City of Carlsbad

COMMUNITY FOREST MANAGEMENT PLAN

SEPTEMBER 2019

West Coast Arborists, Inc.
Anaheim, California

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City of Carlsbad

1: INTRODUCTION

HISTORY AND BACKGROUND

Located on the mild and refreshing coastline of Southern California, the City of Carlsbad has the good fortune of an ideal climate and a wide variety of soil types for growing outstanding specimens of long-lived trees in the urban environment. The city has long valued its trees, both in the agricultural setting and in its city streets, parks, and in residential areas. The value of its trees has been passed down from generations past and continues to this day.

A community is known by the people who live in it and treasure its past, who care for it at present for the benefit of all, and who lead and educate others to ensure that its residents can prosper in the future.

An integral part of a well-planned, safe, and comfortable city is its community forest. The benefits of trees are well known, and even today science continues to shed light on still more health and environmental factors directly influenced by a rich and diverse forest (Appendix A). Trees can have all of the following positive effects:

- Beautify the community
- Clean the air
- Produce oxygen
- Enhance ecosystems
- Provide habitat for wildlife
- Moderate outdoor/indoor temperatures
- Cut heating/cooling costs
- Reduce erosion of top soil by wind/rain
- Increase property values
- Enhance economic vitality of businesses

In the urban environment trees are vitally important to the well-being of the community. The city that manages its trees per industry standards and best management practices provides a great service to the public. Therefore, the value of the community forest to the City of Carlsbad cannot be overemphasized.

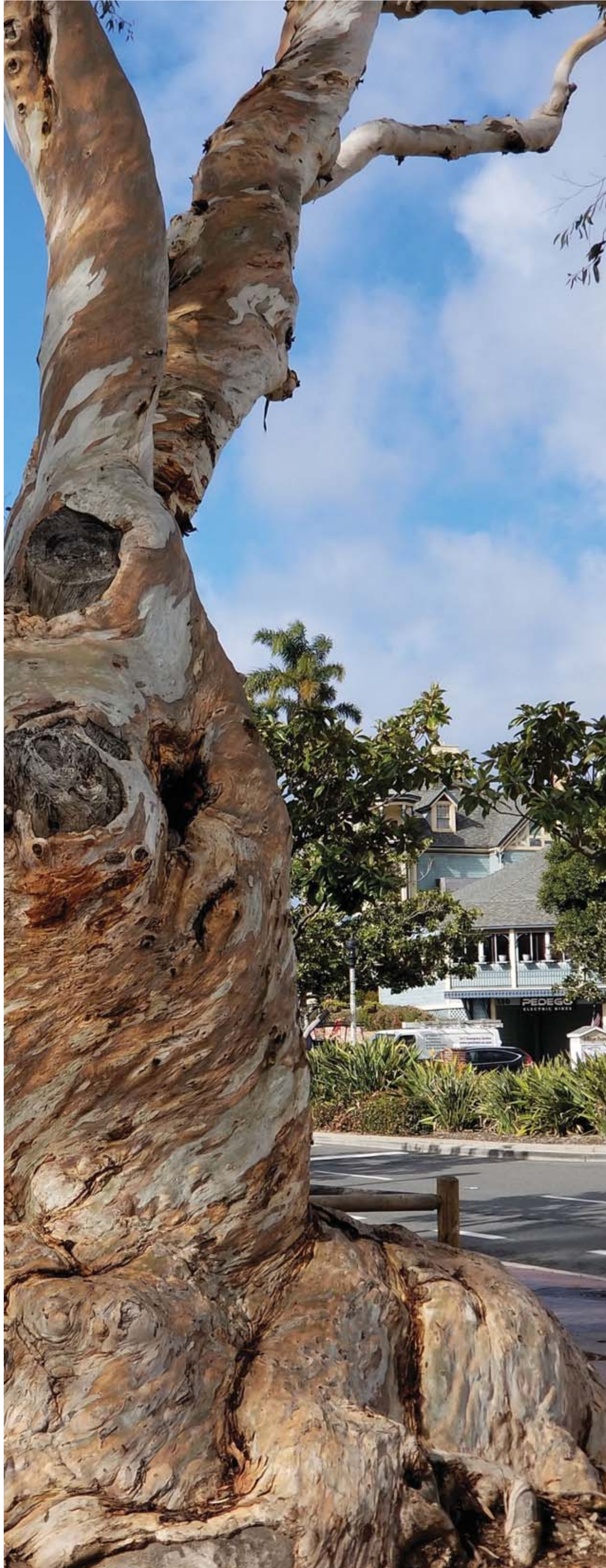
In September 2018, the City Council authorized staff to update the Carlsbad Community Forest Management Plan (CCFMP). The original CCFMP, adopted by the City Council in April 2003, provided a framework and backbone for long term forest planning. As the community grows over time, as best practices and standards evolve, and as science clarifies and informs us, so too must the CCMFP be refined to incorporate gained experience and wisdom.

The authorization to update the CCFMP has given the city a chance to include key components of forest management that have developed in the industry in the interim. One such component is the new *Tree Care for Birds & Other Wildlife Best Management Practices in California* document that was published in February 2018. In this manual, authors Kara Donohue, Ryan Gilpin and Corey Bassett, detail ways to minimize impacts to wildlife in the community and manage wildlife habitat. Another key component is the community green waste, wood, and tree recycling programs that help the communities reduce carbon emissions and be better stewards of the environment. Likewise, incorporating the city's Integrated Pest Management Plan brings current this update to the CCFMP for managing trees in public areas. These and other new components bring invaluable information to assist the community in managing the forest in an environmentally conscientious manner.

This updated CCFMP achieves multiple benefits, including illustrating consistency with the City of Carlsbad Community Vision; alignment with the Carlsbad City Council Policy and the Carlsbad Municipal Code sections on street trees; consideration of the City of Carlsbad's Ordinances on Water Conservation in practical community forest management; finalization of a program that identifies and protects heritage trees where practicable; and maximization of the vitality of the community forest through management guidelines and tools that enhance and preserve the city's tree inventory.

CITY VISION AND THE COMMUNITY FOREST

It is vitally important that a community's vision, policies, and regulations develop over time into a cohesive and unified structure to provide lasting guidance for its residents. The CCFMP is one link in



that structure. A goal of this updated CCFMP is to ensure that it relates back to the City of Carlsbad Community Vision and Values and is in alignment with guidelines in other city plans such as the Carlsbad Landscape Manual and the Carlsbad Village and Barrio Master Plan (CVBMP). The Chapter 4 subsection on the CVBMP goes into greater detail how the updated CCFMP aligns with the CVBMP.

In keeping with this unification theme and in support of the City of Carlsbad Community Vision and Values, the updated CCFMP also refers to the Carlsbad Municipal Code, is consistent with the Carlsbad Landscape Manual, and is complementary to the Carlsbad Climate Action Plan. In so doing, the intent of beautifying the city with trees and creating a more inviting community is addressed while improving the environment. The public is encouraged to continue to support the enhancement and preservation of the community forest.

COUNCIL STREET TREE POLICY, MUNICIPAL CODE, AND WATER CONSERVATION REGULATIONS

The City of Carlsbad Council Policy Statement No. 4 on street trees ensures the preservation, proper maintenance, and continued enhancement of public trees. Each of the five policies outlined in City Council Policy Statement No. 4 establish specific goals to enhance the community. As part of the tree planting section, the CCFMP sets forth standards of planting, removal, replacement, maintenance, and preservation of city street trees. It also calls for the CCFMP to target reforestation areas in the community. A complete picture of the forest management requirements is obtained by utilizing data from the most current inventory data collection. This CCFMP update incorporates this tree data, aligns it with the City Council Policy Statement on Street Trees (Appendix C) and Carlsbad Municipal Code Chapter 11.12 – Trees and Shrubs (Appendix D), as well as Carlsbad Municipal Ordinances on Water Conservation (Appendix E), and describes the practical terms of community forest management in Chapters 3, 4 and 6.

GOALS OF THE COMMUNITY FOREST MANAGEMENT PROGRAM

With so many new factors to consider such as climate change, the movement of invasive pests, as well as changing laws and regulations, this updated CCFMP is an opportunity to refresh the goals and strategies that are needed to guide the city in managing the community forest trees now and in the future. The current community forest goals are listed in three steps on the right, along with the associated strategies to implement.

COMMUNITY FOREST BENEFITS AND MANAGEMENT

The practice of tree care has changed considerably over the years as technology has improved. Better tools are developed for field and office staff, and the public becomes aware of the benefits of having the right tree in the right place. Too often in the past what was thought to be an acceptable practice of tree care later was found to cause harm to trees, would diminish the benefits given to the community, or would alter the local environment for years.

Much has been learned in the industry in the last sixteen years. By learning from past tree care mistakes communities have found that often the practice of “less is better” is the way of the future. Less chemicals applied, less watering in the cool periods of the year, and less live material pruned from trees can all have significant effects on trees, on the environment, and in the community. With sustainability becoming ever more important in our

daily lives, as well as being a core value of the city's vision, it is critical that the CCFMP take into consideration sustainable practices to maximize tree benefits.

To have a sustainable program that is effective over a long period of time, achievable management goals are necessary. Each chapter in the CCFMP update relates to the City of Carlsbad's Community Vision and Values, but also speaks to applicable community forest management goals. By meeting the management goals, the community can see the value of the forest program first hand.

In the right growing situation, select trees in the community can outlive many residents, providing benefits that span generations. Numerous examples of well-placed trees in the community have grown to obtain heritage tree status and continue to thrive. A stroll through the urban forest areas such as Hosp Grove can make our mind wander and perhaps give us a sense of tranquility. Such communing with nature reminds all of us of the importance of trees. In addition to the well-known environmental, economic, and communal benefits that trees provide, we are only scratching the surface of the bark when it comes to the all the societal benefits. Having a well-conceived and unified CCFMP ensures that trees will continue to live on and inspire hope and creativity in residents for many generations to come.

COMMUNITY FOREST MANAGEMENT PROGRAM - GOALS & STRATEGIES

1. Promote citywide tree preservation and community education about the community forest and sustainability.
    A. Maintain the Tree City USA designation in perpetuity.
    B. Encourage residents to participate in city tree planting events held on occasions such as Earth Day, Arbor Day and National Public Lands Day. Such events typically include collaboration with staff from the Communications and Environmental Management Divisions to further assist in promoting quality tree care in the community.
    C. Showcase specimen trees or heritage trees on the city's website and on social media throughout the year to generate interest in the diversity and significance of trees.
2. Expand the community forest in areas with lesser tree canopy density and maximize its benefits.
    A. Add an average of 500 trees per year to the city's tree inventory or affect an increase in Carlsbad's Total Tree Canopy by 5% (whichever occurs first) through the end of calendar year 2025, so as to further enhance the community forest.
    B. Plant two inventoried trees for every one inventoried tree removed, to ensure the longevity of the community forest. Only one each of those planted trees shall count toward the addition of an average of 500 trees per year to the city's tree inventory.
    C. A concentrated effort will be made to install new trees in sparsely forested areas in Hosp Grove that lack shade canopy.
3. Manage an estimated 43,000 City of Carlsbad-owned/ controlled trees using industry standards and best management practices.
    A. Continuously review the condition and recommended maintenance of the city's community forest and look for opportunities to improve health.
    B. Utilize best management practices and industry standards when all work is performed on city trees.
    C. Continuously train staff on new technology and scientific discoveries to ensure the most up-to-date information is in the hands of tree care professionals.

2: TREE CITY USA

COMMUNITY OUTREACH AND EDUCATION

Trees have long had an essential role in unifying communities and making them habitable for their residents. As they take root and become lasting figures on the landscape, people of all ages take note and can mark the passage of time by the size of their favorite tree. A child that plants a tree can grow up taking pride in the good deed they did for their city and pass on that civic pride by educating the next generation. We see examples throughout world history of teachers educating their students while sitting on logs in the shade of majestic trees, an ideal environment to inspire others and awaken their imagination.

In the previous CCFMP of 2003, it was noted that the city would soon become what is called a Tree City USA. This designation is given to cities who celebrate the importance of urban tree canopy through educational activities, have an annual budget for community forestry, and improve tree care in the community through its ordinances and tree committees. With the help of staff and community members, the City of Carlsbad became a Tree City USA in 2004 and has maintained that designation continuously since then.

By having an annual Arbor Day outreach event that educates the public on the benefits of trees and by planting trees in areas that will benefit the public, the tradition of caring for the community forest grows and becomes an integral part of its character and connectedness - which is tied to one of the City of Carlsbad's Community Values. In addition, planting trees enhances the natural environment - which is tied to another Community Value. The planting of trees also provides health benefits, and may lead to participation in active lifestyles - which is a third tie to a Community Value. The City of Carlsbad now has a goal of continuing as a Tree City USA in perpetuity. Through the help of public outreach and citywide events, the population will have the opportunity to be actively involved as advocates for the community forest. In so doing, the City of Carlsbad will likely continue to be a Tree City USA for many years to come.

3: STREET TREES

OVERVIEW AND PURPOSE

An important desire of the residents of the City of Carlsbad is to maintain and enhance a healthy lifestyle in the community. One way to improve human health, quality of life, increased mobility, and physical connectivity in neighborhoods is to ensure pedestrian-friendly transportation corridors are lined with a diverse mix of approved city-maintained street trees. Besides capturing greenhouse gases and particulates in the air, tree-lined streets are aesthetically pleasing and inviting to residents and tourists alike. Tree lined streets also encourage outdoor activities, which the public values highly.

By having an approved street tree species list, staff can respond to the needs of the community. The list in this updated CCFMP has multiple purposes beyond improving pedestrian access and human health. It contains no tree species categorized as 'invasive', within the current inventory of the California Invasive Plant Council.

While having many city trees is good for residents and businesses, if the tree population lacks diversity, a large percentage of the community forest can be damaged in a short amount of time by environmental effects or invasive pests and diseases, thereby harming a valuable city investment and requiring a large capital project to replace the lost trees.

The factors considered in the creation of the updated street tree species list include:

1. Previous street tree species replacement list and current species diversity in the community forest.
2. Carlsbad Municipal Ordinances No. 43, 44, and 46, related to water conservation/irrigation.
3. Carlsbad Municipal Code Chapter 11.12, Trees and Shrubs, specific to Section 11.12.040 and referenced ordinances.
4. City of Carlsbad Council Policy Statement No. 4 Street Trees
5. City of Carlsbad Heritage Tree Report, Phase I, Historic Village District Tree Report specific to recommendations.
6. City of Carlsbad Landscape Manual.
7. City of Carlsbad Village and Barrio Master Plan.
8. City of Carlsbad Local Coastal Program.
9. California Coastal Commission's requirement to plant non-invasive and drought tolerant trees in the Village and Barrio areas.
10. Species diversity recommendation in the original CCFMP.

CURRENT TREE INVENTORY

A wide variety of trees and plants may be grown in the City of Carlsbad, thanks to a mild climate and good soil. The diversity is best expressed in the make-up of the tree inventory. As a part of updating this management plan the tree inventory was re-evaluated and updated to ensure its accuracy. Carlsbad's tree inventory has a total gross estimated value (GEV) of $67.6 million Gross estimated value is derived from formulas used in the Guide for Plant Appraisal, 9th Edition, by the Council of Tree & Landscape Appraisers, and from species ratings taken from the *Species Classification & Group Assignment,* WC-ISA 2004). The inventory shows 28,066 total city-managed trees with 18,264 of them being street trees (valued at $41.5 million) many of which are well-suited in this environment.

The city manages these trees under the guiding principle of species population diversity to ensure that no single species represents more than 10 percent of the total tree population. The current greatest single species, is just under 7% of the inventory, with others in the city's top ten ranging from 2.6% to 6.1%.

COMMUNITY FOREST EXPANSION

The City of Carlsbad can have a profound effect on the quality of life and human health for future generations by planting sites with long-lived trees. Urban trees act as a sink for carbon dioxide and have a net positive effect on ecosystems and quality of life. They influence local air temperature by reducing the heat island effect, help reduce building energy use, and increase property values.

Given the expressed priority of residents to enhance the quality of life through the protection and restoration of the natural and man-made environments, the Parks & Recreation Department identifies locations for new tree plantings as resources and site conditions allow. Residents may also request new street tree plantings by contacting Parks & Recreation staff.

The standards currently in place for street tree planting ensure that trees are planted to perpetuate the forest. It is a stated provision of City Council Policy Statement No. 4—Street Trees and Carlsbad Municipal Code Chapter 11.12—Trees and Shrubs to replace all removed street trees within forty-five days of their removal, presuming site specifications are met. All replacement street trees are to be selected from approved street tree species list below.

The Parks & Recreation Department will now have a goal of planting two street trees for every one tree removed. This goal is important in two ways. In the first way, the first tree planted acts as the replacement for the tree which previously had been a carbon sequester for the city. The second street tree, provides, at a minimum, a back-up for the first tree in the event it does not survive. Most likely, both trees will survive and flourish, thereby potentially having a net positive effect on greenhouse gas reduction once the trees mature.

The second way this goal is important is that, for the community forest to be enhanced for quality of life and not just maintained, the 2:1 ratio as described increases the forest tree count overall. The additional tree in this equation does not necessarily need to be installed at the same location. The city then has an effective tool to better manage overall tree canopy coverage and be able to fill in lesser density areas faster with such a goal in place.

STREET TREE SPECIES LIST

The updated street tree species list on page XX includes drought tolerant tree species, and tree species that offer documented habitat and environmental value, (refer to the Urban Forest Ecosystems Institute website, SelecTree selection guide at https://selectree.calpoly.edu/). Tree species were categorized by the planting site space availability (small up to 3'x3', medium up to 6'x6' and large, greater than 6'x6') and tree characteristics to ensure a wide variety of trees was used. Those characteristics include evergreen or deciduous, mature tree canopy height and width, growth rate and water requirements. This list is meant to serve the community for decades.

STREET TREE SELECTION AND THEME

At one time cities, planted entire blocks of streets with one species of tree. This style provided a uniform appearance, was aesthetically attractive, and in some ways simplified forest management. However, plant pathologists, certified arborists, and municipal planners have more recently concluded that the best approach to reforesting lesser density tree canopy areas is by varying species of trees rather than solid blocks of a single species. By having several species from which to choose on a given block, the urban forester can ensure that pests and diseases are less likely to infect large swaths of the forest and cause a strain on city resources via treatments or removals.

By viewing slightly larger geographical units of pruning zones as having a theme of several species,
then assigning a mix of trees within blocks matched to the planting site space available, when driven or walked the streets will still have a theme and appearance with recognizable trees for a given area but not be planned and planted in such a way where nuisance, environmental, hardscape, or insect/disease complications could arise. This is an important factor to consider for the greater sustainability effort in the city and the longevity of the community forest. Staff will track tree planting by species and zone to ensure proper diversity and to monitor species for viability as conditions change.

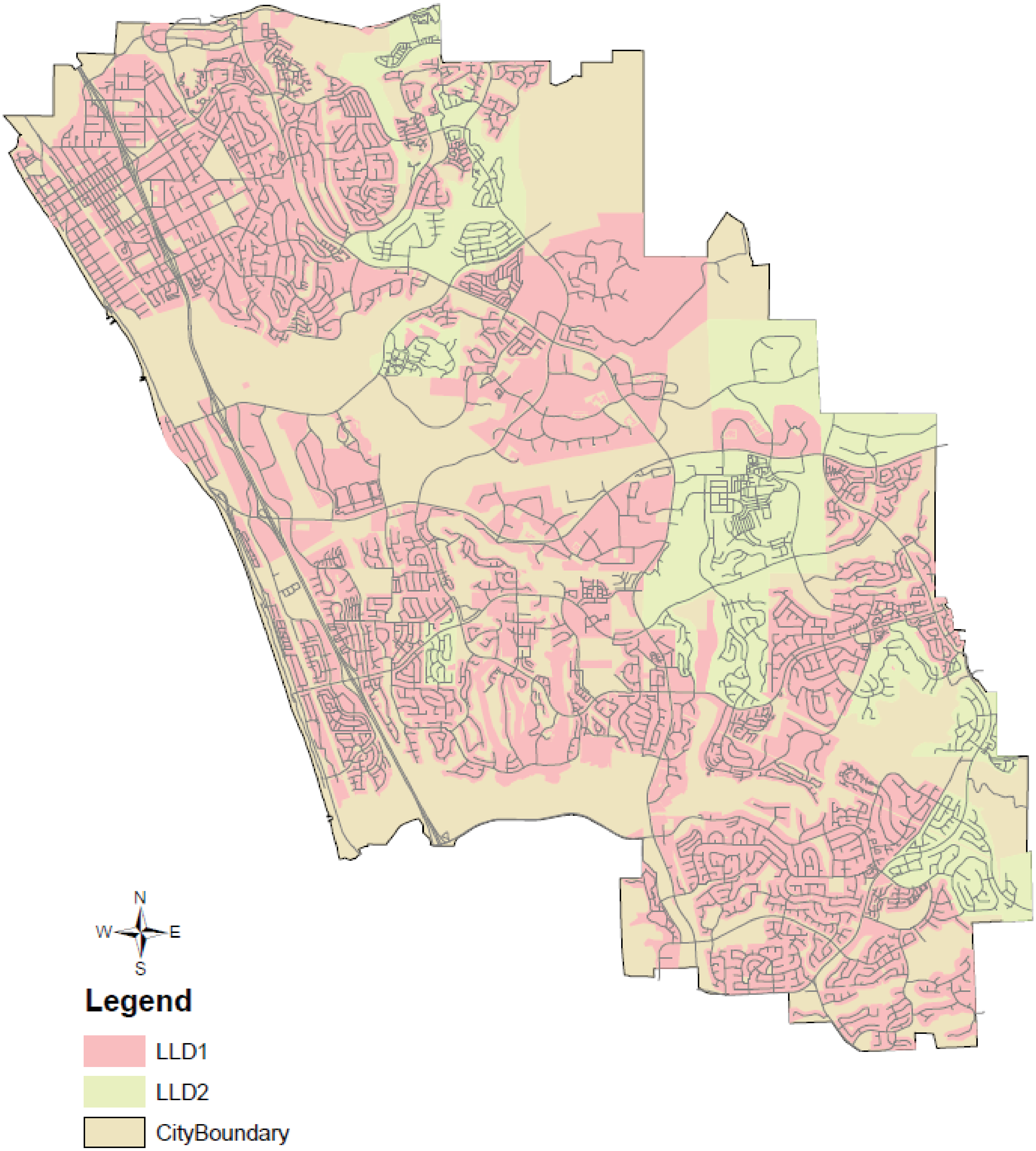
Included in the street tree species list are a group of trees that further meet the greater goal of sustainability for the City of Carlsbad. These tree species offer options at the end of their lives to be used as urban lumber or used as art in the landscape. Refer to Chapter 8, community Green Waste, Wood, and Tree Recycling Program, page XX, for the list.

STREET TREE ASSESSMENT DISTRICTS

The City of Carlsbad has two street tree assessment districts, which are components of Landscape and Lighting District (LLD) 1 and 2. All of LLD-1, and the city-maintained segments of LLD-2, are subdivided into management units called pruning zones. In this way, the city manages the larger community forest cohesively and responsibly with the allocated funds—which are derived from the levying of assessments on the individual property tax rolls. While the number of trees and species diversity levels vary from zone to zone, the same program methods apply to all city maintained street trees. These program methods are detailed in Chapter 4—Community Forest Operations. The public is therefore served with uniformity of street tree maintenance performed by the city.

Most developments within LLD2 have entered into Street Tree Maintenance Agreements with the City of Carlsbad, in lieu of the levying of assessments on the individual property tax rolls. These agreements require the city street trees within these developments to be maintained according city standards, in perpetuity. Typically, the Home Owners Association (HOA) or Property Owners Association (POA) assumes responsibility for the ongoing maintenance of the city street trees from the developer. The HOA or POA then hires licensed contractors to perform the street tree maintenance work, according to city standards. These street trees are to be proactively inspected by city staff to ensure compliance by the HOA or POA. Should the HOA or POA default on the maintenance agreement, the city has the right to levy assessments on the individual property tax rolls and assume the street tree maintenance responsibility.

CARLSBAD LANDSCAPE & LIGHTING DISTRICTS



STREET TREE SPECIES LIST - SMALL

Botanical Name	Common Name	Type	Height	Spread	Growth Rate	Water Use
Acer oblongum	Evergreen maple	Deciduous	20-25	20-25	Mod.	Mod.
Arbutus unedo 'Marina'	Marina' Strawberry tree	Evergreen	10-25	10-25	Slow	Low
Archontophoenix cunninghamiana	King palm	Evergreen	35-55	15-20	Mod.	Low
Brahea armata	Mexican blue palm	Evergreen	15-25	15-20	Mod.	Low
Brahea edulis	Guadalupe palm	Evergreen	15-25	10-15	Mod.	Low
Callistemon citrinus	Lemon bottlebrush	Evergreen	10-15	10-15	Mod.	Low
Cercis canadensis 'Forest Pansy'	Eastern Redbud	Deciduous	25-30	15-20	Mod.	Mod.
Chionanthus retusus	Chinese fringe tree	Semi	15-20	15-20	Slow	Mod.
Eriobotrya deflexa	Bronze Loquat	Evergreen	10-20	10-15	Fast	Mod.
Handroanthus chrysotricha	Golden Trumpet Tree	Deciduous	25-30	15-20	Mod.	Mod.
Howea forsteriana	Paradise Palm	Evergreen	50-60	15-20	Slow	Mod.
Lagerstroemia hybrids	Crape myrtle	Deciduous	15-25	10-20	Mod.	Mod.
Magnolia grandiflora 'Little Gem'	Magnolia 'Little gem'	Evergreen	10-20	10-15	Mod.	Mod.
Podocarpus henkelii	Long-leafed yellow wood	Evergreen	25-40	15-25	Slow	Mod.
Prunus cerasifera	Purple leaf plum 'Thundercloud'	Deciduous	15-20	15-20	Mod.	Mod.
Rhus lancea	African Sumac	Evergreen	15-30	15-30	Mod.	Low
Stenocarpus sinuatus	Firewheel tree	Evergreen	20-25	15-20	Slow	Mod.
Syagrus romanzoffianum	Queen palm	Evergreen	35-45	20-25	Mod.	Mod.

SMALL

STREET TREE SPECIES LIST - MEDIUM

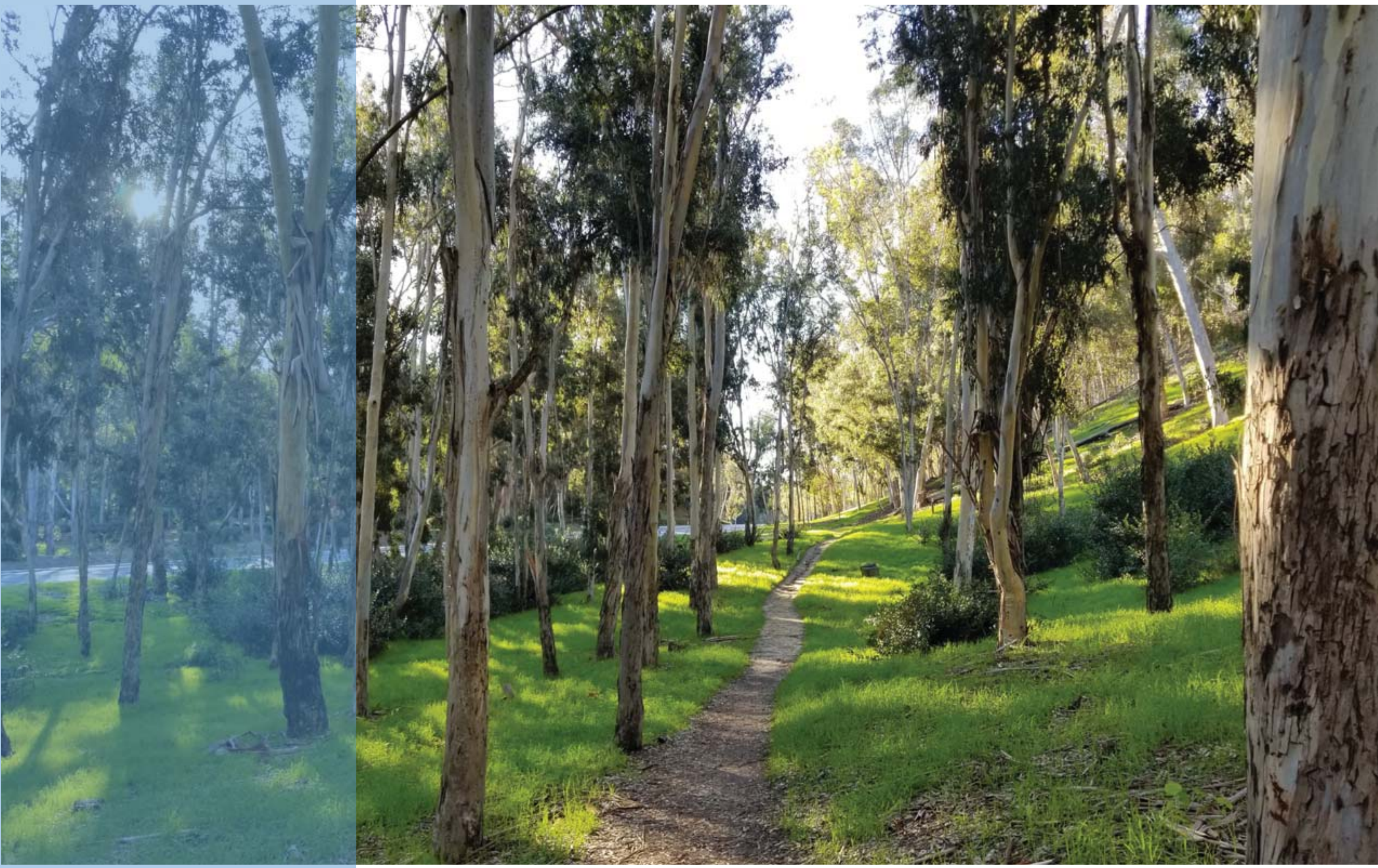
Botanical Name	Common Name	Type	Height	Spread	Growth Rate	Water Use
Agonis flexuosa	Peppermint Tree	Evergreen	25-30	25-30	Mod.	Mod.
Albizia julibrissin	Mimosa	Deciduous	25-35	25-35	Mod.	Mod.
Bauhinia variegata	Hong kong orchid	Semi	20-25	20-25	Mod.	Mod.
Calodendrum capense	Cape chestnut	Deciduous	25-35	25-35	Mod.	Mod.
Cassia leptophylla	Gold medallion	Semi	15-25	15-25	Fast	Mod.
Ceratonia siliqua	Carob tree	Evergreen	30-40	30-40	Mod.	Mod.
Corymbia ficifolia	Red-Flowering Gum	Evergreen	15-45	15-60	Mod.	Mod.
Cupressus arizonica	Arizona cypress	Evergreen	30-40	15-20	Slow	Low
Eucalytpus torquata	Coral Gum	Evergreen	15-35	15-30	Slow	Mod.
Fraxinus oxycarpa 'Raywood'	Flame ash	Deciduous	30-40	25-30	Mod.	Mod.
Gingko biloba	Ginko	Deciduous	30-40	30-40	Slow	Mod.
Handroanthus heptaphyllus	Pink Trumpet Tree	Deciduous	25-50	20-40	Mod.	Mod.
Jacaranda mimosifolia	Jacaranda	Deciduous	25-35	25-30	Mod.	Mod.
Koelreuteria bipinnata	Chinese flame	Deciduous	20-40	20-40	Mod.	Mod.
Laurus nobilis	Sweetbay	Evergreen	30-40	25-35	Slow	Low
Lophostemon confertus	Brisbane box	Evergreen	25-35	20-25	Mod.	Mod.
Melaleuca nesophila	Pink Melaleuca	Evergreen	15-30	15-30	Mod.	Low
Metrosideros excelsus	New Zealand Christmas Tree	Evergreen	15-25	15-25	Mod.	Mod.
Morus alba 'Fruitless'	Fruitless mulberry	Deciduous	20-30	30-45	Fast	Mod.
Pistacia chinensis	Chinese pistache	Deciduous	25-35	25-35	Mod.	Mod.
Podocrpus macrophyllus	Yew pine	Evergreen	30-40	25-35	Slow	Mod.
Prunus caroliniana	Prunus caroliniana	Evergreen	20-30	15-25	Fast	Mod.

MEDIUM

STREET TREE SPECIES LIST - LARGE

Botanical Name	Common Name	Type	Height	Spread	Growth Rate	Water Use
Acacia melanoxylon	Black Acacia	Evergreen	40-50	20-30	Fast	Mod.
Afrocarpus falcatus	Fern pine	Evergreen	50-60	50-60	Slow	Mod.
Alnus cordata	Italian Alder	Deciduous	40-50	25-30	Fast	Mod.
Brachychiton acerifolius	Australian Flame Tree	Deciduous	50-60	30-40	Mod.	Mod.
Brachychiton rupestris	Queensland Bottle Tree	Evergreen	25-30	20-25	Fast	Low
Calocedrus decurrens	Incense Cedar	Evergreen	50-70	15-20	Slow	Mod.
Casuarina equisetifolia	River she-oak	Evergreen	60-70	30-40	Mod.	Mod.
Cedrus deodara	Deodar cedar	Evergreen	40-50	40-50	Slow	Mod.
Cinnamomum camphora	Camphor tree	Evergreen	40-50	50-60	Mod.	Mod.
Corymbia citriodora	Lemon-scented gum	Evergreen	60-80	30-40	Fast	Low
Corymbia ficifolia	Red-flowering gum	Evergreen	15-45	15-60	Mod.	Mod.
Dalbergia sissoo	Indian Rosewood	Deciduous	45-60	30-40	Mod.	Mod.
Eucalyptus camaldulensis	River red gum	Evergreen	45-150	45-105	Fast	Mod.
Eucalytpus sideroxylon	Red ironbark	Evergreen	30-90	30-60	Fast	Mod.
Fraxinus uhdei 'Majestic Beauty'	Majestic Beauty' ash	Deciduous	70-80	50-60	Fast	Mod.
Gleditsia tricanthos var. inermis	Thornless honey locust	Deciduous	50-60	30-40	Fast	Mod.
Grevillea robusta	Silk oak	Evergreen	50-65	25-40	Fast	Mod.
Hesperocyparis macrocarpa	Monterey cypress	Evergreen	45-60	45-50	Fast	Mod.
Juglans nigra	Black walnut	Deciduous	90-100	60-70	Mod.	Mod.
Liquidambar styraciflua	American Sweetgum	Deciduous	60-80	30-40	Fast	Mod.-High
Magnolia grandiflora	Southern magnolia	Evergreen	40-50	30-40	Mod.	Mod.
Melaleuca quinquenervia	Cajeput tree	Evergreen	30-40	20-25	Mod.	Mod.
Platanus acerifolia 'Columbia'	Columbia London Plane	Deciduous	40-80	30-40	Fast	Mod.-High
Pinus canariensis	Canary island pine	Evergreen	50-70	30-40	Fast	Low
Pinus pinea	Italian Stone Pine	Evergreen	40-80	40-60	Mod.	Low
Pinus torreyana	Torrey pine	Evergreen	40-50	30-40	Fast	Mod.
Populus fremontii 'Nevada'	Western cottonwood	Deciduous	40-80	30-50	Fast	Mod.
Quercus agrifolia	Coast live oak	Evergreen	50-60	50-60	Mod.	Low
Quercus ilex	Holly oak	Evergreen	40-50	40-50	Mod.	Mod.
Quercus suber	Cork oak	Evergreen	40-60	40-60	Slow	Mod.
Quercus virginiana	Southern Live Oak	Evergreen	40-80	40-80	Fast	Mod.
Spathodea campanulata	African Tulip Tree	Evergreen	40-75	20-50	Fast	Mod.-High
Ullmus parvifolia	Chinese elm 'Allee'	Deciduous	45-55	40-50	Mod.	Mod.
Umbellularia californica	Californina laurel	Evergreen	40-60	40-60	Slow	Mod.

LARGE



4: COMMUNITY FOREST OPERATIONS

OVERVIEW AND PURPOSE

The City of Carlsbad offers a diverse mix of residential, commercial, and tourism opportunities. A multi-departmental approach to protecting the resources in the community better ensures the balance of public interests is strengthened.

One goal of city community forest management operations is to support a high quality of life, through the performance of services at optimal standards. This chapter outlines the arboricultural operations and procedures to help the City of Carlsbad meet these priorities. In addition, the CCFMP update also takes into consideration the specific tree related provisions set forth in the Carlsbad Village and Barrio Master Plan (CVBMP).

ANSI STANDARDS

To ensure all community forest operations are consistent in approach, standards must be in place for all city staff and contractors to follow. In the tree care industry, the national standard is the American National Standard Institute (ANSI), specifically the A300 and associated sections developed by the Tree Care Industry Association, (TCIA). These standards (Appendix F) are periodically reviewed and revised to provide the industry the best information available. The city keeps the current ANSI standards available for reference. Those standards are to continue to be followed when pruning any city inventoried trees.

ISA BEST MANAGEMENT PRACTICES

The International Society of Arboriculture (ISA) is recognized worldwide as a champion of professionalism in the tree care industry. By certifying tree workers and arborists across the globe, municipalities, contractors, and agencies are assured that the tree care professionals that maintain and report on trees are properly trained and adhere to ethical standards. The ISA Best Management Practices (BMPs) provide guidance to care for trees in various topics which mirror the ANSI A300 parts. The city utilizes these BMPs (Appendix G) in its daily tree care work.

PROACTIVE TREE MANAGEMENT

Systematic maintenance is the key to long-term health and growth of trees in the community forest. Having a scheduled tree management program of monitoring health, inspecting for hazards, pruning or removing to mitigate risk, planting new trees, and recycling green waste is essential to enhancing the natural and urban environment in the City of Carlsbad. Such a program increases the monetary value of the forest over time. The program provides additional benefits to the public by reducing the need for urgent or emergency maintenance calls, reducing tree mortality, and helping to reduce liability risk.

In a systematic program, pre-designed districts, grids, zones, or facilities are typically identified and scheduled for routine maintenance. This scheduled maintenance reduces the number of service request calls and enhances public safety. By proactively maintaining trees, the forest health is improved, and problems can be corrected before reaching an urgent level.

The Parks & Recreation Department has employed a grid pruning schedule for nearly fourteen years to proactively manage the city maintained trees. This routine proactive pruning schedule provides maintenance on trees every 4 to 4.5 years, with supplemental pruning every 2-2.25 years as needed for select tree species. When performing proactive tree service, trees receive a pre-job inspection to look for hazards and any conditions that may call for maintenance other than that of the current work order for the tree. In such situations, tree crews notify inspection staff for a final determination of the work to be performed. Inspection staff convey data and direction to tree maintenance crews to ensure each task is completed on time and then recorded, thus ensuring smooth coordination in this proactive program.

While proactive programs lessen the need for reactive tree management, situations periodically arise that require quick response and action. The city employs tree staff who are generally tasked to respond to requests for expedient service and are secondarily utilized for selective pruning zones.

Funding for all pruning is charged to the respective maintenance budgets. If required, additional funding is allocated to address extraordinary circumstances, such as weather events or other factors.

The process of assigning tree maintenance tasks is the responsibility of the Parks & Recreation Department. Once a request for service is received from any of a variety of sources a service request is drafted. The tree maintenance supervisor reviews the request and delegates to inspection staff, or to tree maintenance crew, depending on the tree(s) and the extent of request. Such work may be assigned to the tree staff, or the tree contractor, for service as needed. Upon completion of the work, the service history is entered in the city database.

RISK MANAGEMENT

The safety of the public is of paramount importance to the City of Carlsbad. To manage risk in trees, the city relies upon the expertise of certified arborists who are qualified in tree risk assessment. The ISA is the organization that qualifies arborists to assess risk and give mitigation options. The city may use staff arborists with the Tree Risk Assessment Qualification (TRAQ) or obtain a report from a contractor with the qualification to provide this service. The ISA basic tree risk assessment form, either in the original or a modified form, is the standard inspection checklist to be used by those performing risk assessment on city trees.

By utilizing the data in the inventory related to tree condition, recommended maintenance, and work history, the city can develop on-going and routine inspection lists of trees requiring further evaluation. Once the risk mitigation option has been chosen, the work is performed in a timely manner and the service history is entered in the database.

TREE REMOVAL POLICY

City of Carlsbad Council Policy No. 4—Street Trees clearly establishes the considerations for street tree removal in section II. A though K. This policy is reinforced under Carlsbad Municipal Code Section 11.12.090. Periodic removals of trees are necessary to provide the public with a healthy and safe community forest. Alternatives to street tree removal are always to be considered in advance. If removal is to be considered, the priority rating of street trees is based on the following factors, with the greatest priority being given to trees meeting all four factors:

1. Service Life
2. Damage to utilities and/or sewer lines
3. Damage to hardscape
4. Conformity of the existing tree to approved tree species list

The Parks & Recreation Department notifies property owners near the planned street tree removal of the upcoming work, and that the tree will be replaced with one from the approved species list.

INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) and sustainability go hand in hand in community forest management, for each needs the other to operate effectively in a city. The City of Carlsbad has one of the most progressive IPM plans in the region, if not the State of California and is committed to providing safe and effective pest control that is environmentally conscious. The city's IPM Plan lists the stated policy and goals for such work (Appendix G) Parks & Recreation's and Public Works' operations. This example of interdepartmental coordination on an IPM Plan is a model for other agencies.

The city's IPM Plan specifies the components as follows: inspection, identification, monitoring, action, and evaluation. The Parks & Recreation Department uses multiple pest control tactics in the community forest to prevent the pests' resistance to pesticides, including any of the following five methods of control: cultural, mechanical, physical, biological, and chemical. Staff reviews the IPM Plan annually for consistency with applicable laws and regulations, pests treatments, and best management practices.

WILDLIFE PROTECTION

The original 2003 CCFMP included limited information about wildlife protection in the chapter on Hosp Grove. Given the desire to enhance the community forest and protect the natural environment within the City of Carlsbad borders, this updated CCFMP includes additional guidance for wildlife protection.

As important as wildlife protection is, prior to 2017 there was no published best management practice to guide tree care professionals in their work. Laws, regulations, and ordinances stated what could and could not be done at given times of year, but there existed no ANSI standard nor any helpful checklist to assist tree crews when performing work near sensitive habitats.

Fortunately, a team of wildlife and tree care industry professionals assembled the first best management practice of its kind to guide those who work in the tree care industry. *Tree Care for Birds & Other Wildlife*, published in 2018, now provides practical information and helpful appendices to assist Californians in protecting wildlife while caring for the trees in our communities.

This guide, subtitled *Best Management Practices in California*, is useful for both public and private tree care. The city acknowledges the vital need to maintain its trees for public benefit and to protect habitat for wildlife, as each contribute benefits to society. In addition, prior to performing tree maintenance within an open space preserve the preserve manager shall be contacted. It may also be necessary to conduct a rare plant survey and nesting bird survey within the work area to ensure no native plants or nesting birds will be harmed.

VILLAGE AND BARRIO MASTER PLAN

A task of the updated CCFMP was to review and incorporate the applicable provisions of the 2018 Carlsbad Village and Barrio Master Plan (CVBMP). This review and a larger environmental scan of city documents revealed several ways to integrate the Community Vision and Values, General Plan, Local Coastal Program, Climate Action Plan and Municipal Code. This integration can improve the

The street tree related goals in the CVBMP, will be applied to the city's management of the community forest. As an example, the Coastal Commission in its June 2019 certification of the CVBMP, required the planting of only non-invasive and drought tolerant street trees in the Coastal Zone portions of the master plan. Staff will therefore ensure that only species which meet these criteria will be planted within the zone. The following sections of the CVBMP are therefore incorporated by reference to the CCFMP:

The following sections of the CVBMP are also incorporated by reference to the CCFMP:

Section 1.5. Goals and Policies

- 1.5.1 Land Use and Community Character
    - Goal E. Recognize and support the historical roots of the Village and Barrio
    - Policy 2. Support a program to identify and protect heritage trees in the Village and Barrio as part of a future update to the citywide Community Forest Management Plan.
    - Category 1.5.2 Mobility and Parking
    - Goal C. Ensure significant public improvements presented in the Master Plan are publicly and adequately evaluated.
    - Policy 1. Engage the community and seek public input on proposals to implement conceptual projects presented in Master Plan Chapter 4, Mobility and Beautification, particularly projects that would reconfigure streets or reduce public parking.
- 1.5.3 Connectivity
    - Goal A. Establish better connectivity within the Village and Barrio and between the two neighborhoods and their surroundings
    - Policy 2. Encourage better connectivity between the center of the Village and the Barrio, including continuous bike and pedestrian access and improvements and design elements like street trees, pedestrian lighting, public art and pedestrian-oriented buildings.
- 1.5.4 Placemaking
    - Goal A. Create Great Streets
    - Policy 2. Dedicate special and immediate attention to traffic calming on principal and key Barrio streets, such as Tyler Street, Roosevelt Street, Madison Street, Harding Street, Oak Avenue and Chestnut Avenue. In addition, enhance the north-south streets that connect directly to the Village core to create continuous lighting, trees, sidewalks and bicycle access from the Village and throughout the Barrio.
    - Goal B. Create magnetic public spaces for arts and culture, civic and other activities
    - Policy 3. Design public spaces, whether plazas, sidewalks or streets, with a comfortable sense of enclosure realized and visually defined by buildings, trees and other vertical elements.

Section 4.3 Create Livable Streets:

- 4.3.1. Design for Pedestrians First
    - (Part) Great streets are walkable streets, and an essential distinction of great walkable streets is that the entire space is designed as an ensemble, from the travel lanes, trees and sidewalks, to the very buildings that line the roadway.
    - Subsection 4.3.3. Provide a Consistent Street Appearance
    - (Part) Street furniture, such as street lights, bus shelters, benches, trash and recycling receptacles, newspaper racks, and pedestrian wayfinding signage should be regularly spaced and typically aligned with the street trees between the sidewalk and street.
- 4.3.8. Provide Shade
    - Street trees are essential for a thriving village environment. Canopy trees that provide shade and shelter from the elements create a space where pedestrians feel comfortable, reduce the “heat island” effect, and absorb greenhouse gases. Further, retail experts have concluded that street trees add value to shopfront businesses, creating an “urban room” where people like to linger. Street trees within the Village, and especially within the Barrio, have been a point of discussion for both residents and business owners. Throughout the community engagement process, participants expressed that more mature trees are needed. The following recommendations address street trees in the Master Plan area:
        - 1. The city’s Community Forest Management Plan sets forth standards for planting, removal, replacement, maintenance and the preservation of street trees. Using a similar palette of species, including the use of more palm trees or other beach character flora, will help add to the small-town beach character of the Village and

    - (cont.) help unify it with the Barrio, an item of repeated interest from members of the community throughout the planning process.
    - 2. Roosevelt and Madison streets, which serve as primary routes between the Village and the Barrio, are a top priority for initial planting. Street tree installation along State Street is also a priority and this would be aided by proposed street improvements discussed on page 4-34 as the current street configuration constrains planting space. As street or infrastructure improvements are completed, consideration should be given to the planting of street trees when appropriate and feasible.
    - 3. No tall or long hedges along the street or tall planters on or along sidewalks on main streets should be permitted. Trees, bushes or any plants should not spill into the pedestrian path along the sidewalk.
    - 4. Besides their obvious daytime benefits, street trees also provide a valuable framework for decorative lighting, which can greatly enliven the Village nighttime atmosphere. Consideration to develop a decorative lighting program should be given.
    - 5. Near railroad crossings, street tree placement must be carefully considered to ensure trees do not reduce visibility of warning devices or approaching trains.
- 4.3.10. Festival Streets/Shared Space Streets
  - (Part) Additional street trees can be added along Roosevelt Street between on-street parking spaces to reduce speeding. A small monument or public artwork could be placed in the intersection to make motorists aware that they have arrived at a special place at the heart of the Barrio.
- 4.3.11. Street Design
  - C. Carlsbad Village Drive (Interstate 5 to Carlsbad Boulevard – Street Cross Section 3
  - (Part) The experience of entering Carlsbad at this location can be improved dramatically by adjusting the elements within the right-of-way. Care should be given to increasing the comfort for pedestrians and cyclists. Sidewalks should be broad and should continuously connect throughout. Sidewalks should be sheltered from adjacent vehicular travel lanes by regularly spaced street trees. Street tree species should be chosen to provide adequate shade over sidewalks but that are also drought tolerant.
  - E. State Street - Street Cross Section 5
  - (Part) Proposed conditions would provide pedestrian improvements by widening both sidewalks to twelve feet to accommodate street trees, furnishings, and an ample pedestrian walkway. Bulb-outs could also be added to expand opportunities for outdoor dining, or additional landscaping and public art.

    …
  - A simple transformation can be achieved by narrowing the travel lanes to accommodate wider sidewalks similar to those on the portion of State Street by Grand Avenue, and the ability to add generous shade trees to both sides of the street.
  - J. Roosevelt Street (and streets with less than 48' between curbs)
  - For Barrio streets where the width does not accommodate the enhanced bikeway configuration, the placement of bulbouts and street trees can create a slower and much more comfortable and aesthetically pleasing street character.
  - K. Harding Street (and streets with more than 48' between curbs) – Street Cross Section 8
  - (Part) Some of the streets in the Barrio, such as Harding Street, already have on street parking and bicycle lanes, but still over half of the right-of-way is given to the movement of cars. A proposed reallocation of pavement would relocate the bike lane to outside the lane of parking while also narrowing the travel lanes to create a protected enhanced bike lane for cyclists. In addition, new tree cover can be added to the neighborhood by placing trees occasionally within the designated parking area to visually narrow the street and provide much needed shade for pedestrians and cyclists. Figures 4-24, 4-25, and 4-26 show existing

- (cont). and proposed conditions.
  …
- Proposed conditions are illustrated for two locations along Harding Street, as figures 4-2, 4-25, and 4-26 indicate. Both street sections would provide for enhanced bicycle facilities and additional street trees and landscaping. Sidewalk, planter and parking widths would be retained, while travel lane widths would be reduced to accommodate the improvements.
- M. Other Barrio Streets:
- (Part) Streets within the Barrio should be enhanced for pedestrian and bicycle safety and travel, yet at the same time maintain traffic flow. Improvements to streets in the Barrio should include sidewalks of a five-foot minimum width, and additional shade in the form of more street trees either within the existing planting strips or within new tree wells created occasionally between parking spaces. The addition of street trees to Roosevelt and Madison Streets, key roadways serving both the Village and Barrio, is a priority. Street improvements should also include a reallocation of paved street area to increase bicycle facilities, pedestrian lighting, and improved intersections.
- Recommendations for non-intersection improvements in the Barrio, such as street trees, lighting, and bicycle paths, are addressed elsewhere in this chapter.

Table 5-1, Implementation Action Matrix:

- Regulatory Programs, Plans, and Studies:
  - (Part) Identify top priority streets to plant trees to provide more shade and increase connectivity between the Village and Barrio. [Ph.1]
- Capital Improvements
  - Consider adding street planters and sharrows (if bike lanes are not present or proposed) on streets with less than 48’ (such as Roosevelt Street) between curbs that cannot accommodate the cycle tracks. [Phase 1-2]
  - Plant trees on priority streets (based on study under action item above) like Roosevelt and Madison Streets between the Village and the Barrio. [Ph. 2]

The Parks & Recreation Department staff will continue to work with Community & Economic Development Department staff and Public Works Branch staff on projects impacting the public rights of way of the Barrio and Village to ensure thorough and timely coordination of these street tree related measures.

5: URBAN FOREST AREAS

A PATHWAY TO TREES

The open space and natural areas of the City of Carlsbad are a treasure to the community and are highly prized by the residents that enjoy them.

Given that public value, as well as the direction within the City of Carlsbad Sustainability Guiding Principles and information provided in the original CCFMP, this update of the CCFMP affirms the importance of both the natural and human-made environment. The city will pursue efforts in protecting, preserving, and restoring these environments. This document outlines, in this and other chapters, ways in which elements of the community forest management strategies interface with each other. For instance, risk management efforts do not stop at street trees, but rather extend to the greater natural and human-made environment for the benefit of the whole community. Therefore, this update includes specific actions necessary to uphold the basic environmental principles, and also enhance the public's experience and safety in the process.

The city-owned urban forests (i.e., Hosp Grove, Woodbine Banks, Batiquitos Lane and Village H) have not been fully inventoried– which is a common practice for such natural environments. If all the Eucalyptus and other trees in the urban forest areas were accounted for in the inventory, the species frequency and demographics of the greater community forest would change. The accounting for all of these trees could increase the total trees in the inventory by up to twenty percent and would likely reflect a decrease in species diversity, as the urban forests are nearly single genra.

Tracking service history for specific trees near property boundaries and high usage zones of urban forest areas is of paramount importance, especially from the risk management perspective. Therefore, data collection efforts in the urban forests has been focused on these interface areas — i.e., property boundaries and high usage zones, as reflected in the maps that follow.

Of concern to the region's urban forest areas are tree species known to be hosts to destructive invasive and/or quarantined insects and fungi such as Eucalyptus Longhorned Beetles, Polyphagous and Kuroshio Shot Hole Borer, South American Palm Weevil, Asian Citrus Psyllid, Goldspotted Oak Borer, Pine Pitch Canker, and others. With the knowledge of the inventory and by utilizing the best practices, staff can effectively manage the urban forest.

Though insects and environmental challenges have increased in the past few decades, the management strategies implemented by the first CFMP have helped to improve the health of the urban forest areas, and Hosp Grove in particular. Hosp Grove is a 74-acre property divided by Monroe Street which consists primarily of Eucalyptus tree species, especially the Sugar Gum (*Eucalyptus cladocalyx)* and Red Gum (*Eucalyptus camaldulensis)*. These and other non-native trees within the grove suffered in the past but have rebounded from proactive management techniques and the preservation of beneficial insects that prey upon pests of these trees. Another facet that has improved since the original CFMP has been the wildlife habitat. The trees within the grove provide shelter and perches for numerous species of birds and animals. By preserving these trees, the grove continues to be a resource for wildlife and the public.

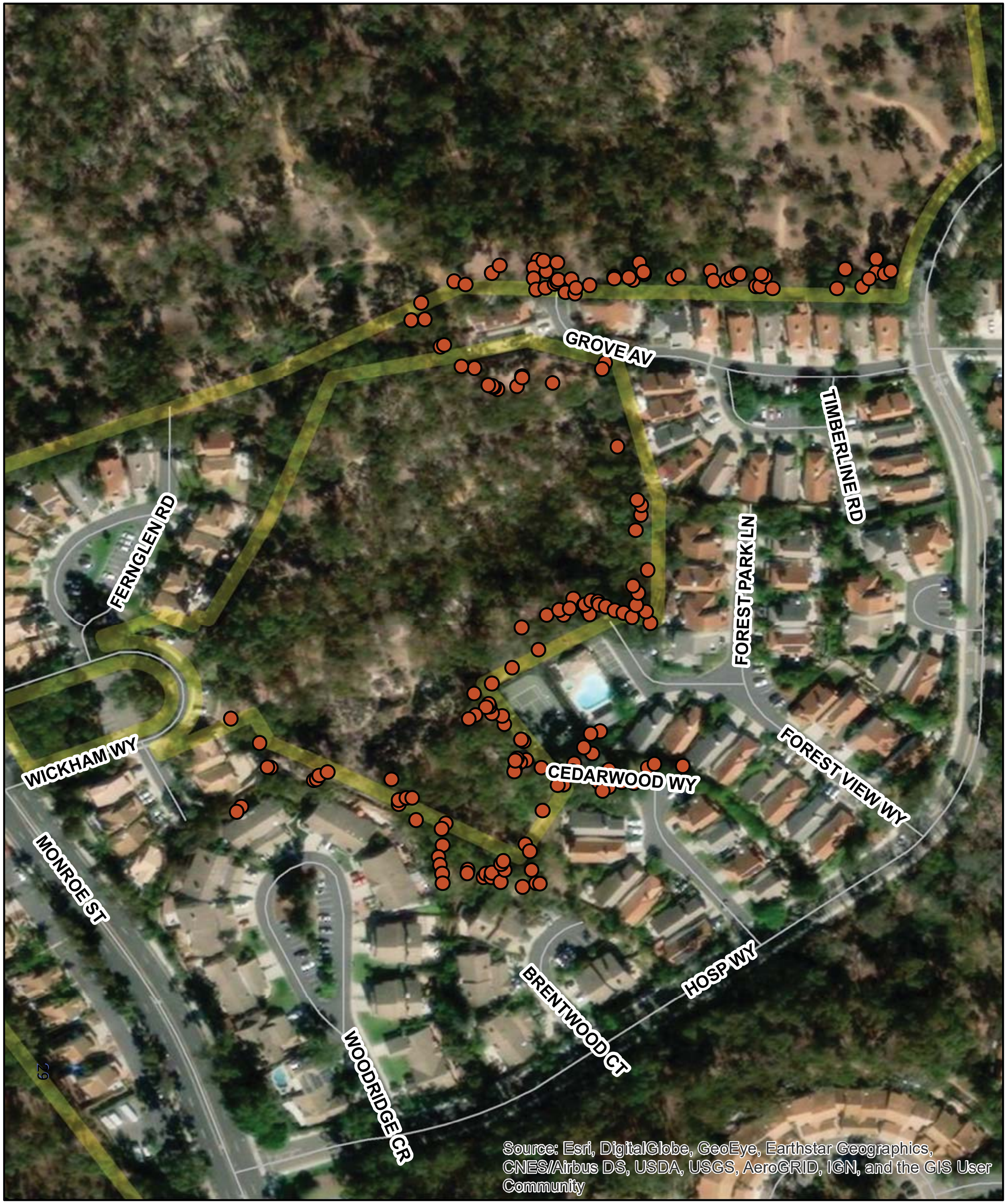
Ongoing monitoring of trees in high public occupancy areas and continuing tree maintenance practices such as thinning heavy branches and removing of diseased trees, will further improve the health of the grove and provide shaded recreation areas that the public will enjoy for many years forward. Consideration should be given to tree density and spacing to allow for proper maintenance, promote more vigor in the trees with the best health, and to allow for timely fire response in the event of an emergency. With funding to maintain the valuable urban forest interface areas such as Hosp Grove, the trees will remain an integral part of the community for generations.

