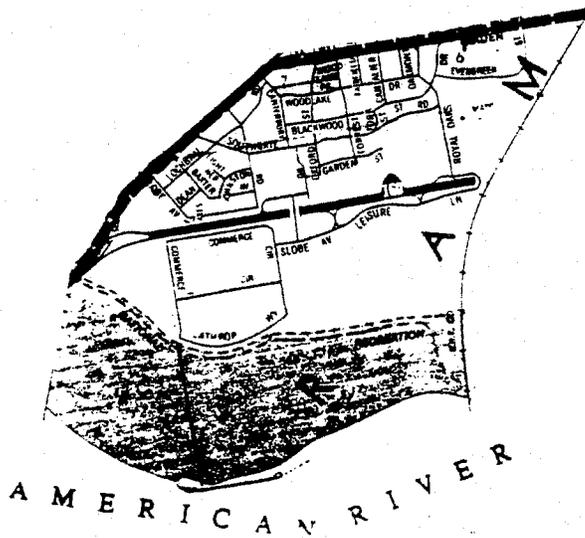
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus douglasii*—Blue Oak, *Quercus lobata*—Valley Oak

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	10 %
Private maintenance easement (6.5 ft. back from prop.line):	89 %
Hardscape:	0 %
Medians:	1 %



Key Map

Type

Platanus Dominant

Description

50+ years old. Slowly declining population with frequent accumulations of small dead wood. Low overall maintenance required. Frequent but not severe problems with Anthracnose and powdery mildew. Problems may cause trees to be visually unsightly. American Plum borer, mite, and scale are more sporadic and more seriously affect tree health.

Recommendations

The species requires dead wood trimming and opening up canopies. Replace with disease-resistant varieties of P. 'Bloodgood' and P. 'Yarwood'.

Ash Dominant

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

North Sacramento
Woodlake



**NORTH SACRAMENTO
WOODLAKE**

EXISTING CONDITIONS

SIZE (in acres): 738 acres DEVELOPMENT AGE (approximate): 1931

LAND USE (by percentage):

Single Family Residential:	48 %	Parks:	12 %
Multi-Family Residential:	3 %	Wild/vacant:	12 %
Commerical/Industrial:	15 %	Transportation:	5 %
Institutional:	3 %	Other (incl. agriculture):	5 %

Major Public Facilities within this neighborhood:
Woodlake Park, American River Parkway

MAJOR STREETS: Arden Way, I-160, Del Paso Blvd.

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,000

AGE (by percentage):	Young:	2 %
	Mature:	97 %
	Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'—Modesto Ash, *Acer saccharinum*—Silver Maple, *Platanus acerifolia*—London Plane Tree, *Ulmus spp.*—Elm species, *Pistacia chinensis*—Chinese Pistache

Accent: *Cedrus spp.*—Cedar, *Ulmus parvifolia*—Chinese Elm, *Cinnamomum camphora*—Camphor Tree, *Lagerstroemia indica*—Crape Myrtle, *Robinia pseudoacacia*—Black Locust, *Magnolia grandiflora*—Southern Magnolia, *Eucalyptus spp.*—Eucalyptus species

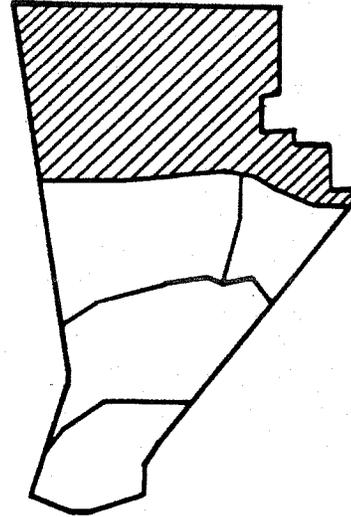
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus douglasii*—Blue Oak, *Quercus lobata*—Valley Oak

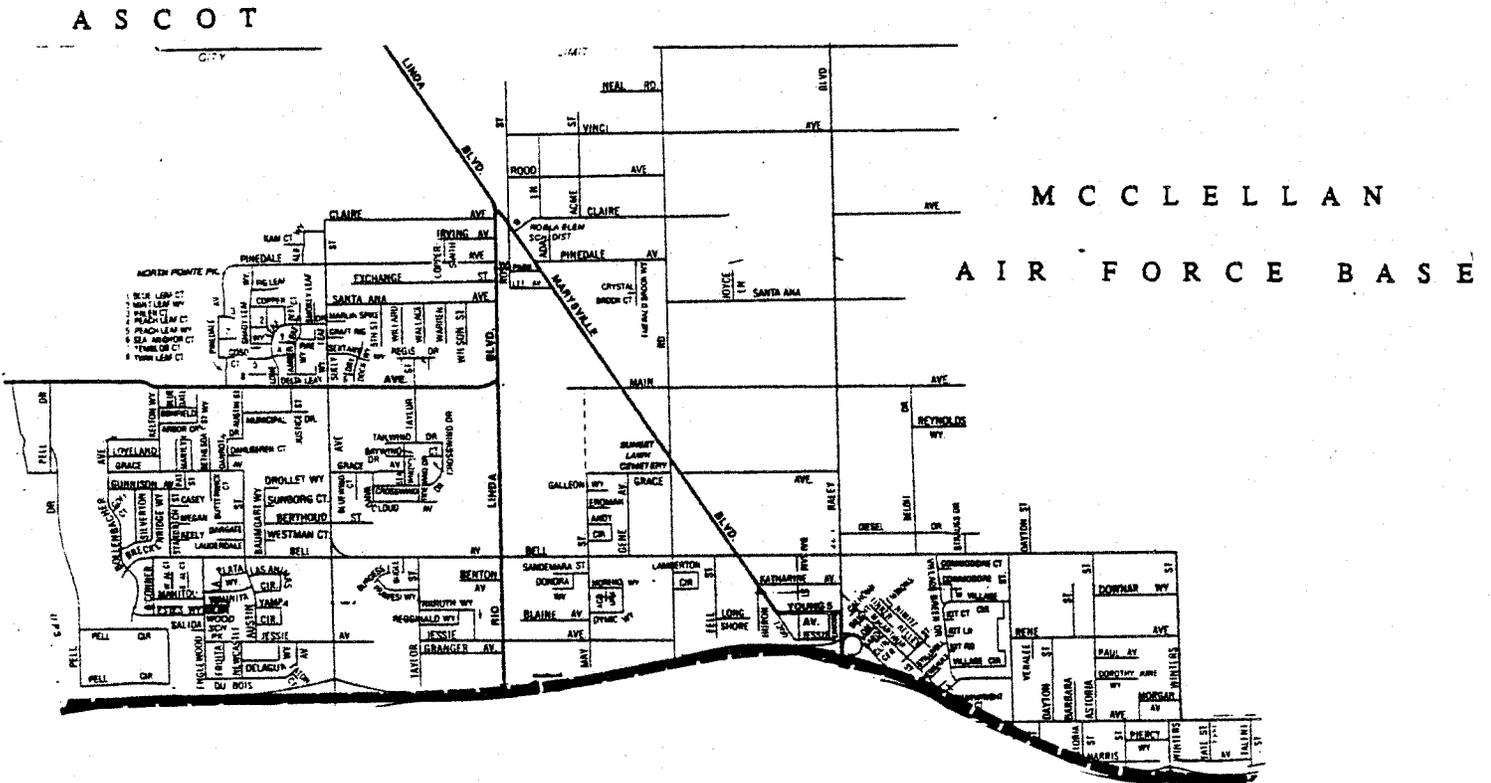
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	59 %
Private maintenance easement (6.5 ft. back from prop.line):	40 %
Hardscape:	0 %
Medians:	1 %



Key Map



Type

Mixed Species, underplanted

Description

Trees are a desirable mixed age and species. Area has been dominated by industrial land use and therefore is underplanted.

Recommendations

More tree planting is needed. Co-ordinated with Richards Boulevard Master Plan.

**North Sacramento
Robla**

8E

NORTH SACRAMENTO ROBLA

EXISTING CONDITIONS

SIZE (in acres): 3138 acres DEVELOPMENT AGE (approximate): 1941-1991

LAND USE (by percentage): (Includes Del Paso Heights)

Single Family Residential:	36 %	Parks:	5 %
Multi-Family Residential:	1 %	Wild/vacant:	43 %
Commerical/Industrial:	6 %	Transportation:	3 %
Institutional:	4 %	Other (incl. agriculture):	6 %

Major Public Facilities within this neighborhood:

Sunset Lawn Cemetery, Glenwood School Park, North Point Park

MAJOR STREETS: I-80, Rio Linda-Marysville Blvd., Main Avenue

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 3,000

AGE (by percentage):	Young:	5 %
	Mature:	93 %
	Declining:	2 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'—Modesto Ash, *Platanus acerifolia*—London Plane Tree, *Liquidambar styraciflua*—Sweetgum, *Ulmus spp.*—Elm species

Accent: *Cinnamomum camphora*—Camphor Tree, *Morus alba*—Fruitless Mulberry, *Juglans spp.*—Walnut species, *Liquidambar styraciflua*—Sweetgum, *Washingtonia spp.*—Fan Palm, *Eucalyptus spp.*—Eucalyptus species, *Catalpa speciosa*—Western Catalpa, *Olea europaea*—Olive, *Pistacia chinensis*—Chinese Pistache, *Cedrus spp.*—Cedar, *Acer saccharinum*—Silver Maple, *Lagerstroemia indica*—Crape Myrtle

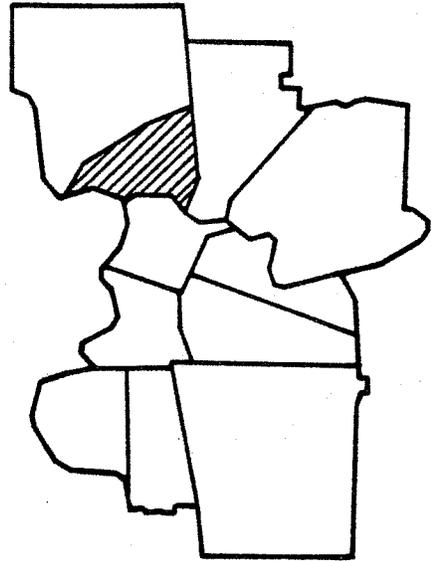
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus douglasii*—Blue Oak, *Quercus lobata*—Valley Oak

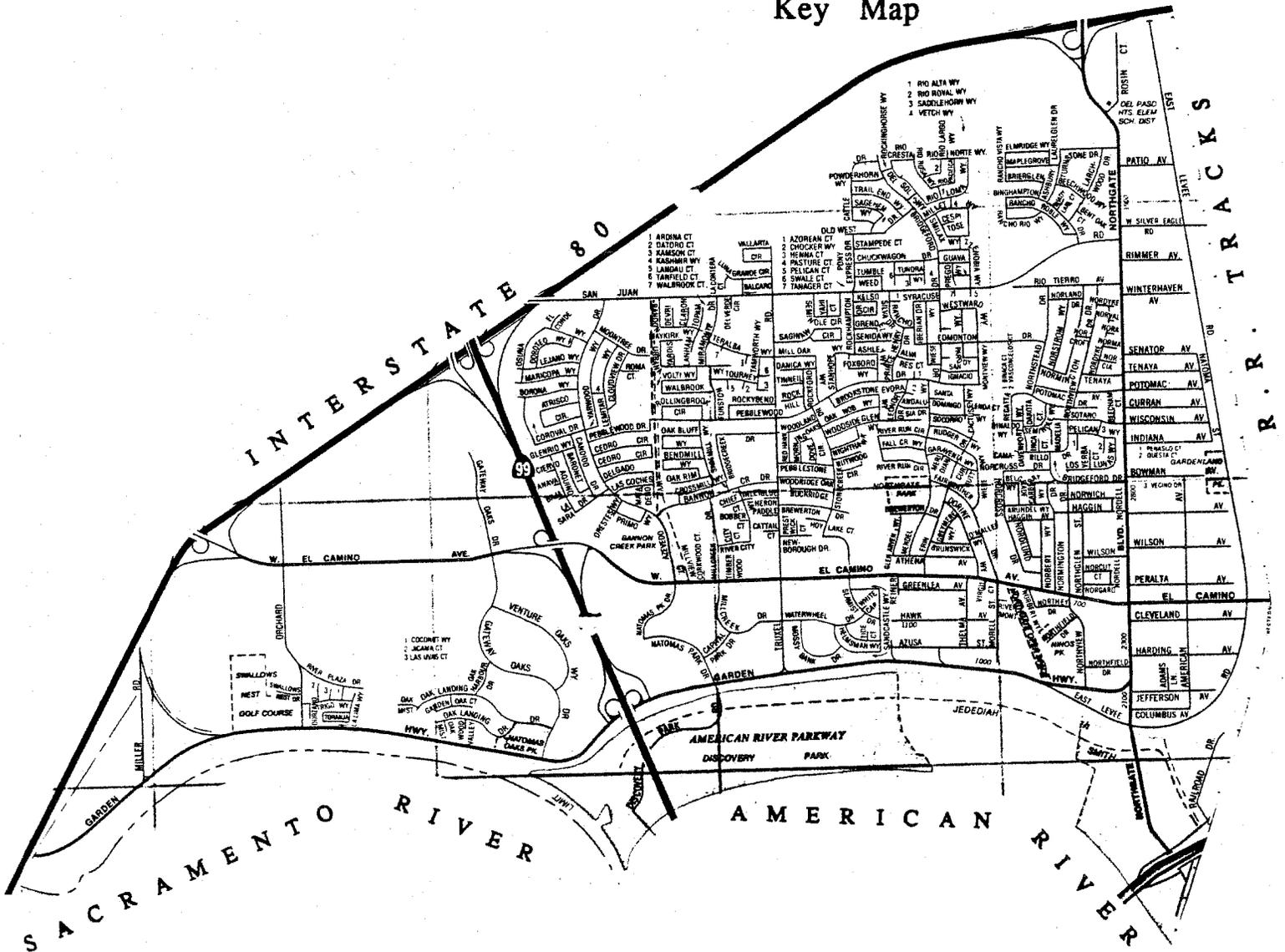
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

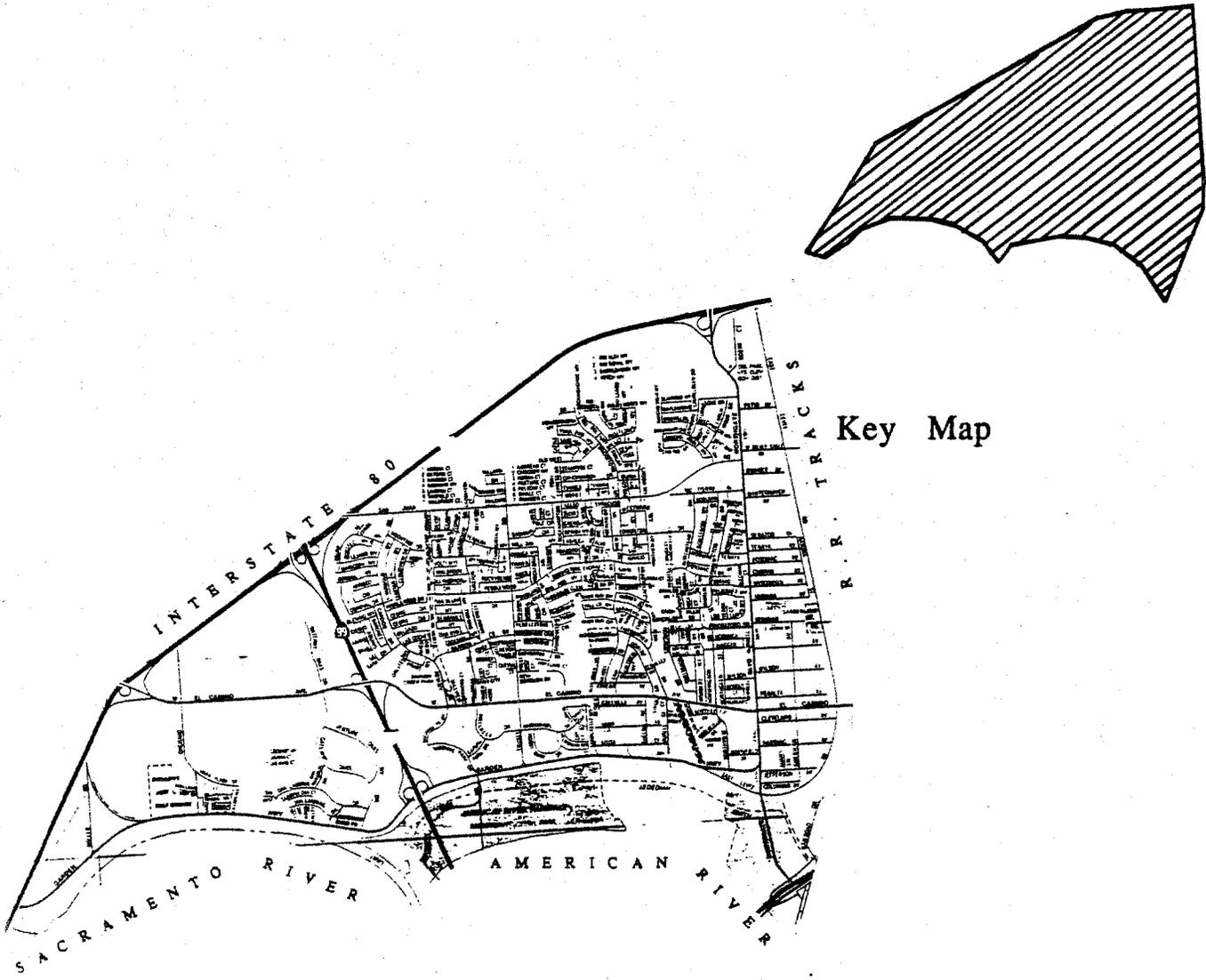
Parkway:	1 %
Private maintenance easement (6.5 ft. back from prop.line):	98 %
Hardscape:	0 %
Medians:	1 %



Key Map



Community Plan Area 9
South Natomas



Key Map

Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

South Natomas

SOUTH NATOMAS SOUTH NATOMAS

EXISTING CONDITIONS

SIZE (in acres): 3918 acres DEVELOPMENT AGE (approximate): 1931-1991

LAND USE (by percentage):

Single Family Residential:	42 %	Parks:	6 %
Multi-Family Residential:	4 %	Wild/vacant:	26 %
Commerical/Industrial:	6 %	Transportation:	2 %
Institutional:	7 %	Other (incl. agriculture):	6 %

Major Public Facilities within this neighborhood: Garden Land Avenue, Northgate Open Space, Ninos Park, Northgate Park, Bannon Creek Park, Swallows Nest Garden Center, Natomas Oaks Park, American River Parkway, Discovery Park, Bushy Lake

MAJOR STREETS:

Northgate Blvd., El Camino Avenue, Garden Highway, I-5, I-80

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 12,000

AGE (by percentage):	Young:	30 %
	Mature:	68 %
	Declining:	2 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'—Modesto Ash, *Liquidambar styraciflua*—Sweetgum, *Quercus lobata*—Valley Oak, *Pinus Pinea*—Italian Stone Pine, *Platanus acerifolia*—London Plane Tree, *Pistacia chinensis*—Chinese Pistache, *Pyrus calleryana*—Bradford Pear

Accent: *Quercus agrifolia*—Live Oak, *Cinnamomum camphora*—Camphor Tree, *Sequoia sempervirens*—Coast Redwood, *Pinus species*—Pine species, *Alnus spp.*—Alder, *Albizia julibrissin*—Silk Tree, *Washingtonia spp.*—Fan Palm, *Morus alba*—Fruitless Mulberry, *Eucalyptus spp.*—Eucalyptus species, *Olea europaea*—Olive, *Acer spp.*—Maplespecies, *Ulmus parvifolia*—Chinese Elm, *Ginkgo biloba*—Maidenhair Tree, *Acer saccharinum*—Silver Maple, *Celtis sinensis*—Hackberry, *Sapium sebiferum*—Chinese Tallowtree, *Salix spp.*—Willow species, *Robinia pseudoacacia*—Black Locust, *Liriodendron tulipifera*—Tulip Tree, *Magnolia grandiflora*—Southern Magnolia, *Populus trichocarpa*—Cottonwood

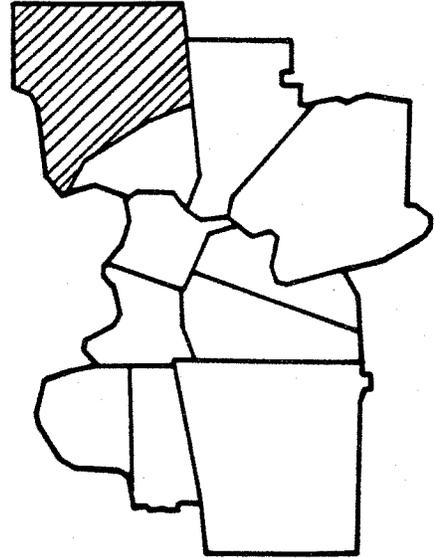
Heritage (as a percentage of neighborhood population): 1 %

Significant species: *Quercus douglasii*—Blue Oak, *Quercus lobata*—Valley Oak, *Platanus racemosa*—California Sycamore, *Juglans nigra*—Black Walnut

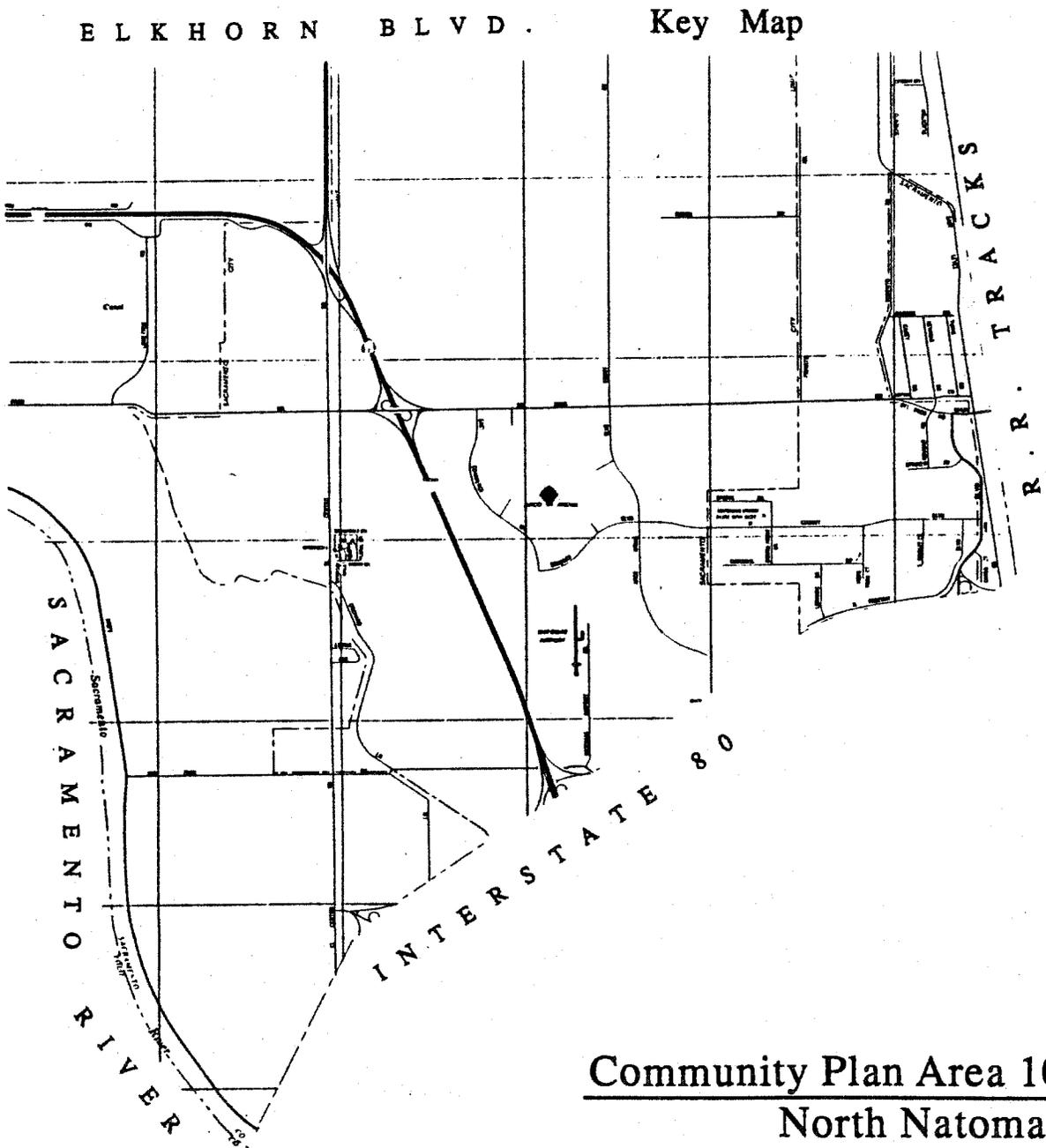
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

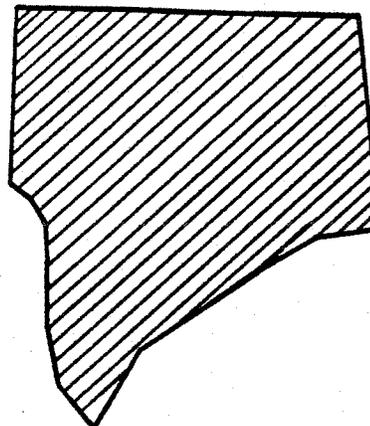
Parkway:	2 %
Private maintenance easement (6.5 ft. back from prop.line):	97 %
Hardscape:	0 %
Medians:	1 %



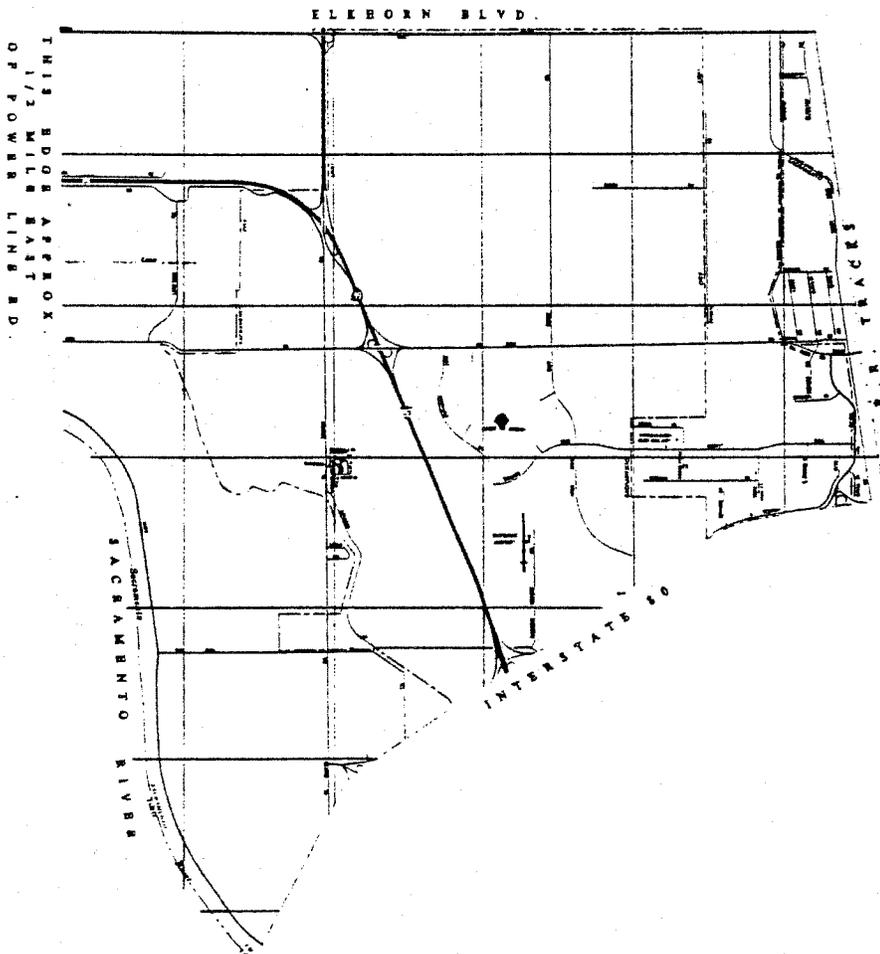
THIS EDGE APPROX.
1 1/2 MILE EAST
OF POWER LINE RD.



Community Plan Area 10
North Natomas



Key Map



Type

Young Tree Population

Description

Characterized by less than 15 years-old. In most cases, this population has a better species mix than older monoculture neighborhood.

Recommendations

Attention to additional planting in new developments, following policies on planting goals. Attention to be given to pruning.

North Natomas

NORTH NATOMAS NORTH NATOMAS

EXISTING CONDITIONS

SIZE (in acres): 6275 acres DEVELOPMENT AGE (approximate): 1951-1991

LAND USE (by percentage): No data available

Single Family Residential:	%	Parks:	%
Multi-Family Residential:	%	Wild/vacant:	%
Commerical/Industrial:	%	Transportation:	%
Institutional:	%	Other (incl. agriculture):	%

Major Public Facilities within this neighborhood:
Natomas Airport

MAJOR STREETS: I-5, I-80 Garden Highway, Elkhorn Blvd., I. Levee Road, Northgate Blvd.,
El Centro Road, Arco Arena Blvd.=Ernst Road

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot
zone planted as a street tree): 2,000

AGE (by percentage):	Young:	20 %
	Mature:	79 %
	Declining:	1 %

SPECIES:

Dominant: *Platanus acerifolia*—London Plane Tree, *Morus alba*—Fruitless Mulberry,
Fraxinus velutina 'glabra'— Modesto Ash

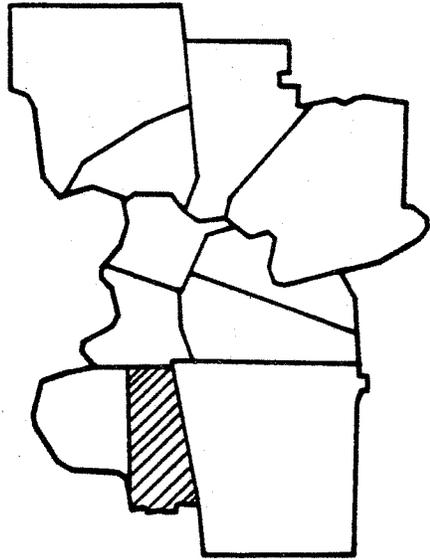
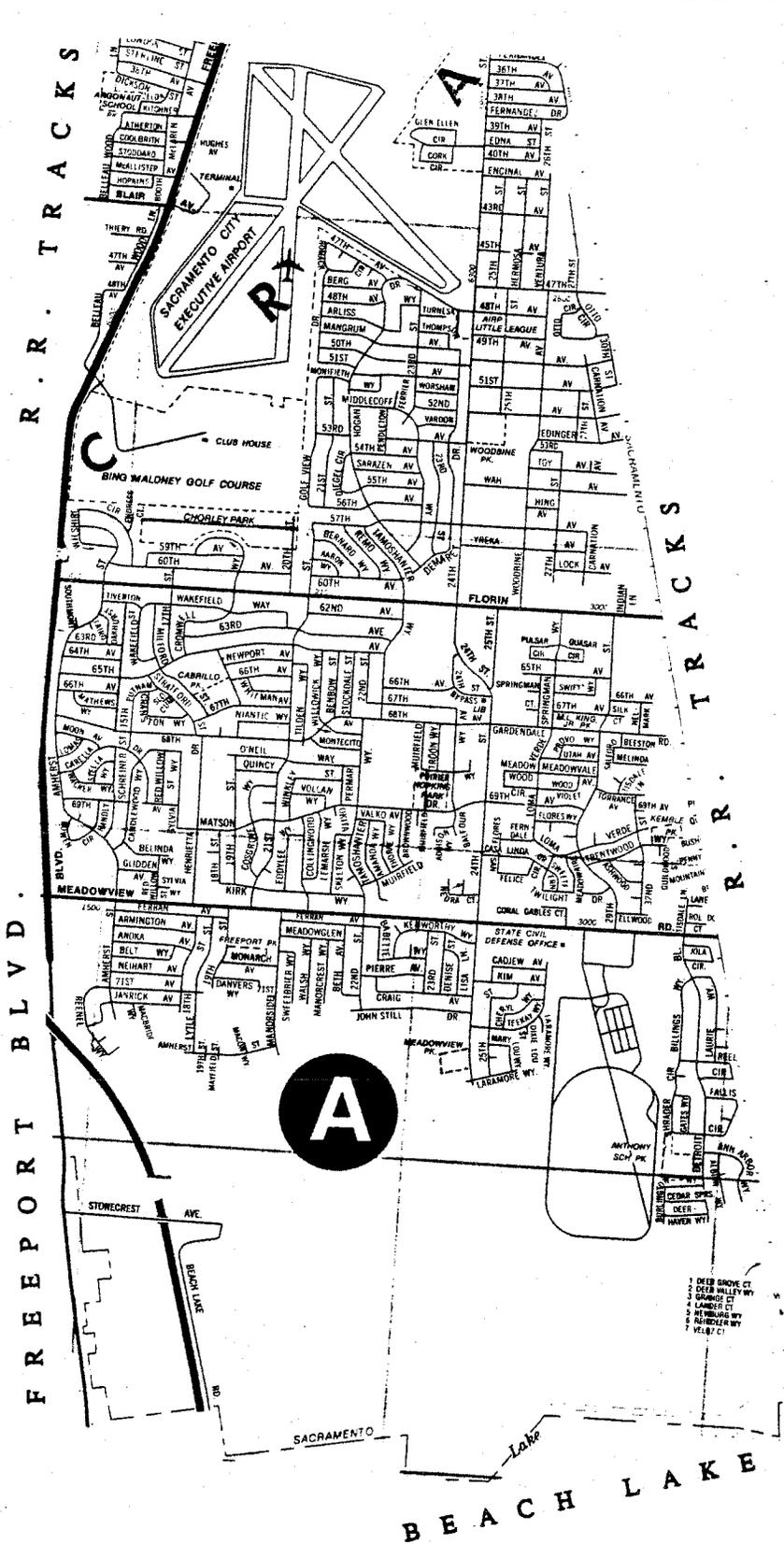
Accent: *Pistacia chinensis*—Chinese Pistache, *Prunus domestica*—Plum, *Pinus spp.*—
Pine species, *Alnus spp.*—Alder, *Sequoia sempervirens*—Coast Redwood,
Quercus lobata—Valley Oak, *Washingtonia spp.*—Fan Palm, *Juglans spp.*—
Walnut species, *Cedrus spp.*—Cedar species, *Ulmus spp.*—Elm species, *Pyrus
calleryana*—Bradford Pear, *Lagerstroemia indica*—Crape Myrtle,
Betula pedula—White Birch

Heritage (as a percentage of neighborhood population): 1 %
Significant species:

PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

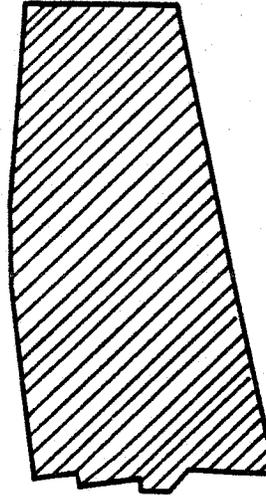
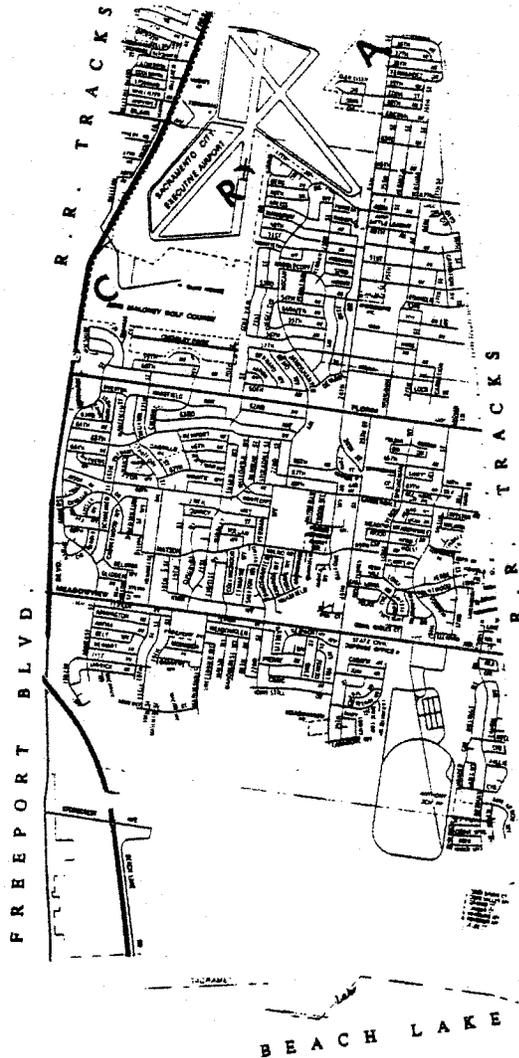
Parkway:	1 %
Private maintenance easement (6.5 ft. back from prop.line):	98 %
Hardscape:	0 %
Medians:	1 %



Key Map

Neighborhood Legend
A Meadowview - Florin

Community Plan Area 11
Meadowview



Key Map

Type

Ash Dominant

Description

Dominated by Ash species heavily infested with Mistletoe; trees also susceptible to Anthracnose and Ash White Fly. Trees are mature to overmature.

Recommendations

Reforestation program needed to replace Mistletoe infested trees. Select species not subject to Mistletoe. Promote self-help program (loaning pole saws) for residents for Mistletoe control. Continue Anthracnose control with fungicide. Ash White Fly - Encarsia wasp used to control. Don't use sprays which will also kill wasp.

Meadowview
Meadowview - Florin

MEADOWVIEW MEADOWVIEW - FLORIN

EXISTING CONDITIONS

SIZE (in acres): 4,689 acres DEVELOPMENT AGE (approximate): 1950's

LAND USE (by percentage):

Single Family Residential:	49 %	Parks:	1 %
Multi-Family Residential:	2 %	Wild/vacant:	15 %
Commerical/Industrial:	7 %	Transportation:	11 %
Institutional:	11 %	Other (incl. agriculture):	4 %

Major Public Facilities within this neighborhood:

Sacramento City Executive Airport, Meadowview Park, Kemble Park, Hopkins Park, Bing Maloney Garden Center, Chorley Park, Woodbine Park, Freeport Park, Airport Little League, Argonaut School Park, Willow Rancho Park, Cabrillo Park, Martin Luther King Jr. Park, Anthony School Park

MAJOR STREETS:

I-5, Meadowview Road, I-160 or Freeport Blvd., Florin Road, Blair Avenue

EXISTING TREE POPULATION

APPROXIMATE NUMBER OF TREES (City jurisdiction includes trees within 12.5 foot zone planted as a street tree): 12,000

AGE (by percentage):	Young:	10 %
	Mature:	89 %
	Declining:	1 %

SPECIES:

Dominant: *Fraxinus velutina* 'glabra'—Modesto Ash, *Liquidambar styraciflua*—Sweetgum, *Pistacia chinensis*—Chinese Pistache, *Ulmus parvifolia*—Chinese Elm, *Zelkova serrata*—Sawtooth Zelkova

Accent: *Cinnamomum camphora*—Camphor Tree, *Phoenix canariensis*—Date Palm, *Washingtonia spp.*—Fan Palm, *Eucalyptus spp.*—Eucalyptus species, *Catalpa speciosa*—Western Catalpa, *Ulmus pumila*—Siberian Elm, *Pyrus calleryana*—Bradford Pear, *Platanus acerifolia*—London Plane Tree, *Albizia julibrissin*—Silk Tree, *Morus alba*—Fruitless Mulberry, *Pinus species*—Pine species, *Betula pedula*—White Birch, *Quercus lobata*—Valley Oak

Heritage (as a percentage of neighborhood population): 1 %

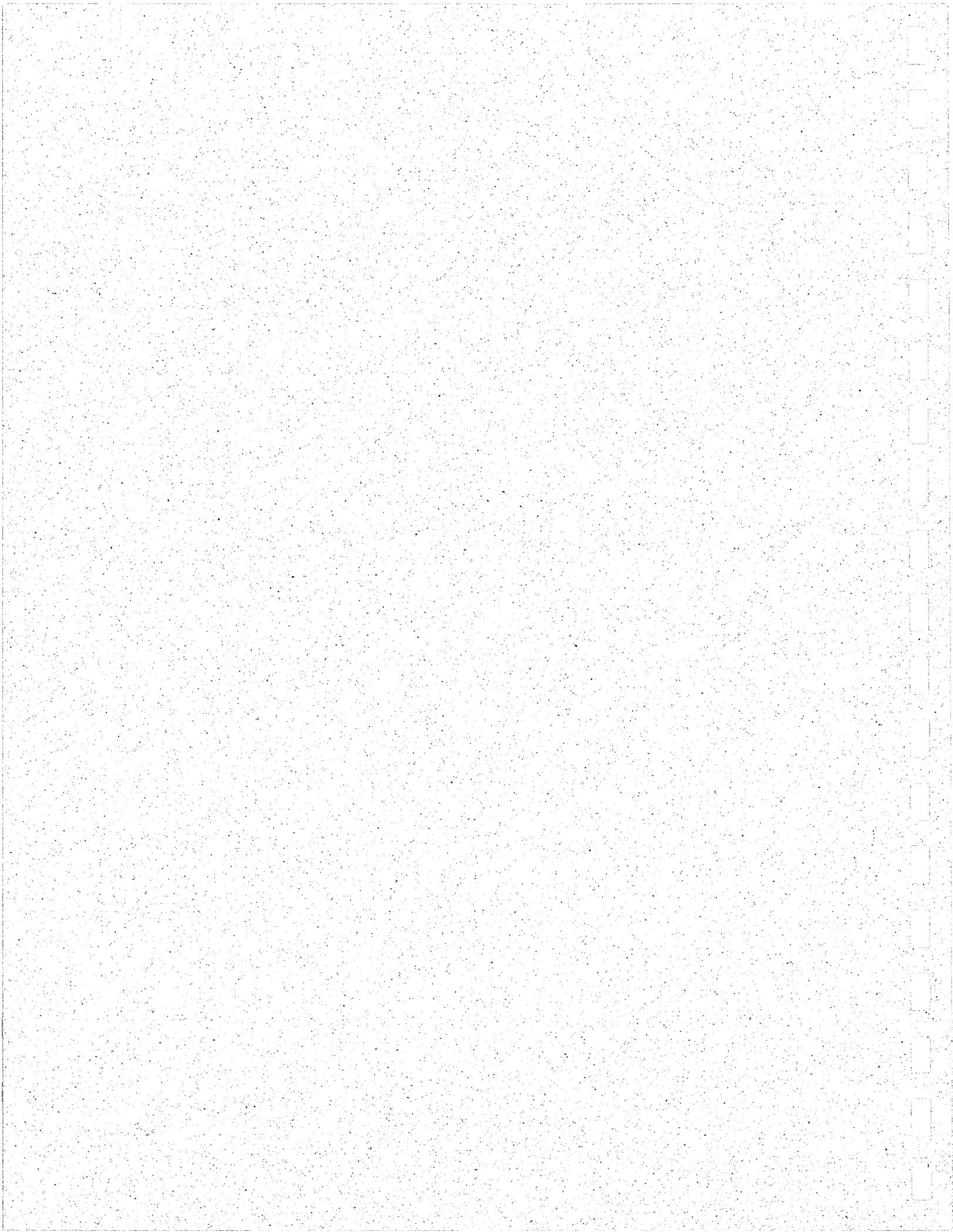
Significant species: *Quercus lobata*—Valley Oak, *Juglans nigra*—Black Walnut, *Platanus racemosa*—California Sycamore