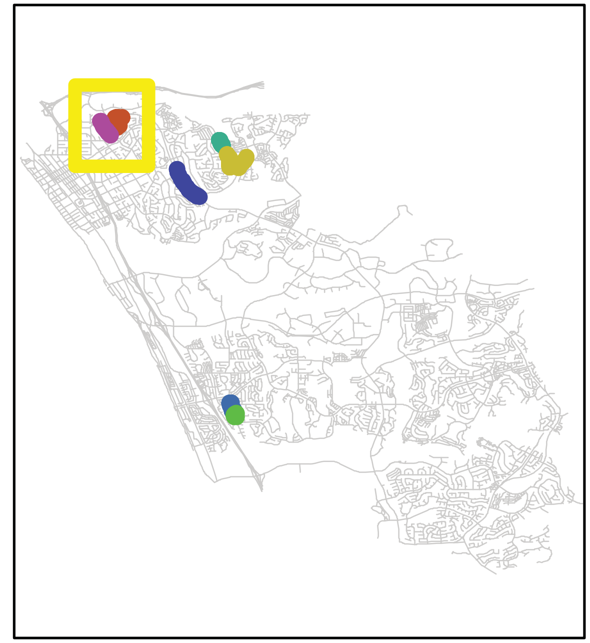
Biotic, abiotic, and environmental impacts, and effects such as drought, and climate change, wildfires, are difficult to predict. But the city has a duty to be proactive in its management of urban forest areas. Within the city-owned urban forests (i.e., Hosp Grove, Woodbine Banks, Batiquitos Lane and Village H), the following practical strategies will be continuously in effect.

Department Protocol

a. The Parks & Recreation Department monitors urban forest areas on a quarterly basis for tree health and vitality and utilizes plant health care best management practices to improve forest health.
b. The Fire Department consults with the Parks & Recreation Department to manage response vehicle access and maintain fire buffer zones along property lines to prevent the spread of fire to or from urban forest areas.
c. The Parks & Recreation Department staff annually reviews the trees within urban forest areas to identify candidates for removal and recycling.
d. The Parks & Recreation Department recognizes the urban forests as being nearly single genera (monoculture) and thus susceptible to pests and disease due to that lack of diversity. Staff monitors these forests accordingly to take targeted action as required to prevent spread within these areas and to other public or private trees.
e. The Parks & Recreation Department identifies and removes non-native invasive species within the urban forest areas as listed and prescribed by the Invasive Species Council of California to prevent the spread to native or other man-made environments.
f. Planting of new ornamental native and non-native trees within urban forest areas is kept to a minimum.
g. Planting of native trees to fill voids is encouraged as these urban forests are suitable for such species.

Urban Forest Interface
Hosp Grove East





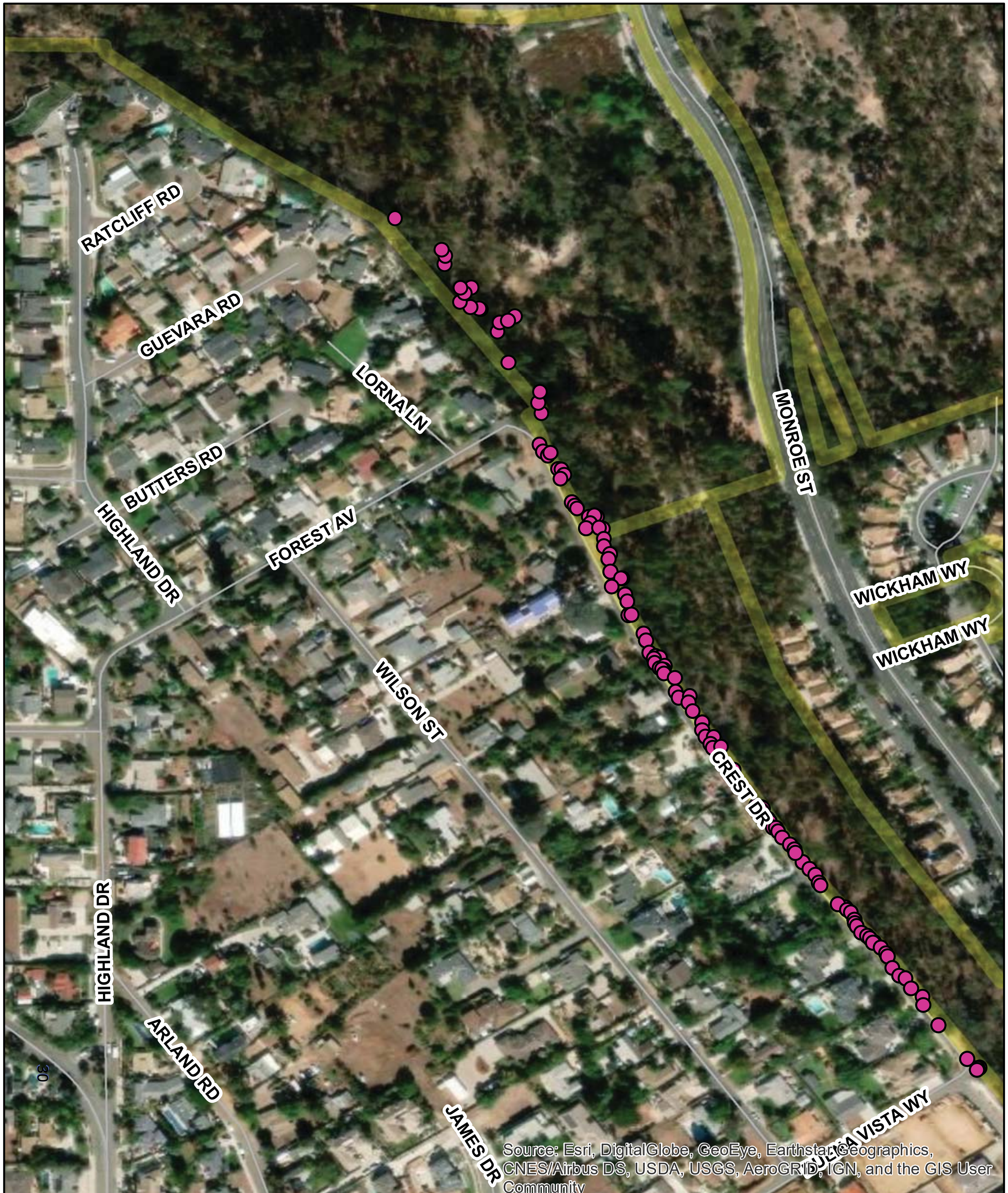
Tree Locations

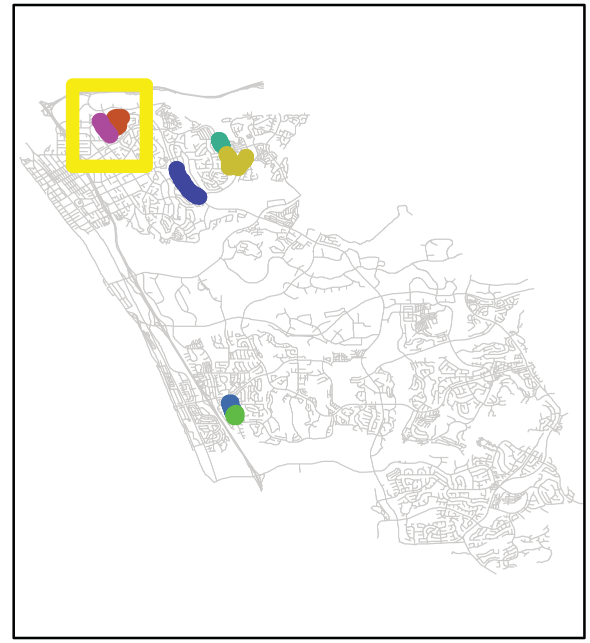
- Batiquitos North
- Batiquitos South
- Hosp Grove East
- Hosp Grove West
- Village H North
- Village H South
- Woodbine Banks
- City Owned Parcels

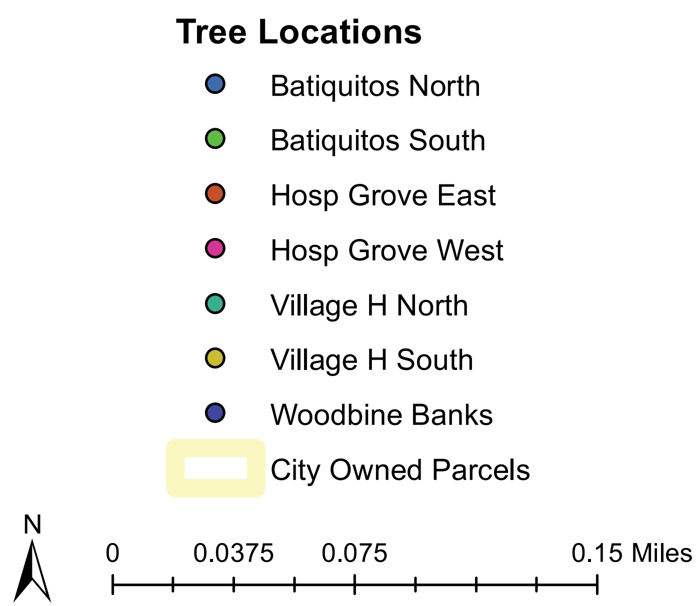
N

0 0.025 0.05 0.1 Miles

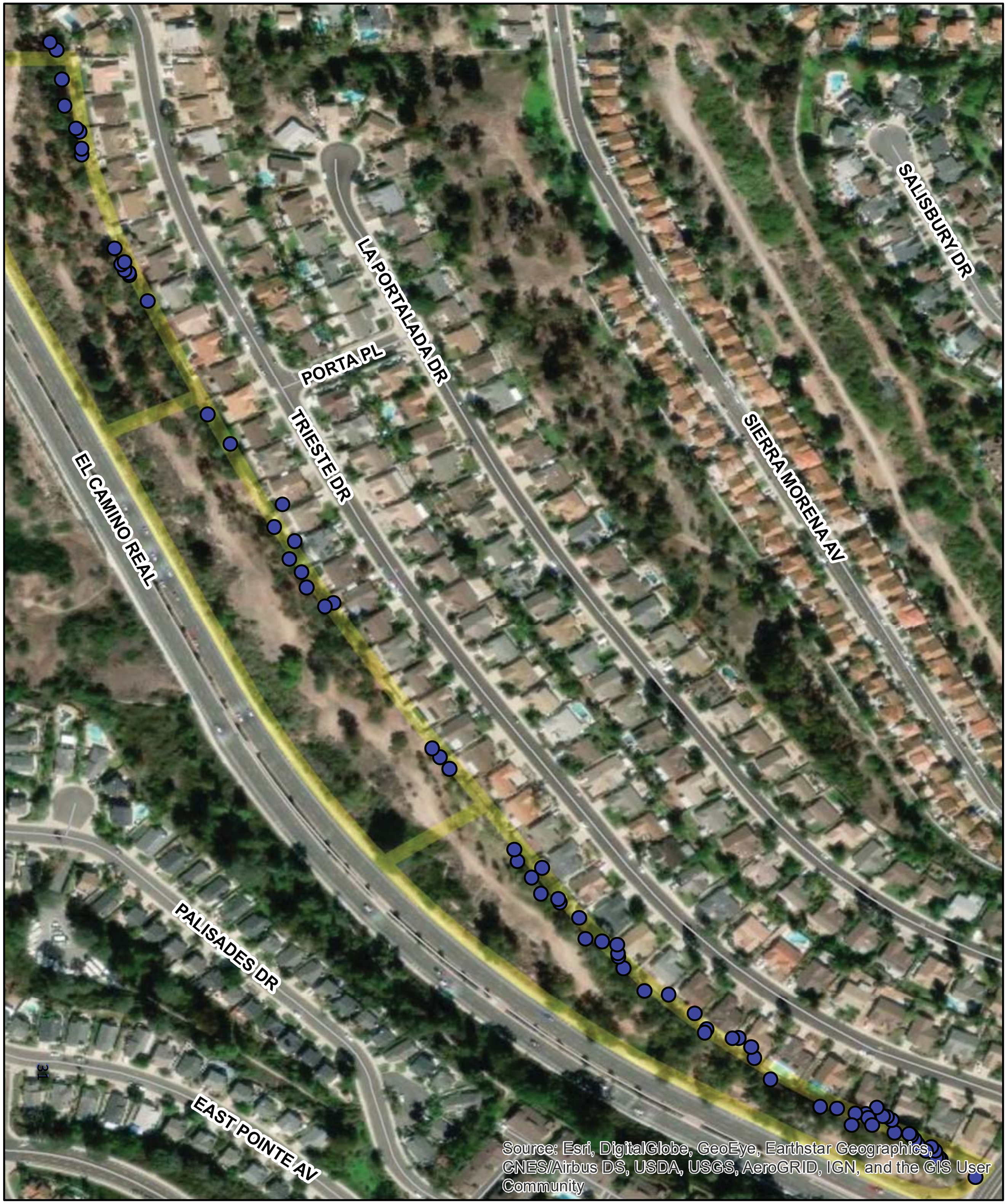
Urban Forest Interface
Hosp Grove West

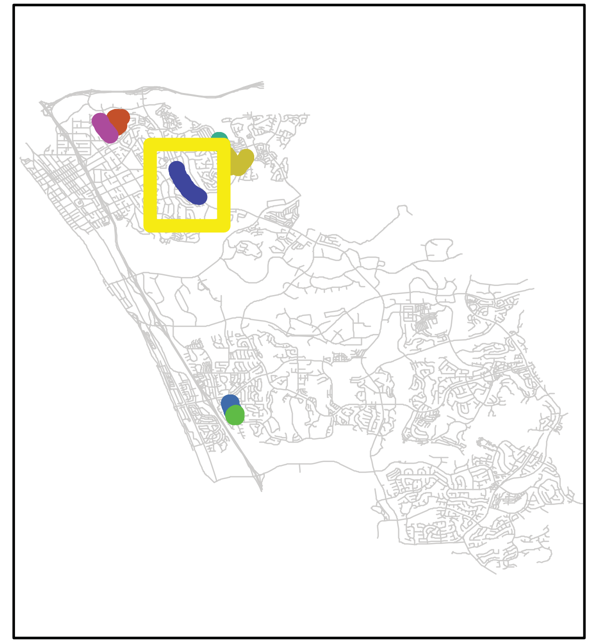






Urban Forest Interface Woodbine





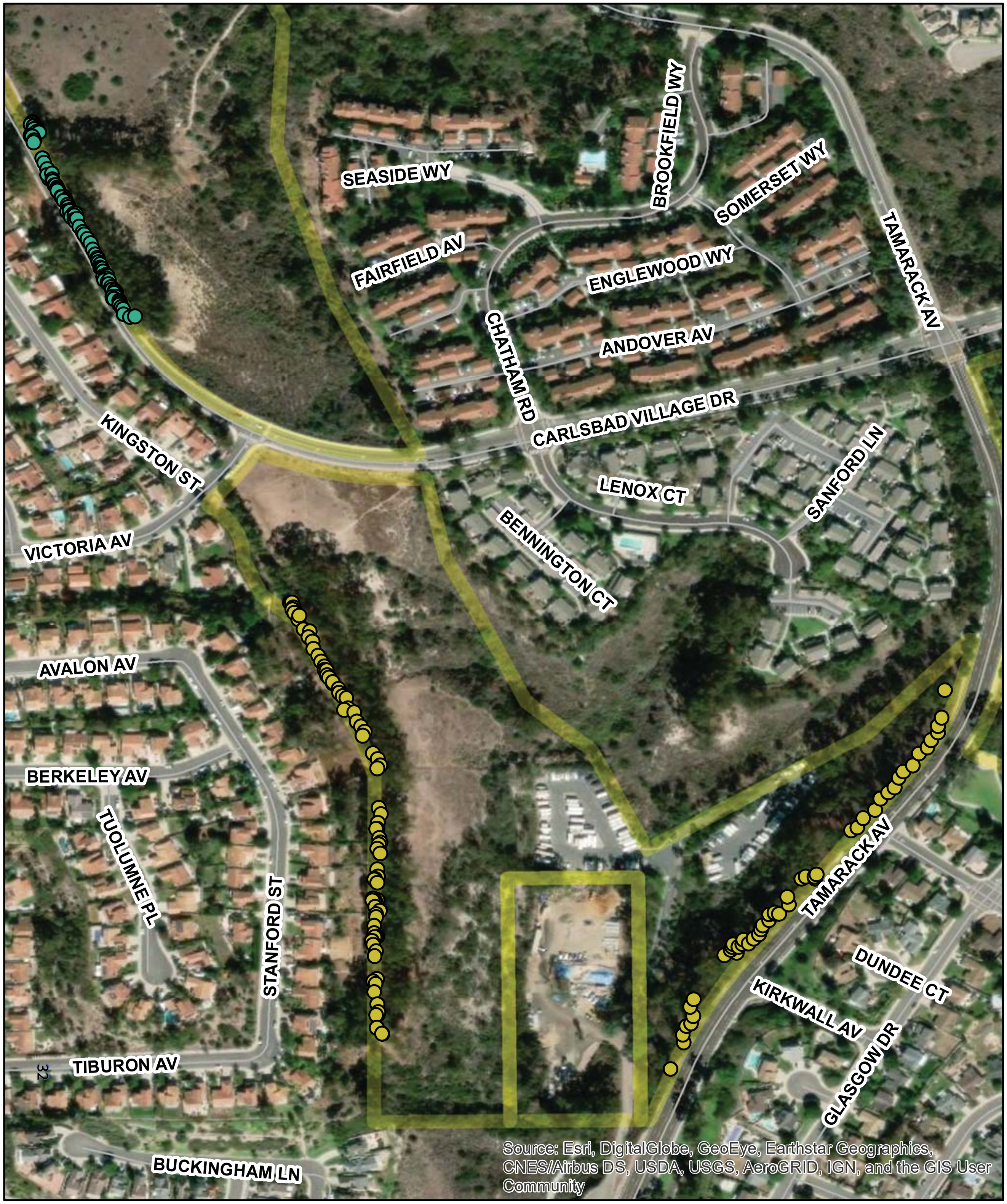
Tree Locations

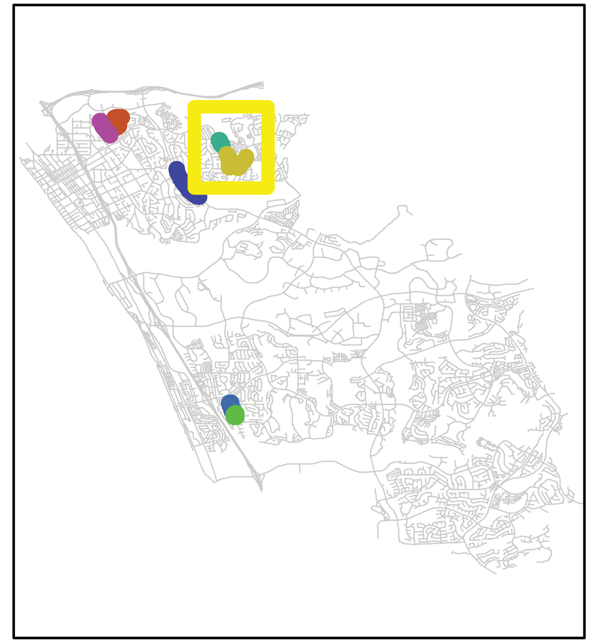
- Batiquitos North
- Batiquitos South
- Hosp Grove East
- Hosp Grove West
- Village H North
- Village H South
- Woodbine Banks
- City Owned Parcels

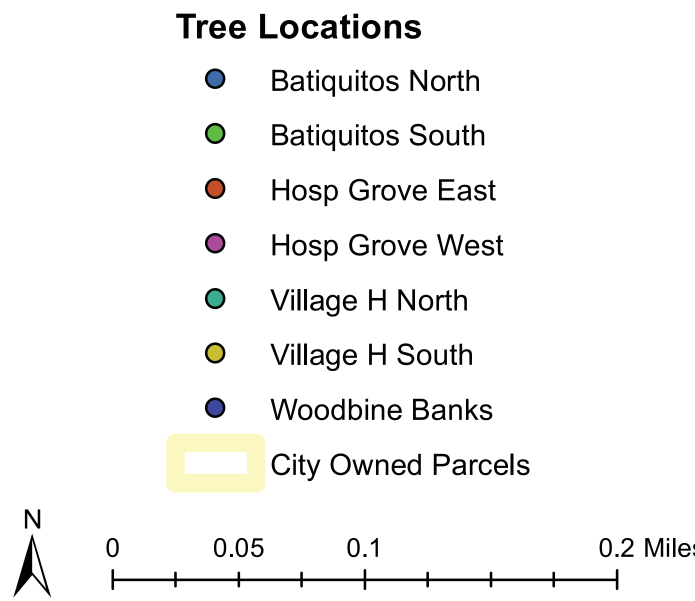
N

0 0.04 0.08 0.16 Miles

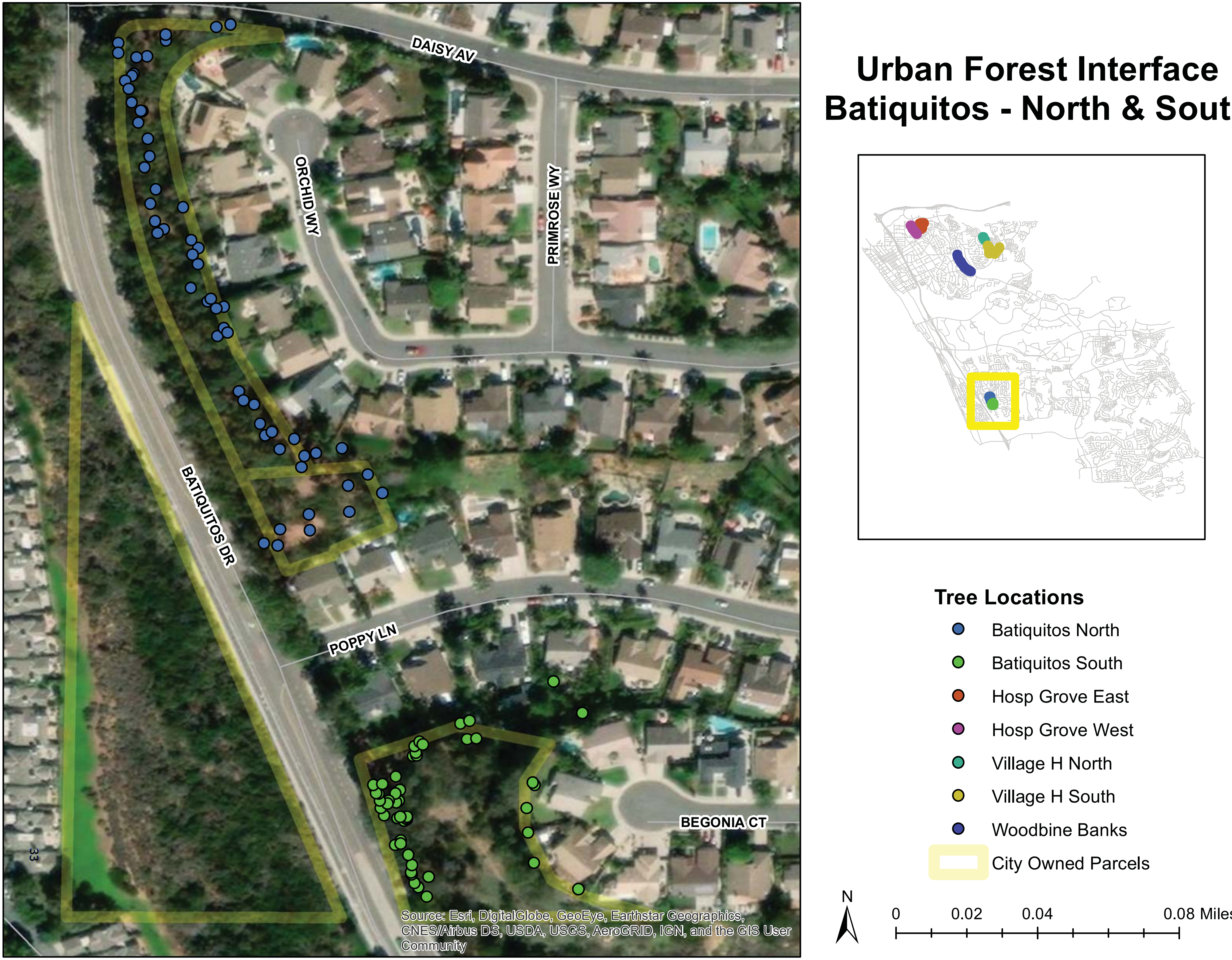
Urban Forest Interface
Village H - North & South



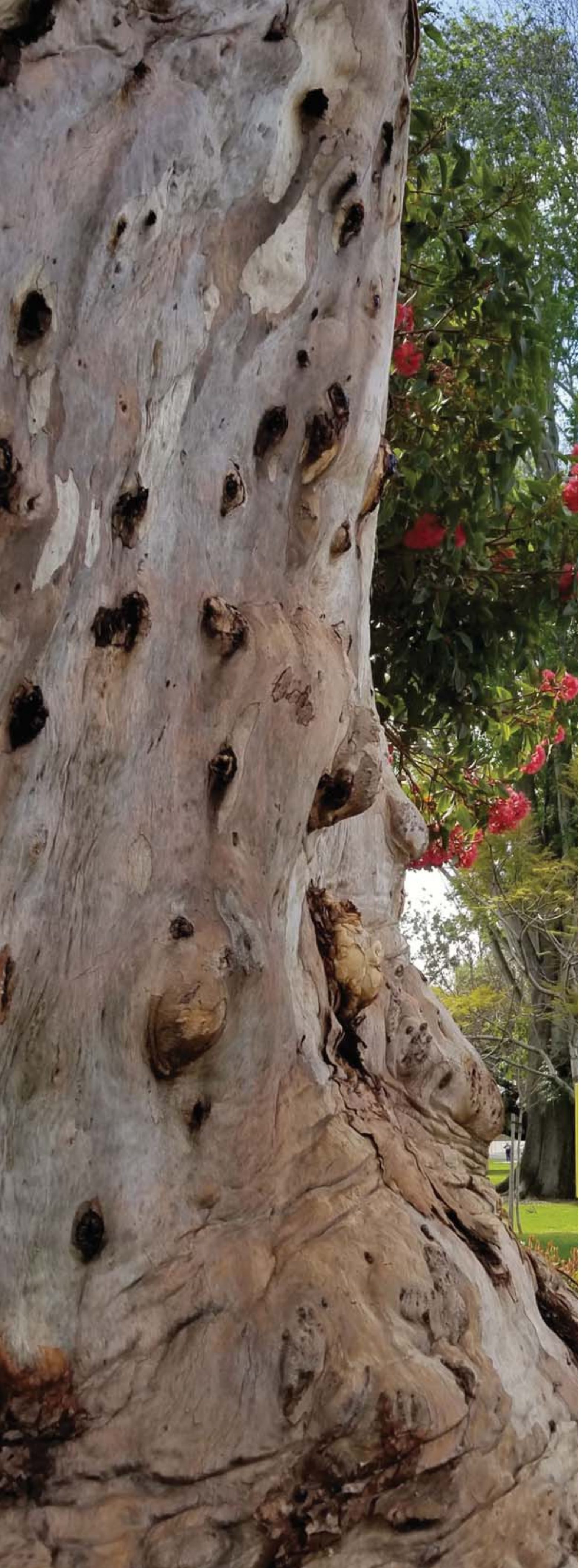




Urban Forest Interface
Batiquitos - North & South



6: HERITAGE TREE PROGRAM



HERITAGE TREES AND THEIR SIGNIFICANCE IN THE COMMUNITY

Arborists, botanists, and collectors of plants have looked the world over for examples of fine specimens for naturally and culturally significant standout trees. In their search they've discovered the largest tree, the tallest tree, the oldest tree, and many other categories by which to classify trees worthy of attention.

The City of Carlsbad embarked on just such a mission within the community, and in 2002 received a Heritage Tree Report—Phase I of the Historic Village District, prepared for the Historic Preservation Commission. Following that submission, in 2011 the city received a Heritage Tree Report - Phase II, also prepared for the Historic Preservation Commission. The latter identified trees in a wider geographical area, near the original zone of the Olde Carlsbad Village as well as several further outlying areas — still within the city limits. Both reports were brought current in 2019, to be included with the CCFMP update.

These two reports together found over 137 candidates for Heritage Tree status. All recommendations as stated in the two documents for the preservation and ongoing maintenance of these candidates are applicable, and are considered mandatory for all city-owned heritage trees. The significance of these heritage trees, and the public good they serve, are worth an additional cost to maintain and preserve them for the benefit of the community.

In the larger picture, these trees are important facets of the City of Carlsbad's history, arts, and cultural resources Community Value. They offer special opportunities for people interested in science and history to learn more about trees outside of the typical arboretum or classroom setting. Likewise, when instructors of art classes, school lessons, or recreational activities incorporate these trees into the programs, additional members of the public gain knowledge of the botanical gems within their midst.

By partnering with local clubs or schools, educators can weave heritage trees into their instruction and make it fun in the process to learn about trees and the environment. Scavenger hunts for these historic trees in the neighborhoods around them can inspire children to consider arboriculture in the future. Some children may grow up to be climbers that care for the trees in the region, while others may choose a path of growing trees or designing new sustainable landscapes that can one day have more heritage trees. The City of Carlsbad's Community Value to enhance the small-town feel is only strengthened by a program that identifies, maintains, and celebrates heritage trees.

Unlike fine artwork, trees do not remain in a static state and are constantly exposed to the elements and biological factors. It is important to preserve heritage trees, but even though the best plant health care practices available may be applied to keep heritage trees in good condition, trees do age and naturally senesce and succumb to factors beyond the control of arboriculture professionals. When a heritage tree reaches the point of needing to be removed out of safety or practicality concerns, the tree may have an extended use and be further memorialized through the Community Green Waste, Wood and Tree Recycling Program, (refer to Chapter 8). By capturing this valuable wood product, the tree may continue to serve a purpose beyond the typically associated public benefits. It may become art in the form of carving, or tables that others may admire.

While tree care may not at first seem like an art, a well-maintained tree can be a work of art in the minds of many residents, especially when they've been shown examples of proper tree maintenance, When maintained to ANSI standards, and by ISA Best Management Practices, heritage trees can be considered art in the landscape. A goal of the city's Heritage Tree Reports is to encourage tree owners to preserve these unique trees for the good of the public, and to nominate other trees with notable historic interest or notable species/size.

CARLSBAD
HISTORIC VILLAGE DISTRICT
HERITAGE TREE REPORT
2002

Revised
June 2019

WISNIEWSKI & ASSOCIATES
ENCINITAS, CALIFORNIA

CARLSBAD
HISTORIC VILLAGE DISTRICT
HERITAGE TREE REPORT
2002

Revised
June 2019

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International Society of Arboriculture – Certified Arborist No. WC-0742
International Society of Arboriculture – Tree Risk Assessment Qualified

TABLE OF CONTENTS

Cover: Pinus torreyana (Tree #78)
1166 Carlsbad Village Drive
Photo by Mark Wisniewski 2002

The hand embossed metal plate attached to the tree states:

TORREY
PINE
PLANTED FROM SEED BY
MRS. JAMES A. GREENWOOD
PLEASE DO NOT DISTURB

PREFACE

The original report was first published in 2002 was subsequently amended in 2006 and 2007. The city has requested all the trees listed in those previous reports be reviewed so their continued existence and current conditions can be evaluated.

The author would like to thank the following for their assistance or technical expertise that contributed to this report. Any mistakes, errors or oversights remain the sole responsibility of the author.

Kyle Lancaster and Tim Selke with the Parks & Recreation Department for providing digital copies of the previous report and encouragement. David Young in the Carlsbad GIS Department for the excellent maps that were produced to show the locations of the study area and the trees.

I also want to thank the staff that oversee the Carlsbad History Collection at the Georgiana Cole Library for their assistance and research that contributed new historical information and photographs for this report.

Tim Clancy, associate, arborist and computer guru, for providing technical computer support and the data base program that allowed for organizing all the information and data summaries. He also provided review of the technical information along with proof reading and editing suggestions. His assistance was invaluable.

To all the citizens of this community past, and present who valued, protected and at times have fought to preserve this community's heritage that is reflected and recorded in its trees. This includes the police officers who stopped and questioned me because a citizen reported that they thought I was acting suspiciously near a Torrey pine during my inspections. I wasn't, but I appreciated both the citizen's concern and the quick response from the police.

This incident occurred as I was photographing the metal sign that graces the cover of this and the original report. The sign has since been removed, but has been preserved by the Parks & Recreation Department. It was located by Tim Selke, whose recent photograph of it, sap and all, is included with his permission. It remains a stunning reminder of period folk craftsmanship and the value that people of Carlsbad attached to their trees.

I recommend that those folks interested in the details of the individual species read the original report as well as this updated information for a more complete appreciation of these valuable community resources.

INTRODUCTION - From the original report

How many times have you heard the quaint, but accurate expression, “You can’t see the forest for the trees?” Well, I found that the reverse is also true - that you often can’t see and appreciate the individual trees for the forest. We all see them. We drive or walk by them frequently or even daily. They may be in our neighbor’s front yard or our own, or a city street tree.

We’ve seen some trees a hundred or a thousand times, but usually we don’t really look at them or study them closely. They are so much a part of the fabric of our lives and the community that sometimes we only really notice them when they are removed. Then we wonder why and sometimes get angry or upset because something that was significant to us, although we may not have fully appreciated it, is gone. There is a void where that tree, which may have been there throughout our entire lives, once stood.

Joni Mitchell in a popular song she composed and sang in 1969 “Big Yellow Taxi” laments, “They took all the trees and put them in a tree museum and they charged all the people a dollar and a half just to see ‘em. Don’t it always seem to go that you don’t know what you’ve got till it’s gone?”

My hope for this study is that people are given an opportunity to learn and appreciate what they have while they have it and perhaps collectively we can keep these significant, strong but silent, members of our community around for a long time. The trees can’t speak for themselves; that is the responsibility of the citizens.

These trees are out here standing on the street corner, down an alleyway, in the parking lot or in your back yard. We don’t have to spend “a dollar and a half just to see ‘em”, but if we do invest in long-term proper tree care and management they just may continue to provide beauty and historical continuity for generations to come. Those future generations will appreciate our efforts and they will not have to go to a tree museum, at least not in the City of Carlsbad.

> *For humankind, the trees—their roots in the ground, their heads reaching into the sky—have seemed always to bind together the universe. Throughout the ages, humankind has looked to the tree to feed not only the flesh, but the spirit.*
>
> George Nakashima, foreword, “The Soul of a Tree”

We will not…shut our eyes to the fact which no observer of men will dispute, that in every age and country are born some persons who belong rather to the past than the present—men to whom memory is dearer than hope—the by-gone ages fuller of meaning than those in the future. These are the natural conservatives whom Providence has wisely distributed, even in the most democratic governments, to steady the otherwise too impetuous and unsteady onward movements of those who, in their love for progress, would obliterate the past, even in its hold on the feelings and imaginations of our race.

Andrew Jackson Downing in "The Architecture of Country Houses, 1850", reprinted by Dover Publications, Inc., 1969, pg. 265.

Pinus torreyana – Torrey pine (Tree #106)
Holiday Park - Perhaps the most viewed tree in the city.
Photo by Mark Wisniewski 2019

ASSIGNMENT

I was originally asked to review all of the trees growing in the Carlsbad Historic Village District for consideration as candidates for Heritage Tree status. I have since been asked to review those original trees and tree sites I had recommended as Heritage Trees, update their current condition and status and provide current recommendations.

As defined by Carlsbad City Ordinance: “Heritage trees shall be trees with notable historic interest or trees of an unusual species or size.” The 110 trees listed in the original report were recommended for consideration by the Carlsbad City Council for designation as Heritage Trees. Since that time several trees have either died or have been removed for various reasons. This report recommends that 74 surviving trees and one new addition be considered for Heritage Tree status.

The original process that I followed was that significant trees in the study area were researched through numerous archival sources. They were reviewed several times in the field for further evaluation, then finally selected, inventoried and listed for consideration as Heritage Trees.

The data collected for the inventory included: the species, street address and location, tree site number, height, canopy spread and DBH (Diameter Breast Height) as well as the condition, vigor and ownership of each tree. In some locations of street tree plantings or groves the trees were not individually listed, but the largest representative was evaluated. In other locations the entire grove was considered as a Heritage Tree site. The trees on private property were not measured, but their size and condition was estimated.

The 75 trees listed in this report are considered worthy of designation as Heritage Trees because of their species, rarity, size, age, shape, historic, or cultural significance. Many other trees were originally considered, but this list is representative of the current most noteworthy trees in the study area.

Where there was a connection between a tree, or trees, to a significant historical property or person that information has been included. If the property is now better known by its current use or owner that information is also provided.

Some Information or stories have been included because they are interesting, at least to me. Every tree has a story. Someone planted it, others have cared for and maintained it over years and decades and once in a while you might get a glimpse of who those folks were and learn what their motivation was.

I have included historic photos and the photos from the first report for the surviving trees, and also current photos. By comparing the photos you can tell some trees have declined while others have grown larger and become even more impressive. I have tried to duplicate the settings, but vantage points have changed, as has the focal length of the lenses on the cameras I used then and now. This can have a significant affect on how a particular tree or setting appears.

Please note that the information about the condition of the trees is from a simple ground level observation. No sounding, coring, drilling, probing or excavations were performed. This was not a tree risk assessment.

HISTORICAL PERSPECTIVE – Please refer to the original report

> *In all countries where trees grow, the noblest specimens ought to be preserved as national monuments since…no nation can boast anything more magnificent than the forest giants Nature gave it.*
>
> Ernest H. Wilson, “Aristocrats of the Trees”

HERITAGE TREES – From the original report with minor revisions

The 110 trees in the following list were originally recommended for the designation of Heritage Trees. Based on the current review, one tree (#111), has been added.

Some trees are listed because of their species, others because of their rarity. There are many trees on this list, which have great size, which is also usually an indicator of age. Some of these trees may also have a unique shape or branching structure, interesting flowers, seed pods or growth habits. One tree is a relic native tree, others are remnants of the groves and orchards that made Carlsbad an important agricultural community and fueled its growth. These trees collectively have significant historic and cultural importance to this city and add to its beauty and charm.

Many other trees were reviewed and considered. These were further evaluated, some as many as seven times, in order to select the best candidates for consideration as Heritage Trees.

The list of the 111 trees in “Appendix B”is arranged alphabetically by their species names in Latin. This is the normally accepted manner of listing trees and plants in horticultural books and studies. The Latin names are used because they are universally recognized around the world as the scientifically correct name. However, even these names often get changed over time. In this case previous names or other names that the trees have been known by are also included. Common names are listed, but are often a source more of confusion than enlightenment as at times more than one plant may be referred to by the same name.

Since the original report there have been several changes to how species are classified and named. Instead of changing names to reflect current botanical nomenclature the original names have been retained.

The place or country or continent of origin was listed in the original report as well as a range when that is of interest. Other more scientific texts can provide more exact descriptions of habitat limits.

Since this study is of a general nature rather than a scientific treatise, a general, rather than scientific, description was provided of the trees. More noteworthy or obvious unique characteristics that may be of interest to the nonprofessional were included.

Since many trees are included that may offer educational opportunities for school or library programs, the approach and intent of the author was to offer botanical details and information in a non-technical manner. This report does include the descriptive information that is in the original report.

This report mainly features photos of the still existing trees from the original report. These photos are paired with photos showing their current condition 17 years later. The photos are in the same order as in the original report.

Due to changes in computer programing and camera technology it was not always possible to size the photographs same.

Trees may also appear differently as they may have been photographed at different times of the year. Some trees may have leaves, while some may be out of leaf. Some may be in bloom and others out of bloom.

A man does not plant a tree for himself; he plants it for posterity.
Alexander Smith, 1863

Araucaria bidwillii – bunya-bunya (Tree #104)
Holiday Park
Note the kite caught in the branches of this “Charlie Brown kite-eating tree.”
Photo by Mark Wisniewski 2002

Araucaria bidwillii – bunya-bunya (Tree #104)
Holiday Park
Note the fencing installed to protect visitors from the falling cones, which can weigh as much as 40 pounds.
Photo by Mark Wisniewski 2019

Eucalyptus cladocalyx – sugar gum (Tree #2)
Elm Avenue (now Carlsbad Village Drive) looking west
The large open branched tree located on the left side of the road next to the railroad tracks.
Photo Courtesy of the Carlsbad City Library Carlsbad History Collection 1916

Eucalyptus cladocalyx – sugar gum (Tree #2)
395 Carlsbad Village Drive
Photo by Mark Wisniewski 2001

Eucalyptus cladocalyx – sugar gum (Tree #2)
395 Carlsbad Village Drive
Photo by Mark Wisniewski 2019

Eucalyptus cladocalyx – sugar gum (Tree #2)
395 Carlsbad Village Drive
The enlarged base of the trunk measures over 10’ in diameter.
Photo by Mark Wisniewski 2001

Eucalyptus cladocalyx – sugar gum (Tree #2)
395 Carlsbad Village Drive
Photo by Mark Wisniewski 2019

This tree has changed appearance over the years as it was heavily pruned and the main branches were significantly reduced in length in 2001. By 2019 the canopy appears more like it did 103 years ago. Tourists often have their picture taken while sitting on the large swollen base of the trunk.

Dracena draco – dragon tree (Tree #79)
1166 Carlsbad Village Drive - Greenwood Home/Park and Recreation Building
Photo by Mark Wisniewski 2002

Dracena draco – dragon tree (Tree #79)
1166 Cardlbad Village Drive - Greenwood Home/Park and Recreation Building
Photo by Mark Wisniewski 2019

Eucalyptus cladocalyx – sugar gum (Tree #63)
500 Block Oak Avenue
Photo by Mark Wisniewski 2002

Eucalyptus cladocalyx – sugar gum (Tree #63)
500 Block Oak Avenue
Photo by Mark Wisniewski 2019

Ficus macrophylla - Moreton Bay fig (Tree #10)
3003 Carlsbad Boulevard - Cohn/Royal Palms/Fidel's
Photo by Mark Wisniewski 2002

Ficus macrophylla - Moreton Bay fig (Tree #10)
3003 Carlsbad Boulevard - Cohn/Royal Palms/Fidel's
Photo by Mark Wisniewski 2019

Leptospermum laevigatum - Australian tea tree (Tree #13)
3080 Lincoln Street - Luther Gage House/Monterey Condominiums
Photo by Mark Wisniewski 2002

Leptospermum laevigatum – Australian tea tree (Tree #13)
3080 Lincoln Street - Luther Gage House/Monterey Condominiums
Photo by Mark Wisniewski 2019

Jacaranda mimosifolia - jacaranda (Tree #59)
799 Pine Avenue - Carlsbad Senior Center - parking lot
Photo by Carlsbad City Photographer 2002

Jacaranda mimosifolia - jacaranda (Tree #59)
799 Pine Avenue - Carlsbad Senior Center - parking lot
Photo by Mark Wisniewski 2019

Agonis flexuousa – peppermint tree (Tree #98)
Holiday Park
Photo by Mark Wisniewski 2002

Agonis flexuousa – peppermint tree (Tree #98)
Holiday Park
Photo by Mark Wisniewski 2019

Pinus torreyana – Torrey pine (Tree #69)
3546 Highland Drive
This may be one of the largest specimens of the species in the state.
Photo by Mark Wisniewski 2002

Pinus torreyana – Torrey pine (Tree #69)
3546 Highland Drive
Photo by Mark Wisniewski 2019

Pinus torreyana – Torrey pine (Tree #11)
3001 Carlsbad Boulevard
Photo by Mark Wisniewski 2002

Pinus torreyana – Torrey pine (Tree #11)
3001 Carlsbad Boulevard
Photo by Mark Wisniewski 2019

Chorisia speciosa – floss silk tree (Tree #26)
421 Grand Avenue – the largest of five trees located just behind the white Jeep.
Photo by Mark Wisniewski 2002

Chorisia speciosa – floss silk tree (Tree #26)
421 Grand Avenue
The “silk” from the opening seed pods is the source of kapok which
has been used in the past for life vests and stuffing for mattress and pillows.
Photo by Mark Wisniewski 2019

Erythrina caffra – coral tree (Tree #27)
507 Grand Avenue – the tree on the right
Photo by Mark Wisniewski 2002

Erythrina caffra – coral tree (Tree #27)
507 Grand Avenue – the tree on the right
Photo by Mark Wisniewski 2019

Tipuana tipu – tipu tree (Tree #29)
2954 Madison Street – taken from the alley
Photo by Mark Wisniewski 2002

Tipuana tipu – tipu tree (Tree #29)
2954 Madison Street - taken from the alley
Photo by Mark Wisniewski 2019

This tipu tree in bloom is one of the most spectacular trees in the Historic Village District. After writing the section below, taken from the original report, I met the grandson of the owner of this tree. He said his grandfather, who was a Native American would let kids climb the tree, but they could not cut branches or damage the tree. He felt his life force was tied to the tree and he would somehow be diminished if the tree was diminished.

The following is from the original report and is an example of the descriptions given there.

TIPUANA TIPU TIPU TREE #29- 2945 MADISON ST. Argentina, Bolivia
(aka ROSEWOOD, PRIDE OF BOLIVIA) & Southern Brazil

This tree is best appreciated from the alley. A great specimen that covers over a third of the lot and dwarfs the house. This is such a marvelous tree with wide-spreading branches because it appears to have been pruned very little over its lifetime. The owners of this special tree must have cared for it deeply to allow it the freedom to grow uninhibited. The species typically has an umbrella shaped flattened crown that is wider than it is high. The foliage is light green in color and is semi-evergreen to deciduous. The tree may be out of leaf from January to May. “Blooms from late spring to early summer, bearing clusters of apricot to yellow, sweet pea-shaped flowers; 2 ½” seed pods follow the flowers.” (Brenzel pg. 634) The San Diego nursery pioneer and horticulturalist Kate Sessions introduced the tree into the nursery trade and helped to popularize its use.

Ceratonia siliqua – carob tree, St. John’s bread (Tree #111)
2810 Madison
Photo by Mark Wisniewski 2019

This particular tree was not originally recommend as a Heritage Tree, but it was listed as a tree "of unusual note or special interest". Since then one of the carob trees recommended as a Heritage Tree (Tree #44) was removed and the other (Tree #57) is declining and may not survive much longer. This tree is now being recommended as a replacement.

I had a chance meeting with Mr. Houston Tucker the owner, planter and caretaker of this tree when he saw me looking at his tree and taking notes during my original field surveys. He shared some stories about his tree with me. He planted the tree in 1955 and he also help plant other carobs at Camp Pendleton where he worked as a civilian employee. Mr. Tucker was one of the original members of the Carlsbad Volunteer Fire Department when it was formed in 1949.

He encouraged neighborhood children to climb his tree, at times to the consternation of their mothers from the nearby apartment complex. He built a tree house for the children to enjoy and taught them how to climb safely. He figured that this was the only nearby "playground" for these children. Not only did they develop climbing skills, but also self-confidence and an appreciation for nature, particularly trees.

He had another amusing story that he shared. The dried seed pods can be ground to a powder and used as a substitute for cocoa powder in cooking, but they made a real mess in his front yard when they were ripe and fell off the tree. One day a local man asked if he could pick up the fallen fruit and Houston told to go right ahead. The man picked up enough of the pods to fill several gunny sacks.

Some time later Mr. Tucker was in Renton, Washington and found carob pods for sale in a health food store labeled as "Carlsbad Carob".

The following is from the original report.

CERATONIA SILIQUA CAROB (aka ST. JOHN'S BREAD) #57-3880 HARDING ST. Mediterranean Region

This tree located along Chestnut Ave. is the largest carob in the study area.

#44-2812 ROOSEVELT ST.

Located to the southwest corner of the building in the patio area. As reported by Houston Tucker, Tree #44 is about the same size as it was in 1955 when he planted his tree, #B at 2810 Madison St. Refer to the listing of "other trees and plants of unusual note or interest" at the end of this section for additional information on this tree.

This evergreen tree has light green leathery leaves. The fruit of the carob is a flat leathery pod. "These pods have a high nutritional value and a sweet mealy flavor. Historically, they served as the principal food supply for Wellington's army in the fight against Napoleon, and they are supposed to have been the 'locusts and wild honey' St. John ate in the wilderness. Today they are ground and used for bread and as an ingredient of cereal, candy, spirits and syrup." (Maino pg. 112)

MRS. JAMES A. GREENWOOD

Why does this woman rate a new section in this report? Because when it came to trees, and especially to her two Torrey pines (Trees #78), she did some very special things. Look back at the cover of this report showing the little metal sign that was attached to one of the Torrey pines growing in front of the Park and Recreation Building at 1166 Carlsbad Village Drive. People who have lived in Carlsbad have probably passed by these trees thousand of times en route to or from downtown, city hall or the library. Most of them have probably never thought about how the trees came to be there and who planted them. They just always seemed to be part of the scenery.

Since I wrote original report I had been wondering about who Mrs. James A. Greenwood was and that little metal sign. When I went back to review those trees for this current report the sign was no longer there. That was a major disappointment and I felt a significant historical artifact had been lost. When I mentioned that the sign was missing to Tim Selke, Carlsbad Parks Superintendent and my contact during writing this report, he said that it had been removed, but that he had seen it around the office somewhere. He was able to find it and sent me this photograph.

Photo by Tim Selke 2019

I suggested to Tim it might be interesting, and educational, to put it on display in the library around Arbor Day along with books and other information about trees, like this report and photos of the Heritage Trees. Since the library was close by I thought that perhaps the research staff might be able to find some information on this lady and her trees. They started to send me bits and pieces. She was listed in numerous newspaper columns reporting on the meetings of various clubs, organizations and social events around town. She like all of the other women were always listed by their husbands' name and their initial. It was difficult to do a Google search without knowing what the A. stood for. I finally found out it stands for Alice.

The following is from the Carlsbad "Historic Resources Inventory" conducted in 1990, and was provided by the Library staff.

> This house was built prior to World War II by James and Alice Greenwood and is currently used as the offices for Carlsbad Park and Recreation Department. The Greenwoods moved to the Carlsbad area in 1929. Mr. Greenwood was a civil service employee. Mrs. Greenwood was active in the Woman's Club and the Garden Club. She planted two large Torrey pine trees in the yard. Because of the possibility of the destruction of the trees, the Greenwoods refused to sell their large comer lot to commercial interests. In 1954, when Mr. Greenwood died, the property was leased to the City of Carlsbad with a five year option to buy. The property was purchased by the City in 1963 for $20,000. The City Hall stands on a portion of the original Greenwood property.
>
> The house is not significant from an architectural perspective nor are the early occupants particularly important in the historical development of the community. What is of significance on this parcel are the trees and efforts to continue preservation should be encouraged.

Alice Greenwood
Photo Courtesy of the Carlsbad City Library Carlsbad History Collection.

Pinus torreyana – Torrey pine (Trees #78)
1166 Carlsbad Village Drive (formerly Elm)
Greenwood Home/Parks & Recreation Building
Photo Courtesy of the Carlsbad City Library Carlsbad History Collection 1990

Pinus torreyana – Torrey pine (Trees #78)
1166 Carlsbad Village Drive
Greenwood Home/Parks & Recreation Building
Photo by Mark Wisniewski 2019

A6 CARLSBAD JOURNAL
Thursday, October 1, 1970

Obituaries

Alice Greenwood

CARLSBAD –Services were held yesterday for Mrs. Alice E. Greenwood, 94, a 40-year resident of Carlsbad.

Mrs. Greenwood died last Friday in a nursing home in Napa where she had been for eight months. Her home here was at 1166 Elm Ave., property she sold to the city several years ago for use when she vacated it.

The native of Vallejo, she came here in 1930 from Honolulu, Hawaii. She had been a member of the Order of Eastern Star since 1900 and belonged to the Poinsettia Chapter #287 here.

She was also a member of the Carlsbad Garden Club and one of the Women's Circles at Carlsbad Union Church.

She is survived by a daughter, Mrs. Grace Holzenberg of Carlsbad, Two granddaughters and six great-grandchildren. A sister, Mrs. Lillie Payntar of San Rafael, is also surviving. She is 100.

Graveside services were held Wednesday at Eternal Hills Memorial Park with the Poinsettia Chapter #287 officiating. Carlsbad Mortuary handled arrangements.

Courtesy of the Carlsbad City Library Carlsbad History Collection

So that is the story behind those two Torrey pine trees and the little metal sign. Thanks to Alice and James for inspiring us to value and to protect the Heritage Trees of Carlsbad. Maybe they also inspired other neighbors and friends to plant trees, which is why there are so many grand old trees surviving to this day in Carlsbad.

NEW INFORMATION AND TREE ART

A couple of other names in the original report require a bit more historical background. The Library staff and other sources helped fill in some of the gaps.

Shirley House, Rancho de la La Motte Kirmse
This property is located on the Northeast corner of Oak Avenue and Highland Drive. At the time of the original inventory there were 12 large Torrey pines (Tree #81) along Highland Drive. Since then the property has been subdivided into three lots, new homes have been built, and only three of the pines remain. They are a favorite nesting site for birds as the white stained pavement below them attests.

On Oak Avenue there is a tall *Grevillea robusta* (Tree #82). It is commonly called a silk oak even though it is not an oak.

"The oak part of the common name comes from the oak-like grain of the wood." (McClintock pg. 100) The fern-like deeply divided leaves, 6-12" long by up to 6" wide, are dark green to golden-green on top and silvery-gray below.

A profuse bloom in the spring, with large clusters of bright golden-orange 4-6" long flowers, occurs when trees are sometimes briefly deciduous. The flowers can produce large amounts of nectar for birds. The wood can be brittle and branches often break readily from the tree. The wood is highly prized and valued by woodworkers who often refer to it as "lacewood" because of its delicate appearance. In Australia it is used for furniture, cabinetry and wall paneling.

The following information was provided courtesy of the Carlsbad Library staff and is included to give the current residents a taste of the city's colorful past.

"[The] house is a cottage which dates back to the early eighties. It is believed to once have been a three-room structure that was either built or remodeled by A.J. Culver. The first known owner of the now U-shaped residence was Dr. H.B. Shirley, who took title to it in 1890. Shirley, the only doctor in town, was diverted from his rounds in 1906 when, according to the local newspaper, he trapped a wildcat in his front yard.

The South Coast Land Company later regained title to the property but sold it in 1915 to G.F. Roberts of Pasadena. Roberts established a successful poultry farm which he sold ten years later to Anna Marx de la Motte, the daughter of a Pawnee Indian chief and the first woman to act as an Indian agent in the Oklahoma territory. Her son looked after the poultry while she continued her business activities in the Midwest. Except for forty acres which have been developed for housing, the homestead is now the property of William and Georgette de la Motte Kirmse, who recently built a small addition to the northwest corner of the house. Kirmse is the son of the first jeweler in Skagway, Alaska, whose home and business have become a feature of the new Skagway National Park."

(Howard-Jones, M. *Seekers of the Spring: A History of Carlsbad* 1982, pg. 61)

From Library staff email:
"The home was included in the city's 1990 Historic Resources Inventory study conducted by Roth and Associates. The entry for 1542 Oak lists "Shirley House" as the common name and "Rancho de la Motte Kirmse" as the historic name."

Pinus torreyana – Torrey pine (Tree #81)
1550 Oak Avenue – three tress located on Highland Drive
Photo by Mark Wisniewski 2019

Lt. Maxton Brown Park
This lovely little urban oasis is located adjacent to Buena Vista Lagoon and is fittingly dedicated to Lt. Maxton Brown. Here one can sit, relax, enjoy the view and listen to the bird song just as Maxton Brown did years ago.