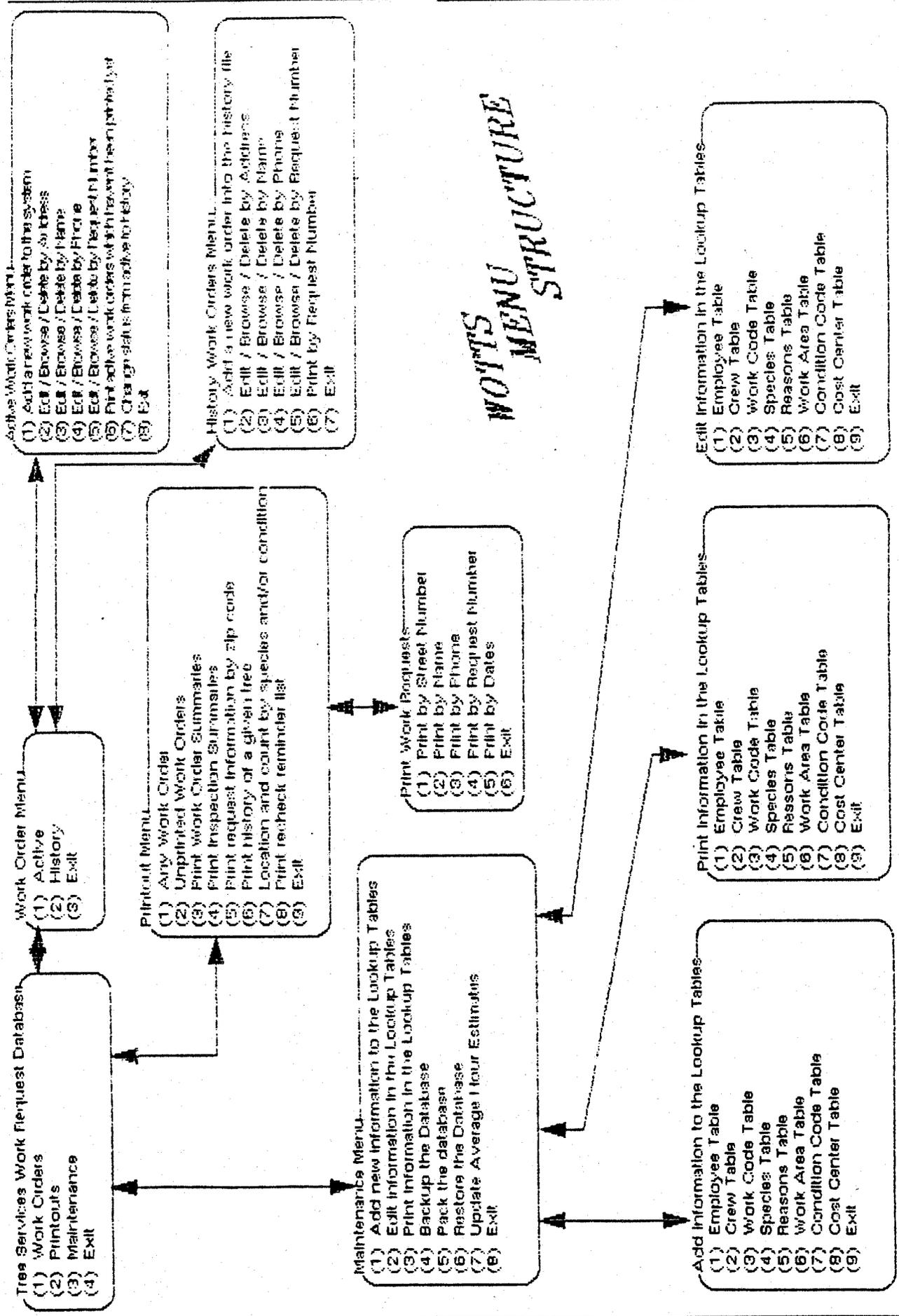
PLANTING CONFIGURATION:

(by percentage of available growing space within city jurisdiction)

Parkway:	1 %
Private maintenance easement (6.5 ft. back from prop.line):	98 %
Hardscape:	0 %
Medians:	1 %

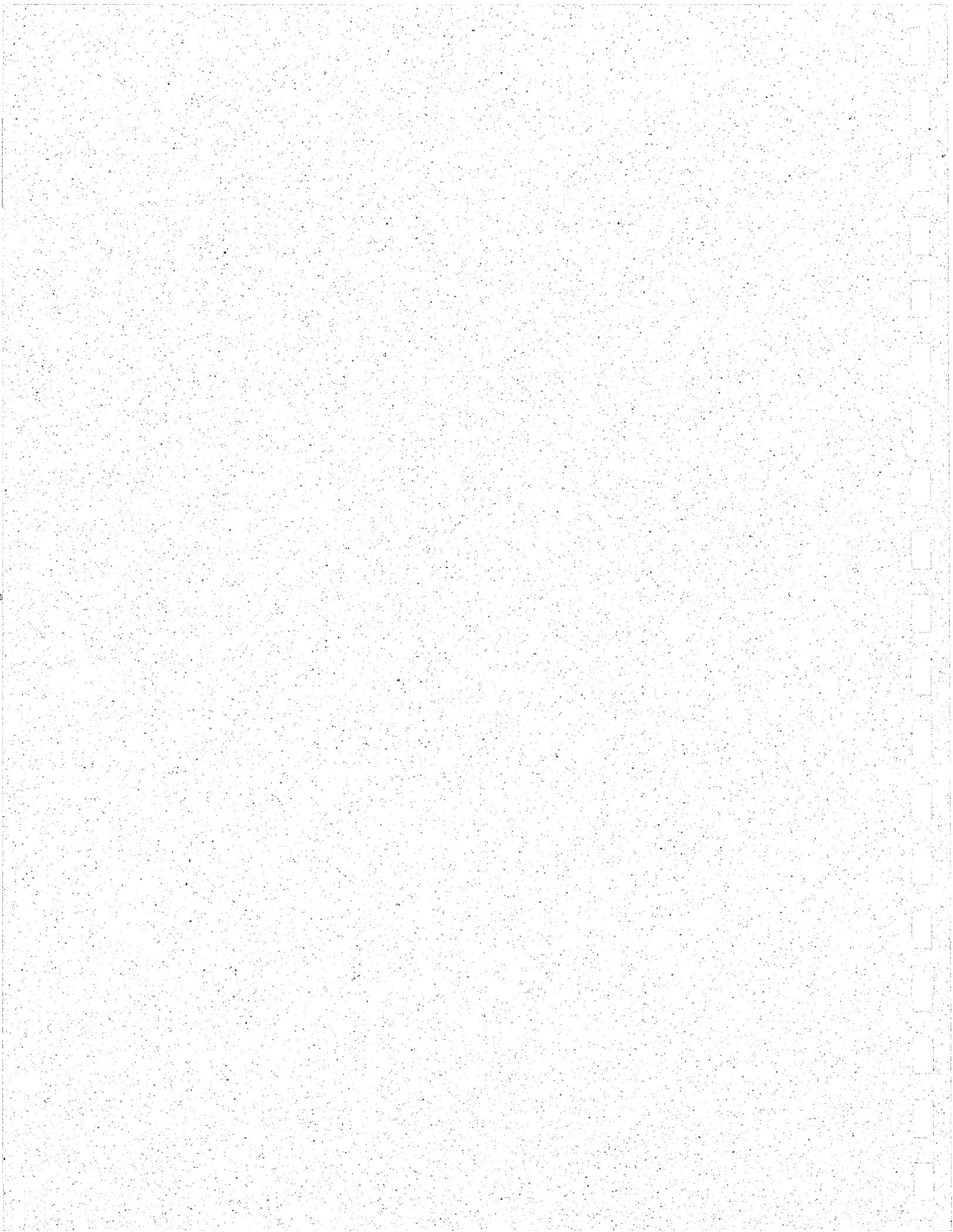
Appendix 4: Existing Application Structure







**Appendix 5: Parks Division Guide for Evaluating Tree
Condition**



CITY OF SACRAMENTO
PARKS DIVISION GUIDE FOR EVALUATING TREE CONDITION

DATE _____

TREE SPECIES _____

ADDRESS _____

DIAMETER BREAST HEIGHT _____

PROPERTY OWNER _____

CROWN SPREAD _____

INSPECTOR _____

TOTAL HEIGHT _____

Sketch of Tree Location Attached; Yes _____

CONDITION CATEGORIES AND CORRESPONDING POINT VALUES

Good Condition.....86 to 100 points
Fair Condition.....71 to 85 points
Poor Condition.....51 to 70 points

Very Poor Condition.....31 to 50 points
Removal Recommended.....20 to 30 points
Removal Required....less than 19 points

<u>EVALUATION CRITERIA</u>	<u>CHECK CONDITIONS THAT APPLY</u>	<u>POINT VALUE</u>
----------------------------	------------------------------------	--------------------

General View:

Overall appearance of tree is representative of species () (10) _____

Overall appearance of tree deviates from that which is representative of species () (5) _____

COMMENTS _____

Location:

Adequate space is available for development of structures and form characteristic of species () (10) _____

Adequate space is not available for development of structures and form characteristic of species () (5) _____

COMMENTS _____

SACRAMENTO URBAN FOREST MANAGEMENT PLAN

Root Area:

No visible defects observed () (10) _____

Invasive roots damaging private property () (-1) _____

Roots lifting sidewalk creating minor displacement of normal grade () (5) _____

Roots lifting sidewalk creating major displacement of normal grade () (-1) _____

Roots displacing curb or gutter from normal alignment () (-1) _____

Extensive portions of the root system have been cut () (-10) _____

Crown root area displays signs or symptoms of wood deterioration () (-5) _____

Crown root area decayed more than 30% of tree's cross-section () (-25) _____

Root area subject to over watering () (-1) _____

COMMENTS _____

Trunk Area:

No visible defects observed () (10) _____

Bark missing from trunk;
Less than 10% of trunk circumference () (8) _____
10% to 30% of trunk circumference () (5) _____
Greater than 30% of trunk circumference () (3) _____

Trunk displays signs or symptoms of wood deterioration () (-5) _____

Trunk area decayed more than 30% of tree's cross-section () (-10) _____

Unequal weight distribution due to trunk lean () (-1) _____

Trunk crack(s) observed () (-10) _____

COMMENTS _____

Canopy Features:

- Canopy full and balanced () (5) _____
- Canopy full and unbalanced () (3) _____
- Canopy unbalanced () (1) _____
- Full canopy lacking () (-1) _____
- Foliage concentrated in the upper 1/3 of the tree () (-1) _____
- Canopy dieback () (-1) _____
- Foliage is representative of species () (5) _____
- Foliage is not representative of species () (-1) _____

COMMENTS _____

Annual Twig Growth:

- Current twig growth more than 6 inches () (10) _____
- Current twig growth between 2 to 6 inches () (8) _____
- Current twig growth less than 2 inches () (5) _____

COMMENTS _____

Insect and Disease:

- No pests observed () (10) _____
- Signs or symptoms of one pest observed () (8) _____
- Signs or symptoms of two or more pests observed () (6) _____
- Pests create an intermittent and temporary nuisance () (1) _____
- Pests create a recurring and permanent nuisance () (-1) _____
- Pests threaten well-being of adjacent trees () (-1) _____

COMMENTS _____

Onset of Canopy:

- No visible defects observed () (10) _____
- Narrow angles of branch attachment
and/or embedded bark observed () (-1) _____
- Branch(es) nearly as large
as main trunk () (-1) _____
- Branch attachment area displays
signs or symptoms of wood deterioration () (-15) _____
- Decay in more than 30% of cross-section () (-25) _____
- Crack(s) observed () (-5) _____
- Evidence of split-out scaffolds () (-5) _____
- Cluster of multiple branches;
uncharacteristic of species () (-1) _____
- Double leader () (-1) _____

COMMENTS _____

Limb Structure:

- No visible defects observed () (10) _____
- One major or several minor dead limbs () (8) _____
- Two or more major dead limbs () (5) _____
- Signs or symptoms of wood deterioration () (-5) _____
- Decay in more than 30% of
limb's cross-sectional area () (-10) _____
- Crack(s) observed () (-5) _____
- Narrow angles of branch attachment
and/or embedded bark observed () (-1) _____
- Large horizontal branches () (-1) _____
- Evidence of split-out branch(es) () (-1) _____
- Multiple branches from heading cuts () (-1) _____

COMMENTS _____

Impact on Block:

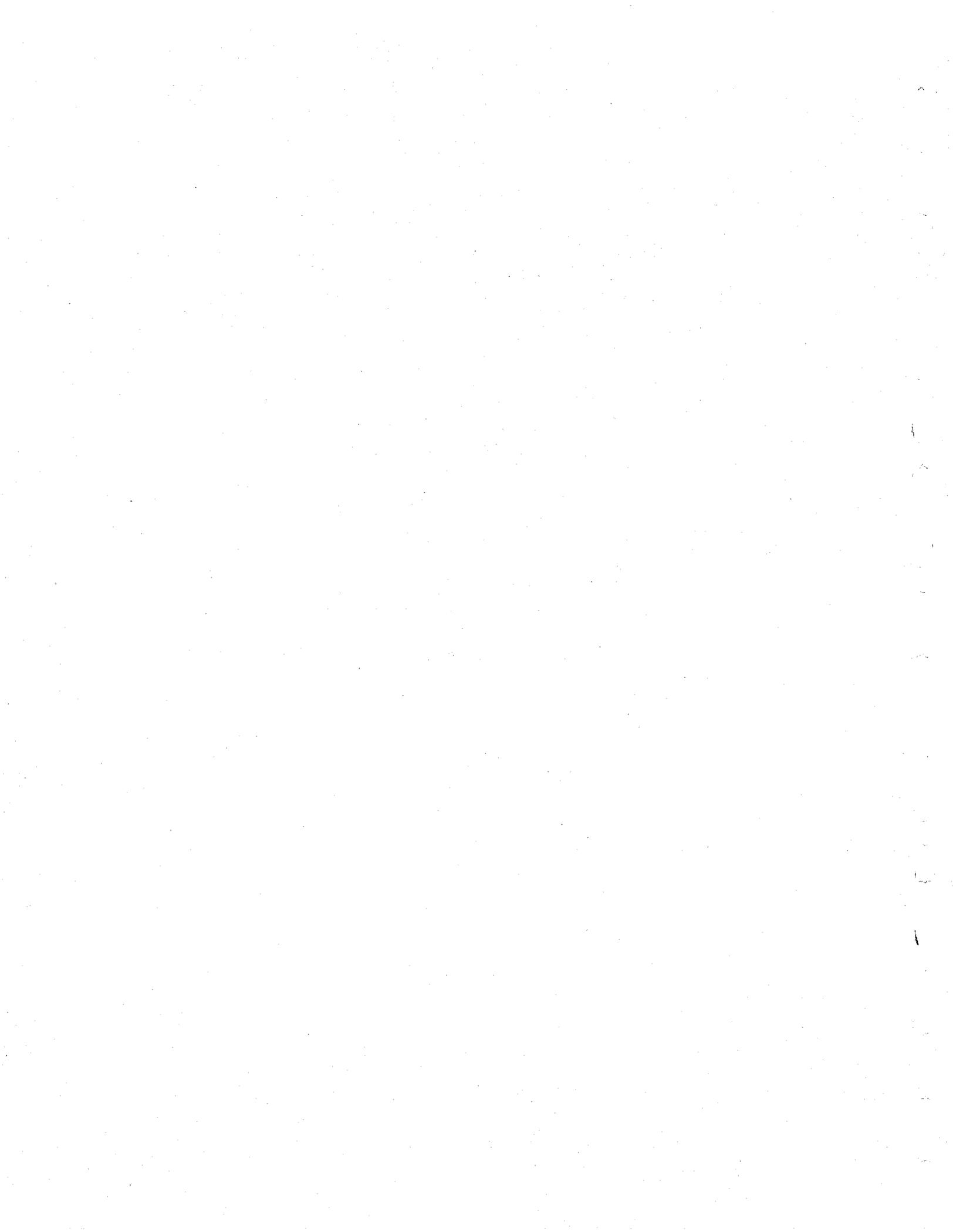
Tree significantly impacts shade, aesthetics
and architectural design of block () (10) _____

Tree does not significantly impact shade,
aesthetics and architectural design of block . () (5) _____

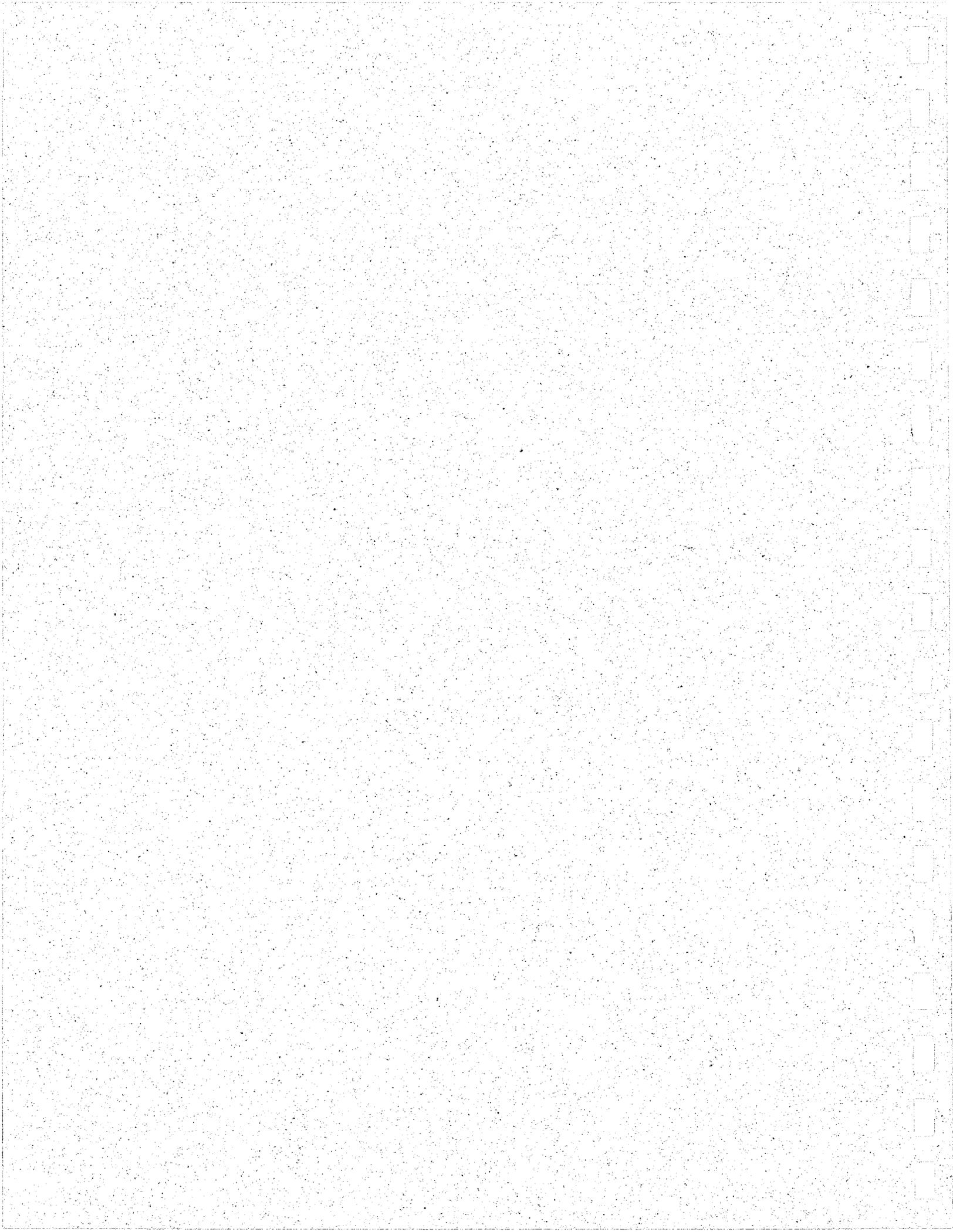
COMMENTS _____

TOTAL POINTS _____

RECOMMENDATION(s) _____



Appendix 6: Parks Division Nuisance Tree Evaluation



Parks Division Nuisance Tree Evaluation

Property Owner _____ Address _____

Inspector _____ Tree Species _____

Date _____ Pest(s) _____

Describe pest problem? _____

Is the pest infestation Remove Comments: _____
 in this tree more serious Unknown
 than in neighboring Re-evaluate
 trees? No

Has the City attempted to Remove Comments: _____
 control the pest? Unknown
 Describe the control Re-evaluate
 and the results. No

Is the tree likely to be Remove Comments: _____
 infested from neighboring Unknown
 trees? Re-evaluate
 Please comment. No

Is the pest present three Remove Comments: _____
 or more months out of the Unknown
 year? Re-evaluate
 List the months. No

Does the presence of the Remove Comments: _____
 pest interfere with the Unknown
 resident's lifestyle? Re-evaluate
 Please comment. No

Has the homeowner attempted to control the pest? Describe control and results.	Remove	<input type="checkbox"/>	Comments: _____
	Unknown	<input type="checkbox"/>	_____
	Re-evaluate	<input type="checkbox"/>	_____
	No	<input type="checkbox"/>	_____

Is there evidence of property damage due to the pest's activity? List.	Remove	<input type="checkbox"/>	Comments: _____
	Unknown	<input type="checkbox"/>	_____
	Re-evaluate	<input type="checkbox"/>	_____
	No	<input type="checkbox"/>	_____

Has the property value been lowered by the pest's activity? Please comment.	Remove	<input type="checkbox"/>	Comments: _____
	Unknown	<input type="checkbox"/>	_____
	Re-evaluate	<input type="checkbox"/>	_____
	No	<input type="checkbox"/>	_____

Would removal of the tree have a positive effect on the surrounding environment? Comment.	Remove	<input type="checkbox"/>	Comments: _____
	Unknown	<input type="checkbox"/>	_____
	Re-evaluate	<input type="checkbox"/>	_____
	No	<input type="checkbox"/>	_____

Is the property owner willing to have the tree removed and replaced?	Remove	<input type="checkbox"/>	Comments: _____
	Unknown	<input type="checkbox"/>	_____
	Re-evaluate	<input type="checkbox"/>	_____
	No	<input type="checkbox"/>	_____

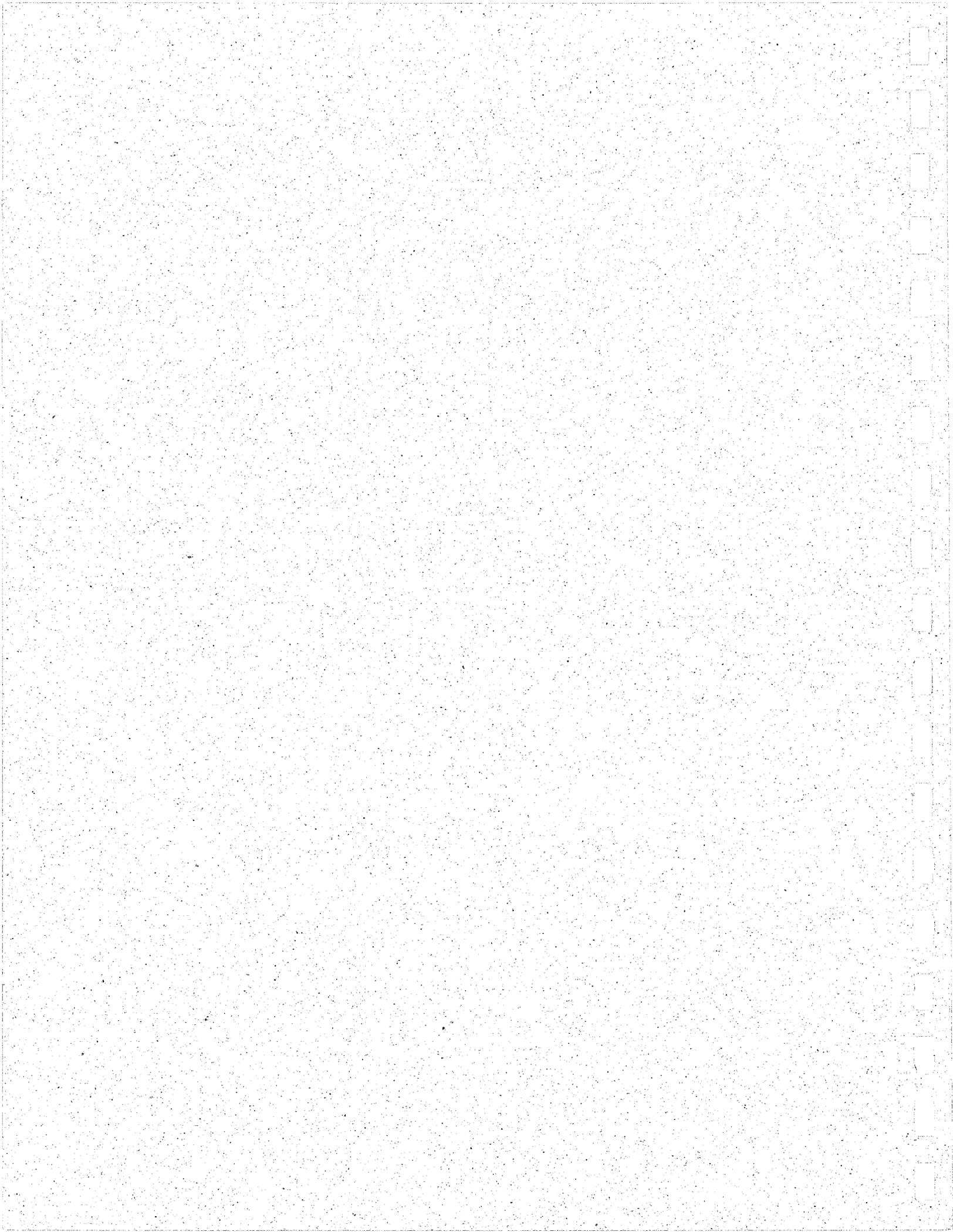
Are other residents willing to have the tree removed and replaced?	Remove	<input type="checkbox"/>	Comments: _____
	Unknown	<input type="checkbox"/>	_____
	Re-evaluate	<input type="checkbox"/>	_____
	No	<input type="checkbox"/>	_____

Inspection recommendation: _____

Reason for recommendation: _____

Appendix 7: Pesticide Training & Records

Training Outline.....	7 - A
Inject - A - Cide " B " Training Outline.....	7 - B
Sevimol 4 Spary Training.....	7 - C
Safety Training Record.....	7 - D
Hazardous Waste Safety Training Record.....	7 - E



PESTICIDE TRAINING OUTLINE

page 1 of 22

GENERAL

I. PURPOSE OF TRAINING:

A. The purpose of this training is to provide you with the knowledge and expertise necessary to use pesticides safely in our work environment. Sections applying to Pesticide Hazardous Wastes will be marked (HZ WASTE).

1. Our job is to place pesticides, public, and ourselves in the same work area; safely and effectively.

B. Public Contact.

1. The task we face is demanding. We are in the public's eyes in everything we do.

1) (Compare to Farmers, Private, Parks, Cal-Trans, others.)

2. The public as a whole is generally afraid of pesticides and will sometimes over react. Remember this!! STAY CALM.

C. Customer Contact:

1. BE POLITE.

a. Hard to be understood with respirator on.

b. If you are unsure of answering a question-ie: policies like tree removal, trimming, or planting. Direct customer to Leadperson.

c. If customer does not want tree treated. Notify Leadperson. LEADPERSON: Take address, name, phone #, and skip tree-- Notify Supervisor.

D. Agency Contact:

1. May or may not identify themselves.

2. Be Polite. Answer questions to the best of your ability, if you do not know the answer--say so. Direct person to Leadperson.

REMEMBER--YOU WILL BE USING PESTICIDES--A POISON--MISUSE MAY CAUSE DAMAGE EVEN DEATH. BE SURE YOU ARE USING IT SAFELY AND CORRECTLY. THIS IS YOUR MAJOR RESPONSIBILITY.

pesticide training: 1

PESTICIDE TRAINING OUTLINE (Cont.)

page 2 of 22

II INSECTS, DISEASES, AND TREES.

A. All trees in the city have some problem. There is no such thing as a perfect tree. --examples:

1. Ash.
 - a. Aphids--various.
 - b. Anthracnose.
 - c. Ash White Fly.
2. Sycamore.
 - a. Spider mites.
 - b. Powdery Mildew.
 - c. Anthracnose.
3. Bay Tree, Purple Leaf Plum, and Others.
 - a. Aphids.

B. Specific tree/insect combination we treat.

1. Liquidambar.
 - a. Redhump Caterpillar.
 - b. Scale.
2. Linden and Maple.
 - a. Aphids.
 - b. Scale.
3. American Elm.
 - a. Scale.
 - b. Aphids.
 - c. Elm Bark Beetle.

pesticide training: 2

PESTICIDE TRAINING OUTLINE (cont.)

page 3 of 22

4. English Elm & Siberian Elm.

- a. Scale.
- b. Aphids.
- c. Elm Bark Beetle.
- d. Elm Leaf Beetle.

- 1) The most noticeable and our main effort.

5. Chinese Elm & Zelkova (member of Elm family/not an Elm).

- a. Treat on special order only.

- b. Has same insect problems as in d. above but not all trees as affected.

C. Life cycles of insects we treat.

1. Elm Leaf Beetle.

- a. Four (4) stages of development.

- 1) Adult - minor problem.

- a) Overwinters in protected space; under bark, under house siding, in houses.

- b) Active in spring, lays eggs on underside of Elm leaves.

- 2) Egg - no problem.

- a) Upright, two rows, egg mass is 1/8 to 1/4 inch in length, 1/16 inch wide.

- b) Hatch in approximately 14 days--depends on weather. The hotter the weather, the quicker they hatch.

- 3) Larva - major problem.

- a) Eats underside of leaves, leaving lacy top. leaves die leaving bare tree -- visual impact.

- b) Grows by shedding outer skin in stages called instars. Usually 3 instars from hatch to pupa stage. In last instar larva try to get to the soil to pupate. This is the major problem as the larva will crawl all over trying to find soil.

pesticide training: 3

PESTICIDE TRAINING OUTLINE (Cont.)

page 4 of 22

4) Pupa - major problem.

a) Pupa are very visible around base of tree. As pupa are crushed or smothered by other pupa, the ones that die begin to decay causing an odor, add to that the dead leaves decaying and in the heat a real offensive odor develops.

2. Elm Bark Beetle.

a. Four stages of development.

1) Egg.

a) Overwinters as egg under bark of Elm Tree.

2) Larva.

a) Eats cambium under bark - develops into pupa stage.

3) Pupa.

a) Pupates under bark.

4) Adult.

a) Eats through bark - emerges - feeds on new growth at the crotch.

b. Vector of DED (Dutch Elm Disease).

1) Transmits DED - when Beetle emerges DED fungi clings to its body. When it feeds on another tree the fungus is introduced. Beetle must have been in infected tree to transmit disease.

3. Scale.

a. Many kinds of scale/different types.

b. Crawlers in the early spring, attach themselves to branch, build a small "dome".

1) Secrete "honeydew" - a sticky substance causing problems.

pesticide training: 4

PESTICIDE TRAINING OUTLINE (cont.)

page 5 of 22

4. Aphids.

a. Many types - secrete "honeydew" same as scale.

5. Redhump Caterpillar.

a. Stages like beetle - adult, egg, larva, pupa.

b. Eats complete leaf except veins.

c. Usually by time damage is noticed, caterpillar is gone.

III PESTICIDES (HZ WASTE).

A. Are chemicals used to destroy, prevent, or control pests. This includes chemicals used to attract or repel pests and chemicals used to regulate plant growth or remove or coat leaves. Includes:

1. Insecticide: Kills Insects.
2. Miticide: Kills Mites.
3. Herbicide: Kills Weeds.
4. Fungicide: Kills Fungi.
5. And many others.

B. Pesticides are grouped according to Chemical nature.

1. Inorganic Pesticides.
 - a. Made from minerals.
 - 1) Sulfur, Mercury, Arsenic.
2. Synthetic Organic Pesticides.
 - a. Contains Carbon, Hydrogen.
3. Living Micro-organisms.
 - a. Viruses, Bacteria.
4. Plant-Derived Organic Pesticides.
 - a. Nicotine, Strychnine.

pesticide training: 5

PESTICIDE TRAINING OUTLINE (Cont.)

page 6 of 22

C. Control of insect pest.

1. Generalized Control Methods.

a. The best answer to pest problems is a combination of methods.

1) Eradication of a pest is not possible by us. We try to suppress the pest to an acceptable level - CONTROL.

a) Our control is hampered by private trees and citizens not wanting their trees treated.

b. Methods of control.

1) Sanitation.

a) Remove poor trees.

b) Remove host trees.

c) Trimming - remove dead wood, weak wood.

2) Plant resistant trees.

3) Use pesticides.

D. How Insecticides work - General.

1. Protectants.

a. Prevents entry or damage by pest.

2. Pheromones.

a. Change pest behavior.

3. Contact.

a. Kills pest by touching it.

4. Stomach Poisons.

a. Kills pest when pest eats treated leaves or plant.

1) Systemic Insecticide.

pesticide training: 6

PESTICIDE TRAINING OUTLINE (Cont.)

page 7 of 22

E. When to use - General.

1. Pre-plant.
 - a. Before you plant.
2. Pre-emergent.
 - a. Before leaves form.
 - b. Before growth starts through soil.
3. Post-emergent.
 - a. After leaves form.
 - b. After foliage is through soil.

F. How to use - General.

1. Band.
 - a. Farm/Park use - Strips of sprayed area with untreated area between them.
 - b. Tree use - A treated area around trunk with above and below untreated.
2. Basal.
 - a. Application to trunk or stem.
3. Broadcast.
 - a. Uniform application to entire area.
 - 1) Usually lawns and fields.
4. Directed.
 - a. Placing pesticide on one area of plant.
5. Foliar.
 - a. Application to leaves/foliage.
6. Injection.
 - a. Placing systemic pesticide into host plant.

pesticide training: 7

PESTICIDE TRAINING OUTLINE (Cont.)

page 8 of 22

G. Specific insecticides we will probably use.

1. BIDRIN.

a. Organophosphate.

- 1) Synthetic organic pesticide.
- 2) Systemic/stomach poison.
- 3) Injection method.

2. SEVINOL.

a. Carbamate.

- 1) Synthetic organic pesticide.
- 2) Stomach poison/contact poison.
- 3) Basal spray.

3. THURICIDE/DIPEL (Bacillus Thuringensis).

a. Bacillus Thuringensis.

- 1) Living micro-organisms.
- 2) Stomach poison - stops digestion & growth.
- 3) Foliar application.

IV PESTICIDE LABELS (HZ WASTE).

A. Label refers to the printed material attached to the container or wrapper.

B. Labeling refers to all the printed material/instructions that comes with the pesticide.

C. For us label will mean both label and labeling.

1. READ THE LABEL -- MOST IMPORTANT THING YOU DO.

a. There are four times you read the label.

pesticide training: 8

PESTICIDE TRAINING OUTLINE (cont.)

page 9 of 22

- 1) Before you buy.
 - a) Is this the right pesticide for the job?
 - 2) Before you mix and apply.
 - a) How much do you use?
 - b) What safety gear is required?
 - c) What about clean up?
 - 3) Before you store.
 - a) Will cold/heat damage the pesticide?
 - b) What's the danger of storing with other chemicals or pesticides?
 - 4) Before you dispose.
 - a) Is this a hazardous waste?
2. SIGNAL WORDS AND SYMBOLS.
- a. Indicates the degree of toxicity.
 - 1) The most hazardous pesticides are assigned to category I and the least to category IV.
 - 2) The pesticide is assigned according to lethal dose (LD) and lethal concentration (LC).
 - a) Dosage - weight ratio in percent.
 - b) Concentration - molecular percentage in a volume of air.
 - 3) LD-50 and LC-50 are based on how much pesticide kills half a population of test animals>
 - 4) LD-50 oral and dermal.
 - a) Expressed as milligrams per kilogram (mg/K).
 - (1) Milligram = .000035 ounce.
(35 millionths of an ounce).
 - (2) Kilogram = 2.2 pounds.

pesticide training: 9

PESTICIDE TRAINING OUTLINE (cont.)

page 10 of 22

5) LC-50.

a) Expressed as milligrams per liter (mg/L).

3. CATEGORY I.

a. Signal word--DANGER--SKULL & CROSSBONES--POISON.

1) Highly toxic.

2) Oral LD-50 is 0 to 50 mg/K.

3) Dermal LD-50 is 0 to 200 mg/k.

4) LC-50 is 0 to 2,000 mg/L.

4. CATEGORY II.

a. Signal word--WARNING.

1) Moderately toxic.

2) Oral LD-50 is 50 to 500 mg/K.

3) Dermal LD-50 is 200 to 2,000 mg/K.

4) LC-50 is 2,000 to 20,000 mg/L.

5. CATEGORY III.

a. Signal word--CAUTION.

1) Slightly toxic.

2) Oral LD-50 is 500 to 5,000 mg/K.

3) Dermal LD-50 is 2,000 to 20,000 mg/K.

4) LC-50 is over 20,000 mg/L.

6. CATEGORY IV.

a. Signal word--CAUTION.

1) Relatively non-toxic.

2) Oral LD-50 is over 5,000 mg/K.

3) Dermal LD-50 is over 20,000 mg/K.

4) LC-50 is N/A.

pesticide training: 10

PESTICIDE TRAINING OUTLINE (Cont.)

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7. Exception:

a. Some pesticides are placed in categories based on special hazards.

1) Example: ROUND-UP; based on oral LD50 (5400mg/K--rat) and dermal LD50 (5,000mg/K--rabbit) ROUND-UP should be in category III. However, due to a special hazard of possible eye damage, ROUND-UP is given the signal word WARNING, and is a category II pesticide.

V POISONING, SIGNS AND SYMPTOMS (HZ WASTE).

A. Human pesticide exposure.

1. Symptoms.

a. What a person feels themselves.

2. Signs.

a. What another person can see or notice about you.

3. Acute exposure.

a. One time, heavy exposure.

1) Ie: bottle of concentrate breaks, drenches you.

4. Chronic exposure.

a. Continue exposure to small amounts of pesticide.

1) Builds up in body over period of time.

5. Four common ways for entry into the body.

a. Dermal exposure.

1) Splashes.

2) Spills.

3) Spray mist.

PESTICIDE TRAINING OUTLINE (cont.)

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b. Oral exposure.

1) Contaminated drinking vessels.

2) Pesticide in wrong container.

a) Ie: pesticide in coke bottle and child drinks it.

3) Eating and smoking while spraying or not washing up before eating or smoking.

c. Respiratory exposure.

1) Vapors while mixing/loading.

2) Spray mist.

d. Eye exposure.

1) Tissue of eye is extremely absorbent.

a) Splashes.

b) Spray mist.

B. pesticide compounds.

1. Chlorinated hydrocarbon.

a. Includes METHOXYCLOR.

1) Many pesticides in this group were banned.

2) Acts on central nervous system.

a) Unknown how it acts.

3) Signs and symptoms.

a) Nervousness.

b) Nausea.

c) Diarrhea.

pesticide training: 12

PESTICIDE TRAINING OUTLINE (cont.)

page 13 of 22

- 4) Severe exposure.
 - a) Extreme nervousness.
 - b) Convulsions.
 - c) Coma.
 - d) Death.

2. Botanical.

a. STRYCHNINE.

- 1) Affects within 10 to 30 minutes.
- 2) If one survives 5 or 6 hours, there is a good chance of recovery.

3. Organophosphates and carbamates.

a. BIDRIN, DIAZINON, SEVIN.

b. This group of pesticides is what we mainly use.

c. Acts on central nervous system by binding the CHOLINESTERASE enzymes.

- 1) Base line blood test.
 - a) Thirty (30) days without exposure.
 - b) Excessive alcohol intake may depress CHOLINESTERASE enzyme count.

d. Signs and symptoms.

- 1) Normally occur in stages.
 - a) Mild poisoning.
 - (1) Fatigue.
 - (2) Headache.
 - (3) Dizziness.
 - (4) Blurred vision.
 - (5) Too much sweating and salivation.

pesticide training: 13

PESTICIDE TRAINING OUTLINE (cont.)

page 14 of 22

(6) Nausea and vomiting.

(7) Stomach cramps.

(8) Diarrhea.

(a) Note: many symptoms flu like.

b) Moderate poisoning.

(1) Unable to walk.

(2) Weakness.

(3) Chest discomfort.

(4) Muscle twitches.

(5) Constriction of pupil of the eye.

(6) Earlier symptoms become more severe.

c) Severe poisoning.

(1) Unconsciousness.

(2) "Pin point" pupil of the eye.

(3) Muscle twitches.

(4) Secretion from mouth and nose.

(5) Breathing difficulty.

(6) Death if untreated.

d) Poisoning can be reversed by treatment by doctor. (need base line and lable from pesticide).

f) Carbamate poisoning can be corrected easier than organophosphate poisoning, therefore is considered the safer.

VI FIRST AID FOR PESTICIDE POISONING (HZ WASTE).

1. It is essential that pesticide poisoning incidents be recognized immediately because prompt treatment may mean the difference between life and death.

2. In some cases 911 must be call for emergency assistance.

pesticide training: 14

PESTICIDE TRAINING OUTLINE (cont.)

page 15 of 22

3. First aid is not a substitute for professional medical treatment.

A. Working alone.

1) STAY CALM -- the serious effects of pesticides are generally not instantaneous, so you will have some time to protect yourself.

2) NOTE: you should get any spilled pesticide off your body as fast as you can.

3) If pesticide is on you or on your clothes:

a) Remove clothes at once and rinse your skin immediately with any uncontaminated water available.

b) Wash with detergent and water after you have rinsed.

c) Call or send for help while you are rinsing and washing.

d) IF YOU ARE BEGINING TO FEEL ANY ILLNESS:

(1) Have someone take you and the label or labeled container to the doctor. DO YOU NEED EMERGENCY ASSISTANCE - 911.

(2) DO NOT DELAY!

4) If you have accidentally swallowed a pesticide.

a) Read the label and determine whether or not to induce vomiting.

b) If the label recommends vomiting, induce it at once by putting your finger down your own throat. DO IT! THIS MAY SAVE YOUR LIFE!

c) GET TO A DOCTOR. DO YOU NEED EMERGENCY ASSISTANCE - 911.

PESTICIDE TRAINING OUTLINE (cont.)

page 16 of 22

5) If you splash or spill a pesticide in you eyes:

- a) Wash your eyes with water AT ONCE.
- b) Use clear stream of running water, keep your eyes open, and WASH FOR AT LEAST 15 MINUTES.
- c) DO NOT use any medicated eyewash.
- d) Call or send for help while you are washing your eyes. DO YOU NEED EMERGENCY ASSISTANCE - 911.
- f) After washing your eyes for 15 minutes, get to a doctor and take the label or labeled container with you.

IF YOU SWALLOW A PESTICIDE OR GET SOME IN YOUR EYES, SEE A DOCTOR BEFORE SYMPTOMS DEVELOP. ANY DELAY CAN CAUSE TEMPORARY OR PERMANENT BLINDNESS OR OTHER INJURY; IT COULD EVEN BE FATAL.

B. Two or more persons finding someone contaminated. DO YOU NEED EMERGENCY ASSISTANCE - 911.

1. General instructions.

a. GEAR UP -- DO NOT COMTAMINATE YOURSELF, FAILURE TO PROTECT YOURSELF MAY MAKE YOU VICTIM NUMBER 2.

b. Give mouth-to-mouth artificial respiration if breathing has stopped.

c. Stop exposure to the pesticide.

1) If on skin, thoroughly cleanse the person, including hair and fingernails.

2) If swallowed, and the pesticide label recommends vomiting, induce vomiting.

3) If in eyes, wash eyes with water for 15 minutes.

4) Save the pesticide container and material in it, and get a readable label or the name of the chemical(s) and bring it to the doctor.

5) IF PESTICIDE IS NOT KNOWN, SAVE A SAMPLE OF THE VOMITUS FOR ANALYSIS.

pesticide training: 16

PESTICIDE TRAINING OUTLINE (cont.)

page 17 of 22

2. Specific instructions.

a. Victim has pesticide on skin.