> "Carlsbad resident and avid birdwatcher Maxton Brown was responsible for organizing opposition to shooting in the Buena Vista Lagoon. An Army Lt. with the 515th Squadron during WWII, he was killed after completing a B-24 bombing raid on July 8, 1943 at the age of 28. The Maxton Brown Bird Sanctuary and Maxton Brown Park were named in his honor. One-acre Maxton Brown Park provides a breathtaking view of the 260-acre Buena Vista Lagoon separating Oceanside and Carlsbad, which remains a bird sanctuary today."

http://notfadeaway1.blogspot.com/2011/07/maxton-brown-park-carlsbad-ca-usa.html

Erythrina caffra – coral tree (Tree #40)
Lt. Maxton Brown Park
Photo by Mark Wisniewski 2019

Platanus racemosa – California sycamore (Tree #41) is visible on the skyline just to the left of the coral tree.

Platanus racemosa – California sycamore (Tree #41)
Lt. Maxton Brown Park
Photo by Mark Wisniewski 2019

From the original report: “This appears to be the only naturally occurring native tree in the study area, every other tree in the area was planted”. To fully appreciate the majesty of this tree you have to walk over from the maintained part of the park to see that the tree trunk starts some 20’ below the level of the sidewalk.

Parks

Since many of the Heritage Trees are growing in Carlsbad city parks it seems appropriate to include information about how the city parks were first established and how they developed over the years. The history of the trees is also the history of the people behind them. Any errors below are in the original text.

Carlsbads' Parks and Recreation Department began in 1954 with the acquisition of its first park, Holiday Park, and the appointment of its first employee, Superintendent Nelson Westree. In the years immediately after incorporation, when the city treasury was limited, new Departments were gradually added into the City Government budget as the funds became available. Prior to the establish of the Parks and Recreation Department, a volunteer group that served a similar function was called the Park, Beach and Recreational Commission. Many of the early city employees were volunteers who worked part time for the city while continuing in other occupations. As Park Superintendent Mr. Westree worked part time while continuing as grounds person for the Carlsbad Hotel, and tending to his own Macadamia nut groves. In 1948, when the Westree family arrived in Carlsbad, they promptly began volunteering in their new neighborhood. When asked in a 1969 interview why they volunteered, Mrs. Westree responded, " I simply believe that you have to figure your own 'good' things in life... maybe money isn't as important as we think it is... maybe happiness and satisfaction in the job are equally important." When asked 30 years later if she still felt the same way about volunteering Mrs. Westree added, "we owe something to life, we shouldn't take up space, we should make a contribution to where we are living."

Gradually the Carlsbad Parks and Recreation Department grew from a mostly volunteer organization with one part time employee and one park site, to an organization that today includes a variety of parks, community centers, sports programs and enrichment classes. Many of the land additions to the park system have interesting and unique stories behind their acquisition.

In 1954 the San Diego County Department of Roads sold to the City of Carlsbad three acres of county owned land that the Department used as a road equipment storage yard for $300. After the purchase civic debate arose on what would be the best use of the land. Some residents suggested reselling the property and putting the money into the city treasury, others wanted to construct a library, and still others wanted a park. Mr. Westree conducted a random phone survey and presented the results to the City Council. The land that was bordered by I-5, Basswood, Eureka and Chestnut finally became the genesis of the Carlsbad Park System and was named Holiday Park, in honor of the annual Spring Holiday Event begun 1951 by the Carlsbad Rotary.

Spring Holiday Event

The Spring Holiday Event was conceived as a way to highlight the achievements of Carlsbad's principal volunteer organizations. An annual week long event, it offered an opportunity to participate to everyone in the community. Once the land was acquired and dedicated as Holiday Park, the park became a venue for one of the activities: a community cookout. Other venues were staged throughout town to accommodate the various Spring Holiday events. The activities included operettas performed at the Army- Navy Academy Auditorium, Carnival rides at Saint Patricks' Church, Zany Hat Breakfast held at the Carlsbad Woman's Club, downtown parades, a pet show at the Union Church, and water skiing exhibitions at Agua Hedionda Lagoon. The entire Spring Holiday Event culminated with a huge dinner dance held at two sites, the Twin Inns and across the street at the Carlsbad Hotel. The weeklong Spring Holiday Event was staged each year through the 50s and 60s and it truly was a community event, organized and enjoyed by all. It was only appropriate that the first community park should be named in honor of such a community holiday event.

Rotary Park

Rotary Park, located on Grand and Washington, is another City acquisition with an interesting origin that also points to the significance and importance of the resident volunteer spirit that benefited the community. By 1960 trains were no longer stopping in Carlsbad for freight or passenger service. The 1907 Santa Fe Station was deteriorating. B.M. (Chris) Christiansen and his wife Kay shared a keen interest in history. It was the Christiansens' shared dream to reopen the Carlsbad Mineral Spring Well, and with this in mind they purchased the property on which the original mineral wells were located. Chris and Kay became founding members of the Carlsbad Historical Society. While researching primary historical documentation relating to the Mineral Wells, it also enabled them to gather information relating to early Carlsbad history. Considering Chris's civic involvement and his interest in local history it was not surprising that he expressed concern in 1960 over the vacant Santa Fe Train Depot that was becoming a downtown eyesore. With his typical energy Mr. Christiansen, wearing his President of the Carlsbad Rotary hat, contacted the President of the Santa Fe Railroad, who also happened to be President of Rotary International. Christiansen was able to convince him that it would be in everyone's best interest to let the community have use of the historic building as well as a few acres of land. The site was designated as Rotary Park and through volunteer efforts the old depot was cleaned up as well as the land around it.

In the mid 1980s, after the sale of the Twin Inn's Restaurant, two of the Inn's famous plaster chickens were moved next door to Rotary Park. Less than 48 hours later, the Chickens were stolen. In December of 1989 one plaster chicken was found abandoned in an apartment house dumpster. Currently the last of the Twin Inns Chickens can be viewed at the Carlsbad Historical Society Museum at Magee Park.

Maxton Brown Bird Sanctuary

In 1965, a small three-acre park was dedicated as Lt. Maxton Brown Jr. Bird Sanctuary at the Buena Vista Lagoon. Maxton Brown Jr. was lost while flying over North Africa during World War II. Prior to the war he spent many hours at the lagoon sighting and recording over 150 species of birds. In consideration of his dedication to the Buena Vista Lagoon and to its inhabitants, the bird sanctuary carries his name.

Magee Park

Magee Park was acquired by the city in 1974 when Florence Shipley Magee passed away, willing her home and the property around it to the City of Carlsbad for a Historic and Recreational Park. This bountiful donation was the partial answer to a serious dilemma facing the city. In 1971 a report to the Mayor and City Council pointed out that because the city lacked an adequate industrial tax base it was not in a financial position to acquire or develop new parks.

In 1972, Chairperson of the Parks and Recreation Commission, Betty Wollrich, proposed a one million dollar bond election for purchase and development of neighborhood parkland. This bond election was in direct response to a city questionnaire that stated 90% of Carlsbad residents wanted more parks. In 1972 Carlsbad owned just 13 acres of parkland. The hope was that bond approval would allow the city to increase that to a total of 40 park acres.

A 2/3 majority vote was necessary for passage of the park acquisition bond. This bond would tax 11 cents on every accessed $100 of land valuation. Opponents to the bond issue expressed discontent with the tax assessment and suggested that other methods be exhausted before more taxes were levied. With a 54.6% approval of the park bond, it failed to gain the necessary number of votes and the city was forced to find other ways to add more land to their park system.

The Parks and Recreation Department made a list of what Carlsbad lacked and what was desired: more ball parks, elimination of lumpy school tennis courts, enlargement of the undersized soccer fields, more basketball courts and at least one community swimming pool. With this list in mind the city needed to find ways to resolve and correct what was lacking in the park system.

A variety of solutions presented themselves, in 1979 the city and the school district entered into an agreement that would guarantee joint use of school facilities. This eventually led to the 1980s construction of a community pool on Carlsbad High School grounds. Additionally, a Park Dedication ordinance was enacted that required developers to either give land or money for park acquisition and development.

When Florence Magee's will bequeathed her home and gardens to the City of Carlsbad for use within the park system in 1974. It was a most welcome and needed addition, since the city had none of the previously mentioned solutions. The land surrounding Mrs. Magee’s home eventually provided a home for other displaced historical buildings, such as Heritage Hall, originally Saint Patrick’s Catholic Church on Harding Street. Later the church was used as Carlsbad's first Police Department, City Hall, and Library. Without question Magee Park, with Mrs. Magee's home as a centerpiece, is one of Carlsbad's most unique and special parks, providing a glimpse of a more tranquil time.

Magee House and its Inhabitants

Samuel Church Smith, one of the founding members of the Carlsbad Land and Water Company, originally constructed the house in 1886. It has retained much of its original charm, having housed only 2 families. The Smith family lived for a few short years in Carlsbad before moving to San Diego. It was left empty until 1896, when the Shipley family arrived looking for a healthier place in which to live. Florence, an only child, was 14 years old on her arrival with her parents Alexander and Julia. Originally from New York, the family had more recently lived in Napa, California after returning from New Zealand, where Mr. Shipley served as Vice Consul for the United States Government. Quite wealthy with financial investments throughout California and the United States, well educated and traveled, the family had a difficult adjustment to small town Carlsbad. However, Mr. Shipley suffered from a variety of ailments that caused considerable strain and upheaval on the family. Carlsbad, with its yearlong spring like climate, seemed ideal for Alexander's health. Florence was educated at Our Lady of Peace Academy, a Catholic boarding school in San Diego. Upon her graduation in 1902, Florence was given an opportunity to do a bit of traveling. However, the 1906 San Francisco earthquake also had a profound impact on the Shipley family finances. This setback, plus her father's failing health forced Florence to accept considerable responsibility for handling much of the family's business affairs. Considering that this took place in a time when women in this country were still not allowed to vote, it points to the great respect that Mr. Shipley showed for his daughter's intellectual abilities. In 1912, after Florence married Hugh Magee, she left Carlsbad for over 29 years, living at Condor's Nest, the Magee family ranch near Pala. Florence was able to visit her parents often, considering the difficulty of travel over unpaved roads, and the difficulty of leaving a working ranch. A close relationship with her parents was maintained through her almost daily correspondence.

In 1941, after Hugh's death, the childless Florence returned to Carlsbad living with her widowed mother. After her mother's death in 1943, Florence remained alone in her family home for the next 30 years with just her pet cats as companions. So numerous and well known were her pets, that in 1985, after her death, their descendants were still living around the park. Irma Algover, who lived nearby, often fed the semi wild cats. When asked why she did this, Ms. Algover said that when she looked at their hungry eyes, she remembered herself and other Hungarian refugees who fled Europe during World War II. The cats had the same look.

After the City acquired the Magee home, some renovations were required to bring the house into compliance with modern safety standards. However, for the most part the original structure remains. Today, two volunteer gardening groups, the Carlsbad Arboretum Foundation and Coastal Rose Society, maintain the gardens that surround the home. Various planting themes that dominate the flower beds: plants native to southern California, those grown commercially in Carlsbad and of course old garden roses as well as modern teas, providing an interesting history lesson to those who visit.

http://carlsbadhistoricalsociety.com/Carlsbad%20Historical%20Society_files/historical/parks.htm

Pines
One of the bits of history that the Carlsbad Library staff provided me was this 1948 newspaper article about approving the planting of pine trees on Pine Avenue. Since there are many very large and old Torrey pines in the study area it was nice to be able to make this connection between how some of them came to be planted over 70 years ago.

It was also interesting to note that there was a tree committee that was interested in seeing hundreds of new trees planted. They certainly got their wish.

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Builders of New Home Would Plant Torrey Pines

Miss Nellie Wilson and Mrs. Alice Ellis have applied to the Planning Commission for permission to plant young Torrey pine trees on Pine street bordering their new residence.

The Carlsbad tree committee highly commends the plan and would like to see a city-wide movement to plant trees about the hundreds of new homes being erected on bare lots that have gone unplanted because of absence of water meters. A concerted plan to beautify the city by planting of well chosen shade or ornamental trees would meet with widespread approval.

Courtesy of the Carlsbad City Library Carlsbad History Collection

Pinus torreyana - Torrey pine
1493 Pine Avenue - two trees and 3229 Highland Drive - one tree
Photo by Mark Wisniewski 2019

Tree Art
Other changes have occurred over the 17 years since the original report was first published. Some new, and hopefully, future potential Heritage Trees have been planted. Some trees, Heritage and others, have died and been removed. At least one non-heritage tree that died was turned to a work of public art for the community to enjoy. While technically the city's requirement for a Heritage Tree does not state the tree has to be alive, that was the assumption I used while doing these studies. So while not recommending this as a Heritage Tree, I thought it deserved some recognition along with its still living peers.

Species unknown – Skinned art tree
3166 Harding Street
Photo by Mark Wisniewski 2019

SUMMARY - From the original report revised and with data that is no longer accurate deleted.

Many interesting pieces of information were discovered during the almost two years that the study encompassed. The following was extracted from the inventory data and listing of 110 candidates for Heritage Tree status. The observations are presented in no particular hierarchy of importance.

Only one tree in the entire study area, a *Platanus racemosa* - California sycamore, Tree #41, growing along the edge of Buena Vista Lagoon, appears to be a naturally occurring native tree. Every other tree in the area was planted. What was surprising was that there were no identifiable remnants of stands of native trees. That may have to do with topography more than anything else. The land grades gently down from the high ridge east of Highland Drive to the Pacific Ocean. There is a mesa above the beach with a moderate bluff. There are no creeks, streams or natural drainage courses in the study area and all the land at one time has either been tilled, planted or developed. If there were any native trees in the area they were removed.

It was also surprising that there were very few trees native to the immediate area planted as ornamentals, even though these same trees are highly valued and even revered in other communities in our state. Only three local native trees made the original list. Two California sycamores, Trees #41 and #19, located on the former grounds of the Apple Inn now the Army Navy Academy, and a *Quercus agrifolia* – coast live oak, Tree #107 in Holiday Park. Only Tree #41 remained in 2019.

There are numerous *Pinus torreyana* – Torrey pines in the study area, several of very significant size with heights and canopy spreads of 75’ or more. Seven individual Torrey pine locations have been noted. Some of these site locations have multiple trees such as Tree #81, which had 12 trees in 2002 from plantings made by Anne de la Motte in the 1920’s, but only three trees remained in 2019.

The largest Torrey pine is Tree #69 which is estimated to be between 100’-120’ tall with a large spreading canopy of almost 120’ and a massive trunk larger than 48” in diameter. This may be one of the largest Torrey pines in the state. This is also one of the tallest trees in the study, if not the tallest. Two of the trees, Tree #78, located in front of the Park and Recreation Building, are known to have been planted from seed by Mrs. James A. Greenwood.

All of the other trees on the proposed Heritage Tree list do not grow as natives in San Diego County. The following is a listing of the trees’ place of origin. If they are native to several countries or regions only the most well known was used for this list and they were not listed twice. For additional information on place of origin refer to the listing and description of each species in the original report.

6 - native to other areas of California
6 - native to other areas of the United States
6 - native to China
5 - native to Mexico
5 - native to the Mediterranean Region

4 - native to Brazil
2 - native to Peru
1 - native to Guatemala
2 - native to other areas of South America
2 - native to the Canary Islands
1 - native to Madagascar
3 - native to other areas of Africa
1 - native to Japan
1 - native to India
1 - native to the Malay Peninsula
1 - was hybridized in England
This is a total of 50 species from these locations.

There are 24 additional trees that are native to Australia, and one tree is native to New Zealand. This is a total of 25 species from this region alone. Over one-third of all the listed species in this study come from this one region.

There are a total of 54 genera and 75 species represented in this study. This represents a very wide range of diversity of tree specimens from around the world located in a relatively small geographic area. This could almost be considered an arboretum collection spread out over the Historic Village District. Two of the characteristics that these foreign trees share is that they either come from a similar climatic zone or region or they are adaptable outside of their preferred climatic zone.

Several of these Heritage Tree candidates are considered rare or endangered in their native habitat. These include *Cupressus macrocarpa* – Monterey cypress, which old photos show it was widely planted in Carlsbad including along the railroad tracks where it formed a green wall along the West side of the tracks. "Its distribution is the most restricted of any California tree and possibly of any conifer in the world. Monterey cypress is listed in the California Native Plant Society's *Inventory* as endangered in part of its range." (McClintock pg. 75)

Eucalyptus globulus – blue gum, is so widely planted in California that some people consider it a native tree. In many areas it has escaped and become naturalized so that it is now considered an invasive pest. In its natural range, it has a very restricted distribution limited to two small areas in Australia and one larger area in Tasmania. (McClintock pg. 89)

Eucalyptus ficifolia – red-flowering gum, "Red-flowering gum has a restricted distribution in Australia. It is limited to a small area on the southwestern corner of Western Australia from near sea level to about 500 feet, and is so rare that it is included in a list of endangered Australian eucalypts. Fortunately, most of the trees are within a national park and therefore protected." (McClintock pg. 88)

Other trees are extremely limited in their native range or numbers in the wild such as *Pinus torreyana*. "Torrey pine, the rarest of the California's pines, and has one of the most limited distributions in the genus. It occurs in only two small areas in Southern

California. One population is on the coastal mainland, within the city of Del Mar and to the immediate south in Torrey Pines State Reserve.

Scattered over a few square miles to the north and south of Soledad Valley, this population was estimated by the California Department of Parks and Recreation in 1975 to include about 3,400 mature trees. The second population, to the northwest on Santa Rosa Island offshore from Santa Barbara County, covers less than one square mile. It includes about 1,000 mature trees, but has a higher proportion of young trees than the mainland population." (McClintock pg. 160)

One of the most fascinating trees on the list is the *Metasequoia glyptostroboides* – the dawn redwood from China, Tree #108, formerly growing in Holiday Park. This is a deciduous conifer that is closely related to both species of evergreen California redwoods, the coast redwood and the big tree or giant sequoia of the Western Sierra Nevada.

"Numerous kinds of trees living today have persisted with little or no change since remote geological times and are well represented by ancient fossils. But the term 'living fossil' seems to be applied chiefly to *Metasequoia* because it was described and named from fossil records before it was known to exist in present world flora. The first living specimens – three of them – were discovered by a Chinese forester in 1941 not far from Chungking, but it was not until 1946 that the tree was identified as of a genus previously unknown in a living state." (Everett pg. 42)

Seed was first sent to the United States in 1946 to the Arnold Arboretum at Harvard University and then was distributed to other universities, parks, botanical gardens and some individuals. One tree that still existed in 1980 in the remote village of Madaoqui, China was revered as the home of a god. This tree was estimated to be over 450 years old. Many trees have been planted as street trees both in Madaoqi and throughout China. (McClintock pgs. 130-131)

Unfortunately, Tree #108, likely the rarest tree in Carlsbad, had been removed by 2019. It would be great to plant another one in its place, maybe on a future Arbor Day.

> *I rank arboriculture as one of the fine arts. I have studied it in all its various schools—the palms of Africa, the cypresses of Mexico, the banyans and peepals of India, the birches of Sweden, the elms of New England. In my mind there is a gallery of masterpieces, which I should not be afraid to place beside those of the Vatican or the Louvre.*
>
> Bayard Taylor, "At Home and Abroad"

MANAGEMENT RECOMMENDATIONS

In managing and maintaining old mature trees such as those that are included on this list of candidates for Heritage Tree status, less is usually more. At least less is usually better. Less damage, less damaging pruning, less hardscape, less root damage, less turf, less compaction are all better for the tree. These practices properly performed also usually mean less cost over the life of the tree.

There are some areas of mature tree care where a little more is better: more knowledge by the people charged with caring for the trees; more diligence in the performance of regular inspections; more respect given to the trees; more mulch applied (within reasonable limits); more soil surface area exposed and more protection provided.

There are also elements that are necessary to promote tree growth and health that are required in moderation. Usually the trees, if they are well adapted to an area, can obtain these on their own. Sometimes these need to be supplied by people. These requirements include air, water, and nutrients. These three growth requirements are obtained from the atmosphere and from the soil.

Less Damage

Less damage means not ripping limbs or roots out of trees with construction equipment. It also means no injury from lawn mowers and string trimmers. It means not attaching electrical wires or signs to trees, or over-pruning or damaging roots, or compacting the soil.

Eucalyptus cladocalyx – sugar gum (Tree #93)
Holiday Park
This tree is slowly "eating" a road reflector sign that was attached to the tree. Someday it will disappear completely only to be rediscovered by an unfortunate chainsaw operator when the tree dies and is removed.
Photo by Mark Wisniewski 2002

Eucalyptus cladocalyx – sugar gum (Tree #93)
Holiday Park
The tree has finished "eating" the reflector sign that is still embedded in the trunk. It has disappeared completely. A surprise waiting to happen.
Photo by Mark Wisniewski 2019

Less Damaging Pruning
Less damage means not over-pruning trees by removing large or even small branches without a demonstrated necessity. The destructive and damaging process of "topping," where large limbs are cut back to stubs while removing large portions of both the branch structure and the canopy of the tree, should be made illegal for all publicly-owned trees in the city.

In 1992 the State of California passed legislation that recognized the problems associated with the costly and destructive practice of "topping" and encouraged every public agency in the state, including cities, to follow accepted pruning standards (refer to "Appendix E").

This information on "topping" is not new knowledge. John Davey, the founder of Davey, a tree service company that is still in operation and is the third largest tree service company in America, wrote the following in his book "The Tree Doctor" in 1907:

> "Few, if any, greater misfortunes have befallen America, in the last quarter of a century, than the coming of what are known as professional "Tree men" in every city and many towns…But in all their ignorant and nefarious frauds, nothing equals their (what ought to be) "criminal" work of cutting away the tops of trees. The old State of Pennsylvania has apparently suffered as much as any from these depredations. Harrisburg, the capital, has been almost completely denuded by them. Substantially all the trees on the streets have been ruined…Tens of thousands of what might have been good trees have been ruined in Philadelphia by these tree vandals, resulting in a

lessening of real estate values to the extent of millions of dollars." (Davey pgs. 33 & 34)

All tree work performed on public trees and all construction work performed in their vicinity should follow the current published American National Standards and Best Management Practices. These publications cover most all aspects of tree care, maintenance and protection during site development or construction that may impact trees.

Another destructive pruning practice is referred to as "lion tailing." This is the removal of the majority (or all) of the interior foliage and small branches of the tree leaving the remaining foliage and weight concentrated in a tuft, like a "lion's tail," at the ends of the branches. The excess removal of foliage along the branch also inhibits proper branch development and taper, leading to a loss of strength and contributes to branch failures.

Less damage also means not over-pruning trees by removing too much foliage throughout the canopy. The leaves (along with green branches and green bark) are the only means the tree has to produce life-sustaining energy for the proper functioning of its physiological and metabolic processes. Removing too much foliage requires the tree to expend stored energy reserves to replace the missing foliage in an attempt to balance its energy expenditures with its energy production. If energy expenditures continually exceed energy production, reserves become depleted over time weakening the tree.

This is particularly critical in these large old Heritage Trees like the eucalypts. What many people don't appreciate is that these trees are growing more each year in volume than at any point in their lives. Each year the trees produce new layers of cells just under the bark. These cells cover the entire length and circumference of all the branches and the trunk and each year it requires that trees produce more energy to produce this increased volume of wood.

Over-pruning on a mature tree, depending on its health, can mean removing as little as 10%, or even less, of its live foliage at any one time or during the course of a year. It is especially difficult for large mature trees to recover from this type of stress, especially if this is done repeatedly. Over-pruning also causes a reduction in root growth. Repeated over-pruning can cause trees to decline and die prematurely.

Some of the Heritage Trees that look the best are privately owned and appear to have received little or no pruning over the years and show little need for any substantial pruning at this time. Other trees, including some city-maintained trees, have been subjected to substantial over-pruning during their lifetime and have been damaged by this work.

Less Hardscape

Less hardscape (sidewalks, curbs and pavement) and other restraints allow normal tree root growth and expansion to occur, without the potential for the tree to damage the adjacent hardscape.

Many of the Heritage Trees were planted over a century ago as street trees when this fact may not have been well appreciated. But they were also planted before wide paved roads and concrete curbs, gutters, and sidewalks were constructed. Many of the trees have had to suffer the loss of the open areas of soil that existed when they were originally planted. It is remarkable that so many have survived in spite of having been damaged from the “improvements” being constructed around them.

Less Root Damage

In addition to the installation of hardscape, which we can see, many of these Heritage Trees have also been subjected to underground damage to their root systems, which we can’t see. Underground utilities that are commonly installed can include any, or all, of the following: conduits or pipes for water, sewer, gas, electrical, cable TV, phone and other communication lines, irrigation pipes and drainage systems, including large storm drains.

There are tools and methods that can be used for underground work that are not damaging to tree roots. These include horizontal boring and excavation using high velocity air such as with an “Air-Spade” or “Air-Knife”. Tunneling under roots is preferred to cutting them. Extensive root cutting on a tree may lead to a lack of structural support and tree failure. Trees should be properly protected when any underground work has to occur in their vicinity.

While doing the research for the original report a *Cupressus macrocarpa* – Monterey cypress (Tree #5) had extensive underground trenching and work performed under at least two sides of its canopy. Surprisingly I observed very few large roots damaged in the excavations around this tree, but numerous smaller roots were damaged and the soil around the tree was compacted from heavy equipment operations. Additionally some limbs appeared to have been ripped out of the tree by construction equipment working under the canopy. The damaged branches have still not been properly pruned as of April 2019.

Bob Bichowsky, (deceased), a well-known local arborist, made some similar observations and was quoted in the Blade-Citizen in 07/24/91 concerning *Eucalyptus cladocalyx* – sugar gum (Tree #63), “I was amazed to find that the roots are much deeper than they are on 95 percent of the trees I look at. If any tree will survive, this will be the one to do it.” This tree is at risk from a nearby construction project as of April 2019.

It appears that the soil throughout the study area is a deep sandy alluvial type that either has been eroded from the ridge where Highland Drive is located and/or is the remains of an ancient beach terrace. In either case the soil has been deposited over millennium and gently slopes towards the ocean. It is understandable that farmers and nurserymen would pick the best soils for growing their crops and orchards. The soil appears to be the secret why these Heritage Trees grew so well and why so many of them are still flourishing today despite all of the “improvements” that have been installed around them.

The Old Village part of the city was developed on this deep natural soil which has not been altered as is commonly done in new projects that are developed today. Projects then, mostly followed the existing land contours as crops and orchards were planted. Contemporary construction practices usually involve the moving of tremendous amounts of soil and compacting the soil with heavy equipment to high densities by removing air spaces. Any loose soils, especially those with a high organic content, are usually disposed of as being unsuitable for building purposes.

Less Turf
Less turf allows the tree better access to water and minerals. Turf, or grass, is much more aggressive than trees are at removing these necessary requirements for life, especially from the top 6”-12” of soil. Less turf means the turf is kept further away from the trunk and any buttress or surface roots of the tree. This not only means less potential damage to the trees from mowing equipment, but also less damage to mowing equipment from hitting exposed surface roots.

Keeping the turf away from the trunk also means less potential damage to the tree trunk from string trimmers cutting down that last little bit of grass up against the tree trunks that the mowers can’t reach. String trimmers hitting the trunks of trees can instantly damage the cambium layer of the tree and can girdle and even kill trees, particularly those that are young or have thin bark.

Less turf can also mean more room for surface applications of mulch, such as coarsely ground or chipped tree prunings. Organic mulch as it breaks down adds minerals and nutrients to the soil, just like that which occurs in a natural forest. Mulch also allows greater biological activity in the soil from earthworms and soil micro-organisms. This in turn provides for better soil aeration, which leads to better soil gas exchange and better (deeper and quicker) water absorption and penetration, with less surface runoff and fewer weeds as well.

Less Compaction
Many of the Heritage Trees have compacted soil over their root systems. Many of the Heritage Trees in Holiday Park have severe compaction from the activity that occurs under and around them. Including mowing operations for example.

One particularly effective treatment is applying organic mulch under the canopies, out to the drip line. This can act as a “shock absorber” preventing the compaction of soils, especially from foot traffic under the canopy of the tree. The mulch can also improve soil condition over time as discussed in the previous section.

Other treatments may be recommended by a qualified arborist based on the needs for a particular tree.

Less Money
Less money is usually required to be spent on maintenance over the life of a tree if it is given adequate growing space, is not improperly pruned, is mulched on a regular basis, and is not damaged by maintenance and construction practices. To help insure the

long-term survival of a Heritage Tree it should have an annual inspection by a qualified arborist familiar with the needs of these special mature trees.

Any recommended treatments, including pruning, should be based on a diagnosis (what is wrong or what condition are we trying or correct or improve?), a dosage (how much work needs to be done?), and timing (when is the best time to perform the work for the tree to receive the maximum benefit?). For trees that have been damaged, a higher level and frequency of inspections and management are warranted resulting is a higher cost.

Utilizing the chipped prunings, from tree maintenance work, will reduce the cost for the mulch and eliminate the cost of transporting it and the fess to dump it at a landfill.

Management Recommendations Summary
The following are recommendations to provide for the health, safety and longevity of Carlsbad's Heritage Trees. These recommendations should be adopted by the City Council as mandatory for all city owned Heritage Trees, and are advisory only recommendations for any privately-owned and non-city owned public Heritage Trees**.**

1. The city arborist shall provide copies of this report (Management Recommendations) to each city employee in charge of managing a Heritage Tree and provide a copy of the entire report to every property owner of a Heritage Tree located on private or other public property. In locations when it is unclear if a tree is publicly or privately owned and who is responsible for its care, this should be clarified by the city arborist.

2. Have all public Heritage Trees inspected at least annually by a qualified arborist who shall provide a written report with recommendations for any required treatment or maintenance, including pruning. The reports are to be kept in a permanent file for each tree for future reference along with a record of any work performed on the tree and the result of that work.

3. Remove any signs or wires that have been attached to any publicly owned Heritage Tree, if this can be done without damaging the tree any further**.**

4. Adopt a city policy, or regulation, prohibiting the "topping" of any public tree.

5. Adopt a city policy, or regulation, that the current published American National Standards and Best Management Practices for Tree Pruning will be followed when pruning any publicly owned trees.

6. Require that all pruning work on publicly owned Heritage Trees shall be performed by a certified arborist or by certified tree workers under the full-time supervision of a certified arborist.

7. Pruning should be timed so as not to interfere with nesting birds.

8. Root damage to publicly owned Heritage Trees should be minimized. Any

proposed construction work (public or private) within 50' of the trunk, shall be reviewed by a qualified arborist during the planning stage of the work. The arborist shall specify a Tree Protection Zone and a Tree Protection and Preservation Plan that is site and tree specific. No activity or soil disturbance in the Tree Protection Zone will be permitted unless specifically approved in writing by the city arborist.

9. In the vicinity of publicly-owned Heritage Trees appropriate alternative means of underground construction, such as the use of tools like an "Air-Knife" or "Air-Spade", horizontal boring or tunneling, should be utilized to protect and prevent damage to the root system of the tree.

10. Hardscape conflicts should be remedied without damaging the root system of a publicly owned Heritage Tree. Some methods that may be utilized include: the use of sand laid unit pavers like brick or flexible paving such as rubber sidewalk sections; grinding raised pavement sections; ramping or bridging over roots. Removing pavement and replacing it with decomposed granite or organic mulch; rerouting the hardscape to accommodate the current and future trunk expansion and root growth is an option. This would also provide additional exposed soil surface that would be beneficial to the tree's health.

11. Turf, under the drip line of the tree, should be removed and replaced with a 3"- 4" deep layer of organic mulch such as ground or chipped tree prunings. The mulch should be kept at least 1' away from the trunk of the tree. The mulch should be inspected at least twice a year and additional mulch added to maintain the 3"- 4" depth. For small trees, or trees with a narrow upright growth habit install the mulch to a distance of 5' from the trunk

12. Compaction under the canopies of trees can be partially corrected by several methods. The least damaging and cost effective method is to install organic mulch as specified above for turf removal over the compacted area or where surface roots are exposed. Other methods may be recommended for specific conditions.

13. Require a report from a qualified arborist for any public Heritage Tree recommended for removal because it presents a "hazardous" condition. The arborist shall use the current published Tree Risk Assessment methodology. The city arborist has the discretionary right to approve, request a second opinion in writing, or recommend actions that may reduce the condition to an acceptable level of risk. If this type of risk reduction cannot be done and it is the city's arborist's recommendation to remove the tree it will remain the City Council's option to approve or deny the removal or require additional measures.

14. For any publicly owned Heritage Tree that is removed, a suitable replacement tree shall be replanted.

A stricken tree, a living thing, so beautiful, so dignified,
so admirable in its potential longevity, is, next to man,
` *perhaps the most touching of wounded objects.*
Edna Ferber

HERITAGE TREE NOMINATION PROCESS

Heritage Trees are defined in the Carlsbad City Ordinance as follows:
“Heritage trees shall be trees with notable historic interest or trees of an unusual species or size.”

A process should be developed for the city to allow for the nomination of additional Heritage Trees by its citizens.

The following is suggested.
1. A nomination form should be developed for submittal to the Parks & Recreation Department for review.

2. The form should contain the following information:
- the address of the tree and its location on the property (front, rear or side yard)
- the name of the owner of the tree (Carlsbad, if it is in the public right-of-way or a city park or open space)
- tree species if known
- estimated size (trunk diameter measured at 54” above grade, height, and canopy spread - if more than one trunk, list the number of trunks and the diameter of the largest trunk)
- estimated age if known
- background or history of the tree and the reason(s) for nominating the tree
- photos of the tree
- name, address, email address, phone number and signature of the person making the nomination
- date the form was submitted to the city.

3. The form should have enough space for a city designated arborist to provide comments when performing an on-site review. The arborist’s comments should include an evaluation of the condition of the tree along with the arborist’s recommendation and reasons for either approval or rejection.

4. After review by city staff, all completed applications should be submitted to the Historic Preservation Commission for their review and action to either accept or decline the application.

5. An application accepted by the Historic Preservation Commission shall be passed along to the City Council for final review and acceptance.

6. The city shall notify, in writing, the individual submitting the application of the Historic Preservation Commission and the City Council’s actions.

7. If a tree is accepted, it will be added to the city’s list of Heritage Trees. This list should be maintained on the city’s website along with photos of all of the Heritage Trees

and maps indicating their locations. The maps shall be updated when any new tree is added or an existing tree has died or been removed.

8. The owner of a designated Heritage Tree shall be provided a copy of the management recommendations and both Heritage Tree reports.

9. Following the tree's designation as a Heritage Tree, the owners of any newly designated Heritage Trees shall be invited to participate in the city's annual Arbor Day planting event.

10. Photos of any newly designated Heritage Trees shall be displayed in the city libraries during the month of March when California Arbor Week is celebrated.

https://calfire.ca.gov/resource_mgt/resource_mgt_urbanforestry_arborweek

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For I had set my mind on making a new kind of tree book . . . not a textbook or manual, nor a tree-identification book, or still another picture book proving that trees are beautiful, but a tree-appreciation book . . . In our largely urban society, the ability to appreciate trees has become dulled - the ability to see the wonder in a tree, the magic and the mystery, the indiscribable (sic) peace and contentment that can fill our hearts when we walk in the wild woods . . . I created this book in the hope of making more people aware of the intangible values that trees can give - values to lift the spirit and refresh the soul of man.

Andreas Feininger, Introduction, “Trees”

APPENDIX A

Appendix A:
Maps of Study Area with Heritage Tree Locations

How to use the maps.

The maps on the next pages include a map of the overall study area and then three enlarged sections breaking the study area into approximate thirds, moving from west to east, and a fourth map that is an enlargement of Holiday Park.

The trees are shown in numbered circles from 1 to 110 in a numerical sequence. The sequence represents a suggested order of viewing the trees in six geographic groupings. Tree 111 has been added and is not in sequence, see Map 2.

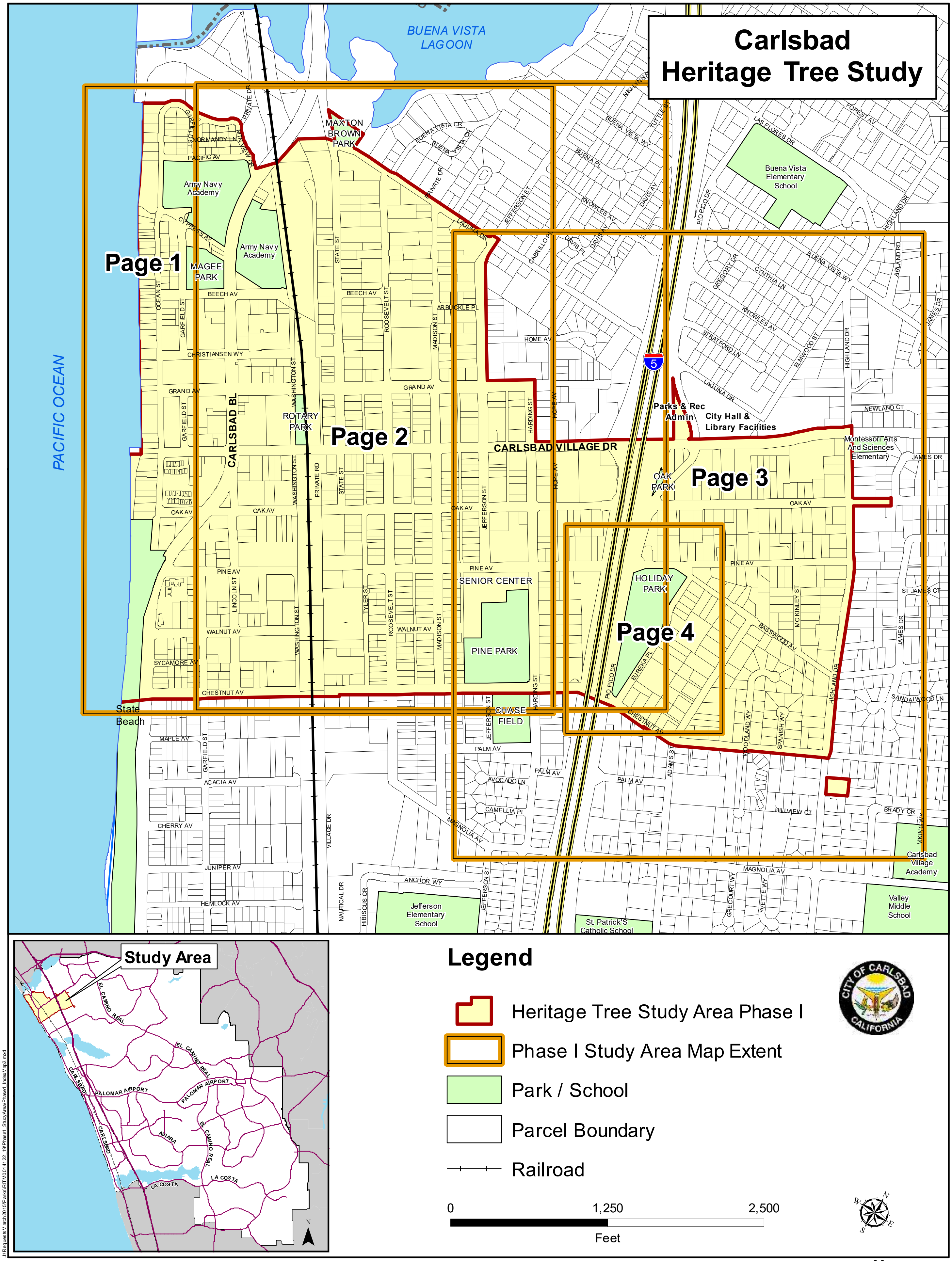
For Map page 1:
Start with 1 and proceed in order to 15 and then back to 1.
Start with 1 and proceed to 16 and then in order to 25.

For Map page 2:
Start with 26 and proceed in order to 44 and then to 111.
Start with 45 and proceed in order to 63.

For Map page 3:
Start with 64 and proceed in order to 92.

For Map page 4:
Start with 93 and proceed in order to 110.

“Appendix C” is a sequential listing of the trees by map number from 1 to 111.



Printed April 2019

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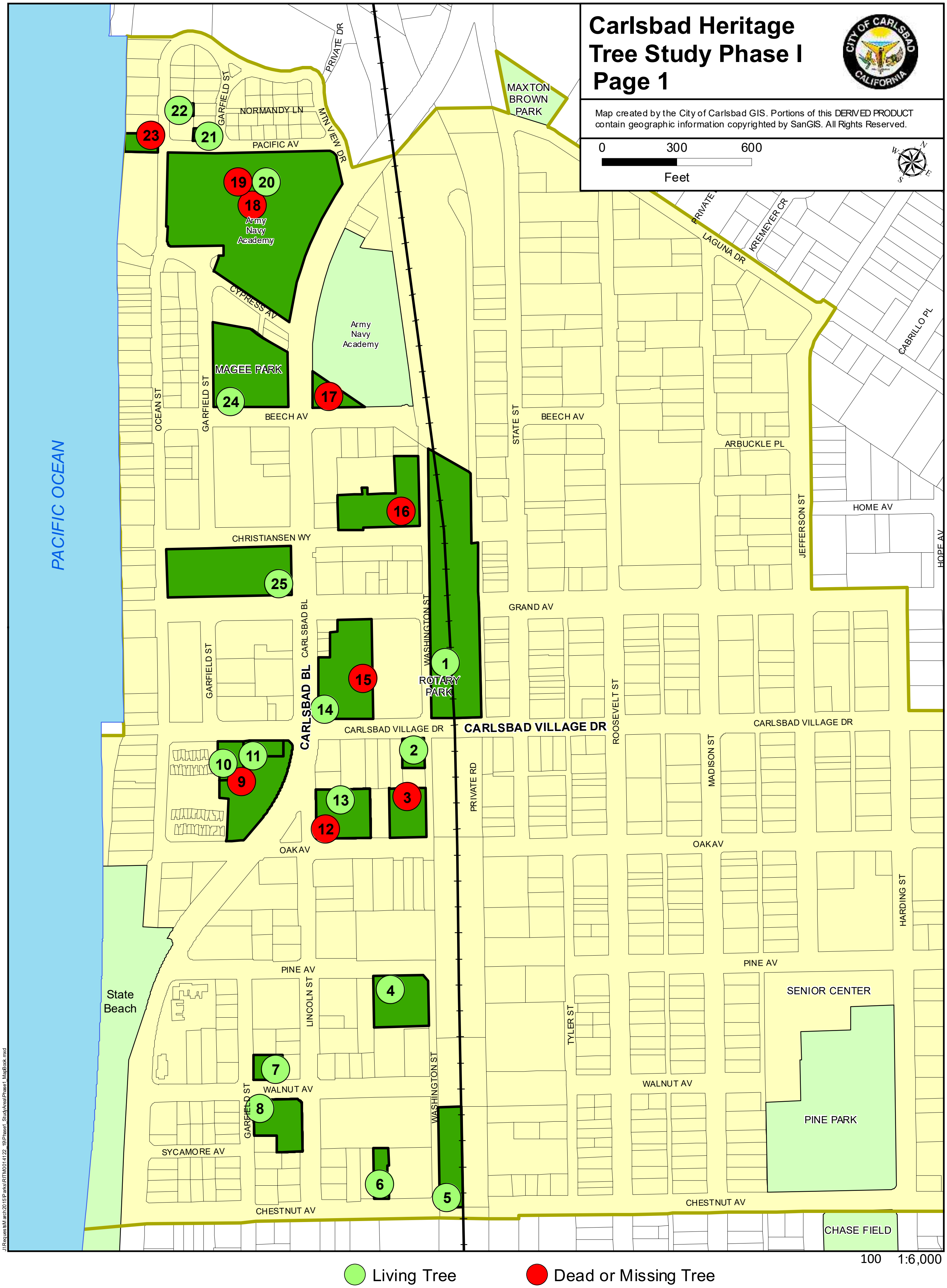
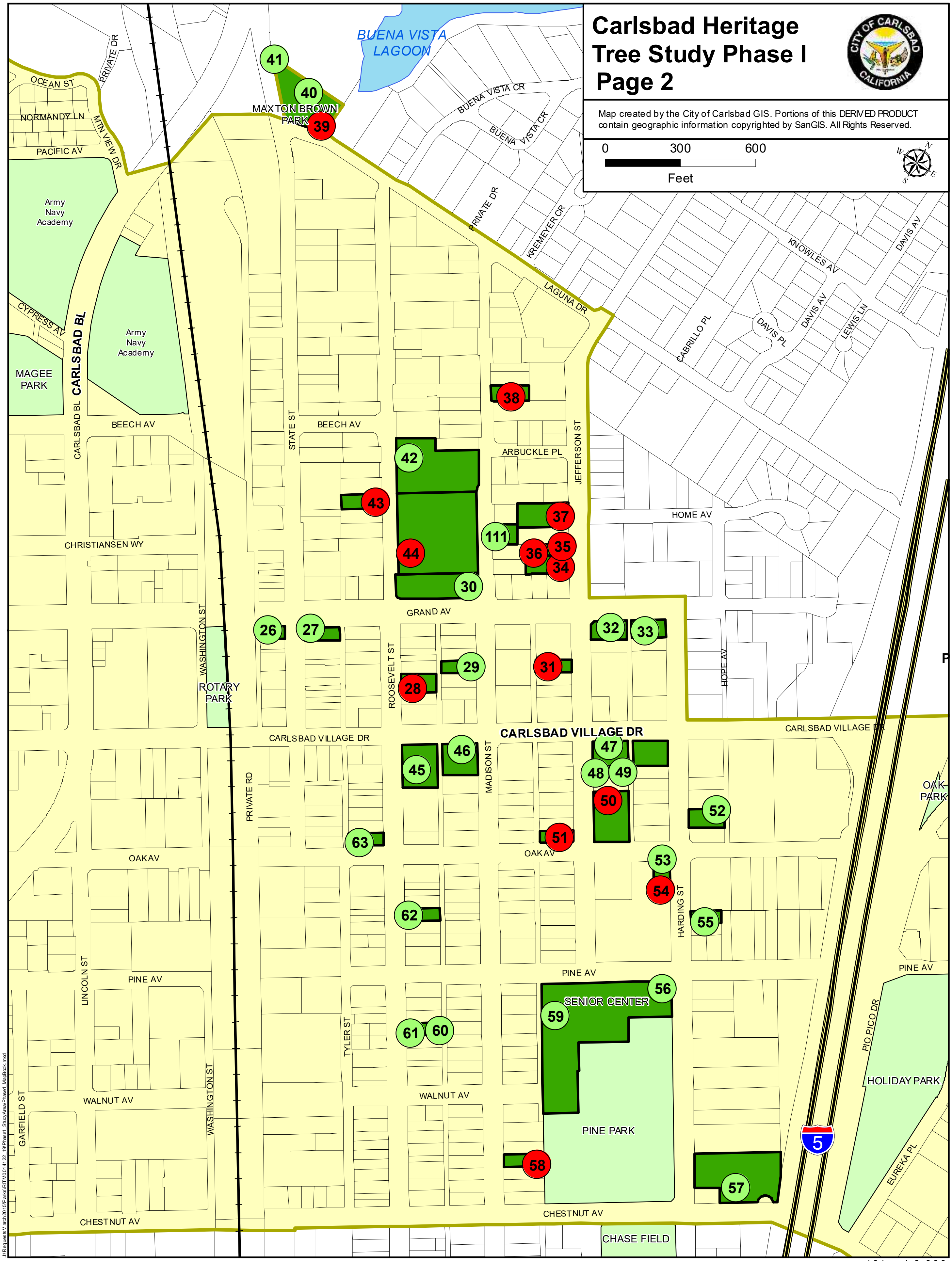
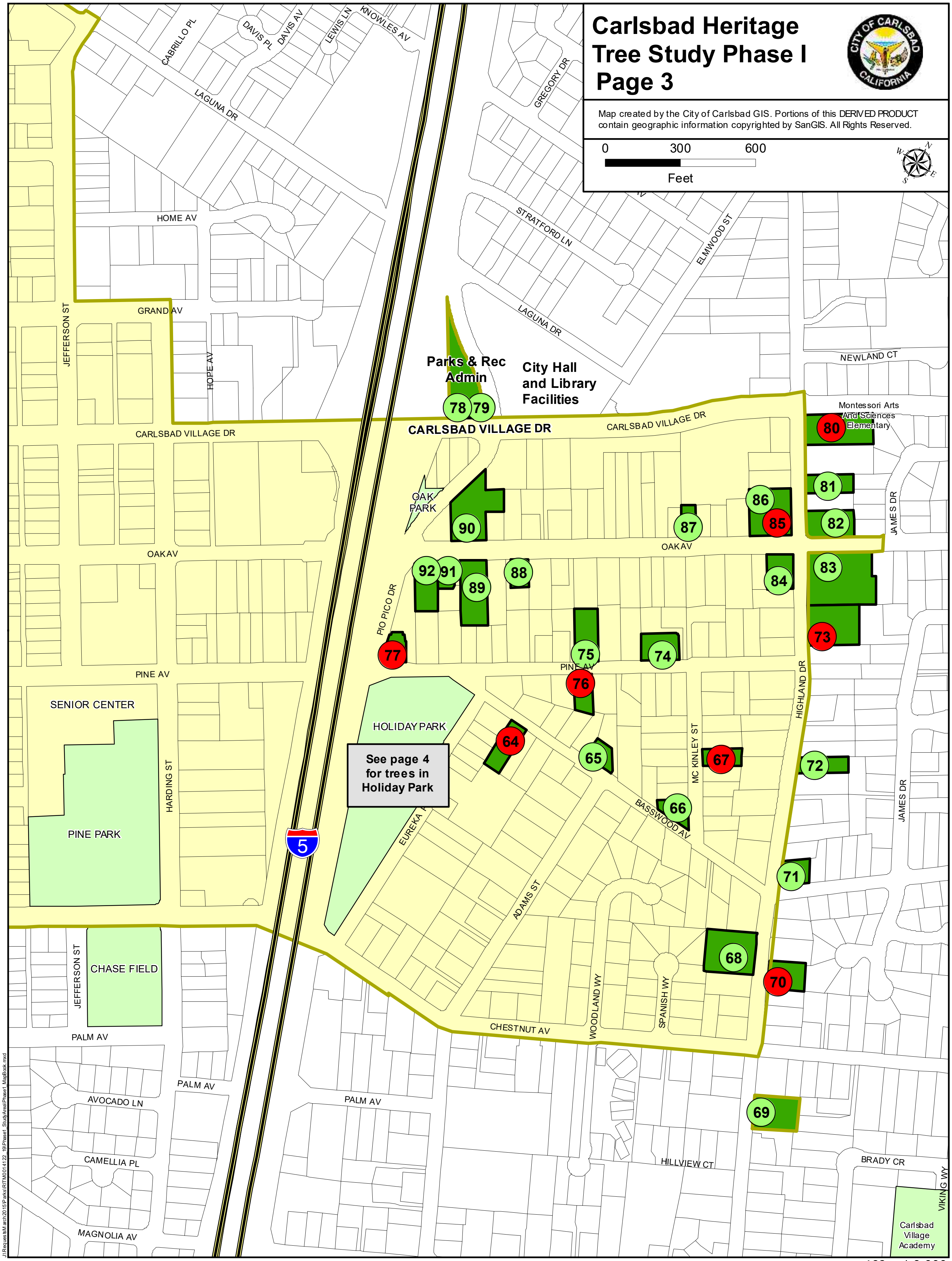

Carlsbad Heritage Tree Study Phase I Page 1
CITY OF CARLSBAD CALIFORNIA
Map created by the City of Carlsbad GIS. Portions of this DERIVED PRODUCT contain geographic information copyrighted by SanGIS. All Rights Reserved.
0 300 600
Feet
PACIFIC OCEAN
State Beach
MAXTON BROWN PARK
Army Navy Academy
Army Navy Academy
MAGEE PARK
ROTARY PARK
SENIOR CENTER
PINE PARK
CHASE FIELD
NORMANDY LN
PACIFIC AV
GARFIELD ST
PRIVATE DR
MTN VIEW DR
CYPRESS AV
OCEAN ST
BEECH AV
CHRISTIANSEN WY
CARLSBAD BL
WASHINGTON ST
STATE ST
GRAND AV
CARLSBAD VILLAGE DR
ROOSEVELT ST
PRIVATE RD
MADISON ST
OAK AV
PINE AV
LINCOLN ST
WALNUT AV
SYCAMORE AV
CHESTNUT AV
TYLER ST
HARDING ST
LAGUNA DR
KREMEYER CR
CABRILLO PL
ARBUCKLE PL
HOME AV
HOPE AV
JEFFERSON ST
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
100 1:6,000
Living Tree
Dead or Missing Tree



Living Tree Dead or Missing Tree

101 1:6,000



102 1:6,000

Living Tree Dead or Missing Tree

Carlsbad Heritage Tree Study Phase I
Page 4

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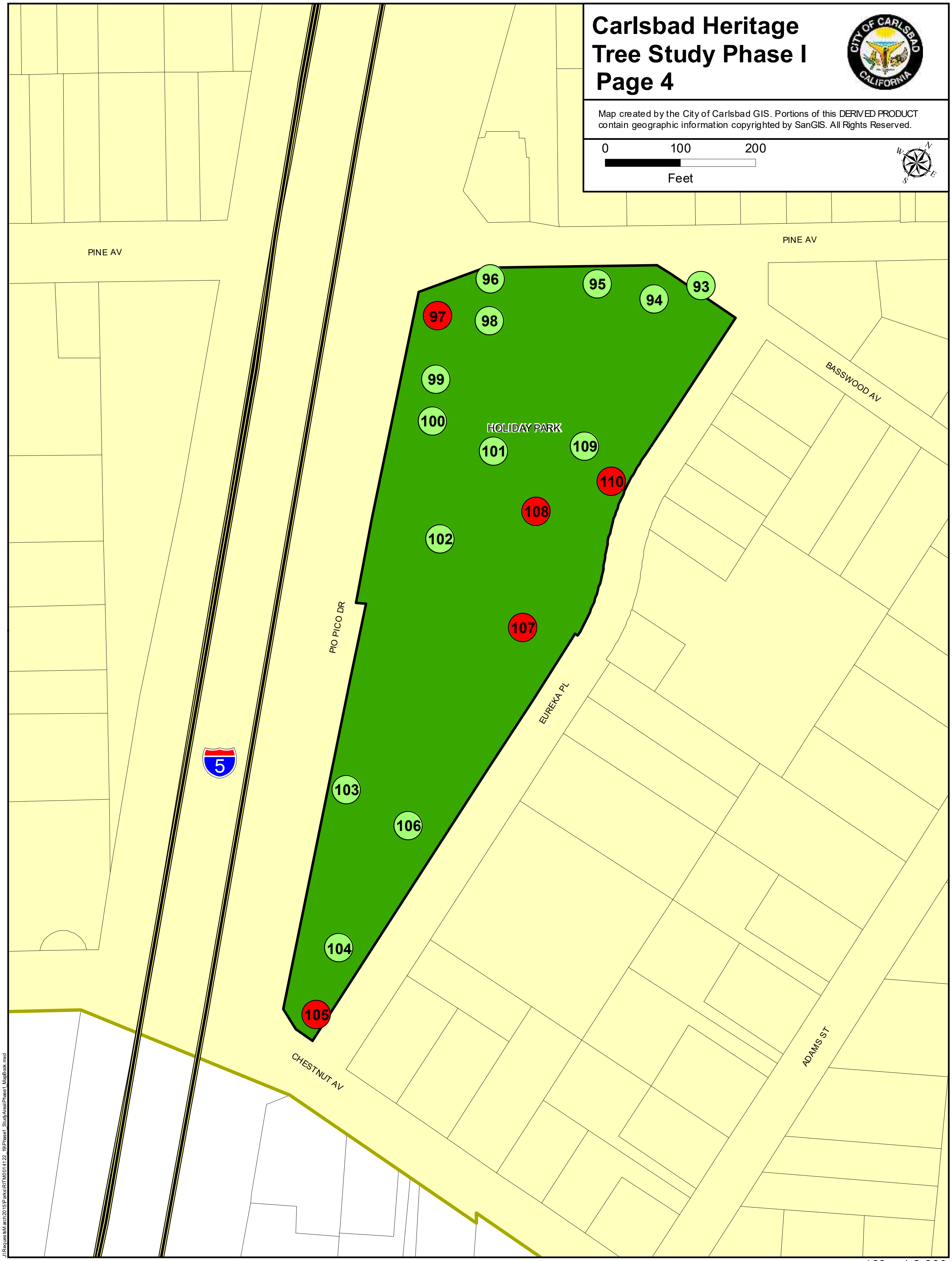

103 1:2,000

Living Tree Dead or Missing Tree

APPENDIX B

Appendix B:
Heritage Trees listed alphabetically by species

How to use this information.

This provides an alphabetical listing of the Heritage Trees by species. The tree number is also listed along with the most widely accepted common name and the address and/or location of the tree. Comments are provided especially if the tree is located on a site of local historical significance or if it is part of a group or larger collection of similar trees at the same location.

The following information is included.

F = tree is located in the front of the property or on a park site
S = tree is located on a side street at the property address
R = tree is located at the rear of the property address or off an alley.

DBH: Diameter Breast Height, the trunk diameter is measured in inches at 54" above the ground level and is listed as a size range, for example 06-12.

Height: The height range of the tree is measured in feet, for example 15-30.

Canopy Spread: The canopy spread, which is the outer edge of the branches, of the tree is measured in feet and is listed as a size range, for example 15-30.

In urban forestry, size ranges are normally used when providing size information on trees. Tree size is constantly changing and using ranges keeps data from being out of date shortly after it is collected. It also allows the urban forester to analyze the comparative ages of a tree population especially when reviewing the size ranges in a single species in a population.

Vigor: A visual assessment of the growth indicators of the tree.

Condition: Numerical scores are given to various parts of the tree and are then calculated to provide an overall condition rating for the tree as either “good”, “fair”, “poor” or “dead”. This is a somewhat subjective process and reflects the condition of the tree at its last evaluation.

Note: Data was collected in the latter half of 2018.

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 3354 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~R-58~~	~~Acacia melanoxylon~~	~~black acacia~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3081 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~S-85~~	~~Acacia spp.~~	~~acacia spp.~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Shaw House~~

Location 3156 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-55	Agathis robusta	dammar pine	12-18	45-60	0-15	Declining	Poor	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-98	Agonis flexuosa	peppermint tree	48+	15-30	30-45	Growing	Fair	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-104	Araucaria bidwillii	bunya-bunya	30-36	60-75	45-60	Growing	Good	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-103	Araucaria cunninghamii	hoop pine	24-30	45-60	15-30	Growing	Fair	

Location 2605 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-18~~	~~Araucaria heterophylla~~	~~Norfolk Island pine~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Army Navy Academy~~

Location 1231 Basswood Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-64~~	~~Bauhinia variegata~~	~~purple orchid tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 675 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-46	Brachychiton discolor	Queensland lacebark	30-36	15-30	15-30	Growing	Fair	On Madison Street

Location 1173 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-88	Callistemon rigidus	stiff bottle brush	24-30	15-30	15-30	Growing	Good	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 3140 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-83	Casimiora edulis	white sapote	12-18	15-30	30-45	Growing	Good	Culver/Myers House

Location 1103 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-91	Casimiora edulis	white sapote	12-18	30-45	15-30	Growing	Fair	

Location 3380 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-57	Ceratonia siliqua	carob	36-42	30-45	45-60	Declining	Poor	

Location 2810 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-111	Ceratonia siliqua	carob	24-30	15-30	15-30	Growing	Good	

Location 2812 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-44~~	~~Ceratonia siliqua~~	~~carob~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-94	Chiranthodendron pentadact	monkey hand	18-24	45-60	15-30	Growing	Good	

Location 421 Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-26	Chorisia speciosa	floss-silk tree	36-42	30-45	45-60	Growing	Good	

Location 3091 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-51~~	~~Cinnamomum camphora~~	~~camphor tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 2777 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-43~~	~~Citrus sinensis~~	~~orange~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 357 Chestnut Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-5	Cupressus macrocarpa	Monterey cypress	48+	45-60	45-60	Growing	Poor	1 of 8

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 2956 # 3 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-28~~	~~Dodonaea viscosa~~	~~hopseed bush~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3048 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-50~~	~~Dombeya wallichii~~	~~pink ball tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Hess House~~

Location 1166 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-79	Dracaena draco	dragon tree	12-18	15-30	15-30	Growing	Fair	Greenwood Home/Park and Recreation Bldg.

Location 2865 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-35~~	~~Duranta erecta~~	~~sky flower~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 507 Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-27	Erythrina caffra	coral tree	42-48	30-45	15-30	Growing	Fair	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location Lt. Maxton Brown Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-40	Erythrina caffra	coral tree	48+	30-45	45-60	Growing	Fair	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-102	Eucalyptus citriodora	lemon scented gum	36-42	75+	45-60	Growing	Good	1 of a group of 3 trees

Location 395 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-2	Eucalyptus cladocalyx	sugar gum	48+	30-45	45-60	Growing	Fair	

Location 380 Chistiansen Way

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-16~~	~~Eucalyptus cladocalyx~~	~~sugar gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 600 Block Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-30	Eucalyptus cladocalyx	sugar gum	48+	75+	45-60	Growing	Fair	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 865 Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-33	Eucalyptus cladocalyx	sugar gum	48+	75+	75+	Growing	Good	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-93	Eucalyptus cladocalyx	sugar gum	48+	75+	60-75	Growing	Fair	
F-95	Eucalyptus cladocalyx	sugar gum	48+	75+	75+	Growing	Good	
F-96	Eucalyptus cladocalyx	sugar gum	48+	45-60	75+	Growing	Fair	

Location 2910 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-32	Eucalyptus cladocalyx	sugar gum	48+	75+	30-45	Declining	Poor	

Location 500 Block Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-63	Eucalyptus cladocalyx	sugar gum	48+	60-75	30-45	Growing	Fair	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location Lt. Maxton Brown Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-39~~	~~Eucalyptus conferruminata~~	~~bushy yate~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3288 Garfield Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-7	Eucalyptus ficifolia	red-flowering gum	42-48	30-45	45-60	Growing	Good	

Location 3003 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-9~~	~~Eucalyptus globulus~~	~~blue gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Cohn/Royal Palms/Fidels~~

Location 3276 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-72	Eucalyptus globulus	blue gum	48+	75+	45-60	Growing	Fair	

Location 3384 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-71	Eucalyptus globulus	blue gum	48+	45-60	45-60	Growing	Fair	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 2943 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~R-31~~	~~Eucalyptus globulus~~	~~blue gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 104 Pacific Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-21	Eucalyptus polyanthemos	silver-dollar gum	48+	30-45	30-45	Growing	Good	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-105~~	~~Eucalyptus viminalis~~	~~manna gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 2605 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-20	Ficus macrophylla	Moreton Bay fig	48+	45-60	75+	Growing	Good	Red Apple Inn/Army Navy Academy

Location 3003 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-10	Ficus macrophylla	Moreton Bay fig	48+	30-45	75+	Growing	Good	Cohn/Royal Palms/Fidels

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 825 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-47	Ficus microcarpa	Indian laurel fig	30-36	45-60	45-60	Growing	Good	On Jefferson Street - 2 trees

Location 1340 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-87	Ficus microcarpa	Indian laurel fig	36-42	45-60	45-60	Growing	Good	

Location 2497 Ocean Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-23~~	~~Ficus microcarpa~~	~~Indian laurel fig~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3150 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-62	Ficus microcarpa	Indian laurel fig	48+	60-75	45-60	Growing	Good	

Location 897 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-53	Ficus rubiginosa	rusty leaf fig	24-30	15-30	30-45	Growing	Good	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-99	Fraxinus uhdei	Shamel ash	48+	75+	60-75	Growing	Good	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-100	Fraxinus velutina	Arizona ash	48+	75+	60-75	Growing	Good	

Location 1542 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-82	Grevillea robusta	silk oak	30-36	75+	30-45	Growing	Fair	Shirley House/Rancho de la La Motte Kirmse

Location 1307 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-76~~	~~Hymenosporum flavum~~	~~sweetshade~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3454 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-70~~	~~Jacaranda mimosifolia~~	~~jacaranda~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 799 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-59	Jacaranda mimosifolia	jacaranda	12-18	15-30	15-30	Declining	Poor	Carlsbad Senior Center

Location 3270 McKinley Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-67~~	~~Juniperus chinensis 'Kaizuka'~~	~~Hollywood juniper~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3080 Lincoln Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-13	Leptospermum laevigatum	Australian tea tree	36-42	0-15	30-45	Declining	Fair	Luther Gage House/Monterey Conduminiums

Location 3250 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-60	Leucaena glauca	white popinac	12-18	30-45	15-30	Growing	Good	Backyard

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-109	Liquidambar styraciflua	sweet gum	30-36	75+	30-45	Growing	Good	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 3125 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-84	Magnolia grandiflora	Southern magnolia	24-30	45-60	30-45	Growing	Good	

Location 2714 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-38~~	~~Melia azedarach~~	~~chinaberry~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-108~~	~~Metasequoia glyptostroboide~~	~~dawn redwood~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3480 Ocean Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-22	Metrosideros excelsus	New Zealand Christmas tree	18-24	30-45	30-45	Growing	Fair	

Location 3115 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-54~~	~~Nerium oleander~~	~~oleander~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 3050 Pio Pico Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-90	Olea europaea	olive	24-30	30-45	30-45	Growing	Fair	12 trees

Location 3048 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-49	Persea americana	avocado	12-18	15-30	45-60	Growing	Good	Hess House

Location 3315 McKinley Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-66	Persea americana	avocado	24-30	15-30	15-30	Growing	Good	

Location 300 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-15~~	~~Phoenix canariensis~~	~~Canary Island date palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 350 Chestnut Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-6~~	~~Phoenix canariensis~~	~~Canary Island date palm~~	~~24-30~~	~~45-60~~	~~15-30~~	~~Growing~~	~~Good~~	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 3288 Garfield Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-8	Phoenix canariensis	Canary Island date palm	24-30	30-45	15-30	Growing	Good	6 trees

Location 3016 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-80~~	~~Phoenix canariensis~~	~~Canary Island date palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3080 Lincoln Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-12~~	~~Phoenix canariensis~~	~~Canary Island date palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Luther Gage House/Monterey Conduminiums~~

Location 258 Beech Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-24	Phoenix dactylifera	date palm	12-18	45-60	15-30	Growing	Fair	Shipley Magee House/Magee Park

Location 1366 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-74	Pinus halepensis	Aleppo pine	36-42	30-45	45-60	Growing	Fair	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 2772 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-42	Pinus halepensis	Aleppo pine	30-36	45-60	30-45	Growing	Fair	Post Office

Location 799 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-56	Pinus radiata	Monterey pine	30-36	15-30	45-60	Growing	Fair	

Location 3001 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-11	Pinus torreyana	Torrey pine	48+	45-60	45-60	Growing	Fair	On Carlsbad Vilage Drive

Location 1166 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-78	Pinus torreyana	Torrey pine	42-48	60-75	75+	Growing	Good	Greenwood Home/Park and Recreation Bldg. - 2 trees

Location 3154 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-73~~	~~Pinus torreyana~~	~~Torrey pine~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 3546 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-69	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-106	Pinus torreyana	Torrey pine	48+	60-75	75+	Growing	Good	

Location 1550 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-81	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	Shirley House/Rancho de la La Motte Kirmse - 3 trees

Location 1308 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-75	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Fair	

Location 2680 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-17~~	~~Pittosporum tobira~~	~~mock orange~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Old State Forestry Headquarters~~

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-97~~	~~Pittosporum undulatum~~	~~Victorian box~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location Buena Vista Lagoon

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-41	Platanus racemosa	California sycamore	36-42	75+	75+	Growing	Good	Native Tree

Location 2605 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-19~~	~~Platanus racemosa~~	~~California sycamore~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Red Apple Inn/Army Navy Academy~~

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-101	Platanus x acerifolia	London plane tree	30-36	60-75	75+	Growing	Good	

Location 3437 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-68	Podocarpus gracilior	fern pine	30-36	30-45	30-45	Growing	Fair	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 3250 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-61	Psidium cattleianum	strawberry guava	06-12	0-15	15-30	Declining	Fair	Backyard

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-107~~	~~Quercus agrifolia~~	~~coast live oak~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 2865 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-36~~	~~Schefflera actinophylla~~	~~octopus tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 1139 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-89	Schinus molle	California pepper tree	36-42	30-45	30-45	Growing	Good	

Location 390 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~S-3~~	~~Schinus molle~~	~~California pepper tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-110~~	~~Schinus polygama~~	~~Chilean pepper tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 645 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-45	Schinus terebinthifolius	Brazilian pepper	42-48	30-45	30-45	Growing	Good	On Roosevelt Street

Location 1103 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-92	Schinus terebinthifolius	Brazilian pepper	48+	30-45	30-45	Growing	Good	

Location 1284 Basswood Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-65	Sequoia sempervirens	coast redwood	36-42	60-75	15-30	Growing	Fair	

Location Rotary Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-1	Stenocarpus sinuatus	firewheel tree	18-24	60-75	15-30	Growing	Good	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 2978 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-14	Syagrus romanzoffianum	queen palm	12-18	45-60	15-30	Growing	Good	Schutte/Twin Inns/Nieman's - 15 trees

Location 3081 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-86	Syagrus romanzoffianum	queen palm	12-18	60-75	0-15	Growing	Poor	Shaw House - 15 trees

Location 1144 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-77~~	~~Syzygium paniculatum~~	~~brush cherry~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3048 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-48	Tecoma stans	yellow bells	06-12	15-30	0-15	Growing	Fair	Hess House

Location 2945 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-29	Tipuana tipu	tipu tree	24-30	30-45	45-60	Growing	Good	

Carlsbad Historic Village District Heritage Tree Alphabetical Listing - 2019

Location 2801 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-37~~	~~Ulmus parvifolia~~	~~Chinese elm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 3096 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-52	Washingtonia filifera	California fan palm	24-30	30-45	0-15	Declining	Fair	

Location 2855 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-25	Washingtonia robusta	Mexican fan palm	06-12	60-75	0-15	Growing	Good	Carlsbad Mineral Springs Hotel/Carlsbad-by-the-Sea - 12

Location 379 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-4	Washingtonia robusta	Mexican fan palm	12-18	60-75	0-15	Growing	Fair	4 trees

Location 2879 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-34~~	~~Yucca gloriosa~~	~~giant yucca~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

APPENDIX C

Appendix C:
Heritage Trees listed numerically

How to use this information.

This is a numerical listing of the Heritage Trees by tree number which is also shown on the maps. The botanical name of the species is also listed along with the common name and location information. Parks, and some historic sites, are listed by name only without an address.

The following information is included.

F = tree is located in the front of the property or on a park site
S = tree is located on a side street at the property address
R = tree is located at the rear of the property address or off an alley.

DBH: Diameter Breast Height, the trunk diameter is measured in inches at 54" above the ground level and is listed as a size range, for example 06-12.

Height: The height range of the tree is measured in feet, for example 15-30.

Canopy Spread: The canopy spread, which is the outer edge of the branches, of the tree is measured in feet and is listed as a size range, for example 15-30.

In urban forestry, size ranges are normally used when providing size information on trees. Tree size is constantly changing and using ranges keeps data from being out of date shortly after it is collected. It also allows the urban forester to analyze the comparative ages of a tree population especially when reviewing the size ranges in a single species in a population.

Vigor: A visual assessment of the growth indicators of the tree.

Condition: Numerical scores are given to various parts of the tree and are then calculated to provide an overall condition rating for the tree as either “good”, “fair”, “poor” or “dead”. This is a somewhat subjective process and reflects the condition of the tree at its last evaluation.

Ownership: The tree may be Publicly or Privately owned. Public trees are considered to be the responsibility of the of the entity that owns the tree to maintain.

Note: Data was collected in the latter half of 2018.

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location Rotary Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-1	Stenocarpus sinuatus	firewheel tree	18-24	60-75	15-30	Growing	Good	North County Transit District

Location 395 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-2	Eucalyptus cladocalyx	sugar gum	48+	30-45	45-60	Growing	Fair	City

Location 390 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~S-3~~	~~Schinus molle~~	~~California pepper tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location 379 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-4	Washingtonia robusta	Mexican fan palm	12-18	60-75	0-15	Growing	Fair	Private

Location 357 Chestnut Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-5	Cupressus macrocarpa	Monterey cypress	48+	45-60	45-60	Growing	Poor	North County Transit District

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 350 Chestnut Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-6	Phoenix canariensis	Canary Island date palm	24-30	45-60	15-30	Growing	Good	Private

Location 3288 Garfield Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-7	Eucalyptus ficifolia	red-flowering gum	42-48	30-45	45-60	Growing	Good	Private

Location 3288 Garfield Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-8	Phoenix canariensis	Canary Island date palm	24-30	30-45	15-30	Growing	Good	City

Location 3003 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-9~~	~~Eucalyptus globulus~~	~~blue gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 3003 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-10	Ficus macrophylla	Moreton Bay fig	48+	30-45	75+	Growing	Good	Private

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 3001 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-11	Pinus torreyana	Torrey pine	48+	45-60	45-60	Growing	Fair	City

Location 3080 Lincoln Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-12~~	~~Phoenix canariensis~~	~~Canary Island date palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 3080 Lincoln Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-13	Leptospermum laevigatum	Australian tea tree	36-42	0-15	30-45	Declining	Fair	Private

Location 2978 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-14	Syagrus romanzoffianum	queen palm	12-18	45-60	15-30	Growing	Good	Private

Location 300 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-15~~	~~Phoenix canariensis~~	~~Canary Island date palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 380 Chistiansen Way

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-16~~	~~Eucalyptus cladocalyx~~	~~sugar gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location 2680 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-17~~	~~Pittosporum tobira~~	~~mock orange~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~State~~

Location 2605 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-18~~	~~Araucaria heterophylla~~	~~Norfolk Island pine~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2605 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-19~~	~~Platanus racemosa~~	~~California sycamore~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2605 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-20	Ficus macrophylla	Moreton Bay fig	48+	45-60	75+	Growing	Good	Private

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 104 Pacific Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-21	Eucalyptus polyanthemos	silver-dollar gum	48+	30-45	30-45	Growing	Good	Private

Location 3480 Ocean Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-22	Metrosideros excelsus	New Zealand Christmas tree	18-24	30-45	30-45	Growing	Fair	Private

Location 2497 Ocean Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-23~~	~~Ficus microcarpa~~	~~Indian laurel fig~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 258 Beech Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-24	Phoenix dactylifera	date palm	12-18	45-60	15-30	Growing	Fair	City

Location 2855 Carlsbad Blvd

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-25	Washingtonia robusta	Mexican fan palm	06-12	60-75	0-15	Growing	Good	Private

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 421 Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-26	Chorisia speciosa	floss-silk tree	36-42	30-45	45-60	Growing	Good	City

Location 507 Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-27	Erythrina caffra	coral tree	42-48	30-45	15-30	Growing	Fair	City

Location 2956 # 3 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-28~~	~~Dodonaea viscosa~~	~~hopseed bush~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2945 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-29	Tipuana tipu	tipu tree	24-30	30-45	45-60	Growing	Good	Private

Location 600 Block Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-30	Eucalyptus cladocalyx	sugar gum	48+	75+	45-60	Growing	Fair	City

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 2943 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~R-31~~	~~Eucalyptus globulus~~	~~blue gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location 2910 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-32	Eucalyptus cladocalyx	sugar gum	48+	75+	30-45	Declining	Poor	City

Location 865 Grand Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-33	Eucalyptus cladocalyx	sugar gum	48+	75+	75+	Growing	Good	City

Location 2879 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-34~~	~~Yucca gloriosa~~	~~giant yucca~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2865 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-35~~	~~Duranta erecta~~	~~sky flower~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 2865 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-36~~	~~Schefflera actinophylla~~	~~octopus tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2801 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-37~~	~~Ulmus parvifolia~~	~~Chinese elm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2714 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-38~~	~~Melia azedarach~~	~~chinaberry~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location Lt. Maxton Brown Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-39~~	~~Eucalyptus conferruminata~~	~~bushy yate~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location Lt. Maxton Brown Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-40	Erythrina caffra	coral tree	48+	30-45	45-60	Growing	Fair	City

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location Buena Vista Lagoon

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-41	Platanus racemosa	California sycamore	36-42	75+	75+	Growing	Good	City

Location 2772 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-42	Pinus halepensis	Aleppo pine	30-36	45-60	30-45	Growing	Fair	Federal

Location 2777 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-43~~	~~Citrus sinensis~~	~~orange~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2812 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-44~~	~~Ceratonia siliqua~~	~~carob~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 645 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-45	Schinus terebinthifolius	Brazilian pepper	42-48	30-45	30-45	Growing	Good	City

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 675 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-46	Brachychiton discolor	Queensland lacebark	30-36	15-30	15-30	Growing	Fair	City

Location 825 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-47	Ficus microcarpa	Indian laurel fig	30-36	45-60	45-60	Growing	Good	City

Location 3048 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-48	Tecoma stans	yellow bells	06-12	15-30	0-15	Growing	Fair	Private

Location 3048 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-49	Persea americana	avocado	12-18	15-30	45-60	Growing	Good	Private

Location 3048 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-50~~	~~Dombeya wallichii~~	~~pink ball tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 3091 Jefferson Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-51~~	~~Cinnamomum camphora~~	~~camphor tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 3096 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-52	Washingtonia filifera	California fan palm	24-30	30-45	0-15	Declining	Fair	Private

Location 897 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-53	Ficus rubiginosa	rusty leaf fig	24-30	15-30	30-45	Growing	Good	Private

Location 3115 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-54~~	~~Nerium oleander~~	~~oleander~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 3156 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-55	Agathis robusta	dammar pine	12-18	45-60	0-15	Declining	Poor	Private

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 799 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-56	Pinus radiata	Monterey pine	30-36	15-30	45-60	Growing	Fair	City

Location 3380 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-57	Ceratonia siliqua	carob	36-42	30-45	45-60	Declining	Poor	Private

Location 3354 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~R-58~~	~~Acacia melanoxylon~~	~~black acacia~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location 799 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-59	Jacaranda mimosifolia	jacaranda	12-18	15-30	15-30	Declining	Poor	City

Location 3250 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-60	Leucaena glauca	white popinac	12-18	30-45	15-30	Growing	Good	Private

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 3250 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-61	Psidium cattleianum	strawberry guava	06-12	0-15	15-30	Declining	Fair	Private

Location 3150 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-62	Ficus microcarpa	Indian laurel fig	48+	60-75	45-60	Growing	Good	Private

Location 500 Block Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-63	Eucalyptus cladocalyx	sugar gum	48+	60-75	30-45	Growing	Fair	City

Location 1231 Basswood Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-64~~	~~Bauhinia variegata~~	~~purple orchid tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 1284 Basswood Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-65	Sequoia sempervirens	coast redwood	36-42	60-75	15-30	Growing	Fair	Private

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 3315 McKinley Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-66	Persea americana	avocado	24-30	15-30	15-30	Growing	Good	Private

Location 3270 McKinley Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-67~~	~~Juniperus chinensis 'Kaizuka'~~	~~Hollywood juniper~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 3437 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-68	Podocarpus gracilior	fern pine	30-36	30-45	30-45	Growing	Fair	Private

Location 3546 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-69	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	Private

Location 3454 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-70~~	~~Jacaranda mimosifolia~~	~~jacaranda~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 3384 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-71	Eucalyptus globulus	blue gum	48+	45-60	45-60	Growing	Fair	City

Location 3276 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-72	Eucalyptus globulus	blue gum	48+	75+	45-60	Growing	Fair	City

Location 3154 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-73~~	~~Pinus torreyana~~	~~Torrey pine~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 1366 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-74	Pinus halepensis	Aleppo pine	36-42	30-45	45-60	Growing	Fair	City

Location 1308 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-75	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Fair	Private

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 1307 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-76~~	~~Hymenosporum flavum~~	~~sweetshade~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 1144 Pine Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-77~~	~~Syzygium paniculatum~~	~~brush cherry~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 1166 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-78	Pinus torreyana	Torrey pine	42-48	60-75	75+	Growing	Good	City

Location 1166 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-79	Dracaena draco	dragon tree	12-18	15-30	15-30	Growing	Fair	City

Location 3016 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-80~~	~~Phoenix canariensis~~	~~Canary Island date palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 1550 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-81	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	City

Location 1542 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-82	Grevillea robusta	silk oak	30-36	75+	30-45	Growing	Fair	City

Location 3140 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-83	Casimiora edulis	white sapote	12-18	15-30	30-45	Growing	Good	Private

Location 3125 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-84	Magnolia grandiflora	Southern magnolia	24-30	45-60	30-45	Growing	Good	Private

Location 3081 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~S-85~~	~~Acacia spp.~~	~~acacia spp.~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 3081 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-86	Syagrus romanzoffianum	queen palm	12-18	60-75	0-15	Growing	Poor	Private

Location 1340 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-87	Ficus microcarpa	Indian laurel fig	36-42	45-60	45-60	Growing	Good	City

Location 1173 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-88	Callistemon rigidus	stiff bottle brush	24-30	15-30	15-30	Growing	Good	Private

Location 1139 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-89	Schinus molle	California pepper tree	36-42	30-45	30-45	Growing	Good	Private

Location 3050 Pio Pico Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-90	Olea europaea	olive	24-30	30-45	30-45	Growing	Fair	City

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 1103 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-91	Casimiora edulis	white sapote	12-18	30-45	15-30	Growing	Fair	City

Location 1103 Oak Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-92	Schinus terebinthifolius	Brazilian pepper	48+	30-45	30-45	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-93	Eucalyptus cladocalyx	sugar gum	48+	75+	60-75	Growing	Fair	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-94	Chiranthodendron pentadactylo	monkey hand	18-24	45-60	15-30	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-95	Eucalyptus cladocalyx	sugar gum	48+	75+	75+	Growing	Good	City

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-96	Eucalyptus cladocalyx	sugar gum	48+	45-60	75+	Growing	Fair	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-97~~	~~Pittosporum undulatum~~	~~Victorian box~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-98	Agonis flexuosa	peppermint tree	48+	15-30	30-45	Growing	Fair	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-99	Fraxinus uhdei	Shamel ash	48+	75+	60-75	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-100	Fraxinus velutina	Arizona ash	48+	75+	60-75	Growing	Good	City

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-101	Platanus x acerifolia	London plane tree	30-36	60-75	75+	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-102	Eucalyptus citriodora	lemon scented gum	36-42	75+	45-60	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-103	Araucaria cunninghamii	hoop pine	24-30	45-60	15-30	Growing	Fair	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-104	Araucaria bidwillii	bunya-bunya	30-36	60-75	45-60	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-105~~	~~Eucalyptus viminalis~~	~~manna gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-106	Pinus torreyana	Torrey pine	48+	60-75	75+	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-107~~	~~Quercus agrifolia~~	~~coast live oak~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-108~~	~~Metasequoia glyptostroboides~~	~~dawn redwood~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-109	Liquidambar styraciflua	sweet gum	30-36	75+	30-45	Growing	Good	City

Location Holiday Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-110~~	~~Schinus polygama~~	~~Chilean pepper tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~City~~

Carlsbad Historic Village District Heritage Tree Numerical Listing - 2019

Location 2810 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-111	Ceratonia siliqua	carob	24-30	15-30	15-30	Growing	Good	Private

APPENDIX D

Appendix D
Carlsbad Historic Village District Heritage Tree
Data Summaries

Based on field observations July 2018.

Trunk Diameter

This summary shows the number and percentage of trees in each DBH (Diameter Breast Height) size range. The size ranges are given in inches and the trees are measured at 54" above ground level. The data shows that the largest number of trees, 25 out of 75, (33.33%) are 48"+ in diameter.

DBH (inches)	Count	Percentage (%)
06-12	3	4.00
12-18	11	14.67
18-24	3	4.00
24-30	11	14.67
30-36	9	12.00
36-42	9	12.00
42-48	4	5.33
48+	25	33.33
Total	75	100.00

Height

This summary shows the number and percentage of trees in each Height size range. The size ranges are given in feet. The data shows that the largest number of trees, 20 out of 75 (48.75%), are between 30-45' tall.

Height (feet)	Count	Percentage (%)
0-15	2	4.88
15-30	12	29.27
30-45	20	48.75
45-60	15	36.59
60-75	11	26.83
75+	15	36.59
Total	75	100.00

Canopy Spread

This summary shows the number and percentage of trees in each Canopy Spread size range. The size ranges are given in feet. The data shows that the largest number of trees, 19 out of 75 (25.33%), have canopies that are 45-60' wide.

Canopy (feet)	Count	Percentage (%)
0-15	6	8.00
15-30	18	24.00
30-45	17	22.67
45-60	19	25.33
60-75	3	4.00
75+	12	16.00
Total	75	100.00

Condition

This summary shows the number and percentage of trees in each Condition category. Condition rating is the result of numerical scores that are given to various parts of the tree and are then calculated to provide an overall condition rating for the tree. The data shows that the largest number of trees, 39 out of 111 (35.14%), are in Good condition.

Condition	Count	Percentage (%)
Good	39	35.14
Fair	30	27.03
Poor	6	5.41
Dead	36	32.43
Total	111	100.00

APPENDIX E

State of California

GOVERNMENT CODE

Section 53067

53067. (a) The Legislature finds and declares the following:

(1) That trees and other woody plants respond in specific and predictable ways to pruning and other maintenance practices.

(2) That careful scientific studies indicate that arboriculture practices including, but not limited to, “topping” are often misunderstood and misapplied.

(3) That the results of the 1988 California urban forestry survey prepared by Plant Science and Research for the California Department of Forestry and Fire Protection’s Urban Forestry Program summarizes that an estimated 5.9 million street trees are managed by California cities of which approximately 30 percent of the cities and 20 counties do not have tree ordinances of any kind. That in 1988 an estimated one hundred nine million dollars ($109,000,000) statewide was spent on municipal tree maintenance, less than 1 percent of most city and county budgets, with an average of sixteen dollars and 82 cents ($16.82) per street and park tree per year and an average of four dollars and 68 cents ($4.68) per resident per year. California’s city governments support urban forestry. Support for tree programs is highest in communities where citizens are involved.

Conclusions of the urban forestry survey state that most cities need an aggressive tree planting program to maintain tree densities at current levels, to keep pace with urban growth, increase species diversity, maintain the health and vigor of their trees, and put more effort into long-term master planning of urban forests. To derive the maximum ecological benefit from the urban forest, the current trend towards planting smaller trees will need to be reversed. Counties lag far behind cities in urban forestry efforts. Most tree programs need to put greater emphasis on educating the public on the benefits the urban forest provides. A healthy flourishing urban forest cannot be developed and maintained without foresight, proper care, and good management.

(4) That the California Department of Forestry and Fire Protection Guidelines for Developing and Evaluating Tree Ordinances 1991 publications states that an ordinance shall be developed for the purpose of prohibiting topping of public and private trees. Topping is the practice of cutting back large diameter branches of a mature tree to stubs and is a particularly destructive pruning practice. It is stressful to mature trees, and may result in reduced vigor, decline, or even death of trees. In addition, new branches that form below the cuts are only weakly attached to the tree and are in danger of splitting out. Topped trees require constant maintenance to prevent this from happening and it is often impossible to restore the structure of the tree crown after topping. Unfortunately many people believe that topping is a proper way to prune a tree, and this destructive practice is prevalent in some communities.

(5) That in an effort to promote practices that encourage the preservation of tree structure, and public safety and health, these standards developed through careful scientific studies by leading industry consultants, United States Department of Forestry scientists, and professors of horticulture and plant pathology, are recognized standards by the Department of Parks and Recreation, California Department of Forestry and Fire Protection, University of California Co-operative Extension Farm advisers, the National Arborist Association, the International Society of Arboriculture, American Forestry Association, and numerous tree planting and preservation organizations throughout the state and nation.

(6) That those standards are working guidelines, recognizing that trees are individually unique in form and structure and that their pruning or maintenance needs may not always fit strict rules.

(7) That the International Society of Arboriculture founded in 1924 with over 21 chapters throughout the world publishes the monthly Journal of Arboriculture which is devoted to the dissemination of knowledge in the science and art of growing and maintaining shade and ornamental trees. The Journal of Arboriculture, March 1988, Volume 14, No. 3, page 76, states that properly trimmed trees not only require less manhours on their next cycle but some may not even need trimming. This conclusion was based on a study performed at Delmarva Power in Maryland during the 1982–84 trim cycles. Results indicate a 25 percent reduction in work force and a 7.4 percent reduction in costs in the first three years.

(8) That the use of proper tree maintenance techniques benefits the public because of reduced costs, reduced hazards, reduced public liability, protection from premature decline or death (conserving energy reducing carbon dioxide and ozone, absorbing particulate matter, producing more oxygen by increasing canopy spread, reduction in wind speed, reducing noise pollution, increasing real property values, enhancing visual and aesthetic qualities that attract visitors and businesses, serve as a source of community image and pride by providing maximum shade and canopy cover). As canopy cover increases the public benefits increase.

(9) (A) The Legislature's findings recognize that topping of trees is a widespread misunderstood consumer request and this form of pruning detracts from public benefits including, but not limited to, safety and property values, and causes premature decline, death, disease, insects, woodrot, and increased maintenance costs. These findings also recognize that a great number of personnel performing maintenance on trees unknowingly and unintentionally produce irreversible harm.

(B) The Legislature finds that nonregulated commercial tree service firms that advertise topping are widespread among commercial advertising including the yellow pages, but not limited to newspaper advertising, and that millions of dollars have been spent topping trees including publicly owned trees.

(C) The Legislature finds that modern techniques utilized by certified arborists through scientific study and continued education are of value and benefit to the citizens of California and to all who care for our resources.

(b) Notwithstanding any other provision of law, the California Department of Forestry and Fire Protection through Sections 4799.06 to 4799.12, inclusive, of the

Public Resources Code, shall to the extent possible, furnish to every public agency, including the state, but not limited to, a city and county, school district, or community college district copies of these publications as listed: Western Chapter International Society of Arboriculture Pruning Standards, California Department of Parks and Recreation specifications for pruning trees, and National Arborist Association Standards of pruning shade trees.

(Added by Stats. 1992, Ch. 755, Sec. 1. Effective January 1, 1993.)

CARLSBAD
HERITAGE TREE REPORT
PHASE II
2011

Revised
June 2019

WISNIEWSKI & ASSOCIATES
ENCINITAS, CALIFORNIA

CARLSBAD
HERITAGE TREE REPORT
PHASE II
2011

Revised
June 2019

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International Society of Arboriculture - Tree Risk Assessment Qualified

TABLE OF CONTENTS

Cover: The first tree planted in Carlsbad, *Schinus molle* - California pepper tree (Tree #1) 2009, now deceased.

Old woman tree
Old man tree
What secret are you whispering into the wind?
Underneath it I will listen
I will listen to the old woman tree
I will listen to the old man tree
Diania Caudell

PREFACE

The original report was first published in 2011. The city has requested all the trees listed in the previous report be reviewed to confirm their continued existence and their current conditions evaluated.

The author would like to thank the following for their assistance or technical expertise that contributed to this report. Any mistakes, errors or oversights remain the sole responsibility of the author.

Kyle Lancaster and Tim Selke with the Parks & Recreation Department for providing digital copies of the previous report and encouragement.

David Young in the Carlsbad GIS Department for the excellent maps and current aerial photographs that were produced to show the locations of the study areas and the trees.

Shelley Hayes Caron for again sharing the history of her remarkable family, allowing the use of old family photographs and providing access to the special trees growing at the Marron-Hayes Adobes Historic District. May your trees continue to grow and inspire future generations.

Diania Caudell for permission to use her family history and a poem she wrote in Luiseno and English about one unique tree in this report that has special place in her family history, that unfortunately has died, but still lives on in memory and family lore.

Tim Clancy, associate, arborist and computer guru, for providing technical computer support and the data base program that allowed for organizing all the information and data summaries. He also provided review of the technical information along with proof reading and editing suggestions. His assistance was invaluable.

To all the citizens of this community past, and present who valued, protected and at times have fought to preserve this community's heritage that is reflected and recorded in its trees.

I highly recommend that those folks interested in the details of the history of the historic sites and information of all of the individual species read the original report as well as this updated information for a more complete appreciation of these valuable community resources.

INTRODUCTION

The city staff requested a Revised Report on the current state of condition of the trees that had been documented in my “Carlsbad Heritage Tree Report Phase II - 2011”. They intend to include this revised report with their updated Community Forest Management Plan.

Numerous changes to the trees, and the community, have taken place since these trees were originally surveyed in 2009. Some trees have grown larger, some trees have declined, some trees have died, and other trees have been removed.

The most significant loss was that of the oldest tree planted in Carlsbad, a California pepper, *Schinus molle*, on the Marron-Hayes Adobes Historic District property. The tree declined and eventually died from unknown causes. Its remains can still be seen from the East bound lanes of Highway 78, if you know where to look.

A significant amount of time and energy has been invested in the repair and restoration work on a second California pepper on the same property after a large branch broke and split open.

There have also been changes in the tree care industry and profession in how trees are managed, maintained, pruned, evaluated for risk, and appraised for value. The profession continues to evolve based on new science-based research, new technology, tools and equipment. This will continue in the future.

One of the biggest changes is in the scientific naming of trees. Additional research, including DNA testing, reveals that some trees that were previously thought to be members of the same genus are not related at all.

These name changes usually take years to work their way through the nursery industry, the literature, landscape plans and reports like this. It is even harder for the homeowner or casual botanist to pick up these changes. Fortunately in the literature when there is a name change the previous name will be usually be included as a synonym. This report uses the names used in the original report as it is an acceptable use in the industry.

> *In the intimate and humanized landscape, trees become the greatest single element linking us emotionally with our surroundings . . . It's no wonder that when we first think of a garden we think of a tree.*
>
> Thomas D. Church, *Gardens Are for People*

ASSIGNMENT

I was originally asked to review the trees of the Carlsbad Historic Village District for a Heritage Tree Report in 2002. A Phase II study was subsequently requested for an expanded study area and also for several outlying historic sites to identify trees for consideration as candidates for Heritage Tree status. I have since been asked to review those original trees and tree sites I had recommended as Heritage Trees, update their current condition and status and provide current recommendations.

The original process that I followed was that significant trees in the study area were researched through numerous archival sources. They were reviewed several times in the field for further evaluation, then finally selected, inventoried and listed for consideration as Heritage Trees.

The data collected for the inventory included: the species, street address and location, tree site number, height, canopy spread and DBH (Diameter Breast Height) as well as the condition, vigor and ownership of each tree. In some locations of street tree plantings or groves the trees were not individually listed, but the largest representative was evaluated. In other locations the entire grove was considered as a Heritage Tree site. The trees on private property were not measured, but their size and condition was estimated.

The 51 trees listed in this report are considered worthy of designation as Heritage Trees because of their species, rarity, size, age, shape, historic, or cultural significance. Many other trees were originally considered, but this list is representative of the current most noteworthy trees in the study area.

Where there was a connection between a tree, or trees, to a significant historical property or person that information has been included. If the property is now better known by its current use or owner that information is also provided.

Some background information, and stories, has been included on several significant historic sites. Every tree has a story. Someone planted it, others have cared for and maintained it over years and decades and once in a while you might get a glimpse of who those folks were and learn what their motivation was.

Instead of making numerous changes to the original report, some sections of the original report have been retained and updated. I have included historic photos and the photos from the original report for the surviving trees, and also current photos. By comparing the photos you can tell some trees have declined while others have grown larger and become even more impressive. I have tried to duplicate the settings, but vantage points have changed, as has the focal length of the lenses on the cameras I used then and now. This can have a significant affect on how a particular tree or setting appears.

All photographs were taken by the author, unless otherwise credited.

Please note that the information about the condition of the trees is from a simple ground level observation. No sounding, coring, drilling, probing or excavations were performed. This was not a tree risk assessment.

PROCEDURES AND NOTES

For the purposes of this report, and to better manage and analyze the data, size ranges are utilized rather than the exact measurements. In cases where direct access to a tree was not possible, due to its location on private property or inaccessibility, sizes were estimated.

The Aqua Hedionda Creek riparian area, where three large native oaks (Trees #9, #10 and #11) were located, is currently posted as a Habitat Conservation Area with “No Trespassing” signs. Since no direct observation of these trees was possible, their original information was not updated.

Since the Phase II study was completed in 2011 10 trees, of the original 51 trees, have either been removed for various reasons or have died.

Sections about historical sites that are taken from the original report are shown italicized and in quotation marks. All the historical photographs were taken from the original report.

The shade hugs my heart.

Candy Polgar

RANCHOS, RANCHES AND NATIVE TREES

Rancho Agua Hedionda and the Marron-Hayes Adobes

"This study of the Heritage Trees of Carlsbad starts with the first known trees to be planted in what is now Carlsbad. The date of the planting is unknown, but what is known makes for a fascinating story.

There are two trees, commonly called California pepper trees (Schinus molle) that are still growing on the home site, La Rinconada de Buena Vista, of the Rancho Agua Hedionda on land granted to Juan Maria Marron in 1842 and passed on to his eldest son Juan Maria Romualdo Marron. "The rancho included parts of the present cities of Oceanside, Vista, and Carlsbad." (Sweet, 2003) A portion of the original land grant has continued to remain in family ownership to this day.

Shelley Hayes Caron, a descendant of the Marron family, is the current owner of the property and the caretaker of the trees. She generously provided me a wealth of historical information about her family, the property and the trees. She also provided copies of numerous historical photographs, several of which have been included in this report.

Shelley lives in a beautifully restored adobe on the north side of a gently sloping hillside that looks out over the appropriately named Buena Vista Valley. To the south is the meandering, flowing Buena Vista Creek surrounded by lush riparian vegetation.

The house was restored in the 1940s by Shelley's grandfather Fred Hayes. There are other melted adobes nearby. "Today the house, the melted Hayes adobe site, and the associated Indian archaeological sites make up the Marron-Hayes Historic District. The district has qualified for inclusion in the National Register of Historic Places." (Sweet, 2003)

Juan Maria Romualdo Marron was politically active and well connected in San Diego. In 1845 "Romouldo (sic) Marron was appointed as the chief administrator of the San Luis Rey Mission" which is located just a few miles north of the home site. (Howard-Jones pg.15) It was at the mission that the very first pepper trees were planted in California. These trees are native to Peru where they grow in the Andes Mountains.

"In 1830, Father Antonio Peyri of Mission San Luis Rey planted some seeds which had been given to him by a sailor who knew only that 'they came from South America'." (Brigham pg. 110) One of the original trees survives to this day at the Mission and is celebrated by the community each year with Pepper Tree Day.

It seems most likely that Juan Maria Romualdo Marron, during one of his visits to the Mission, obtained seeds from the trees growing on the Mission grounds. He then planted the seeds to have these new, unusual and graceful trees growing near his *home. This started a trend that continues to this day in Carlsbad. That is a fascination with non-native exotic trees and the planting of them near homes for people to enjoy their shade and beauty.*

The pepper trees, which can grow quickly, probably benefited from being located close to the adobes where they could receive the benefit of the frequent dumping of wash water.

The Marron pepper trees are significant, but not just because they were the first trees planted in Carlsbad. They have contributed to the ambience and cultural history of both this home and this community. It is easy to imagine generations of this family and their friends gathering under these trees for visits and fiestas or just for a pleasant place to sit and relax or work.

Tree #1 stands off by itself in a field, with the ruins of a melted adobe nearby. Some people claim there are faces you can see if you study the knotty and gnarled trunk. It is indeed possible to picture them with a little creative effort. Then as you let your imagination wander over the rough brown bark, listen to the soft voice-like murmurs coming from the leaves and branches gently stirred by the breeze."

Schinus molle - California pepper tree (Tree #1). 2009

"For a few moments try to picture a landscape without freeways, cars and shopping centers. Watching and listening to this tree can take you back to a time that this tree remembers and has faithfully recorded in its annual growth rings.

The years when the rains came will have large growth increments between the annual rings. The drought years will appear as narrow bands marked by the annual laying down of cells. Larger cells occur in the spring when growth is vigorous and smaller cells later in the summer and fall when growths slows down. The tree integrates all of the factors of weather; temperature, wind, humidity and rainfall and records it everyday, year after year.

This tree has an accurate history of the weather and climate for this site carefully preserved in its wood. Unless decay destroys the wood, this record of the seasons and the years will remain safely hidden away.

Over 140 years ago this tree had grown large enough to provide protective shade to a woman giving birth under its cool green canopy. A story of this birth, written by the woman's great granddaughter Diana Caudell, is called "Born under a Pepper Tree" and is included in this report.

In a Marron family portrait dated 1895 there appear to be some leaves from Tree #2 that are just barely discernible. This pepper tree occupies a unique location near the southeast corner of the existing adobe. It is growing five feet below grade near the entrance to an underground storage room. There its cooling shade helped protect and preserve the foodstuffs and provisions stored under its wide spreading branches.

It is a pleasant surprise when one first discovers this tree's secret. A favorite gathering spot, during special events when people are visiting this unique historical property, is under this tree's spreading branches.

Both of these two trees are in vigorous condition. They have full canopies arrayed along twisted and sculptural branches. There is some internal trunk decay, which is typical for old trees of this species. Tree #1 has the largest trunk diameter at 55" and Tree #2 has the largest canopy spread of 64'. These are without a doubt the premiere Heritage Trees of Carlsbad.

To give additional perspective to these two special trees and this place of living history, I have included historical and background information provided by Diania Caudell with her permission.

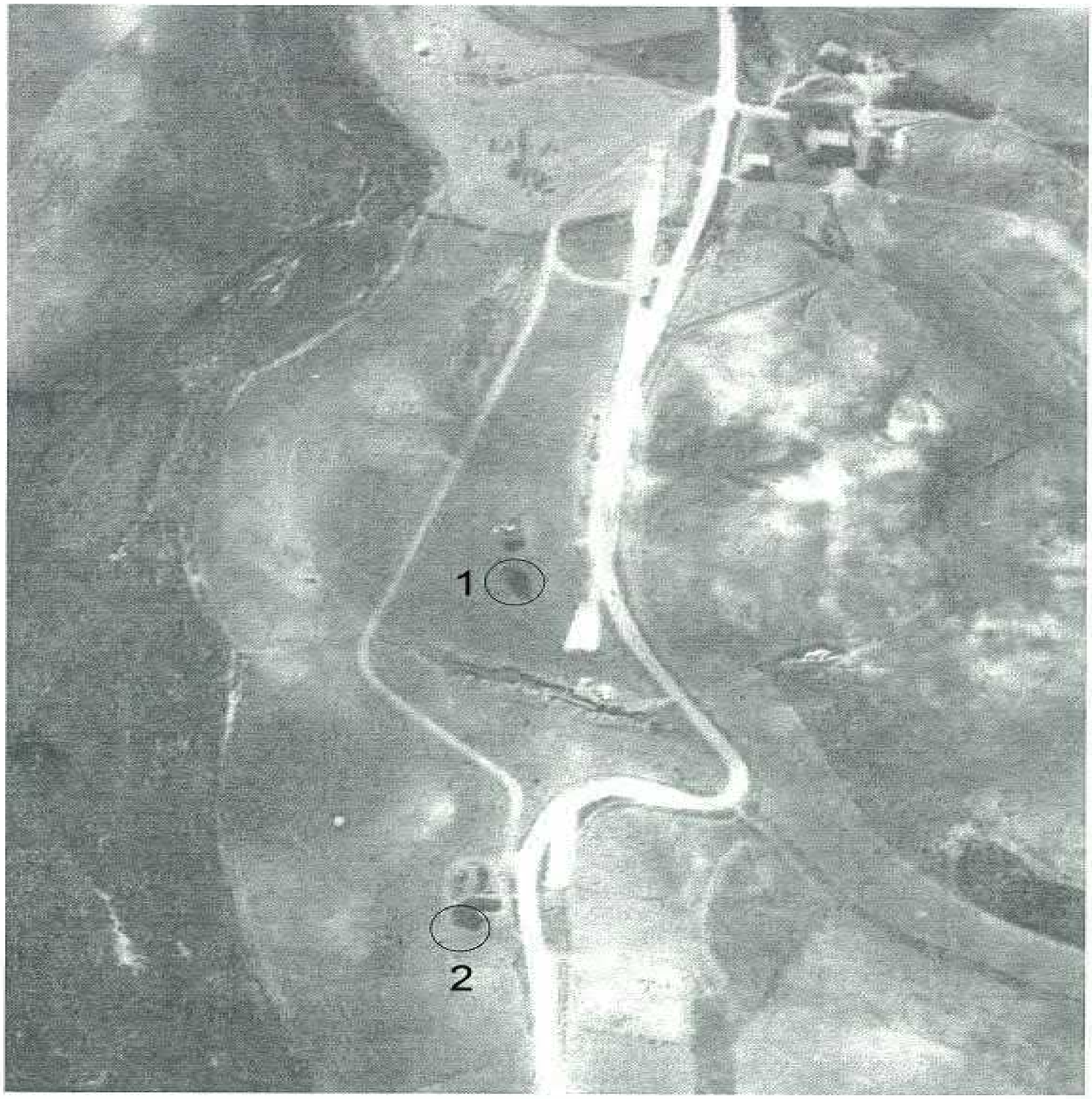
As people traveled to other ranchos, ranches and farms in this area 100 to 150 years ago they would see other pepper trees, sometimes the progeny of these two trees, shading many a house and yard.

1895 – The Silvestre Marron family at Rinconada de Buena Vista, Rancho Agua Hedionda.
What appear to be leaves from Tree #2 are just barely visible along the upper left edge of the photo.
Photograph Courtesy of Shelley Hayes Caron

Schinus molle - California pepper tree (Tree #2). 2009

Schinus molle - California pepper tree (Tree #2). 2019

Because the pepper trees can grow with very little supplemental water they were so widely planted throughout the state that they have become known as California pepper trees. Because of the common name many people have mistakenly assumed that these trees are a California native plant."



1928. The melted adobe with *Schinus molle* - California pepper tree (Tree #1) just below. *Schinus molle* - California pepper tree (Tree #2) is just below the L-shaped adobe.
Photograph Courtesy of Shelley Hayes Caron

"There are several other significant trees on this property that date to the 1940's and show clearly in a 1963 aerial photo. Three of these trees are the largest of their species that were found in Carlsbad."

That tree whose leaves are trembling:
is yearning for something.
That tree so lovely to see acts as if it wants to flower:
it is yearning for something.
Diego Hurtado de Mendoza, 1395

1963. *Schinus molle* - California pepper trees (Trees #1 and #2) plus Trees #3, #4 and #5.
Photograph Courtesy of Shelley Hayes Caron

As I age
in the world it will rise and spread,
and be for this place horizon
and orison, the voice of its winds.
I have made myself a dream to dream
of its rising, that has gentled my nights.
Let me desire and wish well the life
these tress may live when I
no longer rise in the mornings
to be pleased with the green of them
shining, and their shadows on the ground,
and the sound of the wind in them.
Wendell Berry, *Planting Trees*

Pinus pinea – Italian stone pine (Tree #3). 2009

Pinus pinea – Italian stone pine (Tree #3). 2019

This tree has suffered stress and dieback from drought as well as some insect damage. There was also one large branch failure.

Ficus microcarpa – Indian laurel fig (Tree #4). 2009

Ficus microcarpa – Indian laurel fig (Tree #4). 2019

In 2009 this tree had several large branches lying on the ground. Since then the tree has lost foliage in over half of its canopy. The causes for this decline remain under investigation.

Schinus terebinthifolius - Brazilian pepper (Tree #5). 2009

Schinus terebinthifolius - Brazilian pepper (Tree #5). 2019

This tree shades the patio at the rear of the abode. It has slightly declined in condition, which may be related to stress from the drought experienced over several years.

Of the two trees, commonly called California pepper trees that are located on the home site, La Rinconada de Buena Vista of the Rancho Agua Hedionda which is on land granted to Juan Maria Marron in 1842, Tree #1 declined over several years and died.
Today only the dead trunk and branches remain. These will decay over time and then the only memory will be the information contained in these reports.

Schinus molle - California pepper tree (Tree #1) 2018

He that planteth a tree is a servant of God, he provideth a kindness for many generations, and faces that he hath not seen shall bless him.

Henry Van Dyke

Two years ago Tree #2, which grows 5' below grade and shades an underground storeroom, suffered a failure of one of its two major limbs. The branch landed on and damaged the storeroom. A crack in the branch over three feet long and over a foot wide presented a condition that needed to be treated if the tree was to remain.

Shelley Hayes Caron, a descendant of the original Marron family, is the current owner of the property and the caretaker of the trees. She asked for my assistance to evaluate and stabilize the tree and also to coordinate the repairs to reinforce the storeroom roof. The completed repairs will allow this tree to continue to live and contribute to the pastoral setting of this special site as it continues to grow into its third century. See "Appendix E" for the details.

Schinus molle - California pepper tree (Tree #2). 2019

When I reflect that one man, armed only with his own physical and moral resources, was able to cause this land of Canaan to spring from the wasteland, I am convinced that in spite of everything, humanity is admirable. But when I compute the unfailing greatness of spirit and the tenacity of benevolence that it must have taken to achieve this result, I am taken with an immense respect for that old and unlearned peasant who was able to complete a work worthy of God.

Jean Giono, *The Man Who Planted Trees*

"Born Under a Peppertree
By Diania Caudell

Do you ever wonder what it must have been like back in the "old" days when the original people of the state of California were trying to adjust or just survive to the many changes around them? Being told to "stop" speaking your own language, your way of life is not acceptable and to hear over and over again, "children, we are here to save you from your wrongful ways," had to be confusing and heartbreaking for a people that survived for thousands of years with their own guidance of what is right or wrong and their way of life was acceptable to their people.

Finding your family history is sometimes easy but most of the time it is hard and difficult, especially if your family history is associated with early California history and the original native people. I am going to briefly write about my paternal great grandmother, Librada.

Librada's parents: Norato (Honorato, Onorato) Garcia
Refugia Ortiz

Librada's parents: were both born at Pala around the 1840's and were married at the San Diego Mission on December 13, 1857.

Many of the native people were moved from mission to mission depending on the type of work that was needed and the seasonal harvesting of crops grown and especially the herding of cattle and sheep. The native people were exceptional vaqueros and experts at shearing sheep. Librada's parents were no exception. Onorato being an excellent mason' he probably traveled to many missions and ranchos with his skill for adobe building. It is recorded that he built an adobe house on property that he had homesteaded.

On August 18,1865 or August 19,1862 (depends what document is being read) Librada Lorenza Garcia was born under a Peppertree on what is now the Marron Rancho. Near the tree are the ruins of an old adobe. This tree is from the historical Peppertree in the sacred gardens at Mission San Luis Rey.

Librada's parents moved back to Pala around 1874. Librada had several brothers and one sister that were raised in the serene and beautiful valley of Pala. With the San Luis Rey River running near by; life at Pala was simple and probably dominated by the rules of the mission. Washing of the clothes was done *at the river's edge. Cooking done on open fire or old wood burning stoves. But the family survived.*

Librada married at San Luis Rey Mission on Dec 10,1881 to a Mr. John A Giddens, a native of Texas. Mr. John A. Giddens came to the Pala area around 1865 and farmed the surrounding area including Temecula. He was an educated man and became a justice of the peace and storeowner. He also was a partner with Frank Solomon at the tourmaline mines. Mr. John A Giddens was very active with the reconstruction of the Pala mission after the great flood of 1916.

Librada and John Giddens lived and raised a large family at their home in Pala. There all of the children went to the Pala School and some continued on to Sherman Indian Institute for higher education. One of her many children was my grandmother: Benigna "Molly" Giddens. Born February 13,1902 at Pala, Calif. My grandmother went to the Pala School and was taught the fine artwork of lacing. (As were many of the Indian children during that period.)

Librada Lorenza Garcia Giddens died on Sept 4,1914. She is buried at the old cemetery at Pala Mission. One of her daughters, Emma is buried near her and also two grandchildren. Librada's husband is also buried next to her.

The old Peppertree still stands on the property and if you study its features you will notice shapes and faces of children and especially the profile of an old Indian face. When the wind gently blows through the branches; it makes you stop and wonder: What stories can you whisper? If I stand here quietly, will you share your secrets? This tree was special to the local native people who once lived in this area but it is extremely important to my family as part of our heritage and being able to visit and speak about: Librada Lorenza Garcia, born under the old Peppertree.