- 1) Remove clothing.
- 2) Drench skin with water (shower, hose, faucet).
- 3) Wash skin, hair, and fingernails thoroughly with soap and water; speed in washing is most important in reducing the extent of injury.
- 4) Dry the victim and wrap in a blanket.

b. Victim has pesticide in eyes.

- 1) Hold eyelids open; wash eyes IMMEDIATELY with gentle stream of clean running water. Use large amounts of water. DELAY OF A FEW SECONDS GREATLY INCREASES EXTENT OF INJURY.
- 2) Continue washing for 15 minutes or more.
- 3) Do NOT use chemicals or drugs in wash water: they may increase the extent of injury.

c. Victim has inhaled pesticide.

- 1) If victim is in enclosed space, do NOT attempt to rescue without proper respiratory equipment. DO YOU NEED EMERGENCY ASSISTANCE - 911.
- 2) Carry patient (do not allow walking) to fresh air immediately.
- 3) Open all doors and windows, if any.
- 4) Loosen all tight clothing.
- 5) Apply artificial respiration if breathing has stopped or is irregular.
- 6) Call a doctor.
- 7) Prevent chilling (wrap patient in blankets but don't overheat).
- 8) Keep patient as quiet as possible.

pesticide training: 17

PESTICIDE TRAINING OUTLINE (cont.)

page 18 of 22

9) If patient is convulsing, watch breathing and protect from falling and striking head on the floor or wall. Keep patient's chin up so air passage will remain free for breathing.

10) Do not give alcohol in any form.

d. Victim has swallowed pesticide.

1) Call a doctor immediately. DO YOU NEED EMERGENCY ASSISTANCE - 911.

2) Do NOT induce vomiting if:

a) Patient is unconscious.

b) Patient is in convulsions.

c) Patient has swallowed petroleum products--such as kerosene, gasoline, or lighter fluid.

d) Patient has swallowed a corrosive pesticide (strong acid or alkaline products): symptoms include severe pain, and burning sensation in mouth and throat. A corrosive substance is any material which in contact with living tissue will cause destruction of tissue by chemical action: examples include lye and acids.

3) If the patient can swallow after ingesting a corrosive pesticide, give the following substances by mouth:

a) For acids--milk, water, or milk of magnesia; one tablespoon to one cup of water.

b) For alkali--milk or water; for patients 1--5 years old, one to two cups; for patients 5 years and older, up to one quart.

e. Victim has chemical burns of skin.

1) Remove contaminated clothing.

2) Wash with large quantities of running water.

3) Immediately cover with loosely applied clean cloth (any kind will do).

4) Avoid use of ointments, greases, powders, and other drugs.

5) Treat shock by keeping patient flat, warm, and reassured until the arrival of a doctor.

pesticide training: 18

PESTICIDE TRAINING OUTLINE (cont.)

page 19 of 22

f. How to induce vomiting when a non-corrosive substance has been swallowed.

1) Induce vomiting by placing the blunt end of a spoon (not the handle), or your finger, at the back of the patient's throat; or use an emetic of two tablespoons of salt in a glass of warm water.

2) When retching and vomiting begin, place patient face down with head lowered, thus preventing vomitus from entering the lungs and causing further damage. Do NOT let patient lie on back.

3) If there is some difficulty in getting the patient to vomit, it is better to start moving toward the hospital; perhaps vomiting can be induced en route to the hospital. It is important to begin heading for the hospital, especially if it is a long distance away, because the hospital is where drugs can be administered to induce vomiting and stomach pumps are available.

4) Clean vomitus from the patient. Collect some vomitus in case the doctor needs it for chemical tests.

VII HANDLING PESTICIDES: (HZ WASTE).

A. The most important thing to remember about handling pesticides is they are hazardous.

1. They can and will, if handled wrong;

a. Poison people and animals.

b. Damage beneficial insects.

c. Harm desirable plants.

B. Transporting pesticides.

1. Pesticides are most safely transported in the back of a truck.

a. Never transport pesticides in the passenger compartment of any vehicle.

b. Never allow anyone to ride with pesticides.

c. Never transport pesticides with food, feed, or clothing.

pesticide training: 19

PESTICIDE TRAINING OUTLINE (cont.)

page 20 of 22

d. Protect containers to prevent spillage. Tie them down.

2. Accidents.

a. When transporting pesticides, you are legally responsible for the public safety.

b. Spills.

1) Avoid contamination to yourself and others. If you were contaminated by the spill, get yourself cleaned up.

2) Protect yourself.

a) Put on safety gear and equipment.

b) Make a barrier to prevent spread of pesticide.

(1) Dirt, sand, paper.

c) Pick up pesticide.

(1) Use absorbent, place in proper container.

d) Decontaminate the affected area.

(1) Be careful of run off.

3) Major spill.

a) Notify emergency personnel.

(1) 911 -- fire/police.

(a) Inform them of Haz. Material.

b) Prevent public from being exposed.

c) Assist emergency personnel, ie: class of pesticide, MSDS, and label.

pesticide training: 20

PESTICIDE TRAINING OUTLINE (cont.)

page 21 of 22

c. Fire.

- 1) Notify Fire Dept. -- 911.
- 2) Fire Dept. has business plan for Miller Yard, for vehicle fire, Fire Dept. will need to know pesticide, and class.
- 3) Use foam or carbon dioxide when possible.
 - a) Watch run off does not contaminate other sites.
- 4) Evacuate and isolate area downwind of fire.
- 5) Use protective equipment.
 - a) Our respirators are not adequate protection in a smoke environment.
- 6) Avoid contamination.
 - a) Stay out of smoke, mist, run off.
 - b) Be aware of possible exploding cans and bottles.

DON'T TAKE RISKS !! EMERGENCY PERSONNEL -- 911.

VIII PERSONAL PROTECTION (HZ WASTE).

A. You are responsible for your assigned safety equipment.

1. Rubber gloves.
 - a. Check daily for leaks.
 - 1) Replace if found.
 - b. Wash each time they are removed from hands.
2. Face shield.
 - a. Wash at each clean up time.
 - b. Keeps splash/spray off face.

pesticide training: 21

PESTICIDE TRAINING OUTLINE (Cont.)

page 22 of 22

3. Safety glasses.
 - a. Wear under face shield for eye protection.
 - b. Wash daily.
4. Overalls.
 - a. Change daily.
 - b. Do not take home.
 - 1) May be contaminated.
5. Respirator.
 - a. CHECK BEFORE AND AFTER USING.
 - 1) Check inlet, exhaust valves.
 - 2) Check sealing edge.
 - b. Wash daily.
 - 1) Warm water and soap.
 - 2) Do not get canisters wet.
 - 3) Do not get filter pads wet.
6. Rain suit/Spray suit.
 - a. Wash daily.
7. Hard Hat.
 - a. Wash daily.
8. Steel toe rubber boots.
 - a. Wash daily.

B. MOST IMPORTANT THING YOU CAN DO FOR YOURSELF IS REMEMBER TO
WASH UP WASH UP WASH UP WASH UP

DO NOT SMOKE, DRINK, OR EAT BEFORE WASHING UP.
DO NOT FORGET TO WASH BOOTS BEFORE GOING INTO
RESTROOMS, OFFICES, OR STORES.

pesticide training: 22

INJECT-A-CIDE "B" (BIDRIN) TRAINING
OPERATION OUTLINE

PG 1 OF 5

- I METHOD OF APPLICATION - MAUGET.
- A. STANDARD.
1. CAPSULES AT SIX INCH INTERVALS.
 2. NO CAPSULES LEFT UNATTENDED.
 - (A) NO MORE THAT 100 FEET AWAY FROM TREE BEING TREATED.
 - (1) MUST BE CLOSE ENOUGH TO CONTROL SITUTATION.
 3. ALL CAPSULES TO BE REMOVED AT SAME TIME.
 - (A) DOUBLE WALK THE TREE.
 - (B) CHANGE TO 1988 SEASON - DO NOT PULL CAPSULES UNTIL LEADPERSON OR COUNTER IS AT TREE. COUNTER IS TO COUNT AND RECORD CAPSULES AT EACH TREE.
 - (C) COUNTER IS TO RECORD AND REPORT ANY TREE TAKING LESS THAN 75% OF CHEMICAL.
- B. MODIFIED.
1. CAPSULES ARE PLACED CHEST/WAIST HIGH.
 - (A) CAPSULES AT ROOT FLARE ARE A HAZARD TO PUBLIC.
 2. INSERTION TOOL IS USED.
 - (A) IMPROPER DRILLING CAUSES INJURY TO TREE.
 - (B) DRILLING IS NOT PRODUCTIVE ENOUGH.
- II SAFETY EQUIPMENT.
1. VEHICLES.
 - (A) SOAP & TOWELS.
 - (B) EXTRA COVERALLS.
 - (C) REPLACEMENT CARTRIDGES & FILTERS.
 - (D) HYDRANT WRENCH.
 - (E) RUBBER GLOVES.
 - (F) FACE SHIELDS.
 - (G) FIRST AID KIT.
 - (H) SPILL RECOVERY DRUMS WITH ABSORBANT AND CLEAN UP KIT.
 - (J) FIRE EXTINGUISHER.
 - (K) DAILY VEHICLE CONDITION REPORT.
 2. PERSONAL.
 - (A) HARD HAT.
 - (B) FACE SHIELD.
 - (C) COVERALLS.
 - (D) RAIN SUIT.
 - (E) RESPIRATOR.
 - (F) RUBBER GLOVES.
 - (G) RUBBER BOOTS.
 - (H) SAFETY GLASSES.
 - (1) ALL ABOVE MUST BE WORN WHILE HANDLING BIDRIN.
 - (2) ALL ABOVE MUST BE AT SITE (ON VEHICLE) FOR EACH CREWMEMBER.

pesticide training: 2

INJECT-A-CIDE "B" (BIDRIN) TRAINING
OPERATION OUTLINE (CONT.)

PG 2 OF 5

III IN FIELD OPERATIONS.

A. LEADPERSON:

1. DIRECT AND LEAD DAY TO DAY OPERATION.
2. ASSIGN CREWMEMBERS.
3. PROMOTE PERSONAL, PUBLIC, AND PESTICIDE SAFETY.
4. CONTROL PESTICIDE VEHICLE -- "DIRTY" VEHICLE.

B. COUNTER/RECORDER.

1. NOTE COUNT OF CAPSULES PULLED AT EACH TREE.
2. OBSERVE THE CAPSULES GOING INTO THE BUCKET.
3. WALK THE TREE AFTER THE PULLER DOUBLE WALKS THE TREE.
4. NOTE IF THE TREE TAKES LESS THAN 75% OF MATERIAL.
5. MOVE CLEAN VEHICLE (WITHOUT CHEMICAL LOAD).

C. PEGGER.

1. UNDER DIRECTION OF TMW II, LEAD DIRECTION OF DAYS.
WORK.
2. INSERT PEG INTO THE CAMBIUM LAYER OF THE TREE.
3. NO MORE THAN 5 MINUTES PASS BEFORE MATERIAL IS APPLIED.
4. MUST BE CLEAR FROM TREE BEFORE APPLIER "KNOCKS ON"
CAPSULES.

D. APPLIERS.

1. COMPRESS ONLY THOSE CAPSULES YOU WILL USE.
2. NO MORE THAN 5 MINUTES PASS BEFORE MATERIAL IS APPLIED.
3. MAKE SURE PEGGER IS CLEAR FROM TREE BEFORE "KNOCKING ON"
CAPSULES.

D. PULLERS.

1. MONITER CAPSULES DRAINING INTO TREES.
2. PROTECT PUBLIC.
3. ASSIST COUNTING CAPSULES BEFORE PULLING.

IV DEMO OF ELM INJECTION AT RIVER.

pesticide training: 3

INJECT-A-CIDE "B" TRAINING (BIDRIN)

PG 3 OF 5

LABEL AND MSDS TRAINING OUTLINE.

I. LABEL.

A. SIGNAL WORDS - SIGNS.

1. DANGER - POISON.

(A) ORAL LD 50 LESS THAN 50mg/K.

(B) CATEGORY I PESTICIDE.

B. INGREDIENTS.

C. RESTRICTED USE PESTICIDE.

D. STATEMENT OF PRACTICAL TREATMENT.

1. FIRST AID.

E. PRECAUTIONARY STATEMENTS.

1. ENVIRONMENTAL HAZARDS.

F. NOTE TO PHYSICIANS.

G. DIRECTIONS FOR USE.

1. GENERAL DIRECTIONS.

H. RESTRICTIONS (OF USE).

I. STORAGE AND DISPOSAL.

J. INJECT-A-CIDE "B" APPLICATION.

1. CROPS IT'S REGISTERED FOR.

2. PESTS/INSECTS IT'S REGISTERED FOR.

3. REMARKS.

(A) WHEN TO TREAT/USE.

K. NOTICE OF WARRANTY.

pesticide training: 4

INJECT-A-CIDE "B" (BIDRIN) cont.

PG 4 OF 5

II MATERIAL SAFETY DATA SHEET (MSDS).

A. MATERIAL IDENTIFICATION.

1. PRODUCT NAME.
2. MANUFACTURER.
3. 24HR ASSISTANCE PHONE NUMBERS.

B. COMPONENTS.

1. PRODUCT INGREDIENTS, CAS NUMBERS, MIXTURE PERCENT.

C. PHYSICAL DATA.

D. HAZARDOUS REACTIVITY.

E. FIRE AND EXPLOSION DATA.

1. EXTINGUISHING MEDIA.

F. HEALTH HAZARD INFORMATION.

1. LD 50 RATES, CATEGORY I PESTICIDE.
2. HEALTH INFORMATION.
 - (A) SIGNS AND SYMPTOMS.
 - (B) AGGRAVATED MEDICAL CONDITIONS.
3. OCCUPATIONAL EXPOSURE LIMITS.
4. SAFETY PRECAUTIONS.

G. FIRST AID.

1. NOTE TO PHYSICIAN.

H. PROTECTION INFORMATION.

1. PERSONAL PROTECTIVE EQUIPMENT.

I. DISPOSAL INFORMATION.

1. SPILL, LEAK, OR RELEASE.
2. WASTE DISPOSAL.

J. SHIPPING INFORMATION.

K. STORAGE CINDITIONS.

pesticide training: 5

INJECT-A-CIDE "B" (BIDRIN) cont.

PG 5 OF 5

- L. TITLE III HAZARD CLASSIFICATIONS.
- M. ADDITIONAL INFORMATION AND REFERENCES.
 - 1. REGULATORY CONTROLS.
 - 2. RESTRICTED USE PESTICIDE.
 - 3. MATERIAL IDENTIFICATION - CAS NAME.
- O. DATE PREPARED AND NAME OF CONTACT.

pesticide training: 6

SEVIMOL 4 SPRAY TRAINING

PG 1 OF 3

I. METHOD OF APPLICATION.

A. BASAL SPRAY ONLY.

1. TO CONTROL ELM LEAF BEETLE LARVA AND PUPA, TO PREVENT THEM FROM MATURING AND STARTING A NEW GENERATION.
 - (A). IN TREE WELL AND UP TRUNK TO 8 FEET.
 - (B). LOW PRESSURE TO MINIMIZE DRIFT.
 - (C). WET BARK THOROUGHLY.

II. EQUIPMENT.

A. 3 GAL HAND HELD SPRAY TANK.

1. MIX.

- a. 15ml PER GALLON OF WATER (1 TABLESPOON @ GALLON).
- b. SHAKE SPRAY TANK TO KEEP MIX AGITATED.

B. 100 GAL TANK/SPRAY RIG.

1. MIX (KNOWN AS TANK MIX).

- a. 1 QUART PER 100 GALLONS OF WATER.
 - 1) FOR 5 GALLONS MIX 1.6oz/48ml.
 - 2) " 10 " " 3.2oz/95ml.
 - 3) " 20 " " 6.4oz/190ml.
 - 4) " 50 " " 16.0oz/470ml.
 - 5) " 100 " " 32.0oz/950ml.

III. SAFETY EQUIPMENT TO MIX.

- A. HARD HAT.
- B. FACE SHIELD.
- C. COVERALLS.
- D. RAIN SUIT OVERALLS/SPLASH APRON.
- E. RESPIRATOR.
- F. RUBBER GLOVES.
- G. RUBBER BOOTS.
- H. SAFETY GLASSES.

IV. SAFETY EQUIPMENT TO APPLY.

- A. HARD HAT.
- B. FACE SHIELD.
- C. COVERALLS.
- D. RUBBER GLOVES.
- E. RUBBER BOOTS.
- F. SAFETY GLASSES.
- G. RAIN SUIT AND RESPIRATOR IF EXPOSED TO SPRAY MIST.

pesticide training: 7

SEVIMOL 4 SPRAY TRAINING

PG 2 OF 3

LABEL AND MSDS TRAINING OUTLINE.

I. LABEL.

A. SIGNAL WORDS -SIGNS.

1. CAUTION.

(A) ORAL LD 50 MORE THAN 500mg/K.

(B) CATEGORY III PESTICIDE.

B. INGREDIENTS.

C. PRECAUTIONARY STATEMENTS.

1. ENVIRONMENTAL HAZARDS.

D. NOTE TO PHYSICIANS.

E. WARRANTY.

F. DIRECTIONS FOR USE.

G. EQUIPMENT CARE, SPRAY PREPARATION.

H. STORAGE AND DISPOSAL.

I. GENERAL CAUTIONS.

1. PHYSICAL COMPATIBILITY.

J. BEE CAUTION.

1. RESTRICTED BY SAC COUNTY, REQUIRES N.O.I.

pesticide training: 8

SEVIMOL 4 TRAINING

PG 3 OF 3

II. MATERIAL SAFETY DATA SHEET (MSDS).

A. TITLE SECTION.

1. PRODUCT NAME AND ID.
2. BOTTOM OF PAGE, EMERGENCY PHONE NUMBER.

B. SECTION I.

1. PHYSICAL DATA.

C. SECTION II.

1. HAZARDOUS INGREDIENTS.

D. SECTION III.

1. FIRE AND EXPLOSION HAZARD DATA.

E. SECTION IV.

1. HEALTH HAZARD DATA.

(A) FIRST AID.

- (1) IF SWALLOWED, INDUCE VOMITING AT ONCE.

F. SECTION V.

1. REACTIVITY DATA.

G. SECTION VI.

1. SPILL OR LEAK PROCEDURES.

(A) CHANGE "FLUSH HEAVILY WITH WATER" TO "CONTAIN AND ABSORB".

(B) WASTE DISPOSAL METHOD.

H. SECTION VII.

1. SPECIAL PROTECTION INFORMATION.

I. SECTION VIII.

1. SPECIAL PRECAUTIONS.

pesticide training: 9

PESTICIDE SAFETY TRAINING RECORD

Name of Employee: _____ Signature: _____

Name of Employer: _____ Authorized Agent
or Supervisor: _____

Assigned Job Duties: Mixer/Loader Applicator Flagger Other _____

	Respirator Equipment: Needs proper use, sanitary care and limitations.																			
	Immediately decontaminate skin and eyes when exposure occurs.																			
	Safe Procedures: Pouring, lifting, opening, operating equipment, etc.																			
	Protective Clothing & Equipment: Coveralls, gloves, goggles, boots, respirator, apron, etc.																			
	Knowledge of the Symptoms of Pesticide Poisoning. Report symptoms immediately.																			
	Wash hands and arms with soap and water before eating, drinking, smoking, going to the bathroom.																			
	Wash completely at the end of the work day. Change into clean clothing.																			
	Wear clean workclothes daily.																			
	Emergency medical information: Name, address, phone number of clinic, physician, or hospital, emergency room and where information is located.																			
Ag. Only	Medical Supervision: Required when working more than 6 days in 30 days with carbamates, organophosphates with danger or warning on label.																			
	Read the Label: Signal word, caution statement, first aid, rate, dilution, volume.																			
	Triple-rinse the cans at the time of use.																			
	Drift: Confine the spray to the site. Watch out for people, animals, waterways, or any special hazards. Work into the wind.																			
	Storage of pesticide cans in a locked and posted area or with an authorized person watching the containers.																			
Ag. Only	Closed system shall be used in mixing or transferring a liquid pesticide labeled "Danger."																			
	Pesticide Safety Information Series.																			
	Material Safety Data Sheet.																			
Ag. Only	Safety procedures in the event of a release or threatened release of a hazardous material (pesticides, fertilizers, fuels, compressed gases).																			

Employee Initials:																				
Date:																				

Pesticides ➡

Trainer																				

PESTICIDE HAZARDOUS WASTE SAFETY TRAINING RECORD

Name of Employee: _____ Signature: _____

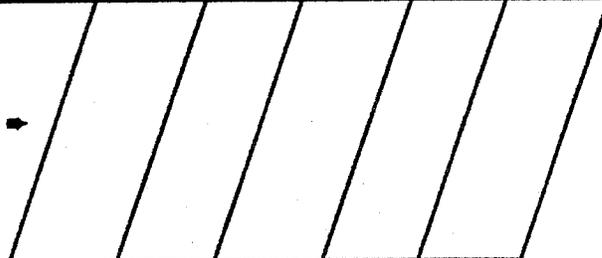
Name of Employer: _____ Authorized Supervisor: _____

Assigned Job Duties: Applicator Packer Other _____

Pesticide Safety Training Record. Completed on pesticide waste to be handled.					
Safe procedures: Pouring, lifting, opening, operating equipment, etc.					
Protective Clothing & Equipment: Coveralls, gloves, goggles, boots, respirator, apron, etc.					
Knowledge of the Symptoms of Pesticide Poisoning. Report symptoms immediately.					
Emergency medical information: Name, address, phone number of clinic, physician, or hospital, emergency room and where information is located.					
Read the Label: Signal word, caution statement, first aid, disposal, etc.					
Material Safety Data Sheet.					
Storage of hazardous waste in a locked and posted area or with an authorized person watching the containers.					
Hazardous waste contingency plan Miller Park Corp. Yard.					
Safety procedures in the event of a release or threatened release of a hazardous material.					