Kuláawut néshmal 'á'$akawish
Kuláawut naxánmal 'á'$akawish
Hish ' óolichi su h'úngyuk $awáayiq
Potówlanga nóo náqmaq
Nóo kuláawut néshmal 'á'$akawichi náqmaan
Nóo kuláawut naxánmal 'á'$akawichi náqmaan

Old woman tree
Old man tree
What secret are you whispering into the wind?
Underneath it I will listen
I will listen to the old woman tree
I will listen to the old man tree"

Carlsbad Heritage Tree Study Phase II

Marron-Hayes Adobes Historic District

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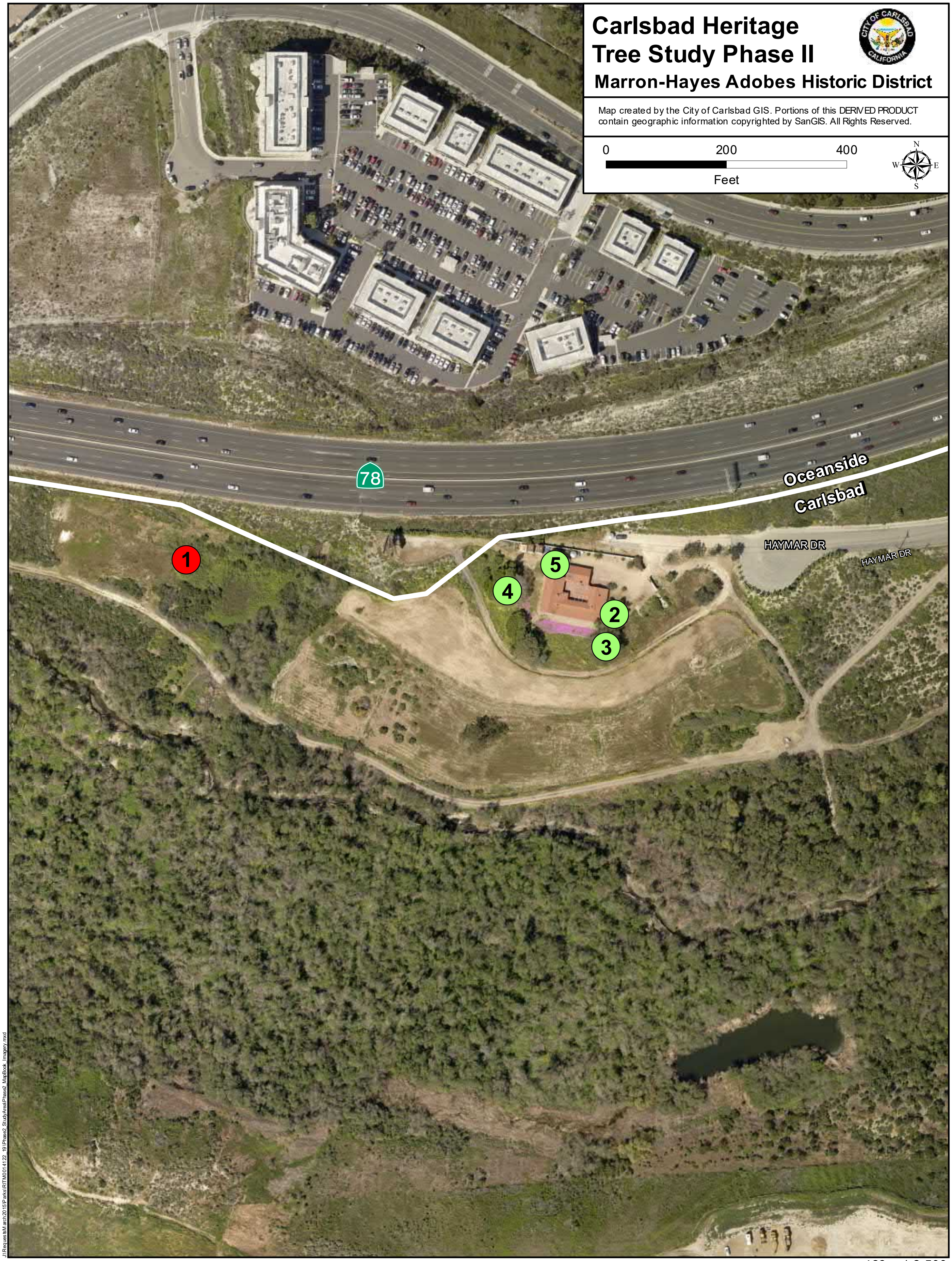

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Living Tree

Dead or Missing Tree

Kelly Ranch

"Francis J. Hinton acquired the title to Rancho Agua Hedionda in 1865 from the Marron family and hired Robert Kelly to oversee the property and its operations. The unmarried Kelly inherited the Rancho in 1870 when Hinton died. (Schnebelen Gutierrez pgs. 11-12)

"Robert's older brother Matthew arrived in the area with his wife and family to establish a ten-thousand-acre homestead "Los Kiotes," southeast of the Rancho Agua Hedionda's southernmost border." (Schnebelen Gutierrez pg. 12)

"Robert Kelly died of cancer in 1890, leaving Rancho Agua Hedionda to the children of his brother Matthew Kelly, who had died five years earlier." (Howard-Jones pg. 30) The property was divided into lots and "A drawing was held to distribute the parcels in a fair manner." (Howard-Jones pg. 35)

One of the few reminders of the old farmstead is a California pepper tree (Tree #6). The 1895 farmhouse is now gone, but the tree can still be seen behind the masonry wall on the south side of Cannon Road. According to Gary Robertson, (the great-grandson of William Sherman Kelly), this tree was a descendent of pepper trees from another Marron family adobe, located nearby on Sunny Creek Road.

Gary related that his mother, Virginia Kelly (later Robertson), when she was 2 or 3 years old climbed the tree and was not able to get back down without help and a ladder.

Circa 1930s. *Schinus molle* – California pepper tree (Tree #6) is located just to the right of the farmhouse at black arrow.
Photograph Courtesy of Gary Robertson

The land that once was the sprawling Kelly Ranch also has vestiges of native trees, especially along the low lying areas adjacent to Calavera Creek where a large number of California sycamores (Platanus racemosa) remain along with a scattering of coast live oaks (Quercus agrifolia) further up the lower slopes of the adjacent hillsides. Old sycamores also grow along Agua Hedionda Creek where it meanders through the adjacent Rancho Carlsbad development.

Many sycamores lined the wagon road leading to where the farmhouse was located. Lucia Kelly Sipple, the daughter of Allan O. Kelly who owned and farmed this property, related how beautiful the trees were and how they shaded the road when she was growing up and how pleasant it was to travel the road and look up at the leafy canopy.

Circa 1950s. *Platanus racemosa* – California sycamore (Tree #7) is located just to the left of the center of the photograph.
Photograph Courtesy of Gary Robertson

Two particularly majestic sycamores growing next to each other had shaded the old road (Tree #7) and are now just visible above the masonry wall along Cannon Road. You can also catch a glimpse of them, growing along the north side of the creek, by looking through the steel fence from El Camino Real.

If you duck under their canopies, that extend to the ground like a green skirt, and look up you will see scraps of weathered lumber that are attached to the trunk leading to a leafy perch high in the branches. Lucia Kelly Sipple recalled that those were probably put there by one of her cousins, years ago. Gary Robertson confirmed that he was the young architect and builder of this leafy and shady hideaway.

Platanus racemosa – California sycamore (Tree #7). Two trees with intertwined branches.

Finding the remnants of a tree house was not too surprising, it was almost anticipated. Several other trees in this study, that have also been recommended as Heritage Trees, had perches or lookout platforms nestled in their branches.

There is something almost irresistible about climbing and sitting up in the branches of trees. Looking out and down at the rest of the world from a protected superior perspective is a special exhilarating experience.

Unfortunately it is an experience that not many children, or adults, have a chance to experience nowadays. That is unfortunate since, many early and lasting connections with trees and nature are formed by children sitting and swaying in the branches of trees while the world below them proceeds unaware of their scrutiny.

Disconnected from the earth except by the roots of a tree, one is free to let their imagination soar and explore dreams and ideas that are not possible when one is standing on the ground.

Platanus racemosa – California sycamore (Tree #7). Notice the hand and footholds still attached to the trunk. 2009

Gary Robertson related that this was not his only arboreal construction project. He and his young friends had constructed another lofty perch in a nearby eucalyptus tree. This was a secretive project, away from the prying eyes of the adults, who might have put a stop to if they had been aware of what the budding young contractors were up to.

Gary said that numerous 3-foot long scavenged 2x4s were first nailed to the trunk to be able to climb the tree. A tree house was then built at about 20-25‘ above the ground. This included a pulley system attached to another nearby tree that provided a thrilling high-speed tire ride. Upon completion of the work he and his crew used a tape measure to check the distance above the ground to the project's topmost level, a slender 4" branch. It was a mere 90' high.

From this lookout point they enjoyed not only spectacular views, but also many exciting moments when the tree would sway with the breeze.

Not far from where the old farmhouse once stood is another old tree, a solitary oak standing on the side of a hill surrounded on all sides by the fields that had been tended by generations of Kellys and later, other farm workers. One might miss this survivor when driving past because Cannon Road makes a sharp turn there changing into College Boulevard and you need to pay close attention to your driving. This tree is a coast live oak (Quercus agrifolia) Tree #8.

What makes this tree remarkable? Perhaps nothing at first glance. Then one might notice some old farm equipment or trucks parked nearby and the answer slowly emerges. This tree was growing here before Robert Kelly started grazing cattle on these hillsides. It was left when the land was cleared to grow crops, probably because it was too large for the equipment available at the time to remove. For many years the main crop grown around the tree was hay. When water became more readily available, tomatoes and other vegetables were grown.

Circa 1940s. *Quercus agrifolia* – coast live oak (Tree #8) is located at the black arrow in this photograph taken from the top of Cerro de la Calavera.
Photograph Courtesy of Gary Robertson

Gary Robertson said this tree was a picnic spot for the Kelly family. Later, farm workers would eat their lunch in the heat of the day under its cooling shade and perhaps grab a quick siesta before going back to work. The tree provided an oasis from the sun. This is where the drinking water could be kept cool, where produce was packed for market and where the tractor was parked to keep the metal driver's seat from becoming blazing hot from the sun or damp from morning dew or mist.

These amenities may appear to be trivial in today's world of computers, the Internet, space travel and a fast food drive-in at every corner. For the people who provide the sweat of trying to coax a crop and a living from the land, this tree would have stood as a temporary haven of respite from toil.

This old oak, like all trees in this study, has formed a perfect environmental record of its location. Its annual growth rings contain this permanent and exact data recording. These local climate histories remain concealed and protected by the tree. If one wanted to learn about Carlsbad and this region, they would do well to study the rings of patriarch trees when they fall or must in time be removed.

The scientific study and analysis of tree rings is called dendrochronology. By comparing tree rings, from both living and dead bristlecone pines in the White Mountains of eastern California, an uninterrupted chronology extending back over 8,500 years has been established. Scientists studying these rings, and rings taken from other sites, have developed exact years of both drought and high rainfall in the Southwest.

Many old historic buildings and Indian settlements have been dated using tree rings by dendrochronologists. By taking sample cores from the beams and timbers used in the construction and by matching them to other known cores a building can be accurately dated. Trees have much to teach us if we are willing to ask the right questions, observe and study".

> *People in suburbia see trees differently than foresters do. They cherish every one. It is useless to speak of the probability that a certain tree will die when the tree is in someone's backyard . . . You are talking about a personal asset, a friend, a monument, not about board feet of lumber.*
>
> Roger Swain

> *Suburbia is where the developer bulldozes out the trees, then names streets after them.*
>
> Bill Vaughan

> *If a tree dies, plant another.*
>
> Linnaeus

In 2019 one of the few reminders of the old Kelly Ranch farmstead is a California pepper tree (Tree #6). The 1895 farmhouse is now gone, but the tree can still be seen behind the masonry wall on the south side of Cannon Road. There is new construction in the vicinity of this tree. Hopefully there is also a tree protection plan.

The two large California sycamores (Tree #7) growing next to each other that shaded the old road are now just visible above the masonry wall along Cannon Road. You can also catch a glimpse of them, growing along the creek, by looking through the steel fence from El Camino Real.

Not far from where the old farmhouse once stood was another old tree, a solitary oak standing on the side of a hill surrounded on all sides by fields. This tree, a coast live oak (Tree #8) was removed for the construction of Sage Creek High School.

Although a section was cut from the trunk, unfortunately, it had deteriorated before it could be preserved.

Carlsbad Heritage Tree Study Phase II

Kelley Ranch

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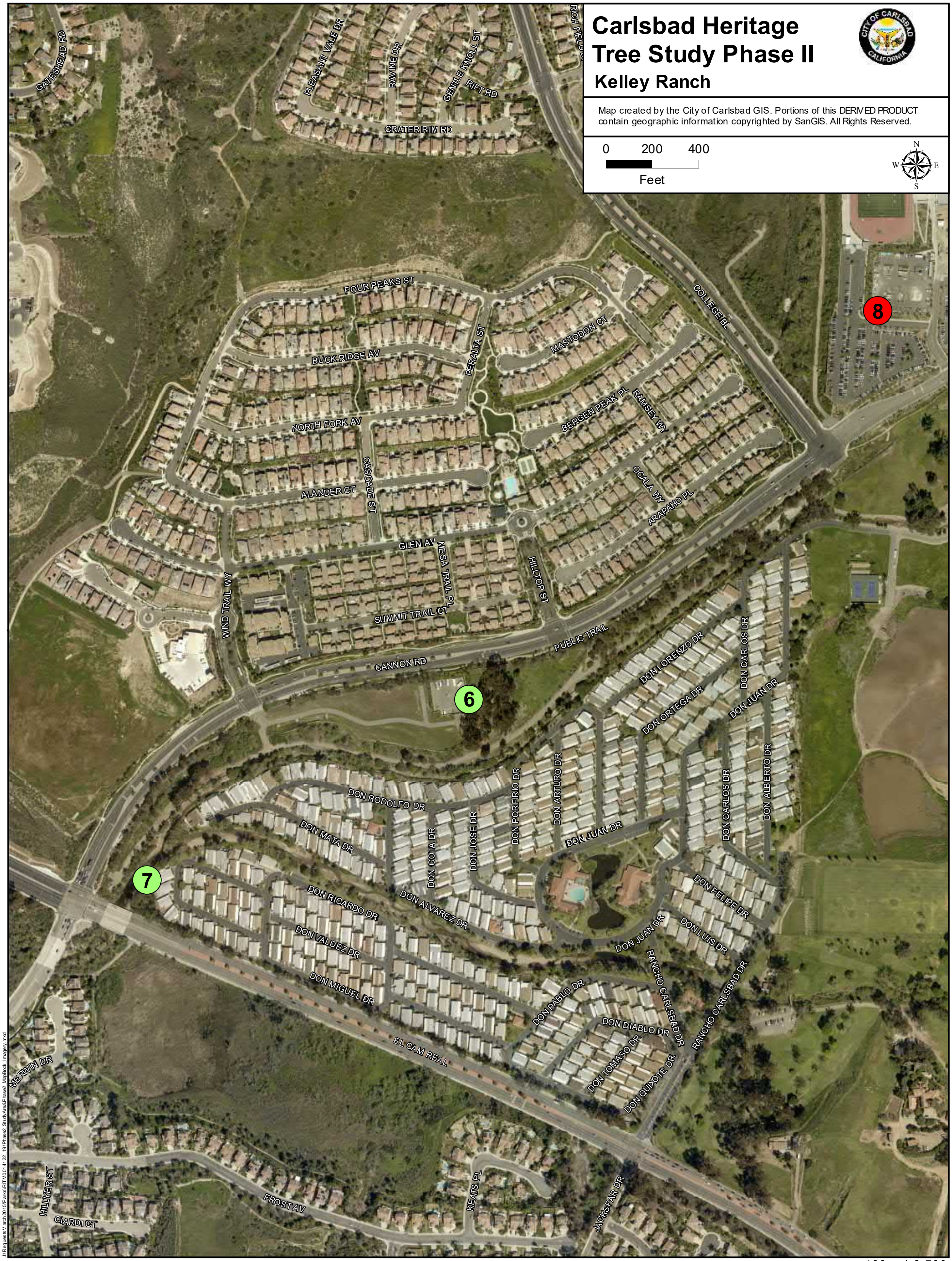

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Living Tree Dead or Missing Tree

Agua Hedionda Creek

"Further upstream along Agua Hedionda Creek there are other even more imposing oaks to be found. Located south of the recently completed extension of Faraday Road and just west of Melrose Drive, the remnants of a grove of very large and very old coast live oaks (Quercus agrifolia) stand.

Before the Carlsbad Oaks North project started construction with the extensive grading required to put in roads and flat building pads on the hillside, Karen Merrill invited me on a hike along a path winding through this grove of patriarch trees. The feel of history in the air was palpable.

Quercus agrifolia – coast live oak (Tree #9). 2009

One could imagine generations of native people living under the protective cover of the branches of these trees. The oaks would have provided an array of useful materials, everything from wood for fires to a food source from the acorns while the creek provided fresh water. The essentials required to sustain life was provided in this sheltering grove.

Oaks were used in native medicines. The Luiseno made a remedy for inflammations, including boils, from a mold that grew on acorn mush. This mold, like many other fungi, was an effective antibiotic. The oaks were also the source for dyes, utensils and materials used for construction and weapons. (Anderson pg. 286)

Oaks were also important in the spiritual lives of many California native tribes, including symbols attending birth, puberty, marriage and death. The oak and its acorns were also used for entertainment, story telling and games. "Acorn musical string toys, tops, and buzzers kept children entertained, and acorn dice games kept adults enthralled for hours." (Anderson pg. 286)

Some of the oaks in this grove were removed due to the nearby construction work. Although there were many large oaks here, two of the remaining trees in particular are of great size. In oak trees, great size is usually an indicator of great age. The age of trees of this size is not just measured in years, but in centuries.

Karen Merrill and I measured several trees in this grove and recorded the following.

Tree #9
The largest of its 4 trunks was 3'8" in diameter and the base of the tree below where the trunks originate was even greater. The dense poison oak surrounding the tree prevented direct measurement, the base of the tree is estimated to be 7-8'. Since the density of the grove did not permit the use of a clinometer to measure the height, an estimate of the height is 60-70' and the canopy spread was 100'.

Tree #10
The trunk of this tree was 6' in diameter. The tree had a height of 50-60' and a 100' canopy spread.

A note of significance was found when reviewing the "Draft Environmental Impact Report" for the "Carlsbad Oaks Specific Plan". This document did not mention any of these oak trees except in very general terms. A supplemental document that did list the major oaks, significantly understated all of the dimensions of the trees that we measured.

These two trees and others in this grove have all been severely impacted by the upslope development. Some trees were removed for grading and construction. The trees, which remain, are not as in good condition as they were at the beginning of this study. Trees #9 and #10 have each had several large branch failures that were not present prior to the start of the construction work. Other trees in the grove have also lost braches and in some cases whole trunks."

The creation of a thousand forests is in one acorn.

Ralph Waldo Emerson

Quercus agrifolia – coast live oak (Tree #10). 2009

"Irrigating the landscape upslope from the oaks causes both surface and subsurface water to increase the soil moisture level around these trees, which are not adapted to wet soil conditions. This oak grove grew here for hundreds of years without supplemental watering and this species has evolved and adapted to dry summers and periodic drought conditions.

Compounding the irrigation problem is the uncontrolled storm water runoff from the extensive upslope development that is discharged in close proximity to these two trees and at other locations in the grove. Because of the uncontrolled discharge, several inches of soil, from erosion occurring upslope, have been deposited over the trees' root systems and it is also covering the original soil in surrounding areas. This discharge compounds the problems already noted due to the irrigation watering.

Additionally, in some locations the uncontrolled discharge has severely eroded the native soils to a depth of 3' and more. This is undermining the root systems and the stability of the adjacent oak trees, including those oak trees planted as part of the work that was supposed to mitigate the impact to the oak grove from the construction project.

Both the volume and the velocity of the uncontrolled water discharged will likely increase significantly with the construction of the buildings and additional paving covering the currently exposed soil.

These continuing offsite water flows favor the development of fungal root diseases, which can lead to the decline and ultimately the premature failure and death of these and other trees in this grove, and most likely the trees that were planted as mitigation.

In England these trees would qualify as "veteran" or even "ancient" tree status. These are trees that would be protected as a highly regarded component of the natural environment. Veteran trees and ancient trees share some common characteristics including: "hollowing, holes, decay, attached and fallen dead wood, water pockets, bark fluxes, bark tears and basal scars and the presence of epiphytes and other dead wood colonizers." (Fey, 2006)

These trees are valued in the English countryside for their contributions in providing niches and habitat for a vast variety of other organisms thereby helping to maintain the complex interconnections present in a natural environment.

In Carlsbad as these two oaks and others in the grove senesce, either naturally or at an accelerated rate due to the increased water flows, all parts of the tree from the leaves, branches, trunk and roots benefit an array of organisms that depend on the oaks for their continued survival. As natural habitat becomes more fragmented through additional development, these trees and this grove will take on an increased importance in helping to maintain the web of life of the complex natural systems.

There is no need to make any modifications to these trees by pruning or debris removal. It is best just to leave them alone as they have been for centuries. The one primary action that would benefit these trees and the grove and help assure its long-term survival is to correct the uncontrolled discharge of water and thus lessen the impact. Secondly reduce the amount of irrigation water applied to the slopes. This water both flows off the slopes and also migrates underground."

> *Oak trees come out of acorns, no matter how unlikely that seems. An acorn is just a tree's way back into the ground. For another try. Another trip through. One life for another.*
>
> Shirley Ann Grau

Quercus dumosa Nutt. in part – Nuttal's scrub oak (Tree #11). 2009

"Scattered among the coast live oaks there were other scrub oak species including one particularly large tree size and well-shaped Nuttall's scrub oak (Quercus dumosa Nutt. in part) (Tree #11). This tree had numerous trunks with the largest being 14" in diameter. The canopy spread was 44' and it was 25' tall. This is very large for a scrub oak."

When you enter a grove peopled with ancient trees, higher than the ordinary, and shutting out the sky with their thickly inter-twined branches, do not the stately shadows of the wood, the stillness of the place, and the awful gloom of this doomed cavern then strike you with the presence of a deity?

Seneca

The creation of a thousand forests is in one acorn.

Ralph Waldo Emerson

No current photographs of the individual trees were taken, as the area is now a Habitat Conservation Area and access is prohibited.

Posted “No Trespassing” sign. 2018

Overall view of the Habitat Conservation Area. 2018

Carlsbad Heritage Tree Study Phase II

Agua Hedionda Creek

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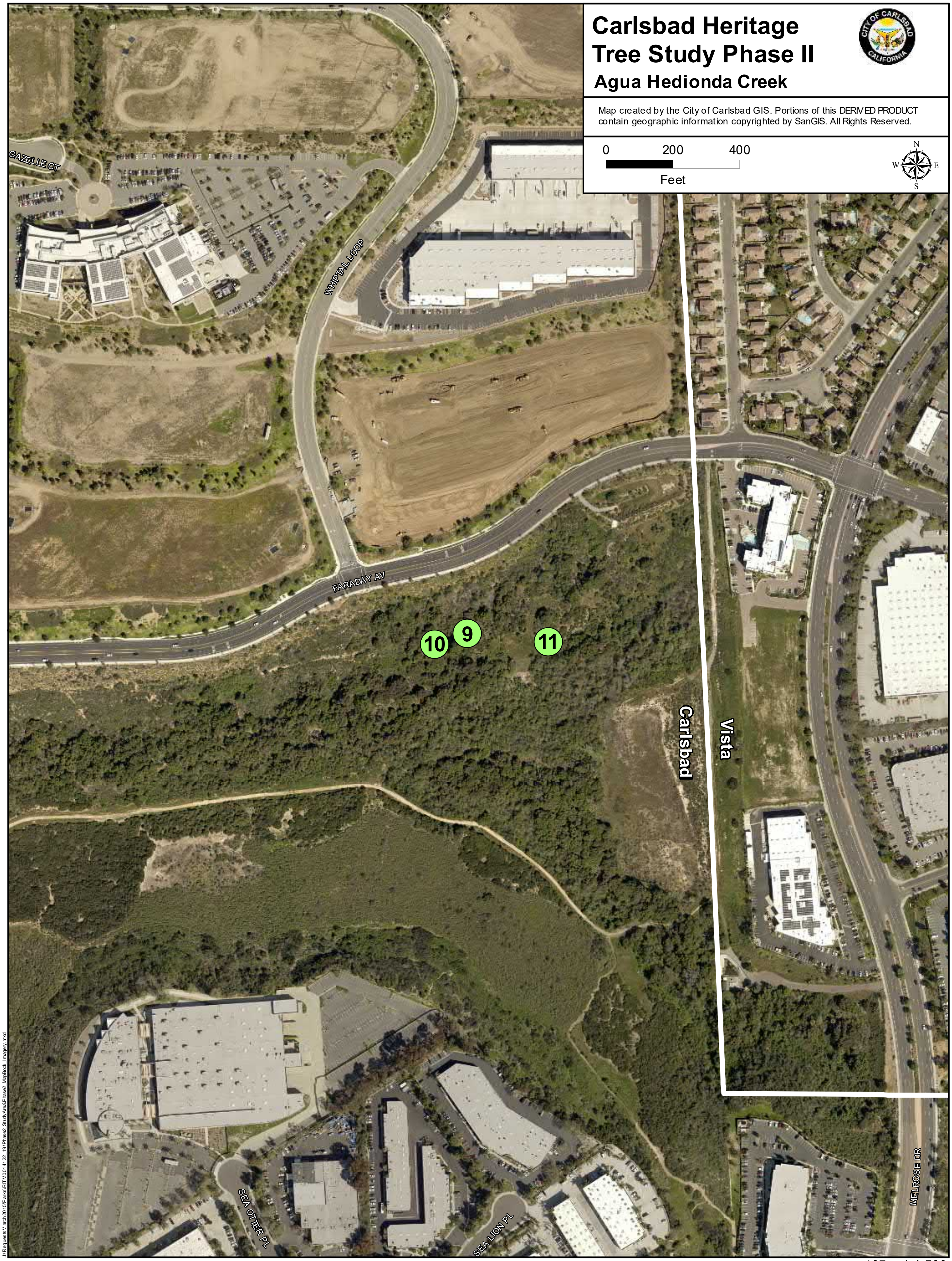

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Living Tree Dead or Missing Tree

Los Kiotes, Leo Carrillo and the Hunt for Dragons and Fossils

> *"Carrillo Ranch is just a small part of the former ten-thousand-acre Los Kiotes (Quiotes) Ranch, one of Carlsbad's oldest homesteads. In 1868, Matthew Kelly established a homestead south of the Rancho Agua Hedionda land grant owned by his brother Robert. The Kelly family retained title to this ranch until 1922, when Matthew's children sold off part of the land.*
>
> *In 1937, during the depth of the Great Depression, Leo Carrillo bought 840 acres of the land from a San Francisco syndicate and set about establishing a weekend retreat. Retaining part of the original Kelly adobe home, Carrillo was able to renovate and add to the structure, creating a replica of an old California-style rancho. His efforts to create a working ranch were completed with the addition of a barn, bunkhouse, as well as other ranch structures." (Schnebelen Gutierrez pg. 149)*

In addition to the existing structures that were renovated and new construction, a veritable botanical collection was planted along the entry roads and around the buildings. Leo developed an eclectic and diverse combination of fruit trees and exotic specimens interspersed among the existing native trees and plants.

In his autobiography, Leo wrote lovingly about the sycamores and the creek at his home place in Santa Monica, but the following description could also be applied to a similar setting at the ranch. "As I sit beneath the arches of my home in the canyon where the sycamores twist upward to the moon there is one sound above all others which impresses itself upon me. It is the murmur of the little stream which runs through my place toward the sea." (Carrillo pg. 65)

One large sycamore (Tree #12) located across the entry road from the caretaker's house, grows near the edge of the creek that runs through the ranch. This old timer has the twisted and contorted look typical of our native sycamore trees.

This tree's sculpted form is derived with assistance from a fungal disease called anthracnose. During the spring, anthracnose causes distortion of the young emerging leaves and can kill them along with the tips of the branches. This disease is particularly vigorous in years when the spring weather is wet and warm. The result is that the new growth, that starts growing below the dead portions of the branches, grows off at odd angles.

Over time the branches and trunks develop a crooked, but somewhat sculptural, appearance. This tree's distinctive branching structure is similar to that of a tree in a 1907 photograph of the Kelly adobe. I believe that they are the same tree."

1907. The Kelly family at Los Kiotes. The sycamore located in the far background (black arrow) has a white trunk and appears to have a similar branch structure to Tree #12 shown below.
Photograph Courtesy of Carlsbad Library Historic Collection

Additional study in 2019 revealed that the trunk and branches of the original tree are no longer present except for a small part of the original trunk. Some large second generation trunks, that sprouted from the original tree, which are still alive and growing, have fallen and are lying on the ground. A third generation of trunks has also sprouted, and some are over 3” in diameter. This is a typical regeneration cycle for many old California sycamores.

Platanus racemosa - California sycamore (Tree #12). 2019

As seen in the previous photo, the tree is showing evidence of its great age by the one short dark remaining upright part of the original trunk in the center of the photo. The large branches leaning and laying on the ground that sprouted from the old trunk after it failed, represent the second generation. Several new trunk sprouts up to 3” in diameter, represent the third generation. The dark green foliage in the center of the photo is from an invasive Brazilian pepper.

Platanus racemosa - California sycamore (Tree #12) with tan colored fall foliage and twisted white trunks and branches. The dark green foliage behind the palm tree trunk is an invasive Brazilian pepper (*Schinus terebinthifolius*). 2009

Note the juvenile queen palm left of center in the above photo and compare it to the black trunk of the same tree in the next photo for a demonstration of how much the tree has grown from 2009 to 2019.

"As I sit beneath the arches of my home in the canyon where the sycamores twist upward to the moon there is one sound above all others which impresses itself upon me. It is the murmur of the little stream which runs through my place toward the sea."

Leo Carrillo

Platanus racemosa - California sycamore (Tree #12) with the large green leaves, A very invasive Brazilian pepper (*Schinus terebinthifolius*) is growing adjacent to this tree and should be eradicated. 2019

"On the hillside just above the caretaker's house is a grove of small oak trees sharing the space with a group of large toyons. The oaks appear to be hybrids of coast live oak (Quercus agrifolia) and Engelmann oak (Quercus engelmannii). The largest of the group (Tree #13) has a 14" diameter trunk, and is 20-25' tall with a 45' canopy spread. These were identified as Quercus agrifolia in a 1991 report on the botanical collection. (Donaldson, pg. 18)"

Additional research has shown that Quercus agrifolia and Quercus engelmannii do not form hybrid crosses. Based on the leaf size and shape along with the bark coloration and pattern I believe that the tree is some type of Engelmann oak hybrid. Perhaps DNA testing will provide the answer.

Hybrid oaks (Tree #13) growing on the hillside above the caretaker’s house. 2009

Hybrid oaks (Tree #13) growing on the hillside above the caretaker’s house and current Visitors Center. 2019

“The native toyon (Heteromeles arbutifolia), which can vary in size from a small tree to a large shrub, is an appropriate plant for a Hollywood movie star's ranch. The dark green holly-like leaves and the red berries, that cover this plant's branches in winter, inspired the name Hollywood. To people from the east coast, who moved to Los Angeles, this plant reminded them of the hollies back home with which they were familiar.

In time these toyons on the ranch may grow large enough to be considered for Heritage Tree status along with some of the large coast live oaks that grow further downstream along the creek.

*Of all of the exotic plants sprawling leisurely about the ranch grounds none is more dramatic than the largest of the three dragon trees (Dracaena draco) Tree #14**,** growing by the back patio. According to the report on the botanical collection, “Date of planting is prior to 1950.” (Donaldson, pg. 16)”*

Circa 1940s. A young *Dracena draco* - dragon tree growing against the adobe wall just to left of the chimney of the smaller building.
Photograph Courtesy of Carlsbad Library Historic Collection

“A native of the Canary Islands, this tree is a member of the lily family and looks like it was treated with growth steroids. In addition to its unusual robust shape, its sap is blood red and is often referred to as "dragon's blood".

This story comes from Greek mythology. In the tale of the labors of Hercules, a dragon named Landon is slain and as his blood flowed on the ground these trees sprang up. That is how they came to be called "Dragon Trees".
The red sap is used as a coloring in varnishes and is reputed to have imparted its distinctive hue to Stradivarius violins.

Leo was officially appointed "Ambassador to the World" by the Governor of California Edmund G. Brown in recognition of his efforts to spread friendship and understanding internationally. Governor Brown also referred to Leo as “Mr. California”.

Dan Simpson informed me that in Hilo, Hawaii there is a street called Banyan Drive, which is lined with banyan trees planted to commemorate the visits of famous people. One of the trees has a plaque proclaiming it to be the Leo Carrillo tree.”

Dracena draco - dragon tree - only the tree on the left was visible as a very short plant in an historic photograph. 2019

Dracena draco – dragon tree (Tree #14) growing by the back patio. 2009

Dracena draco – dragon tree (Tree #14) growing by the back patio. 2019

“Leo’s contributions to California were considerable. He is often considered to have been the state’s most influential and dedicated environmentalist, as well as being an ardent conservationist, and a historic preservationist. He was involved in numerous civic projects and had a keen interest "in the preservation of natural resources, beauty spots, historic sites and notable buildings in California." (Carrillo pg. 269)

In recognition of Leo’s work as his campaign manager, Governor Earl Warren appointed Leo to the State Beaches and Parks Commission on which he served for fourteen years. Leo was instrumental in having both Hearst Castle and the Anza-Borrego Desert become part of the State Park system.

Now this is where the story of Leo Carrillo and the Heritage Trees of Carlsbad gets interesting. In the Phase I Report, one of the most fascinating trees was found in Holiday Park. It is called a dawn redwood (Metasequoia glyptostroboides). This tree is related to the well-known evergreen tree of Northern California, the coast redwood (Sequoia sempervirens). The dawn redwood tree is deciduous, which means it drops its leaves in the fall. Sempervirens is composed of two Latin words semper meaning always or ever and virens meaning green.

Here is some background information from the Phase I Report.

> *"Numerous kinds of trees living today have persisted with little or no change since remote geological times and are well represented by ancient fossils. But the term “living fossil” seems to be applied chiefly to Metasequoia because it was described and named from fossil records before it was known to exist in present world flora. The first living specimens - three of them - were discovered by a Chinese forester in 1941 not far from Chungking, but it was not until 1946 that the tree was identified as of a genus previously unknown in a living state." (Everett pgs. 41-42)*

Seed was first sent to the United States in 1946 to the Arnold Arboretum at Harvard University and then was distributed to other universities, parks, botanical gardens and individuals.

When I started the research for the Phase II Report, several people recommended that I should talk with Ede Westree if I wanted to know more about the dawn redwood in Holiday Park. It was one of the pleasures of this study to meet and visit with Ede. She provided the following information.

Ede related that her husband Nelson was the first park employee for the City of Carlsbad. He was hired in 1954 as parks superintendent, (Schnebelen Gutierrez pg. 61) and he oversaw the development of the City's first park, Holiday Park. Ede recalled that the dawn redwood planted in Holiday Park was one of six seedlings imported from China and obtained by Leo Carrillo who was then serving on the California Beaches and Parks Commission.

Ede remembers these trees because she watered them with a hose while they were stored in her backyard before they were planted. She said that the trees were in tin containers and her recollection was that they came directly from China. Ede recalled that one tree may have been planted at Leo's ranch in Carlsbad, two of these trees were planted in Holiday Park, one at Quail Botanical Gardens in Encinitas and the other two in Balboa Park in San Diego.

Nelson also worked for Leo on his ranch and he was the only person that Leo would allow to prune his roses.

I then undertook additional research and attempted to confirm this information. There is no evidence found to date of a dawn redwood being planted at Leo's ranch. There are two matching dawn redwoods in Balboa Park planted in the Redwood Circle area. There are also two matching dawn redwoods in Quail Botanical Gardens that are almost the same size as the ones in Balboa Park. All four trees were larger than the one tree in Holiday Park. It is possible that two trees were planted at each of the three locations, but I have not been able to confirm this theory.

Since the Phase I Report was completed the Holiday Park dawn redwood declined and was removed, losing that one connection with Leo Carrillo. It would be a good idea to replace it, perhaps from seed or cuttings grown from the trees at Balboa Park or Quail Botanical Gardens.
There is one other part to Ede's story that is unclear: exactly when and where the dawn redwood trees came from originally. The land for Holiday Park was purchased by the City of Carlsbad from San Diego County Department of Roads for $300 in 1954. (Schnebelen Gutierrez pg. 138)

Diplomatic relations between the United States and China in the early 1950s were strained, but if anyone could have charmed the Chinese out of a few trees, it would have been Leo Carrillo.

One other possible source is based on the following account. Ralph W. Chaney, a paleobotanist at UC Berkeley, made a collecting trip to China in March of 1948. He collected seeds from several groves at different locations and also brought back a few seedlings. (McClintock pg. 130)

With Leo's friendly outgoing personality and his position on the Beaches and Parks Commission, he may have persuaded Chaney or other collectors and propagators to let him have the six trees for the parks and public gardens in San Diego County. It would be interesting to discover any additional information or clues to uncovering both the source and the fate of Leo's six dawn redwood trees.

When he was writing about his ranch house Leo also related a different story about the original source of the California pepper trees and how they became so widespread in the area.

> *"It's a very picturesque house-flagstone patios, weeping willows at one side and weeping pepper trees which were called "Los Perus" in Peru where they came from originally. Incidentally, the first one was brought by my great-great-grandfather to the Mission of San Luis Rey and the little birds have propagated the growth of these trees all over this part of the country. There is one enormous tree that stands by my kitchen. I guess that is one hundred years old, and the trunk is five or six feet at the bottom and it stands up about 60 or 70 feet and spreads over the whole patio. The pepper trees are not very clean, except at certain times of the year, but they are beautiful when the red berries come out." (Carrillo pgs. 228-229)*

This story of the pepper trees introduction has not been verified. Leo's observation of "the little birds" spreading the trees may be the first documentation of how the pepper trees have become an invasive pest in many parts of California, including San Diego County, particularly in riparian habitats.

There was another invasive tree, a Brazilian pepper (Schinus terebinthifolius), growing under the California sycamore (Tree #12). The pepper tree has since been removed. In this location it was acting as an invasive plant and could have spread seeds further down the creek or been carried to other locations by "the little birds". This tree was also competing with the sycamore."

In 2019 there is at least one Brazilian pepper growing in close proximity to the California sycamore. It should be eradicated and park employees and maintenance personal should be instructed to be on the lookout for any Brazilian or Californian peppers growing in or near the riparian area. Any new volunteer plants should be removed.

"The California Invasive Plant Council (Cal-IPC) lists both the California pepper and the Brazilian pepper as trees that should not be planted in the state, especially near wetlands in southern California.

This presents a bit of a dilemma. In some locations I have recommended these same trees be considered as Heritage Trees. However, they do pose a potential problem of spreading into wetlands and displacing native trees. My recommendation is that these two species, and others listed by Cal-IPC, should not be planted in the future in Carlsbad. Where they have escaped into natural or restored wildlands, they should be removed. Refer to the following website for additional information on invasive trees and other invasive plants. http://www.cal-ipc.org/

The recommended Heritage Trees that are also identified as invasive, should be allowed to live out their natural life span and be removed when they die, or if they decline and pose a potential hazard if they were to fail. As always, it is the responsibility of the tree owner to exercise good judgment in the management and maintenance of their trees."

Carlsbad Heritage Tree Study Phase II

Leo Carrillo Ranch Historic Park

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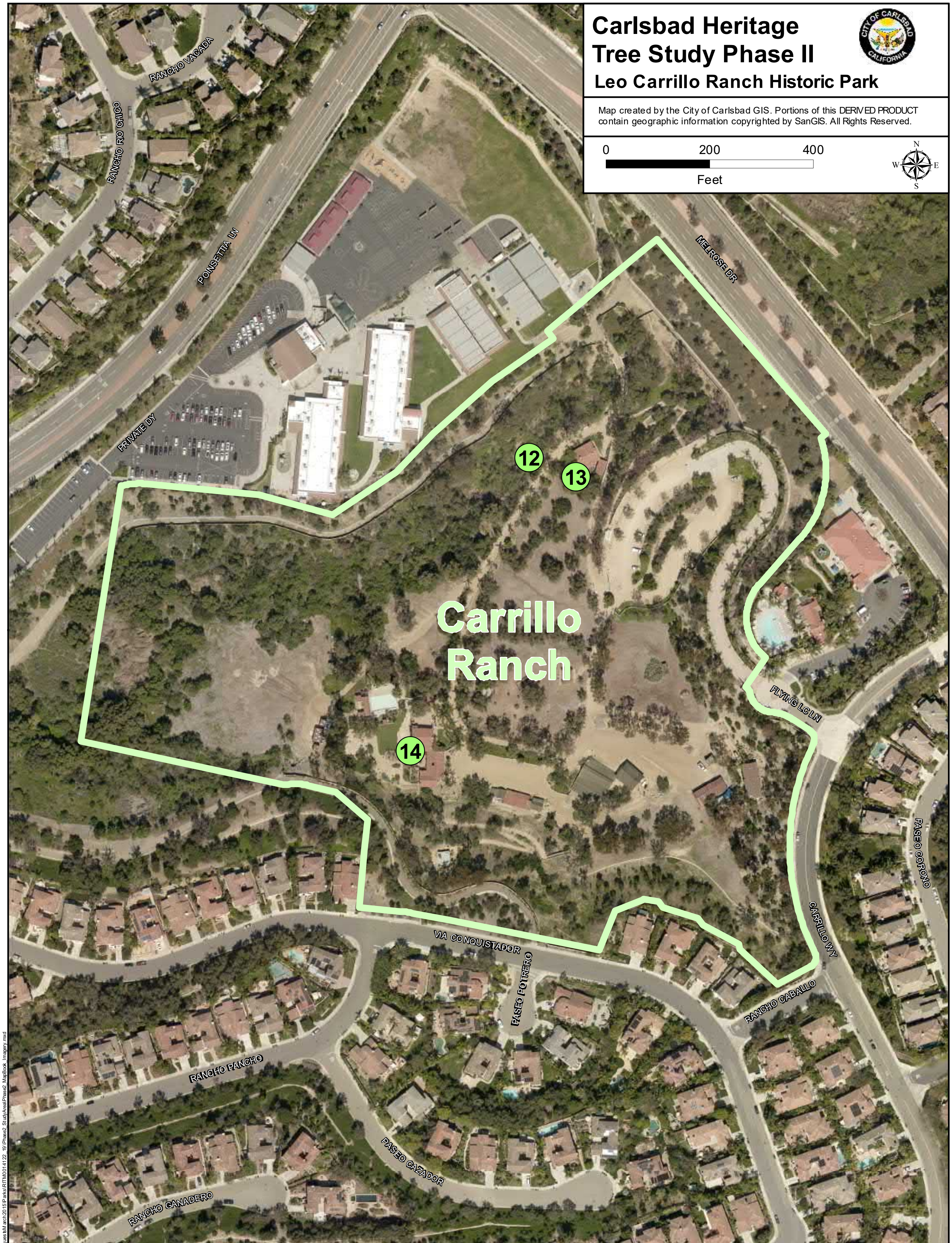

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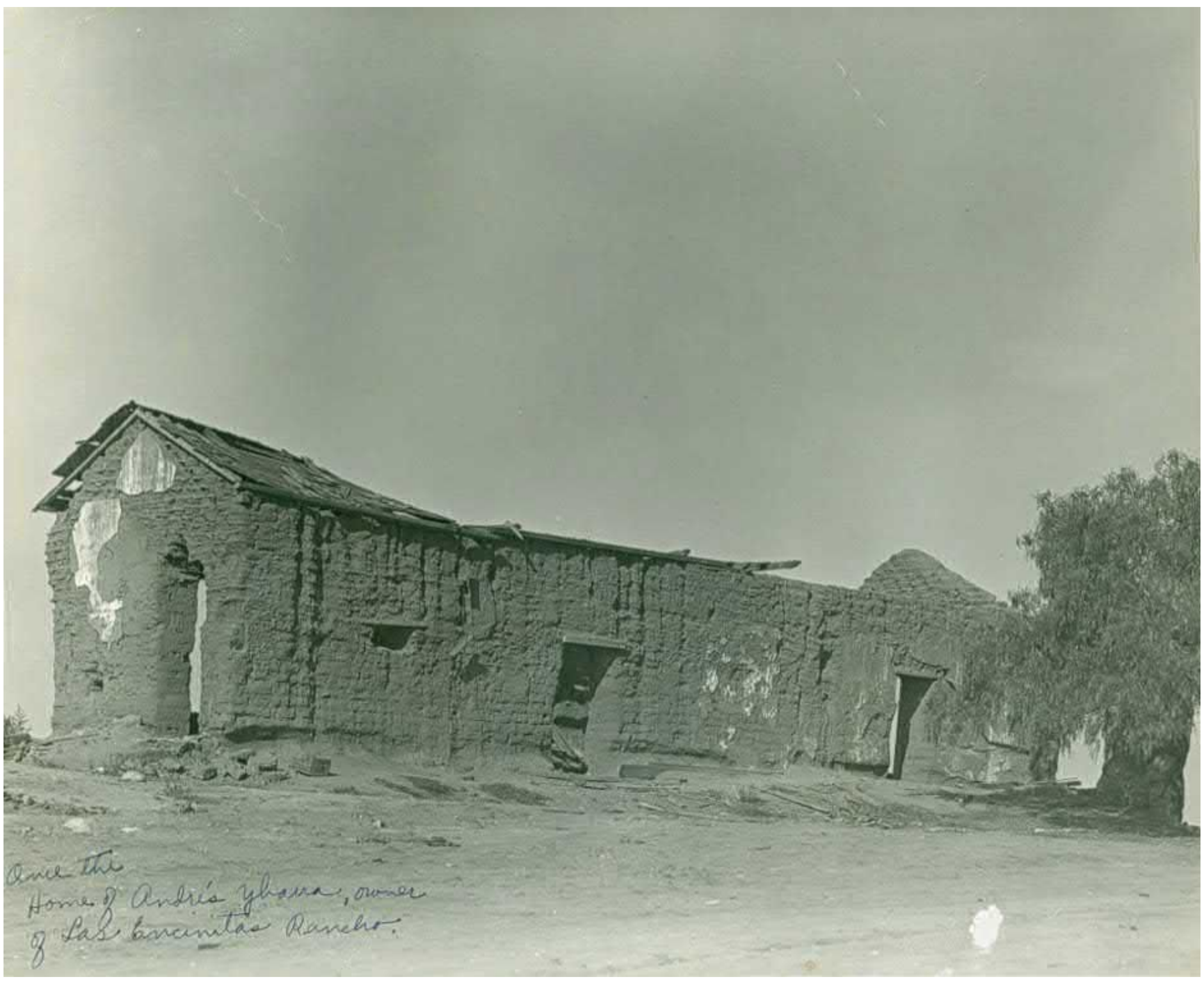
Living Tree Dead or Missing Tree

Las Encinitas Rancho - Camino de los Coches - Stagecoach Park

“"Stagecoach Park occupies a small portion of the former Las Encinitas Rancho, a Mexican land grant given to Don Andres Ybarra in 1842. Las Encinitas, which translates into "Little Live Oaks," passed through many hands. In 1860, subsequent owners Joseph S. Mannassee and Marcus Schiller converted Don Ybarra's adobe home into a stagecoach stop. The remnants of this adobe structure can still be found on the grounds of Stagecoach Park beneath a roofed structure." (Schnebelen Gutierrez pg. 145)

Trees are depicted in two old photographs of this site, which is now Stagecoach Park located on the appropriately named street, Camino de los Coches. The oldest photograph shows a mostly intact but obviously deteriorating adobe structure and a California pepper tree with a very large trunk.”



Date unknown. The hand written caption on the photo reads “Once the Home of Andres Ybarra, owner of Las Encinitas Rancho.” A large California pepper tree is growing to right of the adobe. Photograph Courtesy of Carlsbad Library Historic Collection

"A later photo shows a landscape of rolling hills covered with short grasses and prickly pear cactus. The adobe, the only building in the photograph, has almost melted away and the old pepper tree appears to be dead. There are also two fairly large eucalyptus trees.

Two things are striking about the second photograph. The first is the open look of the landscape all the way to the horizon. The second is how large and vigorous the two eucalyptus trees appear. What is even more remarkable, when one visits the site, is to find that the two trees are still living. All of the other aspects of that moment frozen in time in the photograph, except the now protected adobe ruins, have changed dramatically."

1977. Two *Eucalyptus cladocalyx* – sugar gum trees growing near the old stagecoach stop. (Courtesy of Carlsbad Library Historic Collection)

"The tallest tree, on the left in the old photo, has been cut down but it still refuses to die. It is sending up new vigorous shoots to resume the role of the stately tree. As the new trunks grow they slowly are covering over and enclosing old injuries. These include old nails, spikes and barbed wire with staples. Studying these artifacts the trees' story starts to be revealed.

This place near the creek is where the relay horses and other livestock were penned. Here water was available and these trees, along with the pepper tree at the adobe, provided some of the only shade for miles around for man and beast alike.

The second tree, with its three distinctive main branches, is still growing and vigorous. It is a sugar gum (Eucalyptus cladocalyx) Tree #15. This tree has a 5'2" diameter trunk, is 80' tall and has a 95' canopy spread.

The years have left their signs on this tree in different ways from its nearby kin. Many people have come and left their mark on its trunk, cutting it with a pocketknife or another sharp instrument. The tree bears these indignities for a while and then with a shedding of bark removes their traces and prepares a blank tablet for new generations to record their names, or their love of the moment."

Eucalyptus cladocalyx – sugar gum (Tree #15) with its three distinctive branches. 2009

"A message "Hi" appears near a political statement along with initials, dates, doodles, and hearts covering the lower trunk. These carvings have various scientific names: arborglyphs, dendroglyphs or silvaglyphs. To most people they are tree carvings or tree writings. What may be artistic expression to one may be graffiti or vandalism to another, but this form of self-expression on trees has been practiced around the world for centuries.

There has been some recent research in the mountains of our western states studying and cataloging thousands of aspen trees. These trees are located near high country meadows, and were carved over a period of more than hundred years mainly by Basque sheepherders. Some of these carvings are exquisitely detailed drawings of everything from horses to girlfriends or wives and lovers back home. Other carvings are long poems or prose completely surrounding a tree trunk.

There are records of repeated visits by the same herder over years, or even decades. There are inscriptions that record the weather and grazing conditions on a particular date, and many express the loneliness of this solitary profession.

The Stagecoach Park eucalyptus carvings in comparison are mostly simple and crude, the work of amateurs, not artisans. Unlike the aspens, these engravings will not last long before the bark peels off as the trunk expands in diameter with a new growth increment each year.

The tree carvings, including the markings and the artifacts that are attached to the trees, are considered by anthropologists as culturally modified trees (CMTs). Originally a CMT referred to only those trees, or remnants of trees, altered by indigenous people, usually as a practice of traditional use of trees. However, it has also been applied to trees that have been modified by non-native people as well.

"In British Columbia, culturally modified trees are afforded a degree of legal protection. Provincial law dictates that no tree bearing traditional use markings made before 1846 can be cut down." (Rasmussen, 1999)

"In 1985, the Gifford Pinchot National Forest in south-central Washington adopted a peeled cedar management plan. Gifford Pinchot researchers have identified 338 sites containing nearly 6,000 peeled cedar trees." (Rasmussen, 1999)

The tree In Stagecoach Park probably doesn't care much for these minor insults to its dignity, but simply shrugs them off as a lack of understanding of the damage being done to this sole survivor from a much different period in our history. This tree emanates patience and dignity like a parent with unruly children who are scrawling on the walls. It continues to slowly extend itself upward and outward. Occasionally a limb breaks out of the canopy, but the tree persists."

Artifacts from the days of horses and cattle, nails and staples holding barbed wire. 2009

"There used to be an educational display at the old adobe, showing copies of historic documents, but vandals destroyed this part of the story by burning the display. I have not been able to track down any copies of those documents.

My recollection is that one of the documents was a tax roll or report on the property. I remember that it showed the actual years when trees were planted. There could be two main reasons for recording this information. Back then, as now, trees could be used to increase the value of a property. Trees were also a means to show that a property was being improved."

A tree does not move unless there is wind.

Afghan Proverb

Eucalyptus cladocalyx – sugar gum (Tree #15) with its three distinctive branches. 2019

Carlsbad Heritage Tree Study Phase II

Stagecoach Park

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Feet

216 1:4,000

Living Tree
Dead or Missing Tree

EXOTIC GROVES AND ORCHARDS
Hosp Grove

"Carlsbad with its fertile land and available water was been the focus of many plans and dreams over the years to use trees to get rich quick, or slowly, or to make a living from growing trees, fruits and nuts for a profit. For years the slogan, "The Home of the Avocado" and the annual Avocado Days was used to promote both the city and real estate sales. (Wisniewski, 2007)

Hosp Grove was the result of a get rich quick dream of F. P. Hosp and his business partners. Plantings were started in 1908 and over 40,000 trees were planted in rows on the hillsides south of Buena Vista Lagoon. The trees were to be used as railroad ties, but proved to be unsuitable because of the way the dried wood twisted and shrank."

Circa 1918. Hosp Grove.
Photograph Courtesy of Carlsbad Library Historic Collection

"The difficulties of this failed enterprise are detailed further in the Phase I Report, but there is more to the story.

In 1942, "Hosp grove provided space needed by the U.S. Army to erect a tent city." (Schnebelen Gutierrez pg. 41)

> *"Over the years Hosp Grove shrank as parcels were sold off for housing developments. Hosp Grove held a special place in many local hearts as a childhood playground, where as kids they camped out or rode*

> *horses. . . . In 1986, the remaining eucalyptus-filled acres went on the market for $6.5 million. Fearing commercial development of this last bit of open space in the northern end of town, a citizen-initiated proposition was placed on the ballot. If passed, it would require the city to purchase a total of fifty-three acres of land. After two election attempts the proposition passed, thus authorizing the city of Carlsbad to pay the asking price of $6.5 million." (Schnebelen Gutierrez pg. 144)*

After much political wrangling and arm-twisting by different citizen groups, the city eventually figured out a way to purchase the property. (Schnebelen Gutierrez pg. 145)

Today the remaining trees tower overhead with many reaching over 60'. Because of the density of the original planting the trees are slender due to the shading and crowding they have experienced. The grove is crisscrossed with well-used hiking trails and a playground area was installed.

This 74-acre grove remains a challenge for the city to manage. Many of the trees have succumbed to the combined ravages of old age, competition from being crowded, drought, disease and insect attacks, particularly from the red-gum lerp psyllid. The standing dead trees are periodically cut down and some are left on the steep slopes to retain the soil and help prevent erosion. In 2001 a management plan for Hosp Grove was established as part of the city's Community Forest Management Plan.

The two main eucalyptus species are red gum (Eucalyptus camaldulensis) and sugar gum (Eucalyptus cladocalyx). The trees offer habitat for many animals and insects. Birds of prey can be found along with hummingbirds and woodpeckers, including sapsuckers whose neatly spaced holes form rings, like necklaces, around some of the trees and their branches. (Community Forest Management Plan, 2002)

There are other marks on the tree trunks as well, especially along the trails. These are the result of human interaction, people carving into the soft wood. Like the eucalyptus tree in Stagecoach Park, these can be considered to be CMTs (culturally modified trees). Compared to all of the other problems these trees must endure, engraved expressions of love are but a minor inconvenience to the tree.

One of the largest trees is Tree #16, a sugar gum located next to one of the trails. Although there are taller trees in the grove, the trunk size of Tree #16 makes it atypical when compared to the other trees. The trunk is almost 4' in diameter and its height is estimated at over 75'. It is also a favorite tree for anyone that likes the thrill of swinging high off the ground."

To find Tree #16 tree, start from the Hosp Grove West Parking Lot. Take Trailhead 2 East past the tot lot and cross the bridge. At the fork in the trail, take the right fork and go uphill about 50 yards. While standing in the center of the next fork in the trail, look to your left and you will be looking at the tree.

Eucalyptus cladocalyx – sugar gum (Tree #16) and some local tree swingers. 2009

"Hosp Grove is large enough that one can get the feeling of being in a natural forest, even though this forest was man-made and the result of a failed business venture."

Eucalyptus cladocalyx – sugar gum (Tree #16), but no more tree swingers. 2019

Sometimes Thou may'st walk in Groves,
which being full of Majestie will much advance the Soul.

Thomas Vaughan, *Anima Magica Abscondita*

Carlsbad Heritage Tree Study Phase II

Hosp Grove

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Living Tree Dead or Missing Tree

Westree Nursery

"In addition to his work for the city and Leo Carrillo, Nelson (Ted) Westree with his wife Ede owned and operated Westree Nursery, specializing in macadamia nuts and subtropical fruits in Carlsbad, located at Pio Pico Drive and Los Flores Drive.

Having moved to Carlsbad in 1948, four years before it was incorporated as a city, "They established themselves in the community by buying land and planting macadamia nuts and flowers on the side of a country road that they eventually convinced the county Board of Supervisors to name Las Flores Drive." (Brill, 2006)"

Macadamia spp. – macadamia orchard (Tree #24). The large dark green trees growing behind the chain link fence are the remnants of the Westree Nursery and orchard. 2009

Macadamia spp. – macadamia orchard (Tree #24) The trees still appear to be vigorous. 2019

“Ede Westree related the following information to me.

> *The trees are native to Australia where they were called Queensland nuts. Later they were named for Dr. John Macadam who brought the first trees to Hawaii in 1890 and promoted their cultivation and consumption. Macadamia had a better marketing appeal than the original name, Queensland nuts.*
>
> *Bob Todd, an Oceanside horticulturalist, first introduced Macadamias into this area when he brought trees from his estate in Hawaii. Nelson and Ede started developing their nursery in 1952 by planting nuts. There was one very special tree in Santa Ana that Nelson took cuttings from and grafted onto their trees. One particularly large and productive tree was lost due to the construction of I-5 despite their best efforts to oppose the project and its impacts on their operations.*

Nelson was a skilled nurseryman and horticulturalist. He experimented with numerous varieties of trees and types of plants while he also worked to promote this new commercial enterprise. Ede worked with him and she was the secretary of the California Macadamia Society that was founded in 1953. Together they made significant contributions to the horticultural and agricultural industries in San Diego County. (California Avocado Society, 1955)

> *“Mr. Ted Westree of Carlsbad has one of the most extensive collections of young macadamia varieties of both local and foreign varieties and selections. Many of these specimens are now beginning to produce fruit and will be observed with interest. Among other subtropical fruits which Mr. Westree has been developing by selection and propagation is the Carissa grandiflora, from which a selection has been made having a yellow marking on the fruit. The parent plant of this clone is located in Balboa Park, San Diego. Propagated specimens have borne fruit at the Carlsbad Hotel. The carissa variety is unnamed. The Surinam cherry, Eugenia uniflora, also has been grown in great numbers at this nursery. From among over two hundred seedlings one clone has been selected for propagation. Grafting of the cherry has been successfully accomplished in the field and appears to be a satisfactory means of reproducing the clone. Another species which has attracted attention throughout the world, and which is found in this nursery, is the Acerola or Barbados cherry (Malpighia punicifolia). While seedling specimens only have been planted in California at this time, attempts have been made to introduce superior clones from Florida and the West Indies, where intensive studies are under way on the culture and development of this fruit. The acerola has gained prominence because it contains six or more times the Vitamin C content of a comparable weight of citrus fruits.”*
> *(California Avocado Society, 1956)”*

“Many of their trees, some of which may be as old as 59 years from their first plantings, may be still growing on the site today behind the modest house at 1288 Las Flores Drive. Even from the street the trees are impressive in their size and with their dark green foliage.

Nelson’s position as the city’s parks superintendent along with his skill and knowledge as horticulturalist helps explain the diverse tree collection in Holiday Park. Seventeen of the Holiday Park trees were recommended as Heritage Trees in the Phase I Report. (Wisniewski, 2007)”

Don’t be afraid to go out on a limb - That’s where the fruit is.
Anonymous

THE HEART OF THE CITY

“The remaining 34 Heritage Tree locations are scattered throughout the study area. Usually it was just an individual tree, but at some locations the trees are a part of matched plantings or a large collection of the same species on a single property. In one case it is a group of street trees that shade an entire cul-de-sac with their canopies.

Most of the trees are large, but some species are more diminutive by nature. They are just not large trees even at maturity. In trees large size is usually, but not always, an indicator of great age. Each tree has special characteristics that make it not only unique, but the tree often provides a degree of interest to its setting and sometimes to the surrounding neighborhood.

Some trees are listed because of their rarity. Some of the trees have an unusual shape, while others have spectacular flowers or are edible.

A group of very large tipu trees on Charleen Circle were to be removed several years ago because of the damage they were causing to the street and curbs. The neighbors protested to the city and eventually a solution was achieved that included some limited tree removals, street repairs and the planting of several new trees. This is the prettiest and best shaded street in Carlsbad, especially when the trees are in bloom and the apricot colored blossoms carpet the street and the front yards.

Some of the trees were planted to commemorate people that were important to the community.

> *“Magnolia Elementary school was Carlsbad’s third elementary school and opened in March of 1957. By constructing this school the School Board hoped to eliminate the overcrowding of Carlsbad elementary schools. The Carlsbad Public Works Department moved a thirty-foot-high magnolia tree to Magnolia School from Roosevelt Street. The tree was planted in the memory of Carlsbad Union School Board Member Billy C. Fry.” (Schnebelen Gutierrez pg. 134)*

This tree is still growing, providing shade, beauty and fragrant blossoms in front of the school on aptly named Magnolia Avenue.

These Heritage Trees collectively have significant historic and cultural importance to Carlsbad and they all add to its beauty and its charm. Trees are important to the city financially as well. Trees can add substantially to the value of a property and property value is the basis for determining taxes.

Some people value trees for the environmental benefits they provide and consider them to be the lungs of a city. These benefits, including reducing storm water runoff and carbon sequestration, can be calculated and a dollar value determined.

Trees also have the ability to evoke strong emotional connections in people to particular places, events, and to the community's history. In this way trees can be considered to be the visible expression of the "Heart of the City"."

Someone's sitting in the shade today because someone planted a tree a long time ago.

Warren Buffett

HERITAGE TREE DESCRIPTIONS

The following section has been edited to only include the descriptions for species that were photographed in the original report and were still alive at the time of this study. Please refer to the original report for the complete listing and descriptions.

"The following list, of 51 recommended Heritage Trees, is arranged alphabetically by their Latin species names. This is the normally accepted manner of listing trees and plants in horticultural books and studies. The Latin binomial names are used because they are universally accepted as the scientifically recognized name.

However, these names often get changed over time as plants are reclassified based on new information or research. In those cases, previous names or other names that the trees have been known by are also included. Common names are listed, but are often a source more of confusion than enlightenment since more than one plant may be called by the same common name.

The country or continent of origin is listed as well as its native range, when that is of significance. Other more scientific texts can provide exact descriptions of habitat and range limits.

This is a study of a general nature rather than a scientific treatise. Therefore a general, rather than a scientific, physical description is provided for the trees. Some noteworthy or obvious unique characteristics that may be of interest are also provided.

Since many trees are included that may offer educational opportunities for school or library programs, the approach and intent of this report is to offer botanical details and information in non-technical manner."

> *If we represent knowledge as a tree we know that things that are divided are yet connected. We know that to observe the divisions and ignore the connections is to divide the tree.*
>
> Wendell Berry

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Araucaria bidwillii	BUNYA-BUNYA (BUNYA PINE)	#18 - 2778 ARLAND ROAD	Queensland Australia

Large evergreen tree in front yard south of house. The branches are densely covered with flat sharp-pointed, glossy dark green leaves. The horizontal growing branches dip downward and then turn up at the ends. The pineapple-shaped cones 7-10" long by 6-8" wide, weighing up to 10 pounds, can be dangerous when they fall from the tree. "The large edible seeds, the bunya nuts, were a staple food of Australian Aborigines. They are starchy, with something of the texture of a boiled potato, and were eaten raw, roasted, ground into flour, or boiled." (McClintock pg. 47)

Araucaria bidwilli – bunya-bunya (Tree #18). 2009

Araucaria bidwilli – bunya-bunya (Tree #18). 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Butia capitata	PINDO PALM (JELLY PALM)	#17 - 1250 CARLSBAD VILLAGE DRIVE COLE LIBRARY PARKING LOT	Brazil, Uruguay & Argentina

A slow growing palm, it has a mature height of 10-20'. The feather-like gray-green arching leaves spread 10-15' wide and leave a strong pattern on the stout dark gray trunk from old leaf stubs. The small flowers, growing in long spikes, are followed by clusters of 1" round edible fruits, yellow to red in color. The fruit, with a taste similar to loquats, can be eaten fresh or made into a jelly. This is why it is commonly referred to as the jelly palm.

Butia capitata – pindo palm (Tree #17). 2009

Butia capitata – pindo palm (Tree #17). 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Dracaena draco	DRAGON TREE	#14 - LEO CARRILLO RANCH	Canary Islands

There are three large specimens at the Leo Carrillo Ranch Historic Park. They were planted around the main house prior to 1950. This evergreen tree, a member of the lily family, has a stout smooth gray trunk and large 2' sword-like leaves. The greenish-white flowers are in clusters that form at the ends of the branches. It grows to 60' tall in its native habitat.

The sap is red and has been called "Dragon's Blood". Dried, it is used for coloring in varnishes and is reported to being used to impart its distinctive color to Stradivarius violins. It was also used medicinally. This tree "attains great age, one specimen, at Teneriffe, which was blown down in 1868, was famous for centuries and was long believed to be the oldest tree in the world. When blown down it was 70' high and had a trunk girth of almost 45 feet." (Everett pg. 86)

See Photos under the Carrillo Ranch section of this report.

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Eucalyptus cladocalyx (*E. corynocalyx*)	SUGAR GUM	#15 - STAGECOACH PARK #16 - HOSP GROVE #26 - 3405 ROOSEVELT ST.	South Australia

Several very large specimens of this evergreen species grow throughout the city, particularly in the Old Village area where they were planted as street trees in 1886-1887. Many of these trees still persist today as skyline specimens. In Carlsbad these trees often exceed the heights and canopy spread that are listed in the literature. The new foliage is shiny and coppery-red in color, 3-5" long sometimes oval or variably shaped. The creamy-white flowers are inconspicuous and are followed by small seed capsules. The Stagecoach Park tree has a trunk diameter of just over 8’ and the Roosevelt Street tree has a canopy spread of over 100’.

See photos under the Stagecoach Park and Hosp Grove sections of this report.

Eucalyptus ficifolia (*Corymbia ficifolia*) — RED-FLOWERING GUM (CRIMSON-FLOWERED EUCALYPTUS, SCARLET GUM) — #37 - 4095 HIGHLAND DRIVE — West Australia

This evergreen tree has a large trunk and a canopy extending over the road. Often the trunk of this species will develop an enlarged base. The deep green thick leathery leaves can be similar in appearance to the rubber plant. The showy 1" flowers are usually red in this species and occur in clusters up to a foot long. Peak bloom is in summer, July to August, but may have some flowers throughout the year. Other flower colors include orange, pink, salmon, cream or white.

"Red-flowering gum has a restricted distribution in Australia . . . is so rare that it is included in a list of endangered Australian eucalyptus." (McClintock pg. 88)

Eucalyptus ficifolia – red-flowering gum (Tree #37). 2009

Eucalyptus ficifolia – red-flowering gum (Tree #37). 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Ficus microcarpa	INDIAN LAUREL FIG (CHINESE BANYAN)	#4 - MARRON-HAYES ADOBES	Malay to Borneo

This vigorous mutil-trunked specimen is located on the slope west of the residence. An evergreen tree, it is known for its smooth light gray trunk and heavy canopy of bright green 2-4" long leaves. New leaves are light rose to chartreuse in color and are produced almost continuously. The tree often develops a weeping form if the lower branches are not removed and the tree is not heavily pruned. This species develops a vigorous root system and in humid locations, numerous aerial roots.

Ficus means fig, although the fruit of this tree is not edible. All ficus, both trees and vines, have a distinguishing characteristic, their milky white sap. This sap, when obtained from rubber trees, is the source of latex.

See photos under the Marron-Hayes Adobes section of this report.

Jacaranda mimosifolia (*J. acutifolia, J. ovalifolia*)	JACARANDA	#29 - 3484 HARDING ST.	Brazil

The canopy of this large tree shades the back yard and carpets the ground with its flowers. This species is partially deciduous, usually dropping its leaves during February and March. The tree is normally bare or with sparse foliage at the time it starts blooming. The lavender-blue 2" long tubular flowers appear in mid to late spring, but blooms may continue into summer or even occasionally into fall. The 12-24" long leaves are very finely divided and ferny looking. The 2" brown flattened seed capsules hang on the tree and look like miniature castanets. These are sometimes used in floral arrangements or can be strung and used for beads.

This tree was introduced into the nursery industry and popularized by Kate Sessions a well-known horticulturalist and nursery owner in the San Diego area. In Brazil it is highly prized for making heirloom quality furniture.

Jacaranda mimosifolia – jacaranda (Tree #29). 2009

Jacaranda mimosifolia – jacaranda (Tree #29) Note the tree is out of leaf. 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Macadamia spp.	MACADAMIA	#24 - 1288 LAS FLORES DRIVE	Australia

The many large dark green trees in the background at this location remain from the nursery and grove owned and operated for years by Nelson and Ede Westree. The trees have clean looking foliage with glossy leathery leaves that can be from 5-12” long. The long-lasting leaves can be used in arrangements. The small blossoms, white to pink in color, are in dense hanging clusters up to a foot long. The flowers are occasionally fragrant and bloom from winter to spring. The trees start to produce clusters of tasty nuts with very hard shells about 3-5 years after planting.

See photos under Westree Nursery section of this report.

Pinus pinea	ITALIAN STONE PINE	#3 - MARRON-HAYES ADOBES	Southern Europe & Turkey

This conifer is normally considered to have a moderate growth rate. This particular tree, located on the slope south of the adobe residence, has been very vigorous attaining impressive size. It demonstrates the typical growth habit of this species. It starts as a dense bushy green globe when it is young and then develops into a wide-spreading flat-topped canopy as it matures. The stiff 5-8" long needles are in clusters of two and are bright green to gray-green in color. Before opening, the glossy 4-6" cones are broadly oval in shape and a chestnut brown color.

See photos under the Marron-Hates section of this report

Pinus torreyana	TORREY PINE	#21 - 2635 CREST DRIVE #35 - 3847 HIGHLAND DRIVE	California & San Diego Co.

This evergreen conifer is considered to be the most rare native pine in the United States. It grows naturally in only a few restricted locations, in Del Mar and the nearby Torrey Pines State Reserve and on Santa Rosa Island located off the coast from Santa Barbara.

In its natural habitat at the State Reserve many of the trees grow on rocky soil and exposed sandstone cliffs with little available water where they are shaped by ocean winds and storms. These exposed trees tend to be short and twisted into picturesque shapes by the forces of nature. In protected locations, or where it grows in deep fertile soil and is given supplemental watering, the tree tends to be more pyramidal in shape and can reach monumental proportions. Several cultivated specimens in the state are over 100 years old.

The cones are roundish, 4-6" long and a chocolate-brown color. The needles, in bundles of five, vary in color from a light gray-green to dark green and are listed in various references as being anywhere from 3-4.5" long to 8-13" long.

The seeds of the Torrey pine were a food source for native Kumeyaay people and the long stiff needles were used for weaving baskets. The natives are reported to have used fire to control the growth of under story plants around the trees. The tree was " . . . named for John Torrey, one of the most distinguished and best known American botanists of the nineteenth century." (McClintock pg. 201)

Tree #35 is located on the property that was the home for nearly 40 years of Mary Casler, who was the mayor of Carlsbad from 1982-1986.

Pinus torreyana – Torrey pine (Tree #35). 2009

Pinus torreyana – Torrey pine (Tree #35). One large branch had been removed for utility line clearance. 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Platanus racemosa	CALIFORNIA SYCAMORE (ALISO in Spanish)	#7 - KELLY RANCH - CANNON ROAD #12 - LEO CARRILLO RANCH	California & San Diego Co. & Baja California

These two trees are both native trees that were not planted, but are remnants of the natural vegetation of the area. The California sycamore grows mainly in riparian areas of the foothills and coast mountain ranges from central California to Baja California.

The leaves are maple-like with 3 to 5 deeply cut lobes. The leaves can vary from 4-12" long by 5" to as much as 18" wide. The leaves are a light green on top and paler on the bottom side, which is covered with yellowish hairs that can irritate the skin. The leaves turn a pale brown late in the summer. The trunk peels in pieces like a jigsaw puzzle revealing colors of gray, white, tan, brown and green.

The trunk can be massive and the tree is often composed of several trunks. The trunks and branches are usually twisted, contorted and grow in a zigzag pattern. This pattern is the result of branch tip die back due to a fungal disease called anthracnose. "To many, this is a signature species of western landscapes." (Perry pg. 249)

Note: Anthracnose is a plant disease that has no relation to the animal disease anthrax. Anthrax is a deadly biological agent that disrupted the United States Senate, news services and the Post Office Department a few years ago when envelopes containing the spores were sent through the mail. This act of biological terrorism resulted in the death of several people.

See photos under the Kelly Ranch and Leo Carrillo sections of this report.

Quercus agrifolia	COAST LIVE OAK (ENCINA in Spanish)	~~#8 - KELLY RANCH - COLLEGE BLVD~~. #9 - AGUA HEDIONDA CREEK #10 - AGUA HEDIONDA CREEK #39 - 4403 HIGHLAND DRIVE	California, San Diego Co. & Baja California

The first three trees are native trees that were not planted, but are remnants of the natural vegetation of the area. They persist despite nearby development. Tree #8 was removed for the construction of the Sage High School. parking lot. Trees #9 and #10 could not be evaluated as the area has been posted for habitat conservation.

This species is widely distributed along coastal foothills and valleys throughout the state from Mendocino County in the north to Baja California in the south. The trunks of the trees are gray and smooth when young developing a rougher textured bark as they age. Old trees can grow to massive size with heavy wide spreading branches. Many native tribes used the acorns as a staple food in their diets. Acorn eating is referred to as balanophagy.

"Early Spanish explorers in California found and wrote about the coast live oaks, which they called *encina*. . . . Jepson (1909) pointed out that the location of the chain of Franciscan missions 'corresponded closely' with the distribution of coast live oak." (McClintock pg. 176)

“Widely distributed and widely used, California oaks provided a fountain of resources to California Indian people. In addition to food, they yielded medicine, dyes, utensils, games, toys and construction materials.” (Anderson, pg. 286)

The Europeans and settlers used the wood for lumber in building and in charcoal production and the bark was utilized for the tanning of cattle hides. Many trees in natural stands have been cut for use as firewood.

See photos under the Aqua Hedionda Section of this report.

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
***Quercus dumosa* NUTT. in part**	NUTTALL'S SCRUB OAK	#11 - AGUA HEDIONDA CREEK	California & San Diego Co.

This is a remnant native tree. This species was identified in the "*Draft Environmental Impact Report Carlsbad Oaks North Specific*" as occurring on the site. There is some debate as to the various hybrids and species of scrub oaks in our area. The scientific investigations are still ongoing at this time.

Scrub oak populations in San Diego County are substantially declining due to development and growth pressures. This particular tree is a large specimen, with a wide spreading canopy, located immediately adjacent to a trail near the creek and close to the largest coast live oaks in the area Trees # 9 and #10. The leaves are variously toothed and light green in color and 1-1.25" long. The few acorns found were 1-1.5" long, slender and pointed.
This tree could not be evaluated as the area has been posted for habitat conservation.

See photo under the Aqua Hedionda section of this report.

Quercus hybrid	HYBRID OAK	#13 - LEO CARRILLO RANCH	California & San Diego Co.

The largest tree of a small remnant grove of open-branched native trees growing just south of the caretaker's house and garage, now the visitor center. This tree has a very strong branch structure with very wide angles of attachment and has additional wood laid down by the tree on the topside of these branch connections. The slightly rough bark is an attractive gray and black.

These trees were previously identified as coast live oak (*Quercus agrifolia*) in the report on the botanical collection. However they appear to be a hybrid cross between the coastal scrub oak (*Q. dumosa*) and the Engelmann oak (*Q. engelmannii*). Englemann oaks, also known as mesa oaks, in their natural range normally are found growing at least 20 miles from the coast. If the acorns are viable, this could be a good tree to propagate. If it is not a known hybrid cross, perhaps it could be named the Carrillo oak in honor of Leo Carrillo.

See photos under the Leo Carrillo section of this report.

Quercus suber	CORK OAK	#38 - 4095 HIGHLAND DRIVE	Western Mediterranean & North Africa

The large tree with the thick rough-textured grayish bark is located in the backyard. This tree produces the cork of commerce, including the corks that are used for sealing wine bottles. The oval leaves are toothed, 3" long, dark green and shiny on the top and gray on the bottom side. This is a good tree for the desert and other dry locations with soils that drain well.

" . . . the tree is cultivated extensively on plantations in Spain and Portugal, where the bark of mature trees is harvested every 8-10 years with no ill effect. In nature, the thick corky bark . . . is a protection against fire." (Brigham pg. 104)

The world's oldest and largest cork oak is called "The Whistler Tree", because of all the birds that congregate in its branches, and was planted in 1783 in the town of Aquas de Moura in Portugal. The 1991 harvest from this tree produced 1,200 kilograms (over 2,600 pounds) of top quality bark enough for 100,000 wine corks, which is more than most trees yield in their lifetime.
http://www.corkfacts.com/pdffiles/b2b7.pdf

It has been harvested about every 9 years since 1820.
http://www.corkfacts.com/contpges/whismain.htm

Quercus suber – cork oak (Tree #38). 2009

Quercus suber – cork oak (Tree #38). 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Schefflera actinophylla (*Brassaia actinophylla*)	OCTOPUS TREE (QUEENSLAND UMBRELLA TREE)	#23 - 2361 CIPRIANO LANE	Australia

This evergreen tree with the unusual looking foliage is located near the north side of the house. "The 'umbrella' of the common name comes from the foliage form: the long-stalked, glossy bright green leaves are divided into 7-16 large (to 1-ft.-long) leaflets that radiate outward like ribs of an umbrella. Foliage grows in tiers.

Octopus' refers to showy flower heads: narrow, ray-like structures to 3 ft. long, set all along their length with little blossoms, radiate from a central point. Flowers age from greenish yellow to pink to dark red." (Brenzel pg. 601) This tree has a very tropical look in the landscape.

Schefflera actinophylla – octopus tree (Tree #23). 2009

Schefflera actinophylla – octopus tree (Tree #23). 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Schinus molle	CALIFORNIA PEPPER TREE	~~#1 - MARRON-HAYES ADOBES~~ #2 - MARRON-HAYES ADOBES #6 - KELLY RANCH - CANNON ROAD	Peruvian Andes

Tree #1 has died. This evergreen tree species has a lacy delicate canopy with weeping or pendulous branches. The bright green foliage is almost feathery in appearance. Tiny yellowish summer flowers give way to clusters of rose-colored berries in the fall and winter. The berries are not true peppers.

Since introduction into California at Mission San Luis Rey in 1830 the tree has become so widespread in the state that many think it is a native tree. One of the first trees planted from seed at Mission San Luis Rey is still alive and is celebrated each year with "Pepper Tree Day". Some specimens get quite massive with age and develop gnarled trunks and branches. In many locales it can survive with no supplemental watering. Some plants have escaped cultivation and have become established along watercourses displacing native plants.

At the Marron-Hayes Adobes, one tree is located in the field approximately 600 feet west of the adobe residence. The second tree is located at the southeast corner of the adobe over an underground storeroom. Both trees are readily visible close to the south side of Highway 78 and located across the highway from the end of Rancho Del Oro Drive. These trees were the first non-native trees planted in Carlsbad.

The tree at the Kelly Ranch still stands although the ranch house has been removed.

See photos under the Marron –Hayes Adobes and Kelly Ranch section of this report.

Schinus terebinthifolius BRAZILIAN PEPPER #5 - MARRON-HAYES ADOBES Brazil

This evergreen tree has leaves that are coarser, larger and darker green than *S. molle*. The tree produces an abundant crop of showy bright red berries in the fall. The berries are sometimes dried and sold as pink peppercorns. They can cause gastric distress if eaten in quantity. (Brenzel pg. 602)

Because of the heavy berry production, the plant self-seeds readily and has become an invasive pest in some locations in Carlsbad. This tree is located in the middle of the patio at the northwest corner of the adobe residence.

See photos under the Marron-Hayes section of this report.

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Syzygium jambos	ROSE APPLE	#36 - 3891 HIGHLAND DRIVE	Southeast Asia

This evergreen tree is located along the north side of the front yard.

It has a canopy of ". . .handsome dark green foliage of 4-7" long leathery leaves that are crimson-red when young. It blooms in spring with attractive clusters of 2-3" flowers composed of many creamy-white stamens, followed in summer by round 2" pinkish-yellow fruits that have firm edible pulp. The fruit of the Rose Apple has a delicious fragrance just like roses-but the surprise is that it actually tastes like roses, too." (Brigham pg. 115)

Syzgium jambos – rose apple (Tree #36). 2009

Syzgium jambos – rose apple (Tree #36). 2019

SPECIES	COMMON NAME	TREE NO./LOCATION/ADDRESS	ORIGIN
Tipuana tipu	TIPU TREE	#48 - 2027 CHARLEEN CIRCLE	Argentina, Bolivia & Southern Brazil

This is the prettiest and best-shaded street in Carlsbad. The eight mature trees that form a canopy over the street were saved from being removed for a street repair project by the political action of the people of the neighborhood. Additional replacement trees were also planted further back from the curb to become the large trees of the future. When the trees are in bloom there is a carpet of flowers covering the pavement and surrounding areas.

The species typically has an umbrella shaped flattened crown that is wider than it is high. The foliage is light green in color and is semi-evergreen to deciduous. The tree may be out of leaf from January to May. "Blooms from late spring to early summer, bearing clusters of apricot to yellow, sweet pea-shaped flowers; 2 1/2-in. seed pods follow the flowers." (Brenzel pg. 634)

Kate Sessions, the famed San Diego nursery pioneer, horticulturalist and known as the "Mother of Balboa Park", introduced the tree into the nursery trade and helped to popularize its use. It was one of her favorites. One tree planted from seed about 1920 at her nursery site on Garnet Avenue in Pacific Beach has grown into a magnificent specimen. This tree and the nursery site have been designated by the State of California as a Registered Historical Landmark.

Tipuana tipu – tipu tree (Tree #48) and other tipu trees shade Charleen Circle. 2009

Tipuana tipu – tipu tree (Tree #48) and other tipu trees shade Charleen Circle. The large tree on the left in the previous photo was removed and two new trees of the same species have been planted. 2019

To be able to walk under the branches of a tree that you have planted is really to feel you have arrived with your garden. So far we are on the way: we can now stand beside ours.

Mirabel Osler

TREE ART

Other changes have occurred over the 10 years since the original Phase II report was first published. Some new, and hopefully, future potential Heritage Trees have been planted.

Some trees, Heritage and others, have died and been removed. At least one non-heritage tree that died was turned to a work of public art for the community to enjoy. While technically the city's requirement for a Heritage Tree does not state the tree has to be alive, that was the assumption I used while doing these studies. So while not recommending this as a Heritage Tree, I thought it deserved some recognition along with its still living peers.

When this tree died the homeowner was inspired to create a special work of art. After studying the tree for an extended period of time and because he was a scuba diver an eight tentacled "Kraken" was born. The piece was crafted by a chainsaw artist. The "Kraken" currently terrorizes the neighborhood around 3180 Monroe Street in Carlsbad.

The face of the "Kraken". 2018

The only thing left of an unfortunate surfer is her surfboard. 2018

SUMMARY

Reviewing the data collected and the research for this study provided some interesting information. The following was extracted from the inventory data and the listing of the 51 candidates for Heritage Tree status.

In this Heritage Tree study there are trees native to every continent, except Antarctica. They comprise 10 species each from Australia and Asia, 6 are native to San Diego County and other locations in California, 5 each from Europe and South America, 3 from Africa, 2 from Mexico, and 1 is native to the eastern United States.

This was a total of 42 different species. Five of the species had more than one representative tree. The remaining 37 species had one tree each

In the Phase 1 Study there was only one tree that appeared to be a naturally occurring native tree, a California sycamore. Every other tree in that study area was planted.

The Phase 2 Study area included more areas with native vegetation. This current Heritage Tree list includes 7 trees that are growing in open space areas or in natural habitat and they are some of the largest trees in the Carlsbad. These include 5 oaks, of 3 different species, and 2 California sycamores.

There were 2 Torrey pines that are native to San Diego County, but they were trees that had been planted. These were both two of the largest trees in the study. All of the other trees on this proposed Heritage Tree list do not grow as natives in San Diego County.

This validates the concept that the Heritage Trees constitute an arboretum collection that is spread out over the two study areas.

The main characteristic that most of the foreign trees share is that they either come from a similar climatic zone or region or they are adaptable outside of their preferred climatic zone.

This is truly a remarkable collection of trees, a collection that should be preserved for future generations to enjoy. The people that come after us will also need to continue to care for these trees and the other trees in Carlsbad. The trees are a legacy and a reflection of the Carlsbad's history and growth. Without trees, Carlsbad would not be the remarkable city that it has become.

A garden without trees scarcely deserves to be called a garden.
Henry Ellacombe

MANAGEMENT RECOMMENDATIONS

The specific management recommendations listed in the revised "Carlsbad Historic Village District Heritage Tree Report - 2019" will also serve as the management recommendations for this study as well. The two photographs are from that report.

In managing and maintaining old mature trees such as those that are included on this list of candidates for Heritage Tree status, less is usually more. At least less is usually better. Less damage, less damaging pruning, less hardscape, less root damage, less turf, less compaction are all better for the tree. These practices properly performed also usually mean less cost over the life of the tree.

There are some areas of mature tree care where a little more is better: more knowledge by the people charged with caring for the trees; more diligence in the performance of regular inspections; more respect given to the trees; more mulch applied (within reasonable limits); more soil surface area exposed and more protection provided.

There are also elements that are necessary to promote tree growth and health that are required in moderation. Usually the trees, if they are well adapted to an area, can obtain these on their own. Sometimes these need to be supplied by people. These requirements include air, water, and nutrients. These three growth requirements are obtained from the atmosphere and from the soil.

Less Damage
Less damage means not ripping limbs or roots out of trees with construction equipment. It also means no injury from lawn mowers and string trimmers. It means not attaching electrical wires or signs to trees, or over-pruning or damaging roots, or compacting the soil.

Eucalyptus cladocalyx – sugar gum (Tree #93)
Holiday Park 2002

In the photo above the tree is slowly "eating" a road reflector sign that was attached to the tree. Someday it will disappear completely only to be rediscovered by an unfortunate chainsaw operator when the tree dies and is removed.

Eucalyptus cladocalyx – sugar gum (Tree #93)
Holiday Park 2019

The tree has finished "eating" the reflector sign that is still embedded in the trunk. It has disappeared completely. A surprise waiting to happen.

Less Damaging Pruning
Less damage means not over-pruning trees by removing large or even small branches without a demonstrated necessity. The destructive and damaging process of "topping," where large limbs are cut back to stubs while removing large portions of both the branch structure and the canopy of the tree, should be made illegal for all publicly-owned trees in the city.

In 1992 the State of California passed legislation that recognized the problems associated with the costly and destructive practice of "topping" and encouraged every public agency in the state, including cities, to follow accepted pruning standards (refer to "Appendix E").

This information on "topping" is not new knowledge. John Davey, the founder of Davey, a tree service company that is still in operation and is the third largest tree service company in America, wrote the following in his book "The Tree Doctor" in 1907:

> "Few, if any, greater misfortunes have befallen America, in the last quarter of a century, than the coming of what are known as professional "Tree men" in every city and many towns…But in all their ignorant and nefarious frauds, nothing equals their (what

> ought to be) “criminal” work of cutting away the tops of trees. The old State of Pennsylvania has apparently suffered as much as any from these depredations. Harrisburg, the capital, has been almost completely denuded by them. Substantially all the trees on the streets have been ruined…Tens of thousands of what might have been good trees have been ruined in Philadelphia by these tree vandals, resulting in a lessening of real estate values to the extent of millions of dollars.” (Davey pgs. 33 & 34)

All tree work performed on public trees and all construction work performed in their vicinity should follow the current published American National Standards and Best Management Practices. These publications cover most all aspects of tree care, maintenance and protection during site development or construction that may impact trees.

Another destructive pruning practice is referred to as “lion tailing.” This is the removal of the majority (or all) of the interior foliage and small branches of the tree leaving the remaining foliage and weight concentrated in a tuft, like a “lion’s tail,” at the ends of the branches. The excess removal of foliage along the branch also inhibits proper branch development and taper, leading to a loss of strength and contributes to branch failures.

Less damage also means not over-pruning trees by removing too much foliage throughout the canopy. The leaves (along with green branches and green bark) are the only means the tree has to produce life-sustaining energy for the proper functioning of its physiological and metabolic processes. Removing too much foliage requires the tree to expend stored energy reserves to replace the missing foliage in an attempt to balance its energy expenditures with its energy production. If energy expenditures continually exceed energy production, reserves become depleted over time weakening the tree.

This is particularly critical in these large old Heritage Trees like the eucalypts. What many people don’t appreciate is that these trees are growing more each year in volume than at any point in their lives. Each year the trees produce new layers of cells just under the bark. These cells cover the entire length and circumference of all the branches and the trunk and each year it requires that trees produce more energy to produce this increased volume of wood.

Over-pruning on a mature tree, depending on its health, can mean removing as little as 10%, or even less, of its live foliage at any one time or during the course of a year. It is especially difficult for large mature trees to recover from this type of stress, especially if this is done repeatedly. Over-pruning also causes a reduction in root growth**.** Repeated over-pruning can cause trees to decline and die prematurely.

Some of the Heritage Trees that look the best are privately owned and appear to have received little or no pruning over the years and show little need for any substantial pruning at this time. Other trees, including some city-maintained trees, have been subjected to substantial over-pruning during their lifetime and have been damaged by this work**.**

Less Hardscape
Less hardscape (sidewalks, curbs and pavement) and other restraints allow normal tree root growth and expansion to occur, without the potential for the tree to damage the adjacent hardscape.

Many of the Heritage Trees were planted over a century ago as street trees when this fact may not have been well appreciated. But they were also planted before wide paved roads and concrete curbs, gutters, and sidewalks were constructed. Many of the trees have had to suffer the loss of the open areas of soil that existed when they were originally planted. It is remarkable that so many have survived in spite of having been damaged from the “improvements” being constructed around them.

Less Root Damage
In addition to the installation of hardscape, which we can see, many of these Heritage Trees have also been subjected to underground damage to their root systems, which we can’t see. Underground utilities that are commonly installed can include any, or all, of the following: conduits or pipes for water, sewer, gas, electrical, cable TV, phone and other communication lines, irrigation pipes and drainage systems, including large storm drains.

There are tools and methods that can be used for underground work that are not damaging to tree roots. These include horizontal boring and excavation using high velocity air such as with an “Air-Spade” or “Air-Knife”. Tunneling under roots is preferred to cutting them. Extensive root cutting on a tree may lead to a lack of structural support and tree failure. Trees should be properly protected when any underground work has to occur in their vicinity.

While doing the research for the original report a *Cupressus macrocarpa* – Monterey cypress (Tree #5) had extensive underground trenching and work performed under at least two sides of its canopy. Surprisingly I observed very few large roots damaged in the excavations around this tree, but numerous smaller roots were damaged and the soil around the tree was compacted from heavy equipment operations. Additionally some limbs appeared to have been ripped out of the tree by construction equipment working under the canopy. The damaged branches have still not been properly pruned as of April 2019.

Bob Bichowsky, (deceased)**,** a well-known local arborist, made some similar observations and was quoted in the Blade-Citizen in 07/24/91 concerning *Eucalyptus cladocalyx* – sugar gum (Tree #63), “I was amazed to find that the roots are much deeper than they are on 95 percent of the trees I look at. If any tree will survive, this will be the one to do it**.”** This tree is at risk from a nearby construction project as of April 2019.

It appears that the soil throughout the study area is a deep sandy alluvial type that either has been eroded from the ridge where Highland Drive is located and/or is the remains of an ancient beach terrace. In either case the soil has been deposited over millennium and gently slopes towards the ocean. It is understandable that farmers and nurserymen would pick the best soils for growing their crops and orchards. The soil appears to be the secret why these Heritage Trees grew so well and why so many of them are still flourishing today despite all of the “improvements” that have been installed around them.

The Old Village part of the city was developed on this deep natural soil which has not been altered as is commonly done in new projects that are developed today. Projects then, mostly followed the existing land contours as crops and orchards were planted. Contemporary construction practices usually involve the moving of tremendous amounts of soil and compacting the soil with heavy equipment to high densities by removing air spaces. Any loose soils, especially those with a high organic content, are usually disposed of as being unsuitable for building purposes.

Less Turf
Less turf allows the tree better access to water and minerals. Turf, or grass, is much more aggressive than trees are at removing these necessary requirements for life, especially from the top 6”-12” of soil. Less turf means the turf is kept further away from the trunk and any buttress or surface roots of the tree. This not only means less potential damage to the trees from mowing equipment, but also less damage to mowing equipment from hitting exposed surface roots.

Keeping the turf away from the trunk also means less potential damage to the tree trunk from string trimmers cutting down that last little bit of grass up against the tree trunks that the mowers can’t reach. String trimmers hitting the trunks of trees can instantly damage the cambium layer of the tree and can girdle and even kill trees, particularly those that are young or have thin bark.

Less turf can also mean more room for surface applications of mulch, such as coarsely ground or chipped tree prunings. Organic mulch as it breaks down adds minerals and nutrients to the soil, just like that which occurs in a natural forest. Mulch also allows greater biological activity in the soil from earthworms and soil micro-organisms. This in turn provides for better soil aeration, which leads to better soil gas exchange and better (deeper and quicker) water absorption and penetration, with less surface runoff and fewer weeds as well.

Less Compaction
Many of the Heritage Trees have compacted soil over their root systems. Many of the Heritage Trees in Holiday Park have severe compaction from the activity that occurs under and around them. Including mowing operations for example.

One particularly effective treatment is applying organic mulch under the canopies, out to the drip line. This can act as a “shock absorber” preventing the compaction of soils, especially from foot traffic under the canopy of the tree. The mulch can also improve soil condition over time as discussed in the previous section.

Other treatments may be recommended by a qualified arborist based on the needs for a particular tree.

Less Money

Less money is usually required to be spent on maintenance over the life of a tree if it is given adequate growing space, is not improperly pruned, is mulched on a regular basis, and is not damaged by maintenance and construction practices. To help insure the long-term survival of a Heritage Tree it should have an annual inspection by a qualified arborist familiar with the needs of these special mature trees.

Any recommended treatments, including pruning, should be based on a diagnosis (what is wrong or what condition are we trying or correct or improve?), a dosage (how much work needs to be done?), and timing (when is the best time to perform the work for the tree to receive the maximum benefit?). For trees that have been damaged, a higher level and frequency of inspections and management are warranted resulting is a higher cost.

Utilizing the chipped prunings, from tree maintenance work, will reduce the cost for the mulch and eliminate the cost of transporting it and the fess to dump it at a landfill.

Management Recommendations Summary

The following are recommendations to provide for the health, safety and longevity of Carlsbad’s Heritage Trees. These recommendations should be adopted by the City Council as mandatory for all city owned Heritage Trees, and are advisory only recommendations for any privately-owned and non-city owned public Heritage Trees.

1. The city arborist shall provide copies of this report (Management Recommendations) to each city employee in charge of managing a Heritage Tree and provide a copy of the entire report to every property owner of a Heritage Tree located on private or other public property. In locations when it is unclear if a tree is publicly or privately owned and who is responsible for its care, this should be clarified by the city arborist.

2. Have all public Heritage Trees inspected at least annually by a qualified arborist who shall provide a written report with recommendations for any required treatment or maintenance, including pruning. The reports are to be kept in a permanent file for each tree for future reference along with a record of any work performed on the tree and the result of that work.

3. Remove any signs or wires that have been attached to any publicly owned Heritage Tree, if this can be done without damaging the tree any further.

4. Adopt a city policy, or regulation, prohibiting the “topping” of any public tree.

5. Adopt a city policy, or regulation, that the current published American National Standards and Best Management Practices for Tree Pruning will be followed when pruning any publicly owned trees.

6. Require that all pruning work on publicly owned Heritage Trees shall be performed by a certified arborist or by certified tree workers under the full-time supervision of a certified arborist.
7. Pruning should be timed so as not to interfere with nesting birds.

8. Root damage to publicly owned Heritage Trees should be minimized. Any proposed construction work (public or private) within 50’ of the trunk, shall be reviewed by a qualified arborist during the planning stage of the work. The arborist shall specify a Tree Protection Zone and a Tree Protection and Preservation Plan that is site and tree specific. No activity or soil disturbance in the Tree Protection Zone will be permitted unless specifically approved in writing by the city arborist.

9. In the vicinity of publicly-owned Heritage Trees appropriate alternative means of underground construction, such as the use of tools like an “Air-Knife” or “Air-Spade”, horizontal boring or tunneling, should be utilized to protect and prevent damage to the root system of the tree.

10. Hardscape conflicts should be remedied without damaging the root system of a publicly owned Heritage Tree. Some methods that may be utilized include: the use of sand laid unit pavers like brick or flexible paving such as rubber sidewalk sections; grinding raised pavement sections; ramping or bridging over roots. Removing pavement and replacing it with decomposed granite or organic mulch; rerouting the hardscape to accommodate the current and future trunk expansion and root growth is an option. This would also provide additional exposed soil surface that would be beneficial to the tree’s health.

11. Turf, under the drip line of the tree, should be removed and replaced with a 3”- 4” deep layer of organic mulch such as ground or chipped tree prunings. The mulch should be kept at least 1’ away from the trunk of the tree. The mulch should be inspected at least twice a year and additional mulch added to maintain the 3”- 4” depth. For small trees, or trees with a narrow upright growth habit install the mulch to a distance of 5’ from the trunk

12. Compaction under the canopies of trees can be partially corrected by several methods. The least damaging and cost effective method is to install organic mulch as specified above for turf removal over the compacted area or where surface roots are exposed. Other methods may be recommended for specific conditions.

13. Require a report from a qualified arborist for any public Heritage Tree recommended for removal because it presents a “hazardous” condition. The arborist shall use the current published Tree Risk Assessment methodology. The city arborist has the discretionary right to approve, request a second opinion in writing, or recommend actions that may reduce the condition to an acceptable level of risk. If this type of risk reduction cannot be done and it is the city’s arborist’s recommendation to remove the tree it will remain the City Council’s option to approve or deny the removal or require additional measures.

14. For any publicly owned Heritage Tree that is removed, a suitable replacement tree shall be replanted.

A stricken tree, a living thing, so beautiful, so dignified,
so admirable in its potential longevity, is, next to man,
` *perhaps the most touching of wounded objects.*
Edna Ferber

Supplemental Recommendations

The trees in the Phase II Study have some additional requirements, especially those located in historic parks or in natural open space areas. Some of these recommendations are of a general nature, and others are specific to individual trees.

As in the Phase I Study the recommendations should be adopted as mandatory for all city owned Heritage Trees and are advisory only for privately owned and any non-city owned public Heritage Trees.

1. Remove any tree that is listed by the California Invasive Plant Council as an invasive plant from any natural open space, especially if it is competing or interfering with a Heritage Tree. For example, the invasive Brazilian pepper growing next to the California sycamore (Tree #12) at Leo Carrillo Ranch Historic Park. Any mistletoe should also be removed from this tree.

2. Do not replant any Heritage Tree that dies with the same species, if it is one that is listed by the California Invasive Plant Council as an invasive plant.

3. Follow the city's Management Plan for Hosp Grove.

4. Remove the dead wood and properly recut any branch stubs or broken branches in the sugar gum eucalyptus (Tree #15) at Stagecoach Park.

5. Provide tree protection plans for any Heritage Tree that may be impacted from any proposed construction work.

6. Follow the current versions of any American National Standards that apply to tree care, and safety, and any applicable Best Management Practices. These are periodically updated and expanded to reflect the current knowledge and research in the tree care industry.

I like trees because they seem more resigned to the way they have to live than other things do.

Willa Cather, *O Pioneers!*

HERITAGE TREE NOMINATION PROCESS

Heritage Trees are defined in the Carlsbad City Ordinance as follows:

> "Heritage trees shall be trees with notable historic interest or trees of an unusual species or size."

A process should be developed for the city to allow for the nomination of additional Heritage Trees by its citizens.

The following is suggested.

1. A nomination form should be developed for submittal to the Parks and Recreation Department for review.

2. The form should contain the following information:
- the address of the tree and its location on the property (front, rear or side yard)
- the name of the owner of the tree (Carlsbad, if it is in the public right-of-way or a city park or open space)
- tree species if known
- estimated size (trunk diameter measured at 54" above grade, height, and canopy spread - if more than one trunk, list the number of trunks and the diameter of the largest trunk)
- estimated age if known
- background or history of the tree and the reason(s) for nominating the tree
- photos of the tree
- name, address, email address, phone number and signature of the person making the nomination
- date the form was submitted to the city.

3. The form should have enough space for an arborist designated by the city to provide comments when performing an on-site review. The arborist's comments should include an evaluation of the condition of the tree along with the arborist's recommendation and reasons for either approval or rejection.

4. After review by city staff, all completed applications should be submitted to the Historic Preservation Commission for their review and action to either accept or decline the application.

5. An application accepted by the Historic Preservation Commission shall be passed along to the City Council for final review and acceptance.

6. The city shall notify, in writing, the individual submitting the application of the Historic Preservation Commission and the City Council's actions.

7. If a tree is accepted, it will be added to the city's list of Heritage Trees. This list should be maintained on the city's website along with photos of all of the

Heritage Trees and maps indicating their locations. The maps shall be updated when any new tree is added or an existing tree has died or been removed.

8. The owner of a designated Heritage Tree shall be provided a copy of the management recommendations and both Heritage Tree reports.

9. Following the tree's designation as a Heritage Tree, the owners of any newly designated Heritage Trees shall be invited to participate in the city's annual Arbor Day planting event.

10. Photos of any newly designated Heritage Trees shall be displayed in the city libraries during the month of March when California Arbor Week is celebrated.

https://calfire.ca.gov/resource_mgt/resource_mgt_urbanforestry_arborweek

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Trees are poems that earth writes upon the sky,
We fell them down and turn them into paper,
That we may record our emptiness.

Kahlil Gibran

ACKNOWLEDGMENTS – From the original report

Scores of individuals contributed in numerous ways to this study and I thank them all for their assistance. I would like to particularly acknowledge the following individuals for their special help, insight, historical perspective or technical expertise that benefited this project.

The members of the Historic Preservation Commission for their foresight in recognizing the need for such a study and for their extreme patience during the research, development and writing stages which all took longer than any of us anticipated.

Geoff Armour, Assistant Library Director of the Carlsbad Library, my original liaison to the Historic Preservation Commission, for his unflagging support, sound direction, gentle persuasion and for making available to me the resources of the Carlsbad Library and other City departments.

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Suzanne N. Smithson, Deputy Library Director, for helping bring this project to completion.

The City of Carlsbad GIS Department for the aerial photographs and detailed maps and of the study areas and the walking tours.

Susan Schnebelen Gutierrez and other staff members of the Local History Room of the Cole Library for their invaluable assistance in researching and making available historical photographs. Susan's book, *Windows on the Past – An Illustrated History of Carlsbad, California*, was a source of much useful information.

Shelley Hayes Caron for sharing the history of her family, old photographs and the special trees growing at the Marron-Hayes Adobes Historic District. May your trees continue to grow and flourish.

Diania Caudell for permission to use her family history and a poem she wrote in Luiseno and English about one tree listed in this report that is special to her family.

Ellen L. Sweet for providing additional information about the history of the Marron family and their adobes.

Joan Kindle, Volunteer Curator-Carrillo Ranch Archives, for good leads on which people to talk to and for background information on Leo Carrillo and his special ranch.

Ede Westree for sharing many recollections of her husband Nelson Westree and their macadamia tree nursery as well as Nelson's connections to Leo Carrillo and the City of Carlsbad. Ede also provided first-hand knowledge regarding the dawn redwood tree in Holiday Park.

Mick Calarco and Charles Balteria at the Leo Carrillo Ranch Historic Park for the use of research material and photographs and for background information on the Ranch's botanical collection.

Connie Trejo, Historic Preservation Commission member, for helping me interview Spanish-speaking tree-owners to learn their stories about their trees.

Lucia Kelly Sippel for sharing her family's history and pointing out some great sycamore trees.

Gary Robertson for information and photos of the Kelly Ranch and its trees, including the sycamore in which he built a tree house.

Robert Meyers for information about his mother and the tree that is still in his family.

Karen Merrill for showing me the oaks that are the oldest trees in this study and for inviting me on a hike through the underbrush where we discovered some laurel sumacs that were truly unusual.

Bobbie Hoder and Karin Nordstrom for proofreading and editorial suggestions.

Don Walker and Steve Brigham for permission to quote from *Ornamental Trees of San Diego - Mediterranean Climate Trees for the Garden*. Some of the proposed Heritage Trees are also highlighted in their book. Don provided additional leads for some trees and confirmed the identification of others.

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Dan Simpson, teacher, lecturer, consultant and arborist at the San Diego Zoo for his generous professional assistance on field reviews and tree identification.

Tim Clancy, arborist and friend, for assisting in field evaluations, technical assistance in data management and document formatting.

Lastly, my thanks to the pioneers and founders of this community for their foresight and desire to improve their home sites, to make their land more productive and to enhance and beautify their surroundings. We are all the beneficiaries of their collective efforts to make this an attractive and desirable community through the trees they planted, nurtured and protected.

My hope is that this study will help increase the local knowledge and understanding of the significant contributions that these trees make to the community. That through greater knowledge, understanding and appreciation of these and other trees the community will continue to steward and preserve them for the benefit of future generations.

All photographs are by the author, unless otherwise noted. Any mistakes, errors or oversights in this report remain my sole responsibility. To any remarkable trees and their owners that I missed, my sincere apology. Just keep growing and perhaps someday you, too, will be recognized.

Mark Wisniewski

I am the Lorax,
I speak for the trees,
for trees have no tongues.

Dr. Suess, *The Lorax*

APPENDIX A

Appendix A
Maps of Phase II Study Area with Heritage Tree locations

How to use the maps.

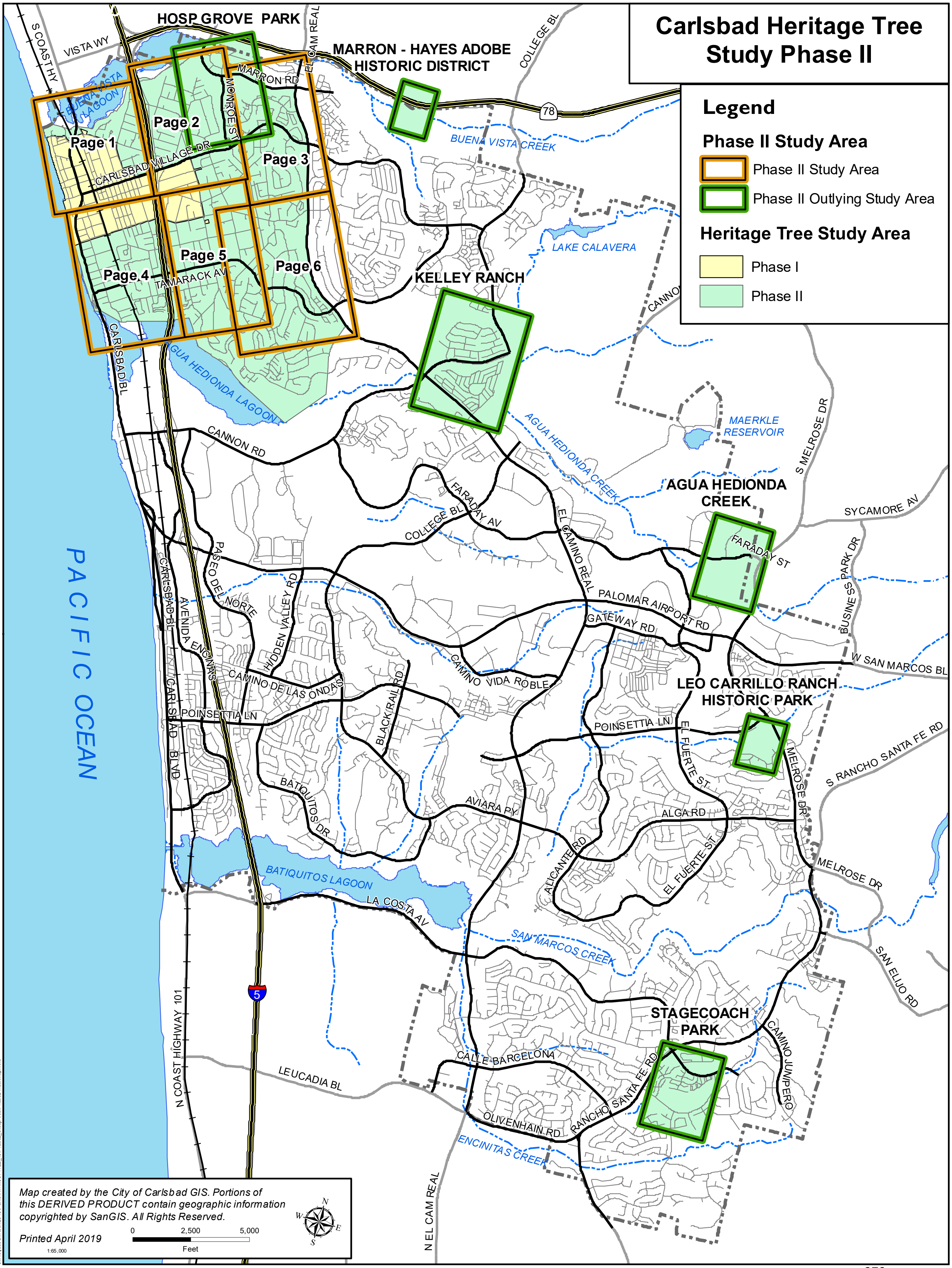
The maps on the following pages include a key map of the overall study area and then enlarged sections that break the main study area down into smaller units.

The outlying areas have aerial photos with the trees numbered and are included in the report section describing each area.

The trees are shown in numbered circles on the maps. They are laid out following a numerical sequence of low to high. The sequence also represents a suggested route that can be followed to view the trees.

Please note that trees on private property can only be viewed from the public right-of-way.

"Appendix C" is a sequential listing of the trees by tree number.