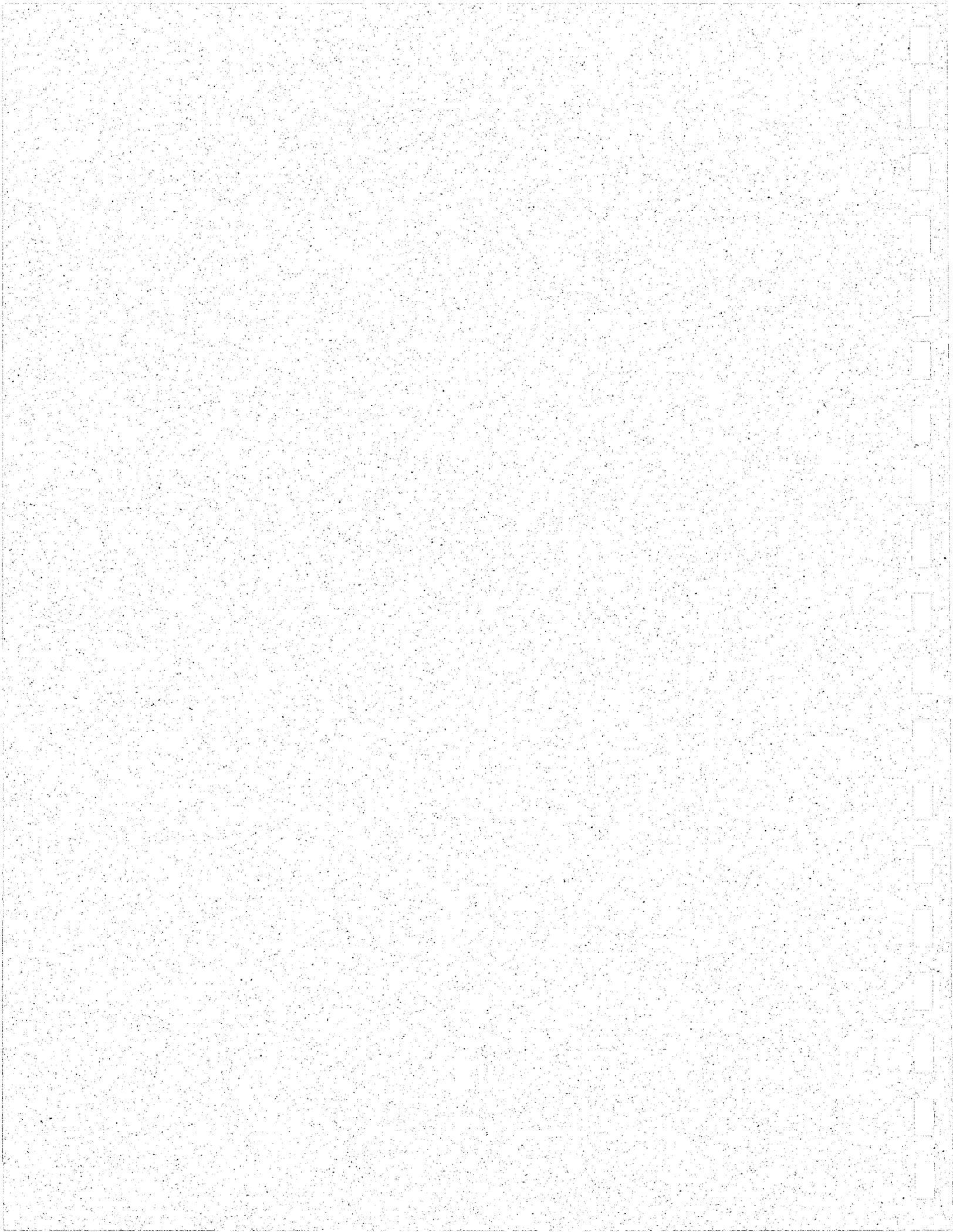
Supervisor Initials					
Date:					

Pesticide Waste ➡



Appendix 8: Trim Cycle Options

Interpretation of Tables and Base Calculations...	8 - A
6 Year Proactive Trim Cycle.....	8 - B
8 Year Proactive Trim Cycle.....	8 - C
10 Year Proactive Trim Cycle.....	8 - D
12 Year Existing Trim Cycle.....	8 - E



INTERPRETING THE TABLES

TABLE 1 PROJECTED TREE POPULATION

The projected tree population has been derived using estimates supplied by Sacramento Tree Services staff. The first element of the table compares the ratios of High, Medium and Low Maintenance trees established in the City-wide sample and a City-wide tree inventory. The projected population figure (150,000 trees, which includes trees in City managed parks) has been segmented according to these established percentages and share of the total.

By using area specific surveys as a base, we have then calculated the ratio of Young, Mature, Overmature and Heritage trees within that area. This percentage is then multiplied by the number of trees in each area which yields a total number of trees within each area by subcategory. The sum of these provides the breakdown of "Estimated Trees by Category" of the City as a whole.

TABLE 2 CREW SIZE AND COSTS

This table provides the basis for estimating overall costs for tree maintenance within the City program. It provides the assumptions regarding crew size, labor, time and equipment costs and trim cycle relationships. These assumptions establish the cost and time relationships and are the underpinnings for all of the cost tables that follow.

- Labor costs and equipment costs are derived from the existing City budget.
- Crew size and cost per hour are derived from posted labor and equipment costs and assumptions provided by the City staff regarding crew composition.
- The tasks are broken out per staff description and utilize average crew sizes and equipment as specified.

TABLE 3 ESTIMATED ANNUAL AVERAGE PROACTIVE TRIMMING COSTS

This table is intended to represent average yearly costs for the normal trim cycle maintenance the City will experience with pro-active as opposed to re-active methods. Unique care (such as emergency services or stump pulling) that does not constitute the routine maintenance cycle is assumed

to reflect the current City workload in terms of the number of trees serviced and are presented in Table 4.

This table uses a set of assumptions for the following categories which are presented in the table in columnar form and thus change uniquely by category (i.e. Low, Medium and High Maintenance along with their subcategories of Young, Mature, Overmature and Heritage - a total of 12 permutations). The assumptions include:

Years between Visits: This variable assigned by the Arborist

Average Hours to Trim: This variable is assumed from Tree Service Experience by task

Crew Size: This variable is assumed from Tree Service Experience by task

Direct Cost: This variable is derived from table 2 and represents the direct hourly cost for labor and equipment.

Per Tree Annual Cost: This figure is derived by multiplying the direct hourly cost by the estimated hours per task and then dividing by the number of years between visits.

Trees per day: This figure is derived by dividing the average hours per trim task into a 7 hour work day (assumes an eight hour day with 1 hour for transportation to and from the job site. This number may actually be higher due to increase time to haul debris for recycling).

Potential Trees per Year: This figure is derived by assuming 240 normal eight hour work days with one hour of each day reserved for transport to and from the work site. This number is multiplied by the derived number above - trees per day and yields a theoretical average annual number of trees in each category that can be maintained.

Percentage of Trees requiring maintenance: This variable is assumed to be 100% for the transition period through the completion of the first trim cycle. Once the population has been proactively maintained, fewer than 100% of the population will require pruning according to its assigned trim cycle. As a result, the budgeted costs will be reduced.

Actual Trees in Category: This figure is developed directly from Table 1 above (or as modified).

Annual Maintained Trees in Category: This derived figure is found by multiplying the number

of trees in the category by the % requiring maintenance and dividing the resultant figure by the number of years between visits. The result is the actual expected number of trees that will be maintained in any calendar year.

of Crews Needed : This derived figure is found by dividing the Annual Trees Maintained by the Potential trees per Year figure (which represents the work of one theoretical crew by task).

Cost Per Year :- This figure represents the per tree annual cost multiplied by the Annual Trees Maintained in each category.

TABLE 4 ANNUAL COSTS FOR ALL SERVICES

This summary table adds the unique services by Category in order to establish the total maintenance costs. The variables include:

Categories:- These variable areas are assigned by the Tree Services Staff

of Trees Annual: This variable is assumed based on fiscal year 90-91 performance

Crew \$/Hour: This variable is obtained directly from Table 2 assumptions

Hours / Tree: This variable is assigned by Tree Services Staff

\$/Tree: This figure is the result of multiplying the hours/tree by the Cost / Hour

Total Annual Cost: This figure is the result of multiplying the \$/Tree by the assumed number of trees annually attended

OTHER DEPARTMENTAL COSTS

The nursery is assumed to continue at the current rate of approximately \$510,000 annually although the City may not be responsible for all or even part of these costs depending on other relationships such as those with SMUD.

Administratio:- This figure is assumed and represents a slight increase over current levels.

Pro Active Maintenance by City Crews: This figure is derived from Table 3 for the 92,500 public ROW trees

Proactive Maintenance by Contractor: This

figure assumes a 40% cost savings of City Crew work and is estimated for 57,500 trees

Overall Budget Note: The budget has been augmented with a short term contribution from the Lighting and Landscape District during the master plan development. This may represent potential savings in the future.

TABLE 1 PROJECTED TREE POPULATION

Assumptions Category	Sample	Inventory	Proj. Prop.	City Only Responsibil.	% of Total
High	13467	17166	22350	13,783	15%
Medium	58667	74657	97200	59,940	65%
Low	18338	23388	30450	18,778	20%
Total	90472	115211	150000	92,500	

Breakdown Within Each Category

Young	9.00%
Mature	89.00%
Overmature	1.38%
Heritage	0.62%

Estimated Trees by Category

	Low	Medium	High
Young	1690	5395	1240
Mature	16712	53347	12266
Overmature	259	827	190
Heritage	116	372	85

Projections based on City-wide figures.

TABLE 2 CREW SIZE AND COSTS

Labor Costs	\$/ Month	\$ / Hour	Equipment Costs	\$ / Hour	Crew Costs by Size	\$ / Hour
Senior	2451	15.32	Boom (B)	22	Crew of 1	19.92
Trimmer 1	2048	12.8	Tower (T)	105	Crew of 2	27.03
Trimmer 2	2277	14.23	Chipper (C)	47	Crew of 3	55.06
			Tool Truck (Tt)	10	Crew of 5	91.79
			Stump Grinder (S)	87		
			1.5 Ton PU (PuA)	10		
			.75 Ton PU (PuB)	6		
			.5 Ton PU (PuC)	4		
			Auger/Bobcat (Au)	30		

Crews are assumed to work a total of 7 hours per crew 5 days per week
 * Includes Benefits

Category	Crew Size	Labor/Hr.	Equipment	Equipmt. /Hr	Crew \$/Hr
Planting	1	19.92	PuB,Au	36	55.92
Training	1	19.92	PuB	6	25.92
Trim Cycle					
Crown Raising	5	458.95	PuB,PuA,Tt,C	73	531.95
General Large	5	458.95	B,T,C	174	632.95
General Med	3	165.18	T,C	152	317.18
General Small	2	54.06	Tt,C	57	111.06
Emergency	2	54.06	T,B	127	181.06
Root Pruning	2	54.06	PuB,S	93	147.06
Pest Spraying	2	54.06	PuB,PuA	16	70.06
Injection	5	458.95	PuB,PuA	16	474.95
Removal					
Tree Down	5	458.95	T,C,B,PuA	184	642.95
Stump Removal	3	165.18	PuA,S	97	262.18
General					
Inspection	1	19.92	PuC	4	23.92
Hanging Signs	2	54.06	T	105	159.06

Table 3. Estimated Annual Proactive Trim Costs

Per Tree Costs Lo Main.	Yrs Btwn Visits	Aver. Hrs/ Trim	Crew Size	Crew/Hr Direct Cost	Per Tree Ann. Cost	Trees/ Day	Pot Trees/ Year	% Req. Main.	Actual Trees in Category	Ann. Main Trees in Category	# of Crews Needed	Cost Per Year
Young	1	0.3	1	54.41	16.32	23.33	5600	100%	2741	2741	0.5	44795
Mature	9	2	3	210.02	46.67	3.50	840	100%	27101	3011	3.6	140534
Over Mature	9	4	3	210.02	93.34	1.75	420	100%	420	47	0.1	4358
Heritage	5	4	3	210.02	168.02	1.75	420	100%	189	38	0.1	6344
Med. Main.												
Young	1	0.3	1	54.41	16.32	23.33	5600	100%	8748	8748	1.6	142800
Mature	6	4	3	210.02	140.01	1.75	420	100%	86508	14418	34.3	2018712
Over Mature	6	6	5	280.55	280.55	1.17	280	100%	1341	224	0.8	62719
Heritage	5	6	3	210.02	252.02	1.17	280	100%	603	121	0.4	30376
Hi Main												
Young	1	0.3	1	54.41	16.32	23.33	5600	100%	2012	2012	0.4	32835
Mature	3	6	3	210.02	420.04	1.17	280	100%	19892	6631	23.7	2785075
Over Mature	3	8	5	280.55	748.13	0.88	210	100%	308	103	0.5	76915
Heritage	5	8	3	210.02	336.03	0.88	210	100%	139	28	0.1	9313
Tot. Trees Pot. Annually Maintained											66	5,354,718
Tot. Trees Pot. Annually Maintained											33119	

Table 4. Annual Costs for All Services

Category	Yrs Btwn Visits	Aver. Hrs/ Trim	Crew Size	Crew/Hr Direct Cost	Per Tree Ann. Cost	Trees/ Day	Pot Trees/ Year	% Req. Main.	Actual Trees in Category	Ann. Main Trees in Category	# of Crews Needed	Cost Per Year
Spraying	235	49.74	0.25	12.44	29.22							
Injection	3475	163.42	0.67	109.49	380483							
Emer. Tree Removal	60	160.74	2.0	321.48	19289							
Planting	3000	51.84	0.4	20.54	61608							
Routine Tree Removal	800	284.48	4.0	1067.94	846272							
Stump Removal	735	145.35	2.2	319.77	235031							
General Inspection	1444	19.34	0.2	3.87	5585							
Hanging Signs	20	185.74	0.5	92.87	1857							
Other Departmental Costs											1,553,047	
Nursery †					510,000							
Estimated Administration					320,000							
ProActive Maintenance					5,354,718							
Overall Budget TotalΔ											7,737,765	

† Excludes \$150,000 contribution from SMUD, expected through 1993.
 Δ Budget includes Short Term contribution of \$200,000 annually from City Lighting and Landscape District.

Tree Services Summary - 8 Yr Rotation, 160,000 Total Trees Maintained

Table 3. Estimated Annual Proactive Trim Costs

Per Tree Costs Lo Main.	Yrs Btwn Visits	Aver. Hrs/ Trim	Crew Size	Crew/Hr Direct Cost	Per Tree Ann. Cost	Trees/ Day	Pot Trees/ Year	% Req. Main.	Actual Trees in Category	Ann. Main Trees in Category	# of Crews Needed	Cost Per Year
Young	1	0.3	1	54.41	16.32	23.33	5600	100%	2741	2741	0.5	44735
Mature	9	2	3	210.02	46.67	3.50	840	100%	27101	3011	3.6	140534
Over Mature	9	4	3	210.02	93.34	1.75	420	100%	420	47	0.1	4359
Heritage	5	4	3	210.02	169.02	1.75	420	100%	189	38	0.1	6344
Med. Main.												
Young	1	0.3	1	54.41	16.32	23.33	5600	100%	8748	8748	1.6	142800
Mature	7	4	3	210.02	120.01	1.75	420	100%	86508	12358	29.4	1483136
Over Mature	6	6	5	280.55	280.55	1.17	280	100%	1341	224	0.8	62719
Heritage	5	6	3	210.02	252.02	1.17	280	100%	603	121	0.4	30376
Hi Main												
Young	1	0.3	1	54.41	16.32	23.33	5600	100%	2012	2012	0.4	32836
Mature	5	6	3	210.02	252.02	1.17	280	100%	19892	3978	14.2	1002627
Over Mature	3	8	5	280.55	748.13	0.88	210	100%	308	103	0.5	76915
Heritage	5	8	3	210.02	336.03	0.88	210	100%	139	28	0.1	9313
Tot. Trees Pot. Annually Maintained											52	3,036,693
Tot. Trees Pot. Annually Maintained											33407	

Table 4. Annual Costs for All Services

Category	Yrs Btwn Visits	Aver. Hrs/ Trim	Crew Size	Crew/Hr Direct Cost	Per Tree Ann. Cost	Trees/ Day	Pot Trees/ Year	% Req. Main.	Actual Trees in Category	Ann. Main Trees in Category	# of Crews Needed	Cost Per Year
Spraying	235	49.74	0.25	12.44	29.22							
Injection	3475	163.42	0.67	109.49	380483							
Emer. Tree Removal	60	160.74	2.0	321.48	19259							
Planting	3000	51.34	0.4	20.54	61608							
Routine Tree Removal	800	284.46	4.0	1057.84	846272							
Stump Removal	735	145.35	2.2	319.77	235031							
General Inspection	1444	19.34	0.2	3.87	5585							
Hanging Signs	20	195.74	0.5	92.87	1867							
Total											1,553,047	
Other Departmental Costs												
Nursery †					510,000							
Estimated Administration					320,000							
ProActive Maintenance					3,036,693							
Overall Budget TotalΔ												

† Excludes \$150,000 contribution from SMUD, expected through 1993.
 Δ Budget includes Short Term contribution of \$200,000 annually from City Lighting and Landscape District.

12 Year Rotation, 92,500 Trees Maintained by City

Table 3. Estimated Annual Proactive Trim Costs

Per Tree Costs	Yrs Bwn Visits	Aver. Hrs/Trim	Crew Size	Crew/Hr Direct Cost	Per Tree Ann. Cost	Trees/Day	Pot Trees/Year	% Req. Main.	Actual Trees in Category	Ann. Main Trees in Category	# of Crews Needed	Cost Per Year
Lo Main.	1	0.3	1	54.41	16.32	23.33	5600	100%	1690	1690	0.3	27587
Young	14	2	3	210.02	30.00	3.50	840	100%	16712	1194	1.4	35815
Mature	13	4	3	210.02	64.62	1.75	420	100%	259	20	0.0	1288
Over Mature	10	4	3	210.02	84.01	1.75	420	100%	116	12	0.0	978
Heritage												
Med. Main.	1	0.3	1	54.41	16.32	23.33	5600	100%	5395	5395	1.0	88060
Young	12	4	3	210.02	70.01	1.75	420	100%	53347	4446	10.6	311218
Mature	11	6	5	280.55	153.03	1.17	280	100%	827	75	0.3	11507
Over Mature	9	6	3	210.02	140.01	1.17	280	100%	372	41	0.1	5781
Heritage												
HI Main	1	0.3	1	54.41	16.32	23.33	5600	100%	1240	1240	0.2	20248
Young	10	6	3	210.02	126.01	1.17	280	100%	12266	1227	4.4	154572
Mature	9	8	5	280.55	249.38	0.88	210	100%	190	21	0.1	5270
Over Mature	9	8	3	210.02	186.68	0.88	210	100%	85	9	0.0	1772
Heritage												664,097

Table 4. Annual Costs for All Services

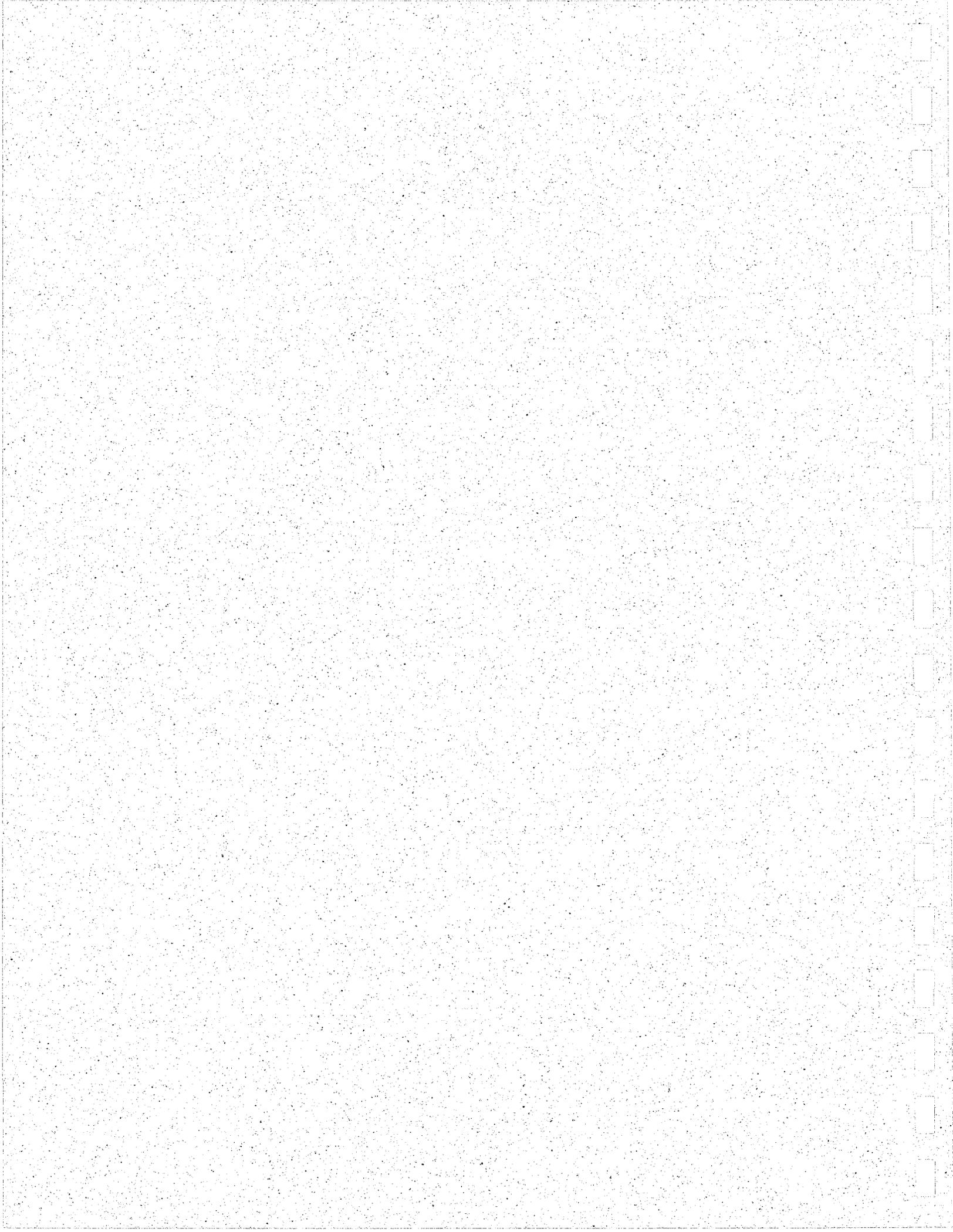
Tot. Trees Pot. Annually Maintained 15370

Category	# of Trees (Annual)	Crew \$/Hr	Hours/Tree	\$/Tree	Total Cost Annual
Spraying	235	49.74	0.25	12.44	2922
Injection	3475	163.42	0.67	109.49	380483
Emer. Tree Removal	60	160.74	2.0	321.48	19289
Planting	3000	51.34	0.4	20.54	61608
Routine Tree Removal	800	264.46	4.0	1057.84	846272
Stump Removal	735	145.35	2.2	319.77	235031
General Inspection	1444	19.34	0.2	3.87	5585
Hanging Signs	20	185.74	0.5	92.87	1857
Other Departmental Costs				Total	1,553,047
Nursery †					660,000
Estimated Administration					320,000
ProActive Maintenance					664,097
Overall Budget TotalΔ					3,197,145

† Includes \$150,000 contribution from SMUD.