Carlsbad Heritage Tree Study Phase II
Legend
Phase II Study Area
Phase II Study Area
Phase II Outlying Study Area
Heritage Tree Study Area
Phase I
Phase II
HOSP GROVE PARK
MARRON - HAYES ADOBE HISTORIC DISTRICT
KELLEY RANCH
AGUA HEDIONDA CREEK
LEO CARRILLO RANCH HISTORIC PARK
STAGECOACH PARK
Page 1
Page 2
Page 3
Page 4
Page 5
Page 6
PACIFIC OCEAN
BUENA VISTA LAGOON
AGUA HEDIONDA LAGOON
BATIQUITOS LAGOON
BUENA VISTA CREEK
LAKE CALAVERA
MAERKLE RESERVOIR
AGUA HEDIONDA CREEK
SAN MARCOS CREEK
ENCINITAS CREEK
S COAST HY
VISTA WY
MARRON RD
MONROE ST
EL CAM REAL
COLLEGE BL
CARLSBAD VILLAGE DR
TAMARACK AV
CARLSBAD BL
CANNON RD
FARADAY AV
COLLEGE BL
EL CAMINO REAL
PASEO DEL NORTE
HIDDEN VALLEY RD
AVENIDA ENCINAS
PALOMAR AIRPORT RD
GATEWAY RD
FARADAY ST
SYCAMORE AV
S MELROSE DR
BUSINESS PARK DR
W SAN MARCOS BL
CAMINO VIDA ROBLE
CAMINO DE LAS ONDAS
POINSETTIA LN
BLACK RAIL RD
EL FUERTE ST
MELROSE DR
S RANCHO SANTA FE RD
BATIQUITOS DR
AVIARA PY
ALGA RD
ALICANTE RD
LA COSTA AV
SAN ELIJO RD
CAMINO JUNIPERO
CALLE BARCELONA
RANCHO SANTA FE RD
OLIVENHAIN RD
LEUCADIA BL
N COAST HIGHWAY 101
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Map created by the City of Carlsbad GIS. Portions of this DERIVED PRODUCT contain geographic information copyrighted by SanGIS. All Rights Reserved.
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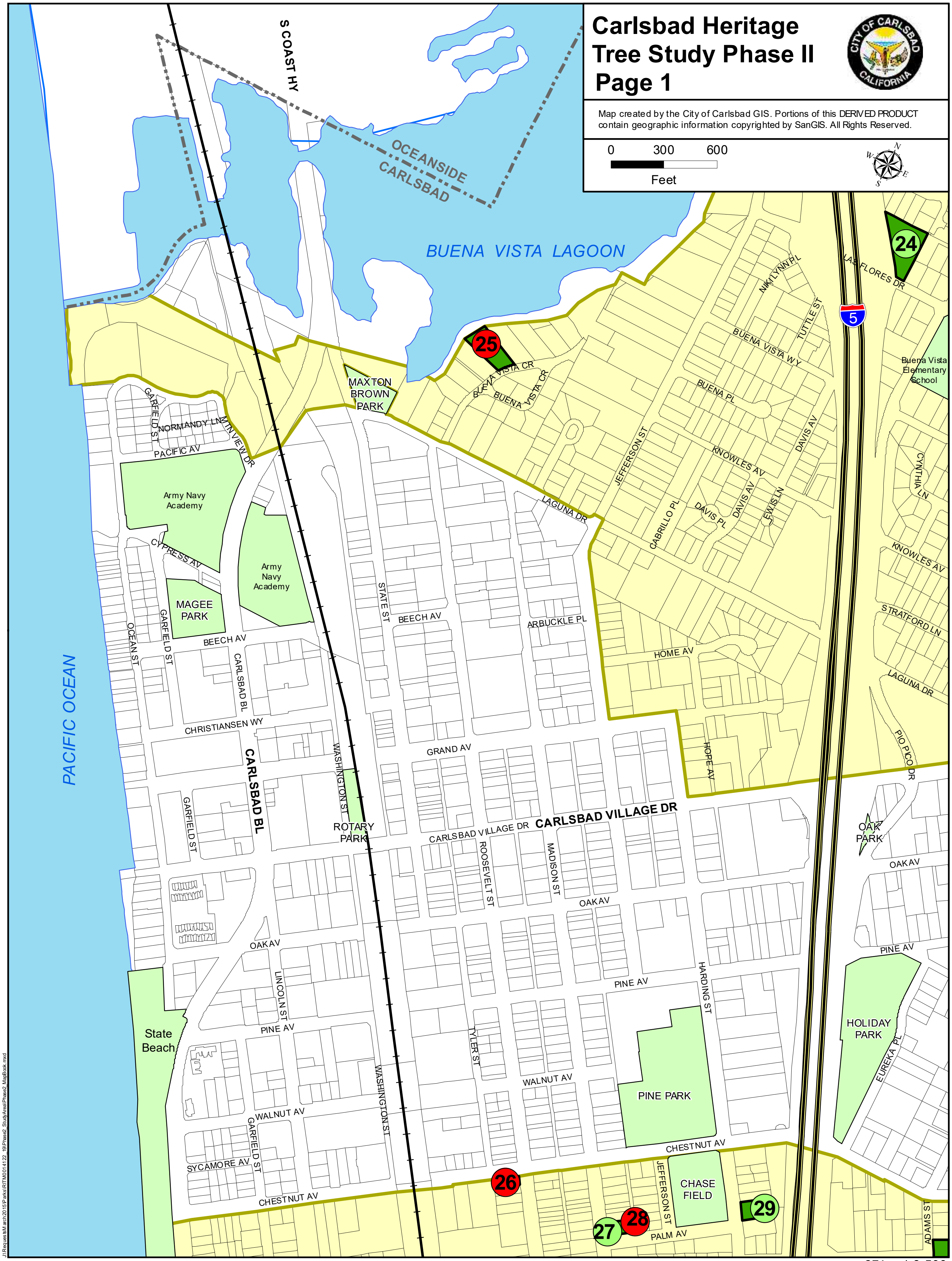
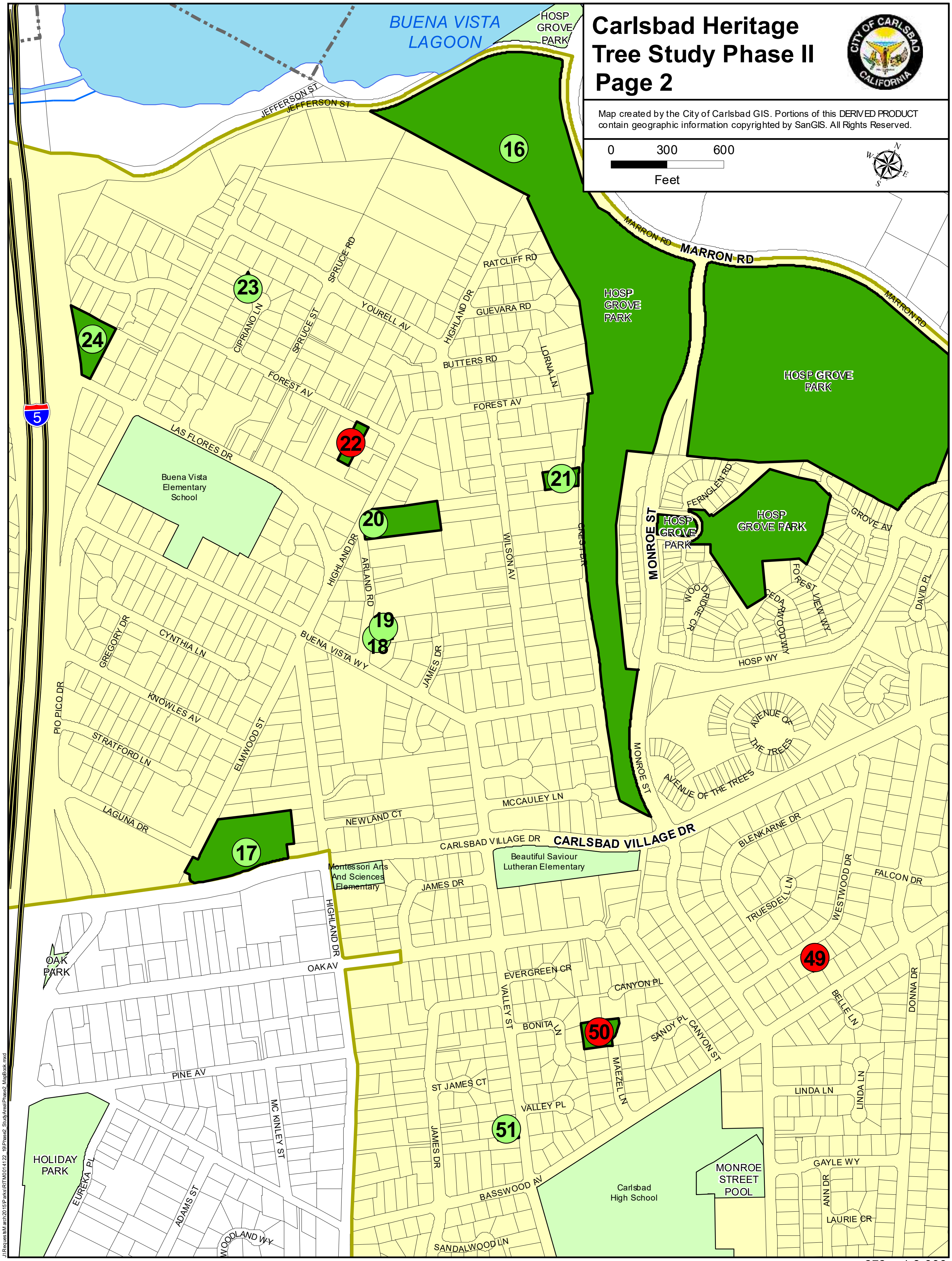


Living Tree Dead or Missing Tree

 1:8,500

Carlsbad Heritage Tree Study Phase II Page 2

0 300 600 Feet



272 1:8,000

Living Tree
Dead or Missing Tree

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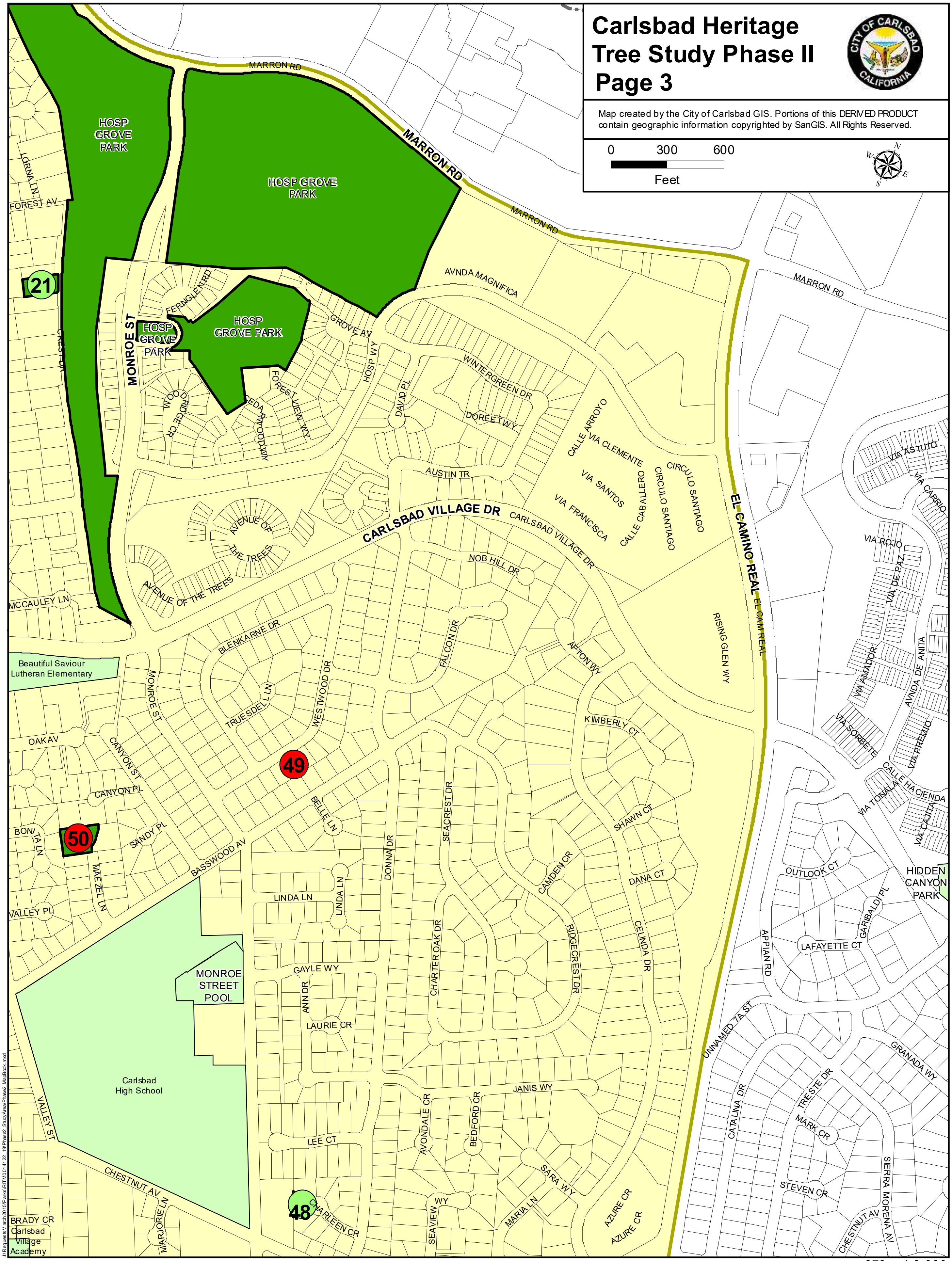
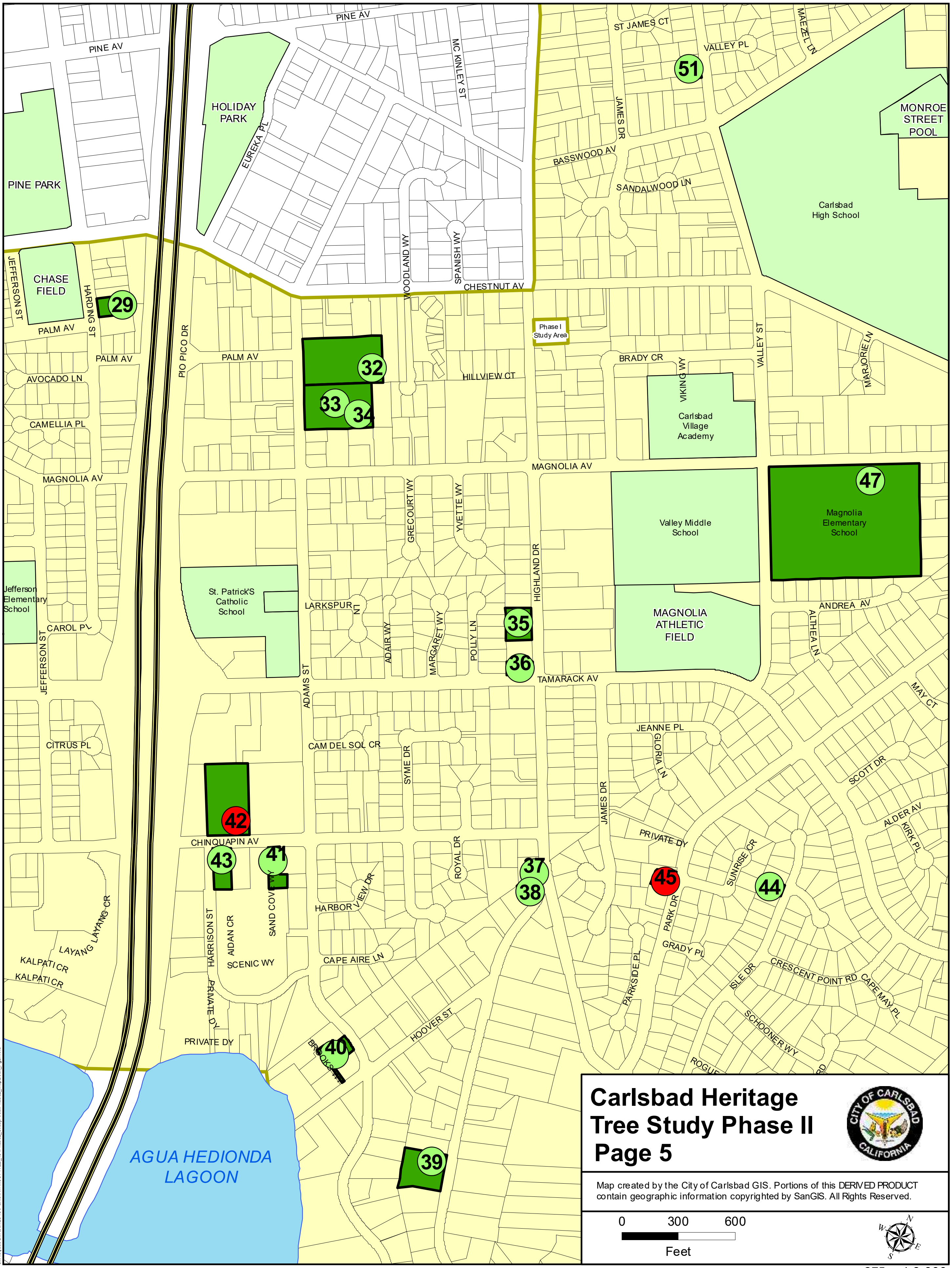


Living Tree Dead or Missing Tree

273 1:8,000

274 1:8,000

Living Tree Dead or Missing Tree



Carlsbad Heritage Tree Study Phase II
Page 5

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0 300 600
Feet

275 1:8,000

Living Tree   Dead or Missing Tree

Carlsbad Heritage Tree Study Phase II Page 6

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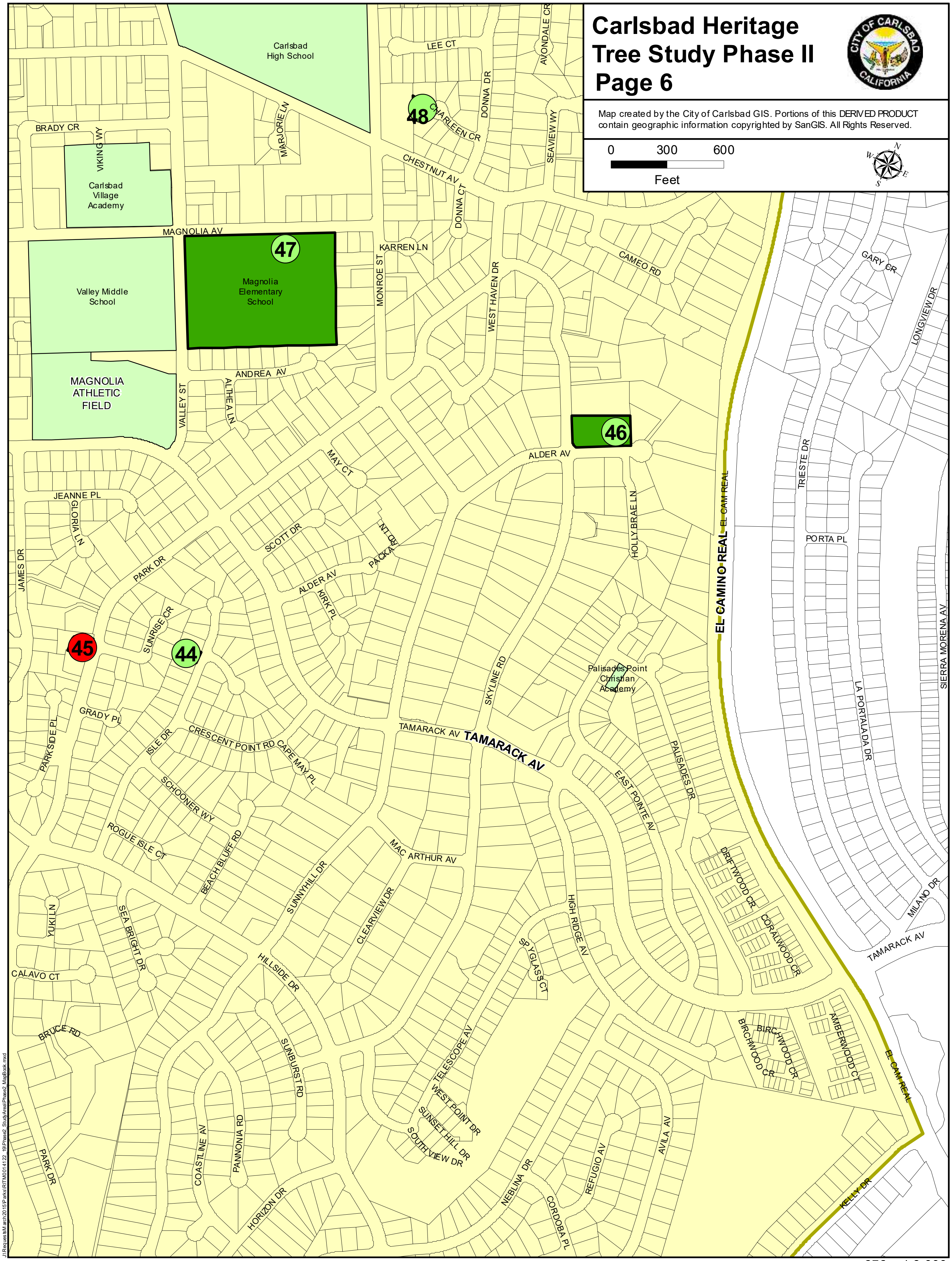

Living Tree Dead or Missing Tree

276 1:8,000

APPENDIX B

Appendix B:
Heritage Trees listed alphabetically by species

How to use this information.

This provides an alphabetical listing of the Heritage Trees by species. The tree number is also listed along with the most widely accepted common name and the address and/or location of the tree. Comments are provided especially if the tree is located on a site of local historical significance or if it is part of a group or larger collection of similar trees at the same location.

The following information is included.

F = tree is located in the front of the property or on a park site
S = tree is located on a side street at the property address
R = tree is located at the rear of the property address or off an alley.

DBH: Diameter Breast Height, the trunk diameter is measured in inches at 54" above the ground level and is listed as a size range, for example 06-12.

Height: The height range of the tree is measured in feet, for example 15-30.

Canopy Spread: The canopy spread, which is the outer edge of the branches, of the tree is measured in feet and is listed as a size range, for example 15-30.

In urban forestry, size ranges are normally used when providing size information on trees. Tree size is constantly changing and using ranges keeps data from being out of date shortly after it is collected. It also allows the urban forester to analyze the comparative ages of a tree population especially when reviewing the size ranges in a single species in a population.

Vigor: A visual assessment of the growth indicators of the tree.

Condition: Numerical scores are given to various parts of the tree and are then calculated to provide an overall condition rating for the tree as either “good”, “fair”, “poor” or “dead”. This is a somewhat subjective process and reflects the condition of the tree at its last evaluation.

Note: Data was collected in the latter half of 2018.

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 2778 Arland Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-18	Araucaria bidwillii	bunya-bunya	30-36	45-60	45-60	Growing	Good	

Location 3640 Adams Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-34	Araucaria heterophylla	Norfolk Island pine	30-36	75+	15-30	Growing	Fair	

Location 2684 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-20	Arbutus unedo	strawberry tree	18-24	15-30	45-60	Growing	Good	

Location 271 Redwood Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-30	Archontophoenix cunninghamia	king palm	06-12	45-60	15-30	Growing	Good	17 trees

Location 1085 Chinquapin Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-41	Bauhinia variegata	purple orchid tree	24-30	30-45	30-45	Growing	Fair	3 trees

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 1435 Forest Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-22~~	~~Brahea armata~~	~~Mexican blue palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 1250 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-17	Butia capitata	pindo palm	12-18	15-30	0-15	Growing	Good	Cole Library parking lot

Location 4135 Park Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-45~~	~~Calocedrus decurrens~~	~~incense cedar~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 2411 Buena Vista Circle

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~R-25~~	~~Caryota gigas~~	~~king kong fishtail palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location Leo Carrillo Rancho Historical Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-14	Dracaena draco	dragon tree	30-36	15-30	30-45	Growing	Good	3 trees at Main House

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 4310 Brooks Way

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-40	Dypsis decaryi	triangle palm	18-24	30-45	0-15	Growing	Good	

Location Hosp Grove

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-16	Eucalyptus cladocalyx	sugar gum	48+	75+	45-60	Growing	Good	Uphill from West parking lot, tot lot

Location 3405 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-26~~	~~Eucalyptus cladocalyx~~	~~sugar gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Canopy over 100' wide~~

Location Stagecoach Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-15	Eucalyptus cladocalyx	sugar gum	48+	75+	75+	Growing	Good	Below Adobe Ruins

Location 1060 Chinquapin Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-42~~	~~Eucalyptus erythrocorys~~	~~red-cap gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 4095 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-37	Eucalyptus ficifolia	red-flowering gum	48+	30-45	30-45	Growing	Fair	

Location 3215 Maezel Lane

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-50~~	~~Ficus benjamina~~	~~weeping fig~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-4	Ficus microcarpa	Indian laurel fig	18-24	45-60	60-75	Declining	Poor	

Location 1049 Chinquapin Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-43	Ficus religiosa	peepul or bo-tree	48+	15-30	75+	Growing	Good	

Location 3470 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-28~~	~~Ginkgo biloba~~	~~maidenhair tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 3470 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-27	Grevillea robusta	silk oak	42-48	45-60	30-45	Growing	Good	

Location 3484 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-29	Jacaranda mimosifolia	jacaranda	24-30	30-45	75+	Growing	Good	Backyard

Location 4015 Isle Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-44	Koelreuteria bipinnata	Chinese flame tree	30-36	30-45	45-60	Growing	Good	

Location 2077 Westwood Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-49~~	~~Lagerstromia indica~~	~~crape myrtle~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	

Location 1288 Las Flores Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-24	Macadamia spp.	macadamia	18-24	30-45	30-45	Growing	Good	Westree Nursery Site

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 1905 Magnolia Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-47	Magnolia grandiflora	Southern magnolia	24-30	30-45	30-45	Growing	Good	Magnolia Elementary School

Location 2778 Arland Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
R-19	Melia azedarach	chinaberry	24-30	15-30	30-45	Growing	Good	Backyard

Location 3630 Adams Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-32	Phoenix canariensis	Canary Island date palm	30-36	75+	30-45	Growing	Good	

Location 102 Acacia Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-31	Phoenix dactylifera	date palm	12-18	60-75	45-60	Growing	Good	3 matched trees

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-3	Pinus pinea	Italian stone pine	48+	30-45	60-75	Growing	Fair	DBH 52"

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 2635 Crest Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-21	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	

Location 3847 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-35	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	

Location Kelly Ranch - Cannon Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-7	Platanus racemosa	California sycamore	30-36	45-60	45-60	Growing	Good	Native Tree

Location Leo Carrillo Rancho Historical Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-12	Platanus racemosa	California sycamore	48+	45-60	75+	Growing	Good	Native Tree across from Visitor Center

Location 3860 Skyline Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
S-46	Podocarpus gracilior	fern pine	30-36	45-60	45-60	Growing	Fair	Located on Alder Ave.

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location Agua Hedionda Creek

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-10	Quercus agrifolia	coast live oak	48+	60-75	60-75	Growing	Poor	Native Tree
F-9	Quercus agrifolia	coast live oak	48+	75+	75+	Growing	Poor	Native Tree

Location 4403 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-39	Quercus agrifolia	coast live oak	42-48	45-60	75+	Growing	Fair	

Location Kelly Ranch - College Boulevard

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
~~F-8~~	~~Quercus agrifolia~~	~~coast live oak~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Native Tree~~

Location Agua Hedionda Creek

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-11	Quercus dumosa Nutt. in part	Nuttall's scrub oak	12-18	15-30	30-45	Growing	Good	Native Tree

Location Leo Carrillo Rancho Historical Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-13	Quercus hybrid	hybrid oak	12-18	15-30	45-60	Growing	Good	Native Tree above Visitor Center

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 4095 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-38	Quercus suber	cork oak	30-36	30-45	45-60	Growing	Good	

Location 2361 Cipriano Lane

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-23	Schefflera actinophylla	octopus tree	06-12	30-45	15-30	Growing	Good	

Location Kelly Ranch - Cannon Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-6	Schinus molle	California pepper tree	36-42	30-45	30-45	Growing	Good	Kelley Ranch House site

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-2	Schinus molle	California pepper tree	48+	15-30	60-75	Growing	Fair	DBH 48.7"/Canopy Spread 67'
~~F-1~~	~~Schinus molle~~	~~California pepper tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~First non-native tree planted in Carlsbad~~

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-5	Schinus terebinthifolius	Brazilian pepper	30-36	30-45	45-60	Growing	Good	Back Patio

Carlsbad Heritage Tree Study Phase II Alphabetical Listing - 2019

Location 3891 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-36	Syzygium jambos	rose apple	18-24	15-30	30-45	Growing	Good	North side of front yard

Location 3305 Valley Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-51	Syzygium paniculatum	brush cherry	18-24	30-45	15-30	Growing	Good	

Location 2027 Charleen Circle

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-48	Tipuana tipu	tipu tree	36-42	60-75	75+	Growing	Good	Largest of 15 street trees

Location 3640 Adams Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Notes
F-33	Washingtonia robusta	Mexican fan palm	12-18	75+	15-30	Growing	Good	8 tallest trees

APPENDIX C

Appendix C:
Heritage Trees listed numerically

How to use this information.

This is a numerical listing of the Heritage Trees by tree number which is also shown on the maps. The botanical name of the species is also listed along with the common name and location information. Parks, and some historic sites, are listed by name only without an address.

The following information is included.

F = tree is located in the front of the property or on a park site
S = tree is located on a side street at the property address
R = tree is located at the rear of the property address or off an alley.

DBH: Diameter Breast Height, the trunk diameter is measured in inches at 54" above the ground level and is listed as a size range, for example 06-12.

Height: The height range of the tree is measured in feet, for example 15-30.

Canopy Spread: The canopy spread, which is the outer edge of the branches, of the tree is measured in feet and is listed as a size range, for example 15-30.

In urban forestry, size ranges are normally used when providing size information on trees. Tree size is constantly changing and using ranges keeps data from being out of date shortly after it is collected. It also allows the urban forester to analyze the comparative ages of a tree population especially when reviewing the size ranges in a single species in a population.

Vigor: A visual assessment of the growth indicators of the tree.

Condition: Numerical scores are given to various parts of the tree and are then calculated to provide an overall condition rating for the tree as either “good”, “fair”, “poor” or “dead”. This is a somewhat subjective process and reflects the condition of the tree at its last evaluation.

Ownership: The tree may be Publicly or Privately owned. Public trees are considered to be the responsibility of the of the entity that owns the tree to maintain.

Note: Data was collected in the latter half of 2018.

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-1~~	~~Schinus molle~~	~~California pepper tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-2	Schinus molle	California pepper tree	48+	15-30	60-75	Growing	Fair	Private

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-3	Pinus pinea	Italian stone pine	48+	30-45	60-75	Growing	Fair	Private

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-4	Ficus microcarpa	Indian laurel fig	18-24	45-60	60-75	Declining	Poor	Private

Location Marron-Hayes Adobes

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-5	Schinus terebinthifolius	Brazilian pepper	30-36	30-45	45-60	Growing	Good	Private

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location Kelly Ranch - Cannon Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-6	Schinus molle	California pepper tree	36-42	30-45	30-45	Growing	Good	Private

Location Kelly Ranch - Cannon Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-7	Platanus racemosa	California sycamore	30-36	45-60	45-60	Growing	Good	Private

Location Kelly Ranch - College Boulevard

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-8~~	~~Quercus agrifolia~~	~~coast live oak~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location Agua Hedionda Creek

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-9	Quercus agrifolia	coast live oak	48+	75+	75+	Growing	Poor	Private

Location Agua Hedionda Creek

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-10	Quercus agrifolia	coast live oak	48+	60-75	60-75	Growing	Poor	Private

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location Agua Hedionda Creek

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-11	Quercus dumosa Nutt. in part	Nuttall's scrub oak	12-18	15-30	30-45	Growing	Good	Private

Location Leo Carrillo Rancho Historical Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-12	Platanus racemosa	California sycamore	48+	45-60	75+	Growing	Good	Public

Location Leo Carrillo Rancho Historical Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-13	Quercus hybrid	hybrid oak	12-18	15-30	45-60	Growing	Good	Public

Location Leo Carrillo Rancho Historical Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-14	Dracaena draco	dragon tree	30-36	15-30	30-45	Growing	Good	Public

Location Stagecoach Park

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-15	Eucalyptus cladocalyx	sugar gum	48+	75+	75+	Growing	Good	Public

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location Hosp Grove

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-16	Eucalyptus cladocalyx	sugar gum	48+	75+	45-60	Growing	Good	Public

Location 1250 Carlsbad Village Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-17	Butia capitata	pindo palm	12-18	15-30	0-15	Growing	Good	Public

Location 2778 Arland Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-18	Araucaria bidwillii	bunya-bunya	30-36	45-60	45-60	Growing	Good	Private

Location 2778 Arland Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-19	Melia azedarach	chinaberry	24-30	15-30	30-45	Growing	Good	Private

Location 2684 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-20	Arbutus unedo	strawberry tree	18-24	15-30	45-60	Growing	Good	Private

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location 2635 Crest Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-21	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	Private

Location 1435 Forest Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-22~~	~~Brahea armata~~	~~Mexican blue palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 2361 Cipriano Lane

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-23	Schefflera actinophylla	octopus tree	06-12	30-45	15-30	Growing	Good	Private

Location 1288 Las Flores Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-24	Macadamia spp.	macadamia	18-24	30-45	30-45	Growing	Good	Private

Location 2411 Buena Vista Circle

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~R-25~~	~~Caryota gigas~~	~~king kong fishtail palm~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location 3405 Roosevelt Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-26~~	~~Eucalyptus cladocalyx~~	~~sugar gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Public~~

Location 3470 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-27	Grevillea robusta	silk oak	42-48	45-60	30-45	Growing	Good	Private

Location 3470 Madison Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-28~~	~~Ginkgo biloba~~	~~maidenhair tree~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Public~~

Location 3484 Harding Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-29	Jacaranda mimosifolia	jacaranda	24-30	30-45	75+	Growing	Good	Private

Location 271 Redwood Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-30	Archontophoenix cunninghamia	king palm	06-12	45-60	15-30	Growing	Good	Private

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location 102 Acacia Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-31	Phoenix dactylifera	date palm	12-18	60-75	45-60	Growing	Good	Public

Location 3630 Adams Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-32	Phoenix canariensis	Canary Island date palm	30-36	75+	30-45	Growing	Good	Private

Location 3640 Adams Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-33	Washingtonia robusta	Mexican fan palm	12-18	75+	15-30	Growing	Good	Private

Location 3640 Adams Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
R-34	Araucaria heterophylla	Norfolk Island pine	30-36	75+	15-30	Growing	Fair	Private

Location 3847 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-35	Pinus torreyana	Torrey pine	48+	75+	75+	Growing	Good	Private

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location 3891 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-36	Syzygium jambos	rose apple	18-24	15-30	30-45	Growing	Good	Private

Location 4095 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-37	Eucalyptus ficifolia	red-flowering gum	48+	30-45	30-45	Growing	Fair	Public

Location 4095 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-38	Quercus suber	cork oak	30-36	30-45	45-60	Growing	Good	Private

Location 4403 Highland Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-39	Quercus agrifolia	coast live oak	42-48	45-60	75+	Growing	Fair	Private

Location 4310 Brooks Way

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-40	Dypsis decaryi	triangle palm	18-24	30-45	0-15	Growing	Good	Private

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location 1085 Chinquapin Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-41	Bauhinia variegata	purple orchid tree	24-30	30-45	30-45	Growing	Fair	Public

Location 1060 Chinquapin Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-42~~	~~Eucalyptus erythrocorys~~	~~red-cap gum~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 1049 Chinquapin Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-43	Ficus religiosa	peepul or bo-tree	48+	15-30	75+	Growing	Good	Private

Location 4015 Isle Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-44	Koelreuteria bipinnata	Chinese flame tree	30-36	30-45	45-60	Growing	Good	Private

Location 4135 Park Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-45~~	~~Calocedrus decurrens~~	~~incense cedar~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location 3860 Skyline Road

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
S-46	Podocarpus gracilior	fern pine	30-36	45-60	45-60	Growing	Fair	Private

Location 1905 Magnolia Avenue

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-47	Magnolia grandiflora	Southern magnolia	24-30	30-45	30-45	Growing	Good	Public

Location 2027 Charleen Circle

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-48	Tipuana tipu	tipu tree	36-42	60-75	75+	Growing	Good	Public

Location 2077 Westwood Drive

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-49~~	~~Lagerstromia indica~~	~~crape myrtle~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Location 3215 Maezel Lane

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
~~F-50~~	~~Ficus benjamina~~	~~weeping fig~~	~~n/a~~	~~n/a~~	~~n/a~~	~~Dead~~	~~Dead~~	~~Private~~

Carlsbad Heritage Tree Study Phase II Numerical Listing - 2019

Location 3305 Valley Street

Tree	Botanical Name	Common Name	DBH	Height	Canopy Spread	Vigor	Condition	Owner
F-51	Syzygium paniculatum	brush cherry	18-24	30-45	15-30	Growing	Good	Private

APPENDIX D

Appendix D
Heritage Tree Phase II - Data Summaries

Based on field observations July 2018.

Trunk Diameter

This summary shows the number and percentage of trees in each DBH (Diameter Breast Height) size range. The size ranges are given in inches and the trees are measured at 54" above ground level. The data shows that the largest number of trees, 11 out of 41, (26.83%) are 48"+ in diameter.

DBH (inches)	Count	Percentage (%)
06-12	2	4.88
12-18	5	12.20
18-24	6	14.63
24-30	4	9.76
30-36	9	21.95
36-42	2	4.88
42-48	2	4.88
48+	11	26.83
Total	41	100.00

Height

This summary shows the number and percentage of trees in each Height size range. The size ranges are given in feet. The data shows that the largest number of trees, 12 out of 41 (29.27%), are between 30-45' tall.

Height (feet)	Count	Percentage (%)
15-30	10	24.39
30-45	12	29.27
45-60	8	19.51
60-75	3	7.32
75+	8	19.51
Total	41	100.00

Canopy Spread

This summary shows the number and percentage of trees in each Canopy Spread size range. The size ranges are given in feet. The data shows that the largest number of trees, 11 out of 41 (26.83%), have canopies that are 30-45' wide.

Canopy (feet)	Count	Percentage (%)
0-15	2	4.88
15-30	5	12.20
30-45	11	26.83
45-60	10	24.39
60-75	4	9.76
75+	9	21.95
Total	41	100.00

Condition

This summary shows the number and percentage of trees in each Condition category. Condition rating is the result of numerical scores that are given to various parts of the tree and are then calculated to provide an overall condition rating for the tree. The data shows that the largest number of trees, 31 out of 51 (60.78%), are in Good condition.

Condition	Count	Percentage (%)
Good	31	60.78
Fair	7	13.73
Poor	3	5.88
Dead	10	19.61
Total	51	100.00

APPENDIX E

Appendix E
Repair and Restoration of California Pepper - Heritage Tree #2

Two years ago one of the two major branches split from the tree and opened a crack three feet long by over a foot wide. The branch fortunately landed on the roof of the adjacent underground storeroom. After analyzing the branch failure and the damage to the storeroom I developed a multi-stage repair and restoration work plan for the tree and the storeroom.

A 16” branch resting on the storeroom. The crack is between the two branches. 2018.

Broken door frame and crack in the concrete roof. 2018

With the help of Steve Hooker, and his crew from One Tripp Tree Service, the tree was first pruned to remove all dead and dying branches, and to provide clearance away from the roof of the old adobe house. A few minor structural problems were also corrected by the pruning.

The crew then installed three 5/8" steel rods 3' long to keep the crack from getting any wider. They also installed a 10' long, 8" wide by ½" thick steel plate under the branch where it was resting on the roof of the storeroom. The purpose of the steel plate was to spread the weight of the branch along the structural supporting wall it was resting on.

Repair work in process. Note steel plate on roof. 2018

Concrete blocks and railroad ties were also placed under several long branches to provide additional support and to keep the branches from contacting the soil. This will prevent decay from starting at the contact points.

Compare this picture with the photograph taken at the same location in 1895.
See page 12.

The crew from One Tripp Tree Service from left to right: Sergio Escobedo-foreman, Felipe Garcilazo, Tedoro Gutierrez, Reinaldo Martinez. 2018

Eddie Garcia, a handyman from Encinitas, performed the next phase of the repair work. He replaced the broken door and window frames. He then constructed two internal support beams under the cracks that had developed in the ceiling of the storeroom. He also filled the cracks in the ceiling above the beams with expanding foam.

He then filled the major cracks in the branches with expanding foam to keep rainwater and debris from collecting in the cavities. Eddie then used various colors of spray paint to protect and camouflage the foam and make it look like part of tree. Minor cracks in other branches were also treated the same way.

Laminated beam supporting the roof and resting on the new door frame. 2018

White expanding foam before trimming to conform to the shape of the branches. 2018.

Finished installation, foam trimmed and painted with the branch resting on the steel support plate. 2018

7: EMERGENCY OPERATIONS

EMERGENCY OPERATIONS

Through their professionalism, first responders often make the difference between life and death in extremely challenging conditions when answering the public need in time times of emergencies. Their care and attention to detail sets a high standard for others to follow. It is critical that first responders and other staff be prepared and well-trained for any given situation. A coordinated effort is necessary from multiple departments to ensure that staff is prepared to handle the emergency at hand. This includes emergencies which staff respond to on a less frequent basis, such as tree failures.

While trees provide numerous benefits to the city if they fail trees can affect emergency operations, both in requiring response themselves and in impeding travel to people in need. It is critical for emergency operations personnel to be able to respond with little or no delay from outside influences such as trees blocking access for vehicles. The city acknowledges the critical nature of such operations and supports tree care to reduce the number of tree related incidents, which protects the safety of others.

The goal of the city's tree emergency protocol is to provide rapid response to the public need. It follows similar procedures and lines of communication as other departments. Whether a request for service comes in from a call to a dispatch line or from other city staff, the communication process is located to the right:

1. The Parks Division on-duty person is notified and takes detailed notes of the situation. In the case of a dispatch call, the appropriate specialized department responds. If the Fire Department or other specialized department arrives first and requires assistance from another department, they are to call dispatch to request Park & Recreation or Public Works staff assistance.
2. The on-duty person notifies the tree maintenance supervisor, who would notify other applicable city departments of the situation to keep the public safe. If needed, the Parks & Recreation staff would call additional staff to work that are not already on-call.
3. After assessing the site, the on-duty person addresses the tree or calls for the first available Parks & Recreation on-call tree/landscape maintenance contractor or crew.
4. The on-call contractor or crew responds to the situation, and if additional assistance is needed, the on-duty person calls for additional specialized response. If the situation involves utilities requiring contractors of those companies, the on-duty person calls the utility emergency response number to request immediate assistance. When complete and safe, the on-call contractor or crew notifies the on-duty person to close the request and report the situation back to normal.
5. The on-duty person calls the tree maintenance supervisor to report the completed request.

Debris associated with the emergency may be taken to a holding facility such as a park or a maintenance yard to await further processing and recycling instructions. In the case of potential litigation situations, the debris shall be taken to a secure location under the direction of the tree maintenance supervisor.

If the situation qualifies as a severe national disaster, the city will contact federal authorities for funding via the Federal Emergency Management Act, (FEMA).


HEAVY DUTY
4x4
26543H2

8: COMMUNITY GREEN WASTE, WOOD, AND TREE RECLYCLING PROGRAM

A SUSTAINABLE FUTURE

The City of Carlsbad recognizes the fact that the community's guiding sustainable principles have a lasting impact on the quality of life for its residents and the neighboring cities in the region. The collective efforts of the public and staff combine to form a sustainable system that is both proactive and cost effective. By continually looking for opportunities to expand sustainability efforts into new areas of city life, the community at large grows responsibly without straining available resources.

The City of Carlsbad is proud of its recycling efforts. Making the recycling of green waste and tree byproducts a priority is vital to the success of the community. One way that the city meets sustainability goals is to incorporate the community forest as part of the overall effort. The trees that make up the community forest contribute significant environmental benefits during their lives and can also provide benefits in greenhouse gas reduction through carbon sequestration as urban wood products.

There are many ways in which trees can be recycled yet kept in the community to provide additional job opportunities for artisans, be further used in landscape and hardscape products such as edging or forming, or made into keepsakes as donations. The city will continue to seek new and useful ways to utilize the trees around them as part of the community sustainability effort, and thereby serve the public in a responsible and environmentally friendly manner.

PLANNING FOR THE COMMUNITY FOREST'S FUTURE

When community members lend support to the management of the forest, the CCFMP becomes a unifying document that city staff can rely upon to provide great service to the public.

Neighborhoods in need of revitalization benefit from well-planned infrastructure, as noted in the city's Community Value of neighborhood revitalization, community design and livability. Critical parts of city infrastructure are the community's trees that help make for unique and memorable experiences for the resident and visitor alike.

With the experience of International Society of Arboriculture (ISA) Certified Arborists, the city can be assured that the best trees for the situation will be chosen for the good of the public, such as when city trees and their management are incorporated into the concept design process for new construction, or in planning transportation upgrades. By inviting an arborist's experience into the city planning equation, these projects are further elevated for many years.

Any future planning of the community forest must consider sustainability for long term success. The City of Carlsbad's Community Value of sustainability initiatives and green development is a central feature in the community forest's future. Sustainability is a crucial component of the CCFMP, for without it, essential city resources would be managed less effectively. Community water conservation needs, recycling of green waste and urban forest material, and planning for replacements of aging/declining and problematic trees are all components of a sustainable program that has a net positive effect for the City of Carlsbad.

A community forest management goal for sustainability includes looking for opportunities to highlight replanting projects, demonstrations of proper tree care techniques, and showcasing recycled green or urban wood products. This approach helps ensure that trees and their management continue to be an integral part of the city from the very first concept design to the day a tree fulfills its final purpose in life.

The city will continue to be a leader for sustainability in the region and to share success stories with the public to gain additional support. To ensure the effort to recycle green material continues and grows, and to allow for the best use of city resources, the following policy is offered.

CITY OF CARLSBAD TREE MATERIAL RECYCLING POLICY

The community's forest sustainability effort diverts tree material byproducts away from landfills to reduce greenhouse gas emissions that are released through the traditional disposal processes. This policy also compliments the City of Carlsbad's Climate Action Plan, as a carbon securing measure.

Tree material salvaging plan:

- Any trees that are cut down, dismantled or harvested by the City of Carlsbad are subject to be potentially repurposed.
- This can include but is not limited to being milled into lumber, left in public spaces as natural architecture or crafted into useable products for example, benches, picnic tables, new construction elements and / or other artisan wood worker crafts.
- Resources for processing the wood can include, but are not limited to, Palomar College furniture technology program, or other various wood processing ventures in the region.
- The selection of wood shall be at the discretion of the tree maintenance supervisor or other designated city representative.
- Tree material can be transformed into useable landscape products. The goal of the salvaging plan is to reduce the amount of recyclable material resulting from community forest operations being taken outside the City of Carlsbad, (resulting in increased greenhouse gas emissions), and instead be processed and utilized in the community. Effective methods of tree material recycling should be a focus of City of Carlsbad events that highlight environmental efforts.

Sustainability tree species list:

- There may at times be special locations and events that call for a specific tree to be planted for a stated purpose or reason. The street tree species list includes sustainability species that could also be planted outside of the typical STAD setting in filling vacant planting sites. With this sustainability species list, the city can customize arbor day events, heritage tree replacements, memorials, legacy or honorific ceremonies, etc. These sustainability species trees could have great value in the community forest, and have a wide diversity of native origin and mature sizes, and growth rates to suit the City of Carlsbad's needs. Most of these tree species have value as urban wood when milled, carved as art, etc. and fit within the city's greater sustainability and climate action goals and policies.

Sustainable Tree Species List

SUSTAINABILITY TREE SPECIES LIST

Botanical name	Common Name	Type
Acacia melanoxylon	Black Acacia	Evergreen
Alnus cordata	Italian Alder	Deciduous
Calocedrus decurrens	Incense Cedar	Evergreen
Casuarina equisetifolia	River she-oak	Evergreen
Ceratonia siliqua	Carob tree	Evergreen
Cupressus arizonica	Arizona cypress	Evergreen
Dalbergia sissoo	Indian Rosewood	Deciduous
Eucalyptus camaldulensis	River red gum	Evergreen
Eucalytpus sideroxylon	Red ironbark	Evergreen
Fraxinus uhdei 'Majestic Beauty'	Majestic Beauty ash	Deciduous
Gleditsia tricanthos var. inermis	Thornless honey locust	Deciduous
Grevillea robusta	Silk oak	Evergreen
Hesperocyparis macrocarpa	Monterey cypress	Evergreen
Juglans nigra	Black walnut	Deciduous
Morus alba 'Fruitless'	Fruitless mulberry	Deciduous
Pinus torreyana	Torrey pine	Evergreen
Populus fremontii 'Nevada'	Western cottonwood	Deciduous
Prunus caroliniana	Prunus caroliniana	Evergreen

City of Carlsbad

APPENDIX A
i-Tree Reports

Benefits Summary of Trees by Species

Location: Carlsbad, San Diego, California, United States of America
Project: City of Carlsbad, Series: September 2019, Year: 2019
Generated: 9/12/2019

Species	Trees	Carbon Storage		Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Structural Value
	Number	(ton)	($)	(ton/yr)	($/yr)	(ft³/yr)	($/yr)	(ton/yr)	($/yr)	($)
Bailey acacia	25	1.82	310.47	0.18	31.33	81.76	5.47	0.00	23.98	32,445.91
Knife-leaf Wattle	1	0.15	25.77	0.01	2.45	4.32	0.29	0.00	1.27	2,397.39
Sydney golden wattle	140	20.17	3,439.91	1.59	270.70	624.71	41.76	0.03	183.24	290,921.25
Blackwood	2	0.11	18.68	0.02	2.66	7.62	0.51	0.00	2.23	3,031.33
Japanese maple	3	0.07	12.72	0.01	2.51	6.38	0.43	0.00	1.87	2,117.83
acacia spp	2	0.48	82.30	0.03	5.49	13.85	0.93	0.00	4.06	5,252.37
Shoestring acacia	10	1.44	246.14	0.11	18.77	47.03	3.14	0.00	13.79	18,066.26
afrocarpus spp	412	84.58	14,425.67	6.23	1,063.19	1,673.92	111.89	0.07	490.99	1,044,560.62
Peppermint tree	51	33.95	5,790.13	1.11	189.81	396.19	26.48	0.02	116.21	232,867.32
Tree of heaven	1	3.69	629.70	0.10	16.66	10.41	0.70	0.00	3.05	11,388.59
alder spp	1	1.07	182.24	0.05	8.06	17.15	1.15	0.00	5.03	8,443.53
Italian alder	10	0.48	81.35	0.08	13.19	37.18	2.49	0.00	10.91	15,156.64
Persian silk tree	32	1.14	193.62	0.19	31.59	75.10	5.02	0.00	22.03	32,469.52
White alder	180	34.52	5,887.73	2.81	479.60	1,340.51	89.61	0.06	393.19	468,949.92
areca spp	33	0.17	28.85	0.00	0.52	58.43	3.91	0.00	17.14	6,130.59
araucaria spp	6	0.90	153.14	0.06	9.62	57.25	3.83	0.00	16.79	20,012.18
Alexandra palm	2	0.00	0.72	0.00	0.01	2.06	0.14	0.00	0.60	358.87
Bunya bunya	1	1.30	221.27	0.04	6.18	26.24	1.75	0.00	7.70	16,445.07
Coral reef araucaria	11	3.42	582.68	0.22	36.95	67.00	4.48	0.00	19.65	36,683.89
King palm	450	2.77	472.02	0.06	10.67	786.07	52.55	0.03	230.57	107,086.58
Norfolk island pine	16	5.86	999.13	0.22	37.18	212.06	14.18	0.01	62.20	99,235.36
Marina arbutus	213	7.29	1,242.81	0.87	147.85	316.31	21.14	0.01	92.78	112,229.85
Queen palm	988	8.91	1,519.74	0.21	36.07	1,729.35	115.60	0.07	507.25	317,382.59
Strawberry tree	19	0.80	136.95	0.13	22.19	45.91	3.07	0.00	13.47	24,406.98
Blake's bauhinia	11	1.15	195.60	0.11	19.20	46.39	3.10	0.00	13.61	21,353.18
Mountain ebony	119	12.11	2,064.88	1.17	199.12	509.77	34.08	0.02	149.52	196,287.75
European white birch	12	1.75	298.26	0.16	27.75	29.02	1.94	0.00	8.51	21,582.32
brachychiton spp	1	0.01	1.50	0.00	0.51	0.97	0.06	0.00	0.28	417.02
Schefflera	1	0.48	82.26	0.03	4.99	10.98	0.73	0.00	3.22	4,835.35
Illwarra Flame Tree	96	17.37	2,962.23	1.52	260.02	582.88	38.96	0.02	170.97	250,621.36

Benefits Summary of Trees by Species

Location: Carlsbad, San Diego, California, United States of America
Project: City of Carlsbad, Series: September 2019, Year: 2019
Generated: 9/12/2019

Species	Trees	Carbon Storage		Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Structural Value
	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
Mexican blue palm	13	0.07	11.43	0.00	0.22	24.61	1.65	0.00	7.22	2,968.87
Lacebark	21	15.54	2,650.45	0.76	129.21	278.71	18.63	0.01	81.75	134,097.29
Guadalupe palm	16	0.15	25.95	0.00	0.52	38.19	2.55	0.00	11.20	4,346.79
Kurrajong	350	14.04	2,394.35	1.87	319.68	641.78	42.90	0.03	188.24	303,070.81
Brachichiton rupestris	1	0.47	80.80	0.03	4.99	11.35	0.76	0.00	3.33	4,835.35
Jelly palm	7	0.06	9.86	0.00	0.19	17.77	1.19	0.00	5.21	1,598.62
fishtail palm spp	2	0.00	0.72	0.00	0.01	2.06	0.14	0.00	0.60	358.87
Cape chesnut	31	1.93	328.71	0.25	41.85	107.48	7.18	0.00	31.53	46,173.25
Crimson bottlebrush	23	1.11	189.84	0.18	30.33	20.95	1.40	0.00	6.15	34,860.27
River she-oak	26	4.72	804.61	0.36	60.58	171.20	11.44	0.01	50.21	62,811.67
Incense cedar	2	0.64	109.10	0.03	5.15	18.08	1.21	0.00	5.30	13,012.04
White sapote	2	1.38	235.19	0.07	12.36	18.08	1.21	0.00	5.30	12,393.09
Gold medallion tree	46	1.92	326.66	0.26	44.56	104.09	6.96	0.00	30.53	44,087.35
Burmese fishtail palm	4	0.06	10.52	0.00	0.24	10.23	0.68	0.00	3.00	1,567.85
Northern catalpa	3	0.15	25.13	0.02	4.04	10.35	0.69	0.00	3.03	4,210.90
Spiny holdback	1	0.70	118.69	0.04	6.18	14.48	0.97	0.00	4.25	6,196.55
Coast beefwood	1	0.05	8.96	0.01	1.35	4.01	0.27	0.00	1.18	1,515.66
Weeping bottlebrush	33	5.48	934.43	0.43	73.28	100.79	6.74	0.00	29.56	78,102.20
redbud spp	11	0.49	83.76	0.08	13.02	27.87	1.86	0.00	8.17	14,258.10
cercidium spp	1	0.01	1.50	0.00	0.51	1.46	0.10	0.00	0.43	417.02
Atlas cedar	1	0.35	59.16	0.02	2.75	10.43	0.70	0.00	3.06	7,887.42
Blue atlas cedar	1	0.08	13.52	0.01	1.17	3.53	0.24	0.00	1.04	2,808.30
Eastern redbud	18	2.88	490.58	0.22	36.74	69.31	4.63	0.00	20.33	40,920.77
Deodar cedar	58	10.52	1,793.47	0.57	96.72	332.51	22.23	0.01	97.53	273,642.35
Carob	29	22.05	3,761.08	0.92	157.64	293.00	19.59	0.01	85.94	176,324.57
silk floss tree	4	1.43	243.90	0.09	15.47	35.03	2.34	0.00	10.28	14,923.08
Chamaedorea spp	2	0.01	1.84	0.00	0.05	2.96	0.20	0.00	0.87	358.87
Mediterranean fan palm	33	0.13	22.89	0.00	0.45	52.52	3.51	0.00	15.40	7,991.49
Mexican hand tree	1	0.74	125.43	0.04	6.52	15.76	1.05	0.00	4.62	6,196.55
Palo borracho	14	8.21	1,401.00	0.41	69.88	153.96	10.29	0.01	45.16	72,709.00

Benefits Summary of Trees by Species

Location: Carlsbad, San Diego, California, United States of America
Project: City of Carlsbad, Series: September 2019, Year: 2019
Generated: 9/12/2019

Species	Trees	Carbon Storage		Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Structural Value
	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
Camphor tree	617	66.01	11,258.86	5.97	1,018.33	2,329.46	155.71	0.10	683.27	1,077,321.43
Lemon	1	0.01	2.00	0.00	0.51	1.90	0.13	0.00	0.56	417.02
Grapefruit	1	0.01	1.95	0.00	0.51	1.90	0.13	0.00	0.56	417.02
Tangerine	2	0.21	35.03	0.02	3.82	8.81	0.59	0.00	2.58	3,913.06
Orange	16	0.88	149.56	0.13	21.64	39.78	2.66	0.00	11.67	25,132.35
Lemonscented gum	6	2.62	447.01	0.16	26.59	54.64	3.65	0.00	16.03	25,306.41
Karaka nut	3	0.75	127.92	0.06	9.77	13.40	0.90	0.00	3.93	9,630.14
Spotted gum	5	3.73	635.76	0.18	29.90	83.11	5.56	0.00	24.38	30,125.38
cypress spp	8	0.71	121.81	0.05	8.62	15.39	1.03	0.00	4.52	18,867.79
Carrotwood	610	210.79	35,949.96	12.88	2,195.92	6,171.90	412.57	0.26	1,810.32	2,222,988.41
Leyland cypress	40	1.09	186.67	0.15	25.29	61.20	4.09	0.00	17.95	53,886.65
Monterey cypress	28	12.55	2,140.31	0.40	68.08	159.18	10.64	0.01	46.69	206,172.93
Italian cypress	211	7.68	1,310.29	0.91	154.37	277.18	18.53	0.01	81.30	355,641.29
Sago palm	25	0.25	43.46	0.00	0.17	140.94	9.42	0.01	41.34	12,234.37
Japanese persimmon	1	0.05	8.12	0.01	1.32	3.86	0.26	0.00	1.13	1,515.66
Florida hopbush	4	0.67	114.18	0.05	9.15	17.62	1.18	0.00	5.17	9,165.43
Canary Island dragon tree	7	0.25	42.05	0.00	0.18	129.82	8.68	0.01	38.08	1,256.06
Triangle palm	17	0.06	10.96	0.00	0.20	26.19	1.75	0.00	7.68	3,050.44
Kaffirboom coral tree	22	57.45	9,797.73	1.49	254.33	335.65	22.44	0.01	98.45	336,019.85
Naked coral tree	3	0.14	24.04	0.02	3.91	9.84	0.66	0.00	2.89	4,546.99
Bronze loquat	64	1.03	174.86	0.24	40.53	94.98	6.35	0.00	27.86	37,675.83
Loquat tree	16	2.40	408.70	0.19	32.67	50.15	3.35	0.00	14.71	32,700.98
Lysistemon coral tree	1	3.76	641.35	0.10	16.86	16.82	1.12	0.00	4.93	21,544.80
gum spp	480	172.88	29,485.30	9.29	1,584.43	2,989.12	199.81	0.13	876.76	1,500,765.36
Red gum eucalyptus	694	354.08	60,388.62	16.34	2,787.47	6,435.42	430.18	0.27	1,887.61	2,618,996.12
Silver dollar eucalyptus	21	3.40	580.42	0.23	39.22	56.15	3.75	0.00	16.47	42,395.74
Lemon-scented Gum	335	135.16	23,051.43	7.19	1,226.48	2,514.29	168.07	0.11	737.48	1,114,262.12
Sugargum	876	857.46	146,241.20	30.78	5,249.03	15,161.20	1,013.46	0.64	4,447.02	5,078,723.65
Bald island marlock	4	1.52	259.17	0.09	15.48	27.72	1.85	0.00	8.13	13,839.35
Yate	7	0.37	62.39	0.05	8.86	7.35	0.49	0.00	2.16	8,734.16

Benefits Summary of Trees by Species

Location: Carlsbad, San Diego, California, United States of America
Project: City of Carlsbad, Series: September 2019, Year: 2019
Generated: 9/12/2019