Δ Budget Includes Short Term contribution of \$200,000 annually from City Lighting and Landscape District.

**Appendix 9: Relative Frequency of Pruning Needed for
Species**



RELATIVE FREQUENCY OF PRUNING NEEDED PER SPECIES

Key: **H** = high**M** = medium**L** = low (Actual trim rotation years to be assigned.)

<i>Species</i>	<i>Common Name</i>	<i>Trim Cycle</i>
Acacia baileyana	BAILEY ACACIA	M
Acacia cultriformis	KNIFE ACACIA	M
Acacia dealbata	SILVER WATTLE	M
Acacia decurrens	GREEN WATTLE	H
Acacia longifolia	SYDNEY GOLDEN WATTLE	M
Acacia melanoxylon	BLACK ACACIA	M
Acacia pendula	WEeping MYALL	M
Acacia spp.	ACACIA SPECIES	M
Acacia verticillata	PRICKLY MOSES	M
Acer buergeranum	TRIDENT MAPLE	L
Acer japonicum	FULL MOON MAPLE	L
Acer macrophyllum	BIGLEAF MAPLE	L
Acer negundo	BOX ELDER	H
Acer palmatum	JAPANESE MAPLE	L
Acer platanoides	NORWAY MAPLE	L
Acer rubrum	RED MAPLE	L
Acer saccharinum	SILVER MAPLE	H
Acer saccharum	SUGAR MAPLE	L
Acer spp.	MAPLE SPECIES	L
Acmena smithii	LILLY PILLY TREE	M
Aesculus californica	CALIFORNIA BUCKEYE	L
Aesculus carnea	RED HORSE-CHESTNUT	L
Aesculus hippocastanum	HORSE CHESTNUT	L
Agathis robusta	QUEENSLAND KAURI	M
Agonis flexuosa	PEPPERMINT TREE	M
Ailanthus altissima	TREE OF HEAVEN	M
Albizia julibrissin	MIMOSA	M
Alnus cordata	ITALIAN ALDER	M
Alnus oregona	RED ALDER	M
Alnus rhombifolia	WHITE ALDER	M
Angophora costata	GUM MYRTLE	L
Araucaria araucana	MONKEY PUZZLE TREE	L
Araucaria bidwillii	BUNGA-BUNGA TREE	L
Araucaria cunninghamii	HOOP PINE	L
Araucaria heterophylla	NORFOLK ISLAND PINE	L
Araucaria spp.	ARAUCARIA	L
Arbutus unedo	STRAWBERRY TREE	L
Archontophoeniz cunningham.	KING PALM	M
Arecastrum romanzoffianum	QUEEN PALM	M
Azara microphylla	BOXLEAF AZARA	M
Bauhinia variegata	ORCHID TREE	L
Betula pendula	WHITE BIRCH	M
Brachychiton acerifolius	AUSTRALIAN FLAME TREE	M
Brachychiton discolor	HAT TREE	M
Brachychiton populneus	BOTTLE TREE	M
Brahea edulis	GUADALUPE PALM	M

<i>Species</i>	<i>Common Name</i>	<i>Trim Cycle</i>
<i>Broussonetia papurifera</i>	PAPER MULBERRY	M
<i>Butia capitata</i>	PINDO PALM	L
<i>Callistemon citrinus</i>	BOTTLEBRUSH	M
<i>Callistemon salignus</i>	WHITE BOTTLEBRUSH	M
<i>Callistemon viminalis</i>	WEeping BOTTLEBRUSH	M
<i>Calocedrus decurrens</i>	INCENSE CEDAR	L
<i>Calodendrum capense</i>	CAPE CHESTNUT	L
<i>Carica papaya</i>	PAPAYA	M
<i>Carya ilinoensis</i>	PECAN	M
<i>Casimiroa edulis</i>	WHITE SAPOTE	L
<i>Cassia excelsa</i>	CROWN OF GOLD TREE	L
<i>Cassia leptophylla</i>	GOLD MEDALLION TREE	M
<i>Castanea dentata</i>	AMERICAN CHESTNUT	M
<i>Castanea sativa</i>	SPANISH CHESTNUT	M
<i>Casuarina cunninghamiana</i>	RIVER SHE-OAK	L
<i>Casuarina equisetifolia</i>	HORSETAIL TREE	M
<i>Casuarina stricta</i>	BEEFWOOD	L
<i>Catalpa speciosa</i>	WESTERN CATALPA	L
<i>Cedrela sinensis</i>	CEDRELA	M
<i>Cedrus atlantica</i>	ATLAS CEDAR	L
<i>Cedrus deodara</i>	DEODAR CEDAR	M
<i>Celtis australis</i>	EUROPEAN HACKBERRY	M
<i>Celtis occidentalis</i>	COMMON HACKBERRY	M
<i>Celtis reticulata</i>	WESTERN HACKBERRY	H
<i>Celtis sinensis</i>	CHINESE HACKBERRY	M
<i>Celtis spp.</i>	HACKBERRY SPECIES	M
<i>Ceratonia siliqua</i>	CAROB	H
<i>Cercis occidentalis</i>	REDBUD	L
<i>Chamaecyparis lawsoniana</i>	PORT ORFORD CEDAR	L
<i>Chamaecyparis spp.</i>	FALSE CYPRESS SPECIES	L
<i>Chamaerops humilis</i>	MEDITERRANEAN FAN PALM	L
<i>Chilopsis linearis x Varalpa</i>	CHITALPA	M
<i>Chionanthus retusus</i>	CHINESE FRINGE TREE	M
<i>Chorisia speciosa</i>	SILK-FLOSS TREE	M
<i>Cinnamomum camphora</i>	CAMPHOR TREE	H
<i>Citrus limon</i>	LEMON	M
<i>Citrus sinensis</i>	ORANGE	M
<i>Citrus x paradisi</i>	GRAPEFRUIT	M
<i>Cocculus laurifolius</i>	LAUREL LEAF SNAIL SEED	M
<i>Cordyline australis</i>	DRACAENA	L
<i>Cornus spp.</i>	DOGWOOD	L
<i>Cotinus coggygia</i>	SMOKE TREE	L
<i>Crataegus laevigata</i>	HAWTHORN	M
<i>Crinodendron patagua</i>	LILLY OF THE VALLEY TREE	L
<i>Cryptomeria japonica</i>	JAPANESE CEDAR	L
<i>Cupaniopsis anacardioides</i>	CARROTWOOD	H
<i>Cupressocyparis leylandii</i>	LEYLAND CYPRESS	L
<i>Cupressus forbesii</i>	TECATE CYPRESS	L
<i>Cupressus glabra</i>	ARIZONA CYPRESS	L
<i>Cupressus macrocarpa</i>	MONTEREY CYPRESS	L
<i>Cupressus nevadensis</i>	CYPRESS	L
<i>Cupressus sempervirens</i>	ITALIAN CYPRESS	L
<i>Cupressus spp.</i>	CYPRESS SPECIES	L

Species	Common Name	Trim Cycle
<i>Cycas revoluta</i>	SAGO PALM	L
<i>Diospyros kaki</i>	PERSIMMON	L
<i>Dodonaea viscosa</i>	HOPSEED	M
<i>Dracaena draco</i>	DRAGON TREE	L
<i>Elaeagnus augustifolia</i>	RUSSIAN OLIVE	H
<i>Eriobotrya deflexa</i>	BRONZE LOQUAT	M
<i>Eriobotrya japonica</i>	EDIBLE LOQUAT	M
<i>Erythea armata</i>	MEXICAN BLUE PALM	M
<i>Erythrina caffra</i>	KAFFIRBOOM CORAL TREE	H
<i>Erythrina coralloides</i>	NAKED CORAL TREE	H
<i>Erythrina crista-galli</i>	COCKSPUR CORAL TREE	M
<i>Erythrina spp.</i>	CORAL TREE SPECIES	H
<i>Eucalyptus amygdalina</i>	BLACK PEPPERMINT	M
<i>Eucalyptus calophylla</i>	MARRI	M
<i>Eucalyptus camaldulensis</i>	RED GUM	M
<i>Eucalyptus cinerea</i>	SILVER DOLLAR TREE	M
<i>Eucalyptus citriodora</i>	LEMON-SCENTED GUM	M
<i>Eucalyptus cladocalyx</i>	SUGAR GUM	H
<i>Eucalyptus creulata</i>	VICTORIAN SILVER GUM	M
<i>Eucalyptus erythrocorys</i>	RED-CAP GUM	M
<i>Eucalyptus ficifolia</i>	RED FLOWERING GUM	M
<i>Eucalyptus globulus</i>	BLUE GUM	H
<i>Eucalyptus intertexta</i>	GUM-BARKED COOLABAH	M
<i>Eucalyptus lansdowneana</i>	CRIMSON MALLEE BOX	M
<i>Eucalyptus lehmannii</i>	BUSHY YATE	M
<i>Eucalyptus leucoxylon</i>	WHITE IRONBARK	M
<i>Eucalyptus macrocarpa</i>	LG FRUIT RED FLOWERING GUM	M
<i>Eucalyptus maculata</i>	SPOTTED GUM	M
<i>Eucalyptus nicholii</i>	WILLOW-LEAVED PEPPERMINT	M
<i>Eucalyptus parvifolia</i>	SMALL-LEAVED GUM	M
<i>Eucalyptus platypus</i>	ROUND-LEAVED MOORT	M
<i>Eucalyptus polyanthemus</i>	SILVER DOLLAR GUM	M
<i>Eucalyptus robusta</i>	SWAMP MAHOGANY	H
<i>Eucalyptus rudis</i>	SWAMP GUM	M
<i>Eucalyptus sideroxylon</i>	RED IRONBARK	H
<i>Eucalyptus spp.</i>	EUCALYPTUS SPECIES	M
<i>Eucalyptus tereticornis</i>	SLATY GUM	M
<i>Eucalyptus torquata</i>	CORAL GUM	M
<i>Eucalyptus viminalis</i>	MANNA GUM	M
<i>Feijoa sellowiana</i>	PINEAPPLE GUAVA	M
<i>Ficus benjamina</i>	WEeping FIG	H
<i>Ficus carica</i>	EDIBLE FIG	M
<i>Ficus elastica</i>	RUBBER TREE	M
<i>Ficus lyrata</i>	FIDDLELEAF FIG	H
<i>Ficus macrophylla</i>	MORTON-BAY FIG	M
<i>Ficus microcarpa nitida</i>	INDIAN LAUREL FIG	H
<i>Ficus rubiginosa</i>	RUSTY-LEAF FIG	M
<i>Ficus spp.</i>	FIG SPECIES	M
<i>Fortunella margarita</i>	KUMQUAT	L
<i>Fraxinaus uhdei Tomlinson'</i>	TOMLINSON ASH	H
<i>Fraxinus holotricha Moraine</i>	MORaine ASH	M
<i>Fraxinus orgona</i>	OREGON ASH	H
<i>Fraxinus oxycarpa</i>	RAYWOOD ASH	M

Species	Common Name	Trim Cycle
<i>Fraxinus uhdei</i>	SHAMEL ASH	H
<i>Fraxinus velutina</i> 'glabra'	MODESTO ASH	M
<i>Fraxinus velutina</i>	ARIZONA ASH	M
<i>Geijera parviflora</i>	AUSTRALIAN WILLOW	M
<i>Ginkgo biloba</i>	MAIDENHAIR TREE	L
<i>Gleditsia triacanthos</i>	HONEY LOCUST	M
<i>Grevillea robusta</i>	SILK OAK	H
<i>Hakea suaviolens</i>	SWEET HAKEA	L
<i>Harpephyllum caffrum</i>	KAFFIR PLUM	M
<i>Heteromeles arbutifolia</i>	TOYON	L
<i>Hibiscus syriacus</i>	ROSE OF SHARON	L
<i>Hymenosporum flavum</i>	SWEETSHADE	M
<i>Ilex cornuta</i> 'Burfordii'	BURFORD HOLLY	H
<i>Ilex altaclarensis</i> Wilsonii	WILSON HOLLY	L
<i>Ilex</i> spp.	HOLLY SPECIES	L
<i>Jacaranda mimosifolia</i>	JACARANDA	M
<i>Juglans californica</i>	SO. CALIFORNIA BLACK WALNUT	M
<i>Juglans hindsii</i>	CALIFORNIA BLACK WALNUT	M
<i>Juglans nigra</i>	BLACK WALNUT	M
<i>Juglans regia</i>	ENGLISH WALNUT	M
<i>Juglans</i> spp.	WALNUT SPECIES	M
<i>Juniperus californica</i>	CALIFORNIA JUNIPER	L
<i>Juniperus chinensis</i> 'kaizuka'	HOLLYWOOD JUNIPER	L
<i>Juniperus chinensis</i>	CHINESE JUNIPER	L
<i>Juniperus monosperma</i>	JUNIPERUS MONOSPERMA	L
<i>Juniperus scopulorum</i>	COLORADO JUNIPER	L
<i>Juniperus</i> spp.	JUNIPER SPECIES	L
<i>Koelreuteria bipinnata</i>	CHINESE FLAME TREE	M
<i>Koelreuteria elegans</i>	FLAMEGOLD	M
<i>Koelreuteria paniculata</i>	GOLDENRAIN TREE	M
<i>Lagerstroemia indica</i>	CRAPE MYRTLE	L
<i>Lagunaria patersonii</i>	PRIMROSE TREE	L
<i>Laurus nobilis</i>	SWEET-BAY	M
<i>Leptospermum</i> spp.	TEA TREE	M
<i>Leptospermum laevigatum</i>	AUSTRALIAN TEA TREE	M
<i>Ligustrum japonicum</i>	JAPANESE PRIVET	M
<i>Ligustrum lucidum</i>	GLOSSY PRIVET	L
<i>Ligustrum ovalifolium</i>	CALIFORNIA PRIVET	M
<i>Liquidambar formosana</i>	CHINESE SWEETGUM	H
<i>Liquidambar styraciflua</i>	SWEETGUM	M
<i>Liriodendron tulipifera</i>	TULIP TREE	M
<i>Lithocarpus densiflorus</i>	TANBARK OAK	M
<i>Lithocarpus densiflorus</i>	TANBARK-OAK	M
<i>Livistona australis</i>	LIVISTONIA PALM	M
<i>Livistona chinensis</i>	CHINESE FOUNTAIN PALM	M
<i>Livistona</i> spp.	FAN PALM SPECIES	M
<i>Lyonothamnus floribundus</i> asp	FERN-LEAF CATALINA IRONWOOD	H
<i>Magnolia grandiflora</i>	SOUTHERN MAGNOLIA	L
<i>Magnolia sinensis</i>	CHINESE MAGNOLIA	L
<i>Magnolia stellata</i>	STAR MAGNOLIA	L
<i>Magnolia x soulangiana</i>	SAUCER MAGNOLIA	L
<i>Malus</i> spp.	CRABAPPLE	L
<i>Malus syvestris</i>	EDIBLE APPLE	M

<i>Species</i>	<i>Common Name</i>	<i>Trim Cycle</i>
Maytenus boaria	MAYTEN TREE	M
Melaleuca armillaris	DROOPING MELALEUCA	M
Melaleuca armillaris	DROOPING MELALEUCA	M
Melaleuca decussata	LILAC MELALEUCA	L
Melaleuca ericifolia	HEATHE MELALEUCA	L
Melaleuca linariifolia	FLAX-LEAF PAPERBARK	M
Melaleuca nesoplia	MELALEUCA	M
Melaleuca quinquenervia	CAJEPUT TREE	M
Melaleuca styphelioides	MELALEUCA	M
Melia azedarach	CHINABERRY	M
Metasequoia glyptostuoboides	DAWN REDWOOD	L
Metrosideros excelsus	NEW ZEALAND CHRISTMAS TREE	M
Metrosideros tomentosus	NEW ZEALAND CHRISTMAS TREE	M
Morus alba	WHITE MULBERRY	H
Morus rubra	RED MULBERRY	H
Myoporum laetum	MYOPORUM	L
Nerium oleander	OLEANDER	M
Nicotiana glauca	TREE TABACCO	L
Nyssa sylvatica	TUPELO	L
Olea euroaea	OLIVE	L
Olmediella betshclerana	GUATAMALAN HOLLY	M
Oxydendrum arboreum	SORREL TREE	M
Palm spp.	PALM SPECIES	M
Persea americana	AVOCADO	M
Persea borbonia	RED BAY	M
Persea indica	MADEIRA-BAY FIG	M
Phoenix canariensis	CANARY ISLAND DATE PALM	M
Phoenix dactylifera	DATE PALM	M
Phoenix reclinata	SENGAL PALM	M
Phoenix roebelenii	PYGMY DATE PALM	L
Photinia fraseri	PHOTINIA	M
Picea engelmannii	ENGELMAN SPRUCE	L
Picea pungens	COLORADO BLUE SPRUCE	L
Pinus attenuata	KNOBCONE PINE	L
Pinus brutia	MONDELL PINE	L
Pinus bungena	LACEBARK PINE	L
Pinus canariensis	CANARY ISLAND PINE	L
Pinus coulteri	COULTER PINE	L
Pinus edulis	PINON PINE	L
Pinus halepensis	ALEPPO PINE	M
Pinus muricata	BISHOP PINE	L
Pinus patula	JELECOTE PINE	L
Pinus pinaster	MARITIME PINE	L
Pinus pinea	ITALIAN STONE PINE	M
Pinus radiata	MONTERY PINE	M
Pinus spp.	PINE SPECIES	L
Pinus sylvestris	SCOTCH PINE	L
Pinus thunbergiana	JAPANESE BLACK PINE	L
Pinus torreyana	TORREY PINE	L
Pinusembroides	MEXICAN PINON PINE	L
Pistacia chinensis	CHINESE PISTACHE	M
Pittosporum crassifolium	PITTOSPORUM CRASSIFOLIUM	M
Pittosporum eugenioides	PITTOSPORUM EUGENIOIDES	M

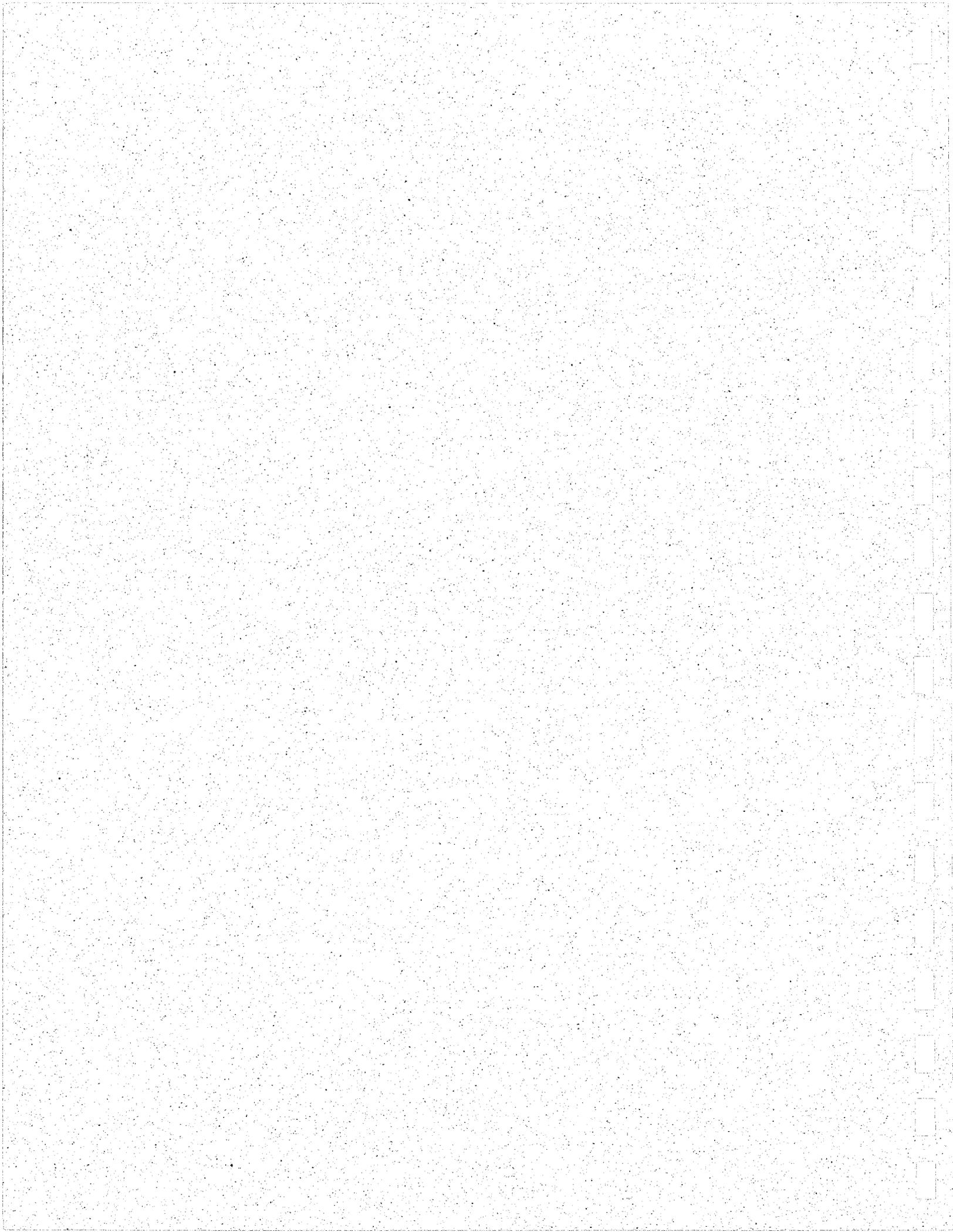
Species	Common Name	Trim Cycle
<i>Pittosporum phillyraeoides</i>	WILLOW PITTOSPORUM	M
<i>Pittosporum rhombifolium</i>	QUEENSLAND PITTOSPORUM	M
<i>Pittosporum tobira</i>	MOCK ORANGE	L
<i>Pittosporum undulatum</i>	VICTORIAN BOX	L
<i>Pittosporum viridiflorum</i>	CAPE PITTOSPRUM	M
<i>Platanus acerifolia</i>	LONDON PLANE	M
<i>Platanus racemosa</i>	WESTERN SYCAMORE	M
<i>Platyclusus orientalis</i>	ORIENTAL ARBORVITAE	L
<i>Podocarpus gracilior</i>	FERN PINE	M
<i>Podocarpus macrophyllus</i>	YEW PINE	L
<i>Podocarpus spp.</i>	FALSE PINE SPECIES	M
<i>Populus alba</i>	WHITE POPLAR	M
<i>Populus canadensis</i>	CAROLINA POPLAR	H
<i>Populus nigra 'Italica'</i>	LOMBARDY POPLAR	M
<i>Populus trichocarpa</i>	BLACK COTTONWOOD	H
<i>Prunus amygdalus</i>	ALMOND	M
<i>Prunus armeniaca</i>	APRICOT	M
<i>Prunus bliriana</i>	FLOWERING PLUM	M
<i>Prunus caroliniana</i>	CAROLINA LAUREL CHERRY	M
<i>Prunus cerasifera</i>	PURPLE-LEAF PLUM	M
<i>Prunus domestica</i>	PLUM	M
<i>Prunus ilicifolia</i>	HOLLYLEAF CHERRY	M
<i>Prunus lyonii</i>	CATALINA CHERRY	M
<i>Prunus persica</i>	PEACH	M
<i>Prunus serrulata</i>	JAPANESE FLOWERING CHERRY	M
<i>Prunus spp.</i>	STONE FRUIT SPECIES	M
<i>Prunus yedoensis</i>	AKEBONO FLOWERING CHERRY	M
<i>Pseudotsuga menziesii</i>	DOUGLAS FIR	L
<i>Pterocarya stenoptera</i>	CHINESE WINGNUT	M
<i>Punica granatum</i>	POMEGRANATE	M
<i>Pyrus calleryana</i>	ORNAMENTAL PEAR	L
<i>Pyrus kawakamii</i>	EVERGREEN PEAR	M
<i>Quercus agrifolia</i>	LIVE OAK	M
<i>Quercus borealis</i>	RED OAK	L
<i>Quercus chrysolepis</i>	MAUL OAK	L
<i>Quercus engelmannii</i>	MESA OAK	L
<i>Quercus ilex</i>	HOLLY OAK	M
<i>Quercus kelloggii</i>	CALIFORNIA BLACK OAK	L
<i>Quercus lobata</i>	VALLEY OAK	L
<i>Quercus spp.</i>	OAK SPECIES	M
<i>Quercus suber</i>	CORK OAK	M
<i>Quercus virginiana</i>	SOUTHERN LIVE OAK	L
<i>Quillaja saponaria</i>	SOAPBARK TREE	M
<i>Rhamnus alaternus</i>	ITALIAN BUCKTHORN	M
<i>Rhus lancea</i>	AFRICAN SUMAC	M
<i>Rhus ovata</i>	SUGAR BUSH	M
<i>Robinia pseudoacacia</i>	BLACK LOCUST	M
<i>Salix babylonica</i>	WEeping WILLOW	H
<i>Salix discolor</i>	PUSSY WILLOW	H
<i>Salix gooddingii</i>	BLACK WILLOW	H
<i>Salix matsudana 'Tortuosa'</i>	TWISTED WILLOW	H
<i>Salix spp.</i>	WILLOW	H
<i>Sambucus mexicana</i>	MEXICAN ELDERBERRY	M

<i>Species</i>	<i>Common Name</i>	<i>Trim Cycle</i>
<i>Sambucus neomexicana</i>	ELDERBERRY	H
<i>Sapium sebiferum</i>	CHINESE TALLOWTREE	M
<i>Schinus molle</i>	CALIFORNIA PEPPER	H
<i>Schinus polygamus</i>	PERUVIAN PEPPER TREE	H
<i>Schinus terebinthifolius</i>	BRAZILIAN PEPPER	H
<i>Sequoia sempervirens</i>	COAST REDWOOD	L
<i>Sequoiadendron giganteum</i>	GIANT SEQUOIA	L
<i>Solanum rantonnetii</i>	NIGHTSHADE	M
<i>Sophora japonica</i>	JAPANESE PAGODA TREE	M
<i>Sorbus americana</i>	AMERICAN MOUNTAIN ASH	M
<i>Stenocarpus sinuatus</i>	FIREWHEEL TREE	M
<i>Strelitsia nicolai</i>	GIANT BIRD OF PARADISE	M
<i>Syzygium paniculata</i>	BRUSH CHERRY	L
<i>Tabebuia avellandae</i>	LAVENDER BLOOM	L
<i>Tabebuia chrysotricha</i>	GOLDEN TRUMPET TREE	L
<i>Tamarix spp.</i>	TAMARISK	L
<i>Taxodium mucronatum</i>	MONTEZUMA CYPRESS	L
<i>Taxus baccata</i>	IRISH YEW	L
<i>Thevetia peruviana</i>	YELLOW OLEANDER	L
<i>Thuja occidentalis</i>	AMERICAN ARBORVITAE	L
<i>Thuja plicata</i>	WESTERN RED CEDAR	L
<i>Tilia spp.</i>	LINDEN	M
<i>Tipuana tipu</i>	TIPU	M
<i>Trachycarpus fortunei</i>	WINDMILL PALM	L
<i>Tristania conferta</i>	BRISBANE BOX	M
<i>Tristania laurina</i>	TRISTANIA LAURINA	M
<i>Tupidanthus calyptratus</i>	TUPIDANTHUS	L
<i>Ulmus americana</i>	AMERICAN ELM	H
<i>Ulmus capestris</i>	ENGLISH ELM	H
<i>Ulmus parvifolia</i>	CHINESE ELM	H
<i>Ulmus pumila</i>	SIBERIAN ELM	H
<i>Ulmus spp.</i>	ELM SPECIES	H
<i>Umbellularia californica</i>	CALIFORNIA BAY	M
<i>Valliandra tweedii</i>	TRINIDAD FLAME BUSH	M
<i>Vhaneaeyparis funebris</i>	MOURNING CYPRESS	L
<i>Viburnum japonicum</i>	JAPANESE VIBURNUM	M
<i>Vitex lucens</i>	NEW ZEALAND CHASTE TREE	M
<i>Washingtonia filifera</i>	CALIFORNIA FAN PALM	M
<i>Washingtonia robusta</i>	MEXICAN FAN PALM	M
<i>Xylosma congestum</i>	XYLOSMA	H
<i>Yucca aloifolia</i>	SPANISH BAYONET	L
<i>Yucca gloriosa</i>	SPANISH DAGGER	M
<i>Yucca recurvifolia</i>	YUCCA RECURVIFOLIA	L
<i>Zelkova serrata</i>	SAWTOOTH ZELKOVA	L

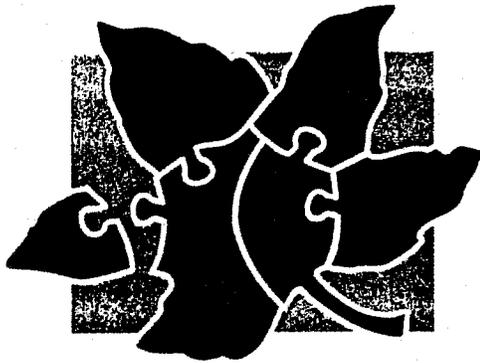
Credit:

Golden Coast Environmental Services, Inc., Irvine, CA
Barrie D. Coate, Horticultural Consultant, Los Gatos, CA

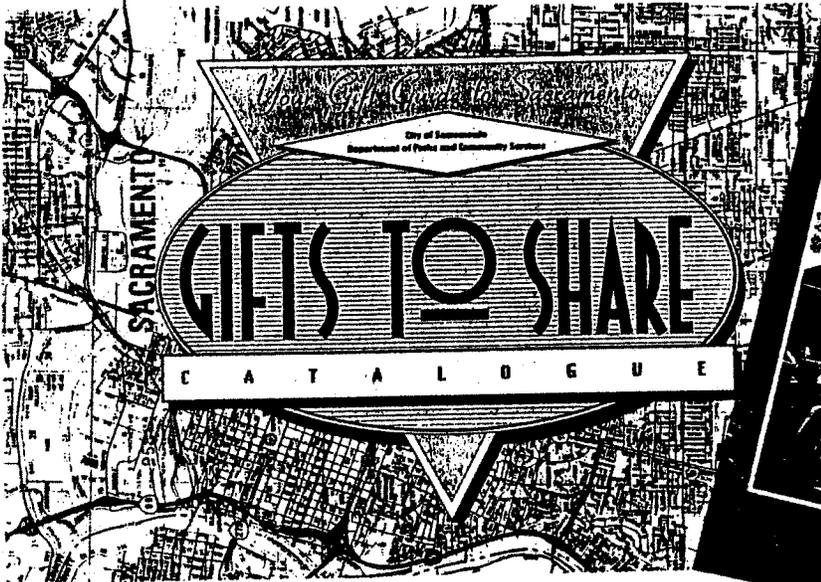
Appendix 10: Sacramento Public Information Brochure



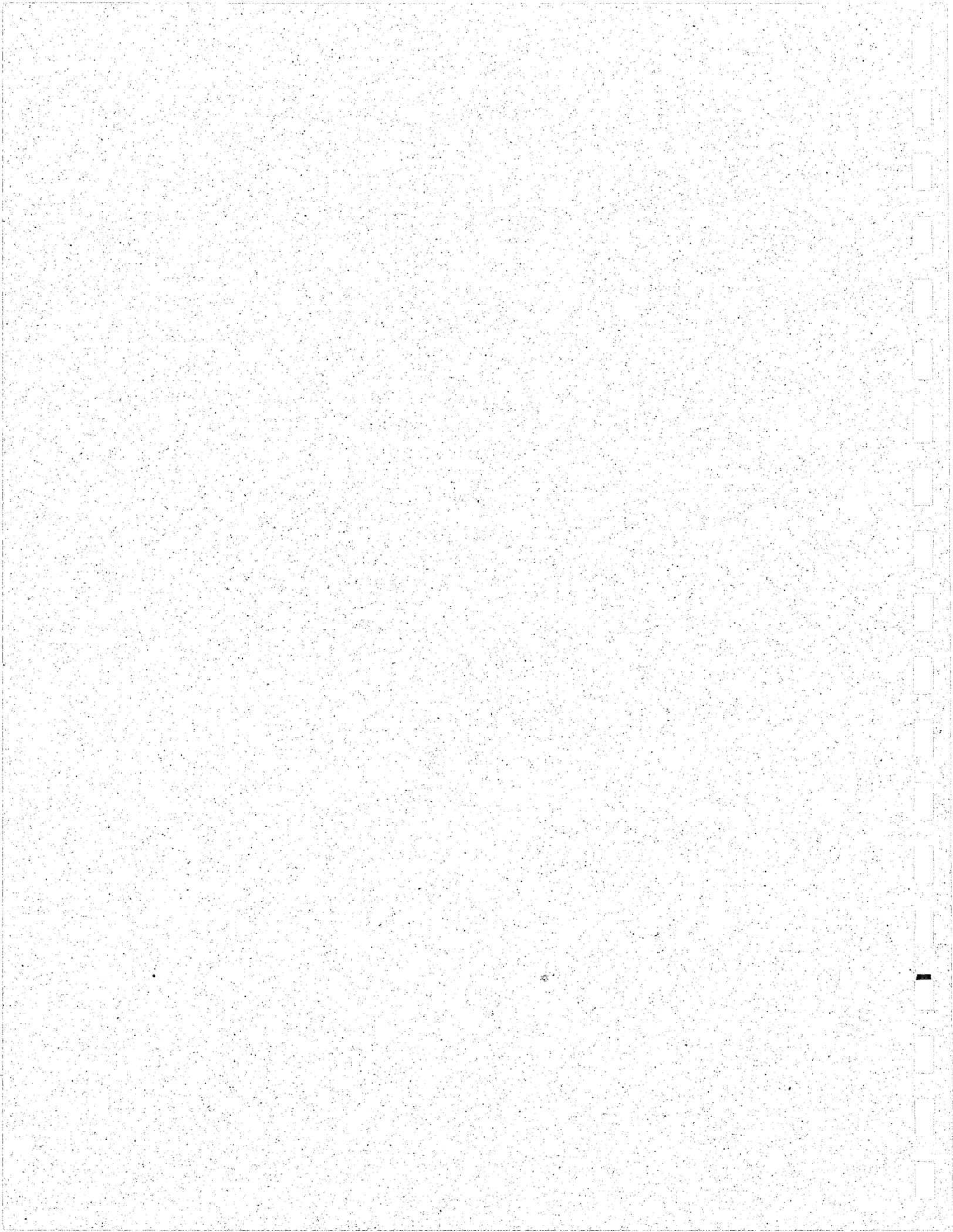
What your tree wishes you knew.



NEIGHBORHOOD
SELF-HELP
STREET TREE
PROGRAM



Appendix 11: Design Analysis of Existing Plans



DESIGN ANALYSIS OF EXISTING PLANS

Analysis of these plans shows that the design standards emphasize low maintenance and water conservation. Recommendations include medians designs of concrete or textured paving with tree cutouts or shrub screens. The use of turf is discouraged. Highly visible areas such as gateways, intersections and commercial areas are not recognized with special treatments. Median landscape design does not emphasize adjacent land uses or the hierarchy of streets.

Design Review Guidelines

In the Design Review Guidelines, the landscape section includes recommendations for new construction and renovations. Specific recommendations include:

- retention of existing trees where possible
- setbacks from property lines for landscaping
- incorporation of plant material into projects
- screening of shearwalls, trash enclosures, etc. with plant material
- shading of parking lots
- landscaping of planter strips
- berming to screen parking

The guidelines are general as related to landscaping and simply advise property owners to incorporate landscaping into their projects. There are no standards or specific design recommendations given.

Sacramento Urban Design Plan Street Guidelines

The Sacramento Urban Design Plan Street Guidelines establishes design guidelines for the streetscape within the Central Business District (CBD). Key elements include:

- identification of main streets and gateways within the CBD
- prescribed design treatments of the major streets
- special treatment of key intersections and entries
- details of materials and street furniture to be

used throughout the planning area

- financial mechanisms to implement the plans
- a street tree planting program for the major streets

This plan is an excellent planning tool for the CBD in its establishment of general design guidelines without make specific recommendations.

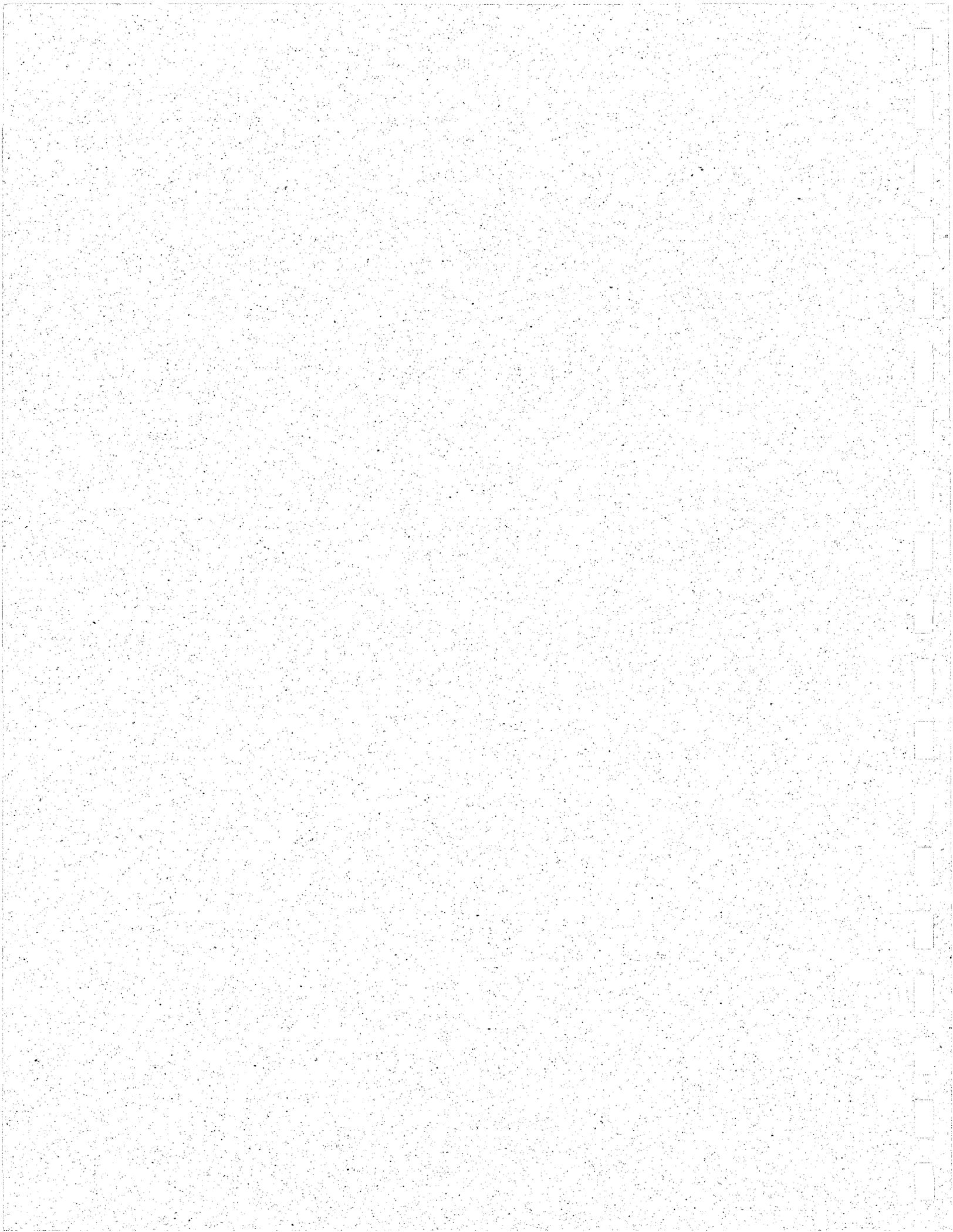
The Sacramento General Plan is a guide for the growth of the City. Within the document are sections on circulation, housing, commerce, and general land use that help establish the system of arterials and neighborhoods that are part of the Urban Forest Management Plan. The plan does not address issues of landscaping and/or trees within the City. The community plans for the districts of Sacramento identify neighborhood issues and long range plans for these regions. Several of the plans comment on the existing landscape character of their area and have long range goals related to that character, but generally do not establish specific policies or designs to achieve these goals.

Parking Lot Tree Shading Ordinance

The Parking Lot Tree Shading Ordinance requires that trees be planted to ensure 50% coverage of all surface lots fifteen years after installation. In addition, developers are required to provide landscape strips adjacent to public roads. The City also has established a plant list of recommended species to insure specimens that are well adapted to Sacramento's climate. This ordinance insures that new developments in Sacramento will continue to promote the tree filled landscape that is a signature of the City.

Each of the above ordinances and programs has helped establish Sacramento's reputation as the "City of Trees," but none addresses the comprehensive issue of maintaining and expanding the urban forest within Sacramento. The following design recommendations present methods for future planning and enhancing existing areas while complementing past plans.

Appendix 12: Lighting & Landscape Overview



OVERVIEW OF THE 1972 LIGHTING AND LANDSCAPE DISTRICT ACT

PURPOSE(S) OF THE ACT

The Landscaping and Lighting Act of 1972 allows local public agencies to raise funds for installing, maintaining and servicing public landscaping and lighting facilities. The revenue to pay for these improvements comes from the collection of special assessments on the land benefiting from the improvements. The local legislative body sets the assessment each year after a public hearing and collects the assessment as a separately-stated item on the county tax bill. The determination is subject to a majority protest from the electorate.

DEFINING THE IMPROVEMENTS

The Act can be used to acquire land for park, recreational or open-space purposes including on-going maintenance of facilities.

TYPES OF FACILITIES

Landscaping (trees, shrubs, grass or other ornamental vegetation), may be installed, maintained and serviced. Appurtenant facilities may also be installed, maintained and serviced. These include, among others, curbs, gutters, walls, sidewalks or paving and irrigation and drainage facilities.

SETTING THE BOUNDARIES

The assessment district does not have to be contiguous. The boundaries of the assessment district should include all land specially benefited by the improvement(s). Recent court decisions suggest that the benefits should be equally shared through the district. Differing levels of benefit can be established through additional sub-district designation and charges assessed appropriately.

DETERMINING BENEFIT

The 1972 Act contains no formula for determining whether land benefits from the improvement, or to what degree. The assessment "may be apportioned by any formula or method which fairly distributes the net amount among all assessable lots or parcels in proportion to the

estimated benefits to be received by each such lot or parcel from the improvements".

PAYING THE BILLS

Improvements installed or maintained under the 1972 Act, must be paid for on a "pay-as-you-go" basis, with capital improvement installments limited to five years, or through the issuance of bonds or notes.