Species	Trees	Carbon Storage		Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Structural Value
	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
Red-cap gum	6	4.30	732.98	0.22	37.62	87.52	5.85	0.00	25.67	32,227.80
Redflower gum	7	5.24	894.34	0.19	33.23	64.48	4.31	0.00	18.91	37,301.92
Blue gum eucalyptus	58	182.46	31,119.04	4.15	707.86	3,071.68	205.33	0.13	900.97	834,541.50
Dwarf blue gum	5	8.94	1,525.00	0.23	38.70	141.42	9.45	0.01	41.48	44,125.04
Flooded gum eucalyptus	2	2.21	376.53	0.08	14.32	40.41	2.70	0.00	11.85	13,438.34
White ironbark	3	2.44	416.43	0.09	15.34	28.78	1.92	0.00	8.44	16,113.90
Bushy yate	65	21.15	3,606.30	1.15	195.38	366.79	24.52	0.02	107.59	192,686.58
Willow-leaved gimlet	182	32.62	5,562.62	2.34	399.59	602.59	40.28	0.03	176.75	394,808.10
Sliver dollar eucalyptus	226	163.92	27,957.25	7.04	1,199.99	2,945.75	196.91	0.12	864.03	1,122,844.29
Silverleaf mountain gum	1	0.47	79.51	0.03	4.88	5.25	0.35	0.00	1.54	4,233.93
Beakpod euclayptus	1	2.49	425.11	0.08	13.11	42.99	2.87	0.00	12.61	13,193.70
Desert gum eucalyptus	101	58.69	10,009.20	2.68	457.86	1,082.58	72.37	0.05	317.54	424,816.59
Sydney blue gum	5	12.20	2,081.55	0.33	55.93	210.51	14.07	0.01	61.75	59,769.83
Mugga ironbark	671	228.53	38,975.64	12.48	2,128.35	4,244.27	283.71	0.18	1,244.91	2,017,385.20
Coral gum	14	0.68	116.40	0.11	18.44	11.98	0.80	0.00	3.51	20,441.43
Ribbon gum eucalyptus	12	18.39	3,135.81	0.60	102.08	325.68	21.77	0.01	95.53	101,280.13
fig spp	1	0.46	79.08	0.03	4.88	5.85	0.39	0.00	1.72	4,835.35
Benjamin fig	51	37.52	6,399.17	1.68	286.00	444.21	29.69	0.02	130.29	307,719.33
Common fig	3	1.49	253.60	0.08	13.26	14.69	0.98	0.00	4.31	13,695.91
Rubber plant	7	19.27	3,286.70	0.45	77.14	98.89	6.61	0.00	29.01	107,083.10
Moreton bay fig	1	3.77	643.44	0.10	16.86	15.67	1.05	0.00	4.60	21,544.80
Caucho microcarpa	7	12.86	2,193.44	0.43	72.55	108.80	7.27	0.00	31.91	85,503.77
Green indian laurel fig	233	158.03	26,952.94	5.66	964.49	1,611.97	107.75	0.07	472.81	1,127,717.82
Rustyleaf fig	83	73.35	12,510.32	3.10	528.81	900.01	60.16	0.04	263.99	574,739.06
ash spp	7	2.68	456.90	0.12	20.81	61.45	4.11	0.00	18.03	30,217.50
Caucasian ash	2	0.58	98.64	0.03	5.68	19.31	1.29	0.00	5.66	8,621.75
Shamel ash	144	51.01	8,699.16	2.38	405.98	1,191.29	79.63	0.05	349.42	578,503.55
Velvet ash	19	7.52	1,281.84	0.38	64.29	210.11	14.05	0.01	61.63	89,829.51
Wilga; australian willow	47	2.16	368.92	0.29	49.05	129.27	8.64	0.01	37.92	51,530.05
Ginkgo	100	4.27	727.79	0.54	92.73	191.10	12.77	0.01	56.05	84,454.95

Benefits Summary of Trees by Species

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Generated: 9/12/2019

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	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
Honeylocust	5	6.22	1,061.24	0.20	33.49	23.06	1.54	0.00	6.76	41,746.02
Silk oak	40	30.06	5,126.29	1.42	242.00	528.00	35.29	0.02	154.87	247,649.01
Wild Plum	95	39.88	6,801.03	2.18	371.95	123.11	8.23	0.01	36.11	393,805.79
Handroanthus heptaphyllus	50	0.51	87.33	0.15	25.35	92.46	6.18	0.00	27.12	20,851.10
Ipe	45	3.08	525.10	0.34	58.12	183.68	12.28	0.01	53.88	52,889.88
Toyon	13	2.53	430.90	0.16	27.68	36.63	2.45	0.00	10.75	32,291.63
Kentia palm	47	0.10	17.78	0.00	0.41	42.73	2.86	0.00	12.53	9,182.46
Sweetshade	1	0.05	8.99	0.01	1.37	3.12	0.21	0.00	0.91	1,515.66
inga spp	1	0.48	82.45	0.03	4.99	12.40	0.83	0.00	3.64	4,835.35
Blue jacaranda	624	90.93	15,508.95	7.65	1,304.54	3,769.61	251.98	0.16	1,105.68	1,316,270.13
Chinese juniper	82	8.53	1,454.71	0.48	81.39	313.67	20.97	0.01	92.00	225,839.70
Hollywood juniper	14	4.10	698.94	0.16	27.02	115.72	7.74	0.00	33.94	78,564.19
sausage tree spp	1	0.15	24.96	0.01	2.52	7.88	0.53	0.00	2.31	2,397.39
Chinese flame tree	590	41.15	7,017.53	4.47	763.08	3,212.72	214.76	0.13	942.34	736,651.95
Goldenrain tree	380	20.91	3,566.87	2.61	445.69	1,184.01	79.15	0.05	347.29	409,823.52
Common crapemyrtle	729	23.70	4,042.76	4.03	687.57	1,105.87	73.92	0.05	324.37	719,068.48
Bay laurel	207	2.03	346.95	0.62	105.47	256.22	17.13	0.01	75.15	86,323.56
Coastal Tea-tree	1	0.05	8.24	0.01	1.32	0.92	0.06	0.00	0.27	1,515.66
Lemon tea-tree	1	0.05	7.88	0.01	1.28	0.67	0.04	0.00	0.20	1,515.66
Broom teatree	2	0.09	15.75	0.02	2.56	1.34	0.09	0.00	0.39	3,031.33
Glossy privet	60	2.74	467.74	0.33	56.89	135.77	9.08	0.01	39.82	51,898.23
Oriental sweetgum	3	0.06	10.05	0.01	1.37	7.01	0.47	0.00	2.06	4,719.11
Sweetgum	210	23.17	3,951.97	1.36	232.62	1,319.91	88.23	0.06	387.15	699,018.42
Tulip tree	76	3.22	549.62	0.41	70.16	348.08	23.27	0.01	102.10	82,260.04
Vinegartree	1,709	214.14	36,520.98	19.70	3,360.65	4,575.16	305.83	0.19	1,341.97	3,367,006.96
Lyontree	15	0.74	126.13	0.12	19.62	41.38	2.77	0.00	12.14	22,734.96
Southern magnolia	1,035	62.03	10,579.75	6.47	1,103.80	2,678.26	179.03	0.11	785.58	1,453,643.35
Mango	1	0.46	78.51	0.03	4.88	1.54	0.10	0.00	0.45	4,835.35
Macadamia nut	5	1.11	189.05	0.08	13.33	22.78	1.52	0.00	6.68	12,902.14
Saucer magnolia	2	0.10	16.53	0.02	2.67	8.10	0.54	0.00	2.38	3,371.95

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Benefits Summary of Trees by Species

Location: Carlsbad, San Diego, California, United States of America
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Species	Trees	Carbon Storage		Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Structural Value
	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
European crabapple	2	0.02	3.00	0.01	1.01	3.14	0.21	0.00	0.92	834.04
Rough-shell macadamia	4	0.20	34.95	0.03	5.37	11.62	0.78	0.00	3.41	6,062.65
melaleuca spp	66	20.82	3,550.31	1.08	183.70	288.72	19.30	0.01	84.69	190,656.71
Chinaberry	3	1.41	239.97	0.08	13.65	37.25	2.49	0.00	10.93	13,908.76
New zealand chrstmas tree	691	30.95	5,278.25	3.87	659.59	593.03	39.64	0.02	173.95	622,290.35
Dawn redwood	2	0.05	7.76	0.01	1.18	3.59	0.24	0.00	1.05	3,371.95
Cajeput tree	13	1.62	275.78	0.12	20.44	34.27	2.29	0.00	10.05	20,276.26
Pink melaleuca	45	3.43	585.15	0.40	68.85	59.21	3.96	0.00	17.37	77,566.63
Punk tree	538	369.85	63,078.11	17.24	2,941.04	5,960.31	398.42	0.25	1,748.25	3,127,434.76
White mulberry	11	2.43	413.63	0.17	29.10	73.26	4.90	0.00	21.49	30,714.95
banana spp	1	0.00	0.59	0.00	0.01	1.81	0.12	0.00	0.53	179.44
myoporum spp	1	0.48	82.56	0.03	4.99	13.21	0.88	0.00	3.88	4,835.35
Mioporo	168	109.88	18,739.86	4.37	745.53	1,321.36	88.33	0.06	387.58	884,279.84
Oleander	45	2.23	381.07	0.34	58.18	93.49	6.25	0.00	27.42	67,106.23
Olive	152	35.26	6,013.72	2.16	369.03	902.28	60.31	0.04	264.65	380,781.28
Olmediella spp	1	0.73	123.90	0.04	6.37	17.85	1.19	0.00	5.24	6,196.55
Jerusalem thorn	1	0.01	1.50	0.00	0.51	1.57	0.11	0.00	0.46	417.02
Avocado	15	7.51	1,281.25	0.35	60.13	117.34	7.84	0.00	34.42	65,891.85
Canary island date palm	134	3.90	665.95	0.07	11.66	653.80	43.70	0.03	191.77	196,702.16
Date palm	17	0.42	71.59	0.01	1.35	72.34	4.84	0.00	21.22	8,685.43
Cuperlin	1	0.05	7.79	0.01	1.28	1.94	0.13	0.00	0.57	1,515.66
Senegal date palm	2	0.03	5.24	0.00	0.12	5.87	0.39	0.00	1.72	1,794.37
Pygmy date palm	100	0.46	78.42	0.01	1.69	127.52	8.52	0.01	37.40	24,121.62
Wild date palm	11	0.04	7.13	0.00	0.16	14.81	0.99	0.00	4.34	3,960.67
pine spp	7	2.27	388.00	0.09	15.91	58.62	3.92	0.00	17.20	51,289.85
cheesewood spp	1	0.01	1.80	0.00	0.54	1.29	0.09	0.00	0.38	417.02
Turkish pine	1	0.90	153.92	0.03	4.61	21.22	1.42	0.00	6.22	18,000.07
Canary island pine	864	168.33	28,708.40	8.81	1,503.05	6,971.15	465.99	0.29	2,044.75	4,042,858.51
Chinese pistache	152	1.64	279.62	0.49	83.63	105.75	7.07	0.00	31.02	68,663.65
Afghan pine	96	4.66	795.41	0.37	63.32	247.35	16.53	0.01	72.55	202,879.98

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	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
Aleppo pine	626	117.95	20,116.90	5.33	909.87	4,076.52	272.50	0.17	1,195.71	2,929,427.63
Jeffery pine	1	1.50	256.60	0.04	6.33	25.01	1.67	0.00	7.34	25,003.04
Pittosporum willow	1	0.69	116.89	0.04	6.14	11.88	0.79	0.00	3.48	6,196.55
Italian stone pine	110	38.59	6,582.01	1.33	227.14	988.25	66.06	0.04	289.87	859,877.50
Monterey pine	185	52.29	8,918.00	2.21	376.90	1,439.46	96.22	0.06	422.22	1,236,915.12
Queensland pittosporum	10	1.78	303.57	0.13	22.80	45.15	3.02	0.00	13.24	24,518.40
Chir pine	96	13.07	2,229.58	0.74	126.98	607.50	40.61	0.03	178.19	364,563.03
Japanese pine	24	3.25	555.02	0.19	32.12	121.08	8.09	0.01	35.51	112,967.73
Japanese black pines	112	4.64	791.43	0.43	72.68	288.25	19.27	0.01	84.55	230,937.01
Japanese pittosporum	3	0.24	41.50	0.03	5.08	10.12	0.68	0.00	2.97	5,428.72
Torrey pine	65	47.09	8,030.54	1.19	203.79	748.69	50.05	0.03	219.60	703,124.86
Victorian box	20	5.80	988.83	0.37	63.39	114.08	7.63	0.00	33.46	66,135.03
sycamore spp	5	1.90	323.65	0.11	18.92	79.18	5.29	0.00	23.23	20,830.42
London planetree	124	13.09	2,232.28	1.25	212.68	843.75	56.40	0.04	247.49	249,813.47
Mexican sycamore	379	27.62	4,710.91	3.04	519.23	2,267.15	151.55	0.10	664.99	521,576.03
California sycamore	155	34.26	5,842.69	2.45	418.45	1,974.90	132.01	0.08	579.27	466,241.72
Frangipani	1	0.01	1.50	0.00	0.51	1.13	0.08	0.00	0.33	417.02
Fremont cottonwood	14	3.19	544.45	0.21	35.90	73.26	4.90	0.00	21.49	24,638.37
Fern pine	377	32.83	5,599.24	2.22	378.75	2,019.45	134.99	0.08	592.34	912,218.40
Long-leafed yellowwood	10	0.31	52.42	0.04	6.62	27.29	1.82	0.00	8.01	15,365.00
Yew podocarpus	12	2.25	384.33	0.11	19.55	130.20	8.70	0.01	38.19	48,255.13
Broad leaf podocarpus	1	0.03	4.71	0.00	0.62	2.16	0.14	0.00	0.63	1,536.50
Lombardy poplar	23	0.87	147.69	0.14	24.63	28.24	1.89	0.00	8.28	29,339.72
plum spp	6	2.15	367.14	0.15	24.86	46.32	3.10	0.00	13.59	20,430.50
mesquite spp	1	0.15	24.96	0.01	2.52	7.53	0.50	0.00	2.21	2,397.39
Blierana plum	47	2.58	440.66	0.42	72.04	116.10	7.76	0.00	34.06	67,467.37
Carolina laurelcherry	41	2.28	389.25	0.37	62.52	103.21	6.90	0.00	30.27	58,846.29
Cherry plum	94	6.12	1,044.11	0.90	153.41	286.71	19.17	0.01	84.10	140,096.03
Catalina cherry	5	0.25	42.37	0.04	7.00	12.08	0.81	0.00	3.54	6,479.68
Peach	3	1.35	229.63	0.07	11.88	11.90	0.80	0.00	3.49	10,376.22

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Common guava	7	0.20	33.35	0.03	5.48	3.36	0.22	0.00	0.99	4,899.52
Pomegranate	1	0.05	7.79	0.01	1.28	0.92	0.06	0.00	0.27	1,515.66
Callery pear	374	18.54	3,161.64	2.53	431.93	675.18	45.13	0.03	198.04	421,291.69
Chanticleer callery pear	1	0.68	115.31	0.04	6.14	11.13	0.74	0.00	3.27	6,196.55
Evergreen pear	224	31.77	5,418.99	2.65	452.46	654.74	43.77	0.03	192.04	488,471.81
Asian pear	1	0.01	1.50	0.00	0.51	0.68	0.05	0.00	0.20	417.02
Coastal live oak	379	57.76	9,850.59	4.62	788.50	1,125.77	75.25	0.05	330.20	814,648.43
Engelmann oak	8	1.92	327.42	0.14	23.11	43.27	2.89	0.00	12.69	26,400.81
Holly oak	813	43.29	7,382.69	6.11	1,041.70	1,905.67	127.39	0.08	558.96	1,174,376.39
Cork oak	18	0.62	106.52	0.10	16.54	29.30	1.96	0.00	8.59	18,377.31
Live oak	379	68.31	11,649.92	5.66	964.56	1,667.49	111.47	0.07	489.10	1,079,314.05
Majesty palm	12	0.05	9.15	0.00	0.18	20.55	1.37	0.00	6.03	2,153.25
rhaphiolepis spp	6	0.18	29.91	0.03	5.41	11.58	0.77	0.00	3.40	5,798.06
African sumac	199	15.04	2,564.76	1.58	269.02	185.61	12.41	0.01	54.44	281,493.52
Black locust	1	0.01	1.50	0.00	0.51	1.43	0.10	0.00	0.42	278.76
Black locust Purple Robe	1	0.05	8.43	0.01	1.35	3.66	0.24	0.00	1.07	1,403.63
Florida royal palm	1	0.01	2.38	0.00	0.05	4.05	0.27	0.00	1.19	179.44
elderberry spp	19	0.87	148.22	0.14	24.34	28.31	1.89	0.00	8.30	28,797.61
Babylon weeping willow	28	3.30	563.12	0.31	52.32	110.50	7.39	0.00	32.41	48,688.63
Red willow	15	0.73	123.84	0.12	19.99	40.21	2.69	0.00	11.80	21,054.51
Chinese Popcorn Tree	1	0.68	116.39	0.04	6.18	11.71	0.78	0.00	3.44	6,196.55
California peppertree	732	192.12	32,766.24	11.47	1,956.59	868.62	58.06	0.04	254.78	2,142,120.22
Brazilian peppertree	283	142.86	24,365.53	6.65	1,133.31	346.62	23.17	0.01	101.67	1,247,914.07
Coast redwood	8	0.35	60.23	0.04	5.97	28.72	1.92	0.00	8.42	13,508.22
Japanese pagoda tree	1	0.05	8.57	0.01	1.37	2.96	0.20	0.00	0.87	1,515.66
African tulip tree	3	1.17	199.22	0.07	11.57	22.74	1.52	0.00	6.67	11,448.92
Bird of paradise tree	12	0.26	44.74	0.00	0.54	106.02	7.09	0.00	31.10	4,379.71
Firewheel tree	4	0.16	27.31	0.03	4.48	9.76	0.65	0.00	2.86	4,964.01
Scrub Cherry	20	0.31	53.21	0.07	12.07	6.32	0.42	0.00	1.86	10,320.81
Syzygium paniculatum	36	2.94	501.04	0.28	47.95	49.53	3.31	0.00	14.53	45,493.82

Benefits Summary of Trees by Species

Location: Carlsbad, San Diego, California, United States of America
Project: City of Carlsbad, Series: September 2019, Year: 2019
Generated: 9/12/2019

Species	Trees	Carbon Storage		Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Structural Value
	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
Syagrus romanzoffiana	962	12.93	2,205.04	0.29	49.62	2,332.79	155.94	0.10	684.24	277,288.19
Athel tamarisk	1	0.70	119.24	0.04	6.22	13.48	0.90	0.00	3.95	6,196.55
Ipe-amarelo	2	0.09	15.85	0.02	2.59	7.04	0.47	0.00	2.06	3,031.33
Luckynut	1	0.05	8.74	0.01	1.35	2.38	0.16	0.00	0.70	1,515.66
Pride of bolivia	211	78.64	13,412.73	4.57	778.92	2,010.68	134.41	0.08	589.76	780,034.45
Windmill palm	9	0.05	8.89	0.00	0.25	12.87	0.86	0.00	3.78	3,239.66
Water gum	138	1.35	230.97	0.42	72.32	33.45	2.24	0.00	9.81	60,844.97
Elegant water gum	3	0.14	24.20	0.02	3.90	2.45	0.16	0.00	0.72	4,546.99
Chinese elm	449	38.70	6,599.91	4.07	693.81	2,741.56	183.26	0.11	804.14	837,344.25
California palm	48	0.41	70.31	0.01	1.27	132.29	8.84	0.01	38.80	12,528.00
Mexican fan palm	1,033	35.71	6,090.12	0.63	107.75	3,557.30	237.79	0.15	1,043.41	272,250.65
Foxtail palm	5	0.01	1.34	0.00	0.03	3.59	0.24	0.00	1.05	897.19
Shiny xylosma	3	0.64	109.50	0.05	8.01	16.84	1.13	0.00	4.94	7,649.77
yucca spp	6	0.04	7.03	0.00	0.04	22.47	1.50	0.00	6.59	1,076.62
Moundlily yucca	71	1.34	228.39	0.01	1.53	678.36	45.35	0.03	198.97	12,740.06
Japanese zelkova	4	0.17	29.72	0.02	4.10	10.41	0.70	0.00	3.05	4,067.97
Total	**28,066**	**5,886.35**	**1,003,922.72**	**327.76**	**55,899.57**	**140,947.38**	**9,421.75**	**5.91**	**41,342.08**	**67,632,377.37**

Carbon storage and gross carbon sequestration value is calculated based on the price of $170.55 per ton.
Avoided runoff value is calculated by the price $0.067/ft³. The user-designated weather station reported 7.8 inches of total annual precipitation.
Pollution removal value is calculated based on the prices of $1,379.71 per ton (CO), $5,672.65 per ton (O3), $742.50 per ton (NO2), $273.88 per ton (SO2), $271,840.03 per ton (PM2.5).
Structural value is the compensatory value calculated based on the local cost of having to replace a tree with a similar tree.
A value of zero may indicate that ancillary data (pollution, weather, energy, etc.) may not available for this location or that the reported amounts are too small to be shown.

Susceptibility to Pests by Stratum

Location: Carlsbad, San Diego, California, United States of America
Project: City of Carlsbad, Series: September 2019, Year: 2019
Generated: 9/12/2019

		Number of Trees		Structural Value ($)		Leaf Area (%)		Leaf Area (ac)	
Pest Name	Stratum	Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible
Aspen Leafminer	Study Area	15	28,051	21,055	67,611,323	0.0	100.0	0.2	658.9
Asian Longhorned Beetle	Study Area	511	27,555	914,568	66,717,809	2.1	97.9	13.5	645.6
Beech Bark Disease	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Butternut Canker	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Balsam Woolly Adelgid	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Chestnut Blight	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Dogwood Anthracnose	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Douglas-fir Black Stain Root Disease	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Dutch Elm Disease	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Douglas-Fir Beetle	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Emerald Ash Borer	Study Area	172	27,894	707,172	66,925,205	1.1	98.9	6.9	652.1
Fir Engraver	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Fusiform Rust	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Gypsy Moth	Study Area	4,278	23,788	8,900,505	58,731,873	9.6	90.4	63.3	595.8
Goldspotted Oak Borer	Study Area	379	27,687	814,648	66,817,729	0.8	99.2	5.3	653.8
Hemlock Woolly Adelgid	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Jeffrey Pine Beetle	Study Area	1	28,065	25,003	67,607,374	0.0	100.0	0.1	659.0
Large Aspen Tortrix	Study Area	218	27,848	535,187	67,097,190	1.0	99.0	6.8	652.2
Laurel Wilt	Study Area	632	27,434	1,143,213	66,489,164	1.7	98.3	11.4	647.6
Mountain Pine Beetle	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Northern Spruce Engraver	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Oak Wilt	Study Area	1,597	26,469	3,113,117	64,519,260	3.4	96.6	22.3	636.8
Pine Black Stain Root Disease	Study Area	1	28,065	25,003	67,607,374	0.0	100.0	0.1	659.0
Port-Orford-Cedar Root Disease	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Pine Shoot Beetle	Study Area	2,075	25,991	10,546,907	57,085,470	10.9	89.1	71.6	587.5
Polyphagous Shot Hole Borer	Study Area	350	27,716	956,246	66,676,131	2.4	97.6	15.7	643.4
Spruce Beetle	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Spruce Budworm	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Sudden Oak Death	Study Area	379	27,687	814,648	66,817,729	0.8	99.2	5.3	653.8
Southern Pine Beetle	Study Area	2,075	25,991	10,546,907	57,085,470	10.9	89.1	71.6	587.5
Sirex Wood Wasp	Study Area	2,075	25,991	10,546,907	57,085,470	10.9	89.1	71.6	587.5
Thousand Canker Disease	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1

Susceptibility to Pests by Stratum

Location: Carlsbad, San Diego, California, United States of America
Project: City of Carlsbad, Series: September 2019, Year: 2019
Generated: 9/12/2019

		Number of Trees		Structural Value ($)		Leaf Area (%)		Leaf Area (ac)	
Pest Name	Stratum	Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible
Winter Moth	Study Area	802	27,264	2,045,207	65,587,170	2.2	97.8	14.6	644.4
Western Pine Beetle	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
White Pine Blister Rust	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
Western Spruce Budworm	Study Area	0	28,066	0	67,632,377	0.0	100.0	0.0	659.1
All Pests	Study Area	6,938	21,128	21,248,870	46,383,507	24.1	75.9	158.8	500.2

Note: this table tells the potential pest risk rather than actual pest impact

i-Tree
Ecosystem Analysis

City of Carlsbad

Urban Forest Effects and Values
September 2019

Summary

Understanding an urban forest's structure, function and value can promote management decisions that will improve human health and environmental quality. An assessment of the vegetation structure, function, and value of the City of Carlsbad urban forest was conducted during 2019. Data from 28066 trees located throughout City of Carlsbad were analyzed using the i-Tree Eco model developed by the U.S. Forest Service, Northern Research Station.

- Number of trees: 28,066
- Tree Cover: 156.8 acres
- Most common species of trees: Vinegartree, Southern magnolia, Mexican fan palm
- Percentage of trees less than 6" (15.2 cm) diameter: 60.5%
- Pollution Removal: 5.911 tons/year ($41.3 thousand/year)
- Carbon Storage: 5.886 thousand tons ($1 million)
- Carbon Sequestration: 327.8 tons ($55.9 thousand/year)
- Oxygen Production: 874 tons/year
- Avoided Runoff: 140.9 thousand cubic feet/year ($9.42 thousand/year)
- Building energy savings: N/A – data not collected
- Avoided carbon emissions: N/A – data not collected
- Structural values: $67.6 million

Ton: short ton (U.S.) (2,000 lbs)
Monetary values $ are reported in US Dollars throughout the report except where noted.
Ecosystem service estimates are reported for trees.

For an overview of i-Tree Eco methodology, see Appendix I. Data collection quality is determined by the local data collectors, over which i-Tree has no control.

Table of Contents

I. Tree Characteristics of the Urban Forest

The urban forest of City of Carlsbad has 28,066 trees with a tree cover of Vinegartree. The three most common species are Vinegartree (6.1 percent), Southern magnolia (3.7 percent), and Mexican fan palm (3.7 percent).

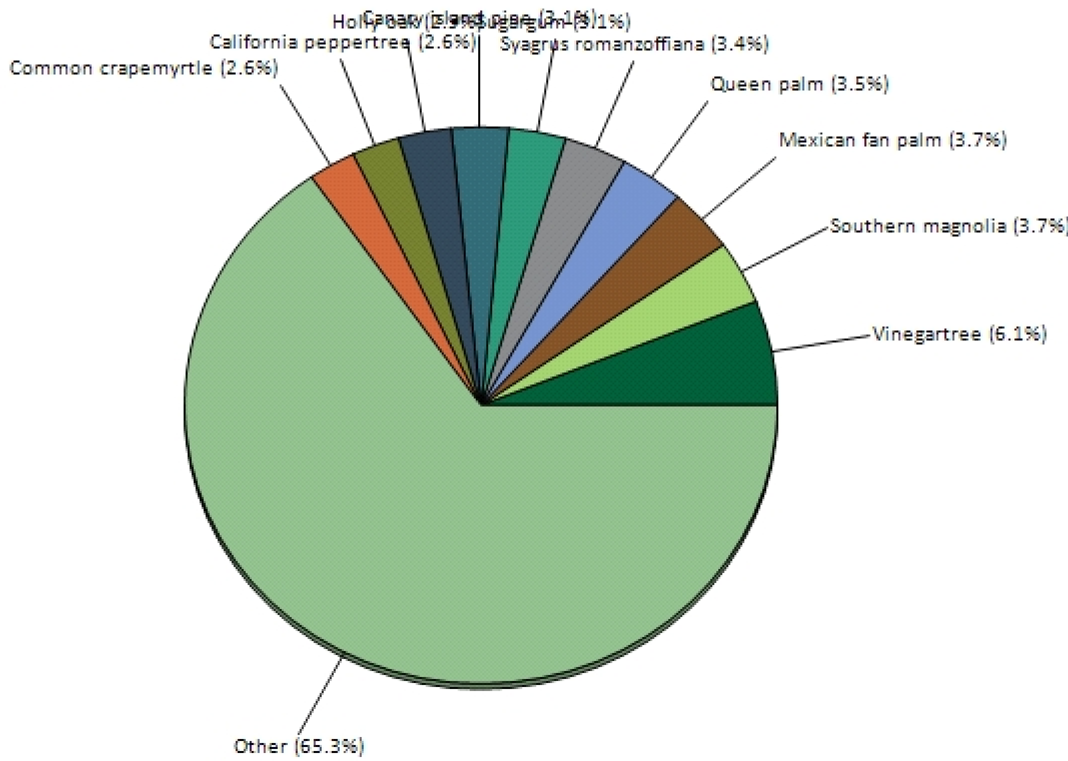


Figure 1. Tree species composition in City of Carlsbad

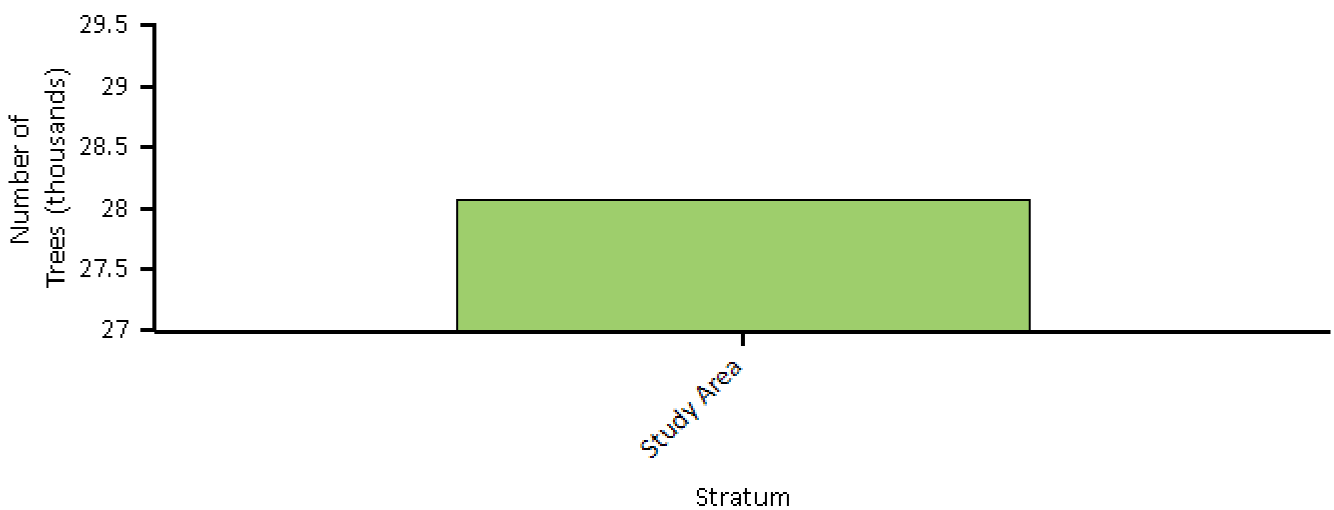


Figure 2. Number of trees in City of Carlsbad by stratum

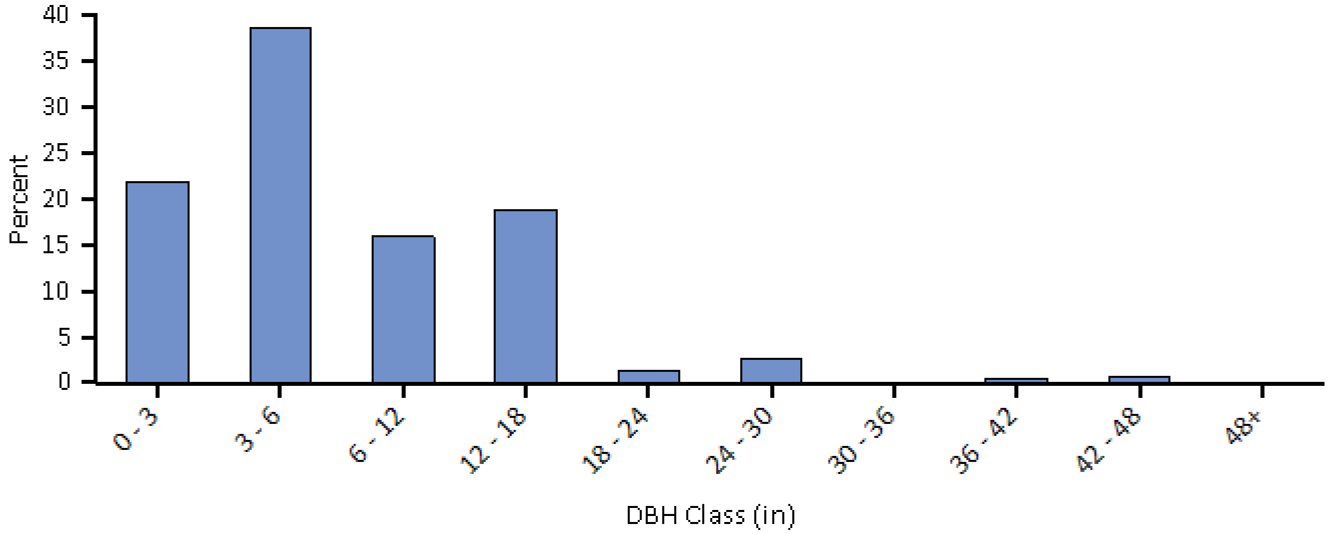


Figure 3. Percent of tree population by diameter class (DBH - stem diameter at 4.5 feet)

Urban forests are composed of a mix of native and exotic tree species. Thus, urban forests often have a tree diversity that is higher than surrounding native landscapes. Increased tree diversity can minimize the overall impact or destruction by a species-specific insect or disease, but it can also pose a risk to native plants if some of the exotic species are invasive plants that can potentially out-compete and displace native species. In City of Carlsbad, about 15 percent of the trees are species native to North America, while 4 percent are native to California. Species exotic to North America make up 85 percent of the population. Most exotic tree species have an origin from Australia (27 percent of the species).

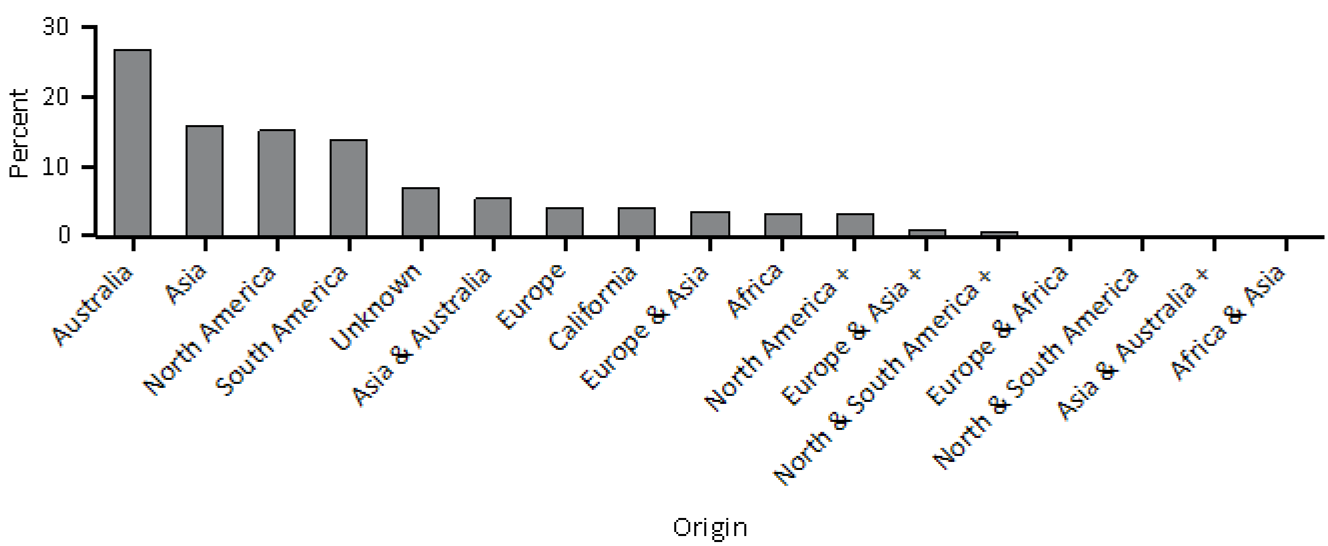


Figure 4. Percent of live tree population by area of native origin, City of Carlsbad

The plus sign (+) indicates the tree species is native to another continent other than the ones listed in the grouping.

Invasive plant species are often characterized by their vigor, ability to adapt, reproductive capacity, and general lack of natural enemies. These abilities enable them to displace native plants and make them a threat to natural areas. Four of the 256 tree species in City of Carlsbad are identified as invasive on the state invasive species list (California Invasive Species Advisory Committee 2010). These invasive species comprise 3.8 percent of the tree population though they may only cause a minimal level of impact. The three most common invasive species are California peppertree (2.6 percent of population), Brazilian peppertree (1.0 percent), and Blue gum eucalyptus (0.2 percent) (see Appendix V for a complete list of invasive species).

II. Urban Forest Cover and Leaf Area

Many tree benefits equate directly to the amount of healthy leaf surface area of the plant. Trees cover about 156.8 acres of City of Carlsbad and provide 659.1 acres of leaf area.

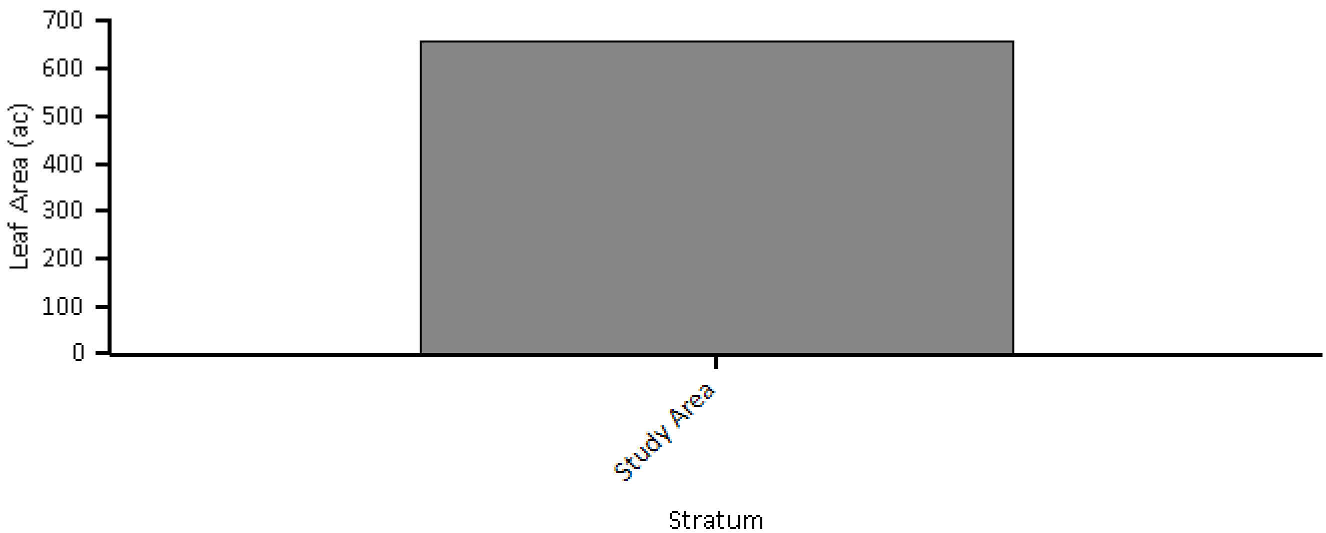


Figure 5. Leaf area by stratum, City of Carlsbad

In City of Carlsbad, the most dominant species in terms of leaf area are Sugargum, Canary island pine, and Red gum eucalyptus. The 10 species with the greatest importance values are listed in Table 1. Importance values (IV) are calculated as the sum of percent population and percent leaf area. High importance values do not mean that these trees should necessarily be encouraged in the future; rather these species currently dominate the urban forest structure.

Table 1. Most important species in City of Carlsbad

Species Name	*Percent Population*	*Percent Leaf Area*	*IV*
Sugargum	3.1	10.8	13.9
Vinegartree	6.1	3.2	9.3
Canary island pine	3.1	4.9	8.0
Red gum eucalyptus	2.5	4.6	7.0
Carrotwood	2.2	4.4	6.6
Mexican fan palm	3.7	2.5	6.2
Punk tree	1.9	4.2	6.1
Southern magnolia	3.7	1.9	5.6
Mugga ironbark	2.4	3.0	5.4
Aleppo pine	2.2	2.9	5.1

Common ground cover classes (including cover types beneath trees and shrubs) in City of Carlsbad are not available since they are configured not to be collected.

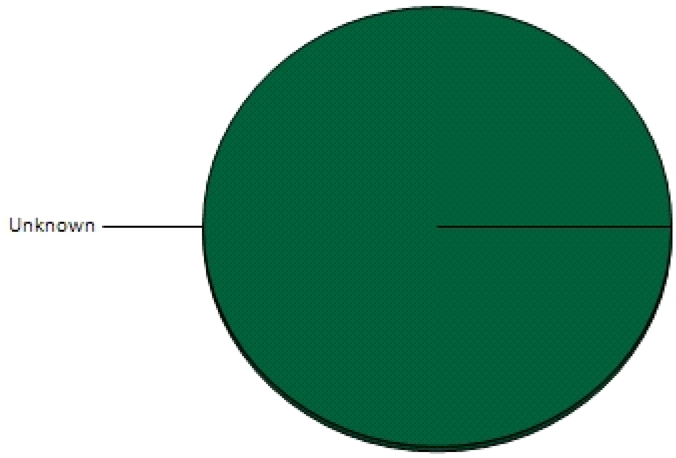


Figure 6. Percent of land by ground cover classes, City of Carlsbad

III. Air Pollution Removal by Urban Trees

Poor air quality is a common problem in many urban areas. It can lead to decreased human health, damage to landscape materials and ecosystem processes, and reduced visibility. The urban forest can help improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings, which consequently reduces air pollutant emissions from the power sources. Trees also emit volatile organic compounds that can contribute to ozone formation. However, integrative studies have revealed that an increase in tree cover leads to reduced ozone formation (Nowak and Dwyer 2000).

Pollution removal[1] by trees in City of Carlsbad was estimated using field data and recent available pollution and weather data available. Pollution removal was greatest for ozone (Figure 7). It is estimated that trees remove 5.911 tons of air pollution (ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 2.5 microns (PM2.5)[2], and sulfur dioxide (SO2)) per year with an associated value of $41.3 thousand (see Appendix I for more details).

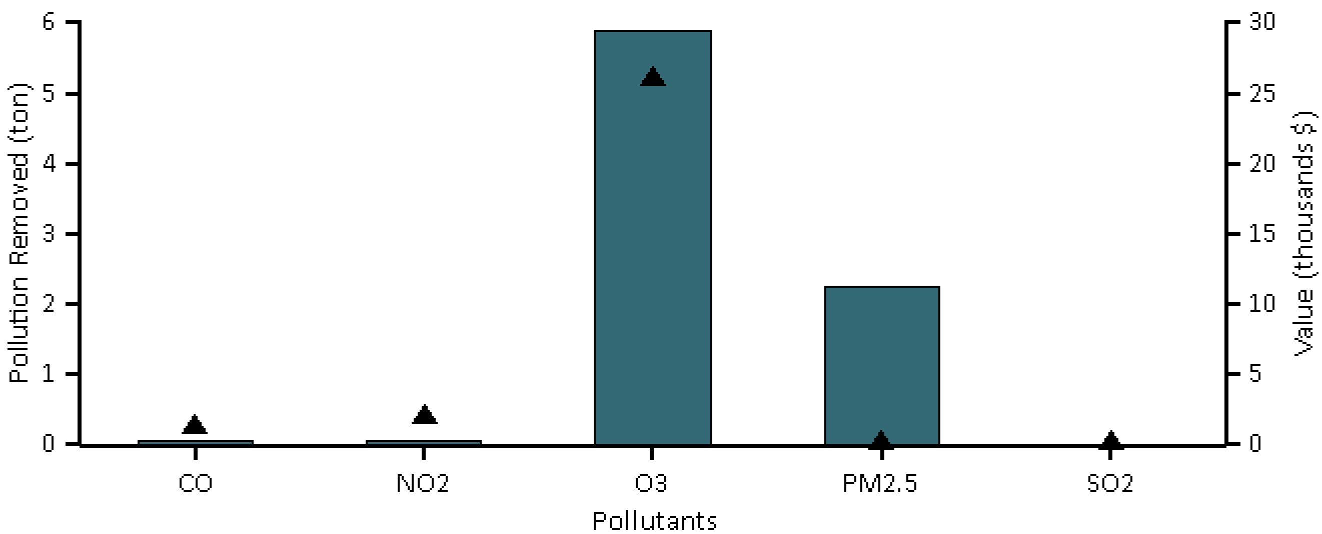


Figure 7. Annual pollution removal (points) and value (bars) by urban trees, City of Carlsbad

[1] Particulate matter less than 10 microns is a significant air pollutant. Given that i-Tree Eco analyzes particulate matter less than 2.5 microns (PM2.5) which is a subset of PM10, PM10 has not been included in this analysis. PM2.5 is generally more relevant in discussions concerning air pollution effects on human health.

[2] Trees remove PM2.5 when particulate matter is deposited on leaf surfaces. This deposited PM2.5 can be resuspended to the atmosphere or removed during rain events and dissolved or transferred to the soil. This combination of events can lead to positive or negative pollution removal and value depending on various atmospheric factors (see Appendix I for more details).

In 2019, trees in City of Carlsbad emitted an estimated 9.28 tons of volatile organic compounds (VOCs) (7.404 tons of isoprene and 1.877 tons of monoterpenes). Emissions vary among species based on species characteristics (e.g. some genera such as oaks are high isoprene emitters) and amount of leaf biomass. Thirty- seven percent of the urban forest's VOC emissions were from Sugargum and Red gum eucalyptus. These VOCs are precursor chemicals to ozone formation.[3]

General recommendations for improving air quality with trees are given in Appendix VIII.

[3] Some economic studies have estimated VOC emission costs. These costs are not included here as there is a tendency to add positive dollar estimates of ozone removal effects with negative dollar values of VOC emission effects to determine whether tree effects are positive or negative in relation to ozone. This combining of dollar values to determine tree effects should not be done, rather estimates of VOC effects on ozone formation (e.g., via photochemical models) should be conducted and directly contrasted with ozone removal by trees (i.e., ozone effects should be directly compared, not dollar estimates). In addition, air temperature reductions by trees have been shown to significantly reduce ozone concentrations (Cardelino and Chameides 1990; Nowak et al 2000), but are not considered in this analysis. Photochemical modeling that integrates tree effects on air temperature, pollution removal, VOC emissions, and emissions from power plants can be used to determine the overall effect of trees on ozone concentrations.

IV. Carbon Storage and Sequestration

Climate change is an issue of global concern. Urban trees can help mitigate climate change by sequestering atmospheric carbon (from carbon dioxide) in tissue and by altering energy use in buildings, and consequently altering carbon dioxide emissions from fossil-fuel based power sources (Abdollahi et al 2000).

Trees reduce the amount of carbon in the atmosphere by sequestering carbon in new growth every year. The amount of carbon annually sequestered is increased with the size and health of the trees. The gross sequestration of City of Carlsbad trees is about 327.8 tons of carbon per year with an associated value of $55.9 thousand. See Appendix I for more details on methods.

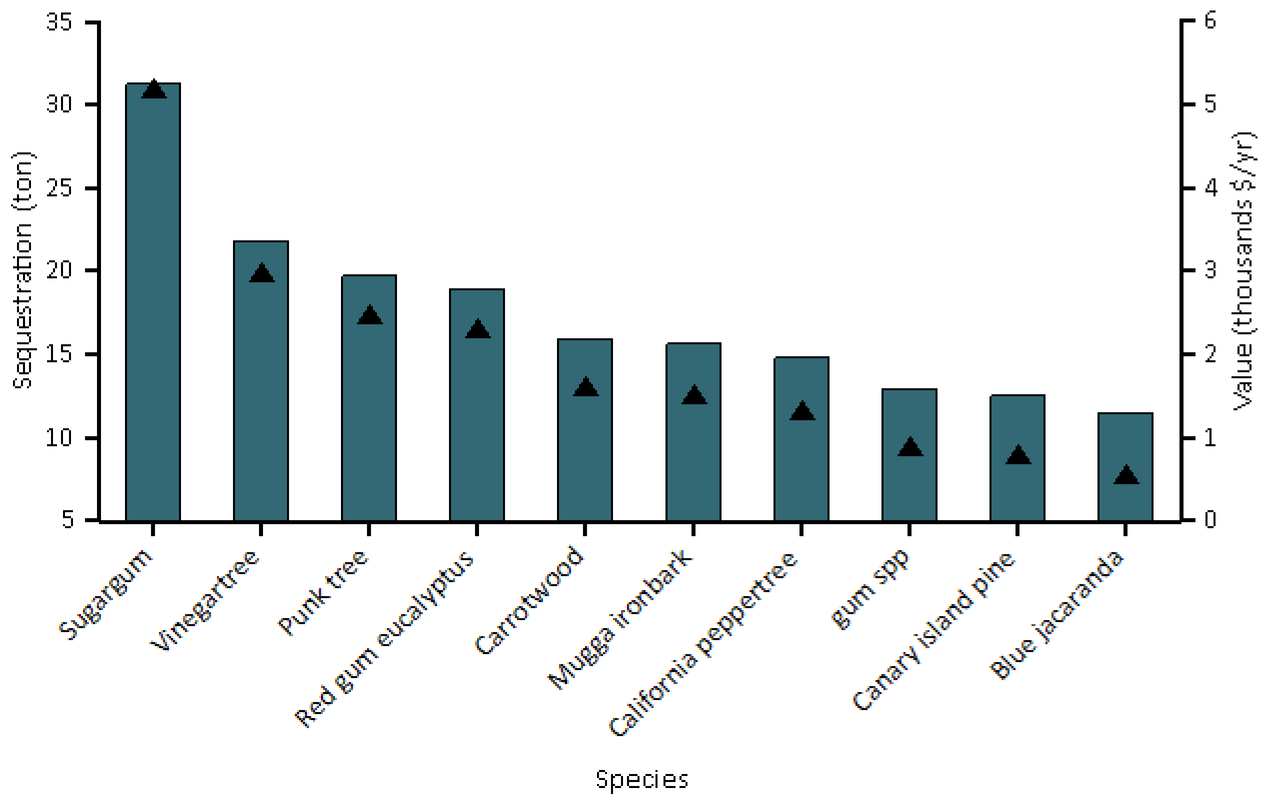


Figure 8. Estimated annual gross carbon sequestration (points) and value (bars) for urban tree species with the greatest sequestration, City of Carlsbad

Carbon storage is another way trees can influence global climate change. As a tree grows, it stores more carbon by holding it in its accumulated tissue. As a tree dies and decays, it releases much of the stored carbon back into the atmosphere. Thus, carbon storage is an indication of the amount of carbon that can be released if trees are allowed to die and decompose. Maintaining healthy trees will keep the carbon stored in trees, but tree maintenance can contribute to carbon emissions (Nowak et al 2002c). When a tree dies, using the wood in long-term wood products, to heat buildings, or to produce energy will help reduce carbon emissions from wood decomposition or from fossil-fuel or wood-based power plants.

Trees in City of Carlsbad are estimated to store 5890 tons of carbon ($1 million). Of the species sampled, Sugargum stores and sequesters the most carbon (approximately 14.6% of the total carbon stored and 9.39% of all sequestered carbon.)

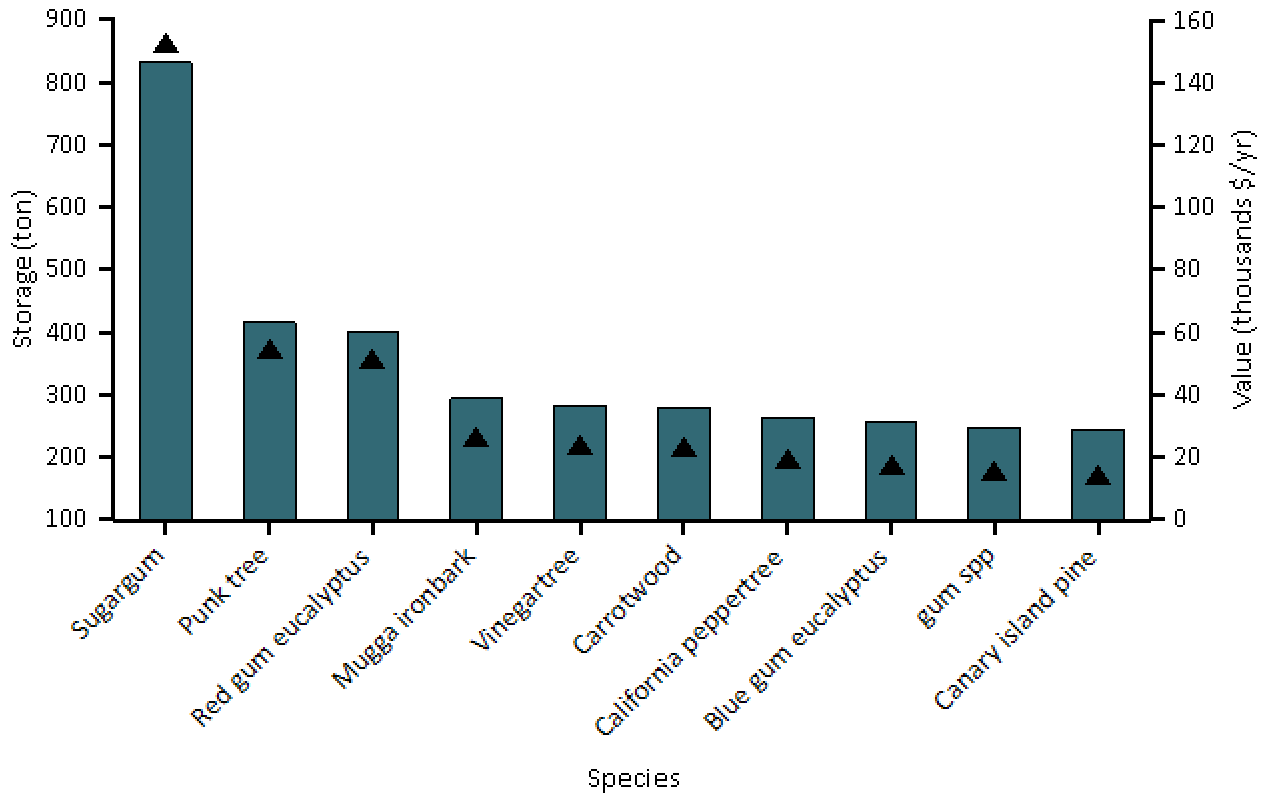


Figure 9. Estimated carbon storage (points) and values (bars) for urban tree species with the greatest storage, City of Carlsbad

V. Oxygen Production

Oxygen production is one of the most commonly cited benefits of urban trees. The annual oxygen production of a tree is directly related to the amount of carbon sequestered by the tree, which is tied to the accumulation of tree biomass.

Trees in City of Carlsbad are estimated to produce 874 tons of oxygen per year.[4] However, this tree benefit is relatively insignificant because of the large and relatively stable amount of oxygen in the atmosphere and extensive production by aquatic systems. Our atmosphere has an enormous reserve of oxygen. If all fossil fuel reserves, all trees, and all organic matter in soils were burned, atmospheric oxygen would only drop a few percent (Broecker 1970).

Table 2. The top 20 oxygen production species.

Species	*Oxygen (ton)*	*Gross Carbon Sequestration (ton/yr)*	*Number of Trees*	*Leaf Area (acre)*
Sugargum	82.07	30.78	876	70.89
Vinegartree	52.55	19.70	1,709	21.39
Punk tree	45.98	17.24	538	27.87
Red gum eucalyptus	43.58	16.34	694	30.09
Carrotwood	34.33	12.88	610	28.86
Mugga ironbark	33.28	12.48	671	19.85
California peppertree	30.59	11.47	732	4.06
gum spp	24.77	9.29	480	13.98
Canary island pine	23.50	8.81	864	32.60
Blue jacaranda	20.40	7.65	624	17.63
Lemon-scented Gum	19.18	7.19	335	11.76
Sliver dollar eucalyptus	18.76	7.04	226	13.77
Brazilian peppertree	17.72	6.65	283	1.62
Southern magnolia	17.26	6.47	1,035	12.52
afrocarpus spp	16.62	6.23	412	7.83
Holly oak	16.29	6.11	813	8.91
Camphor tree	15.92	5.97	617	10.89
Live oak	15.08	5.66	379	7.80
Green indian laurel fig	15.08	5.66	233	7.54
Aleppo pine	14.23	5.33	626	19.06

VI. Avoided Runoff

Surface runoff can be a cause for concern in many urban areas as it can contribute pollution to streams, wetlands, rivers, lakes, and oceans. During precipitation events, some portion of the precipitation is intercepted by vegetation (trees and shrubs) while the other portion reaches the ground. The portion of the precipitation that reaches the ground and does not infiltrate into the soil becomes surface runoff (Hirabayashi 2012). In urban areas, the large extent of impervious surfaces increases the amount of surface runoff.

Urban trees and shrubs, however, are beneficial in reducing surface runoff. Trees and shrubs intercept precipitation, while their root systems promote infiltration and storage in the soil. The trees and shrubs of City of Carlsbad help to reduce runoff by an estimated 141 thousand cubic feet a year with an associated value of $9.4 thousand (see Appendix I for more details). Avoided runoff is estimated based on local weather from the user-designated weather station. In City of Carlsbad, the total annual precipitation in 2015 was 7.8 inches.

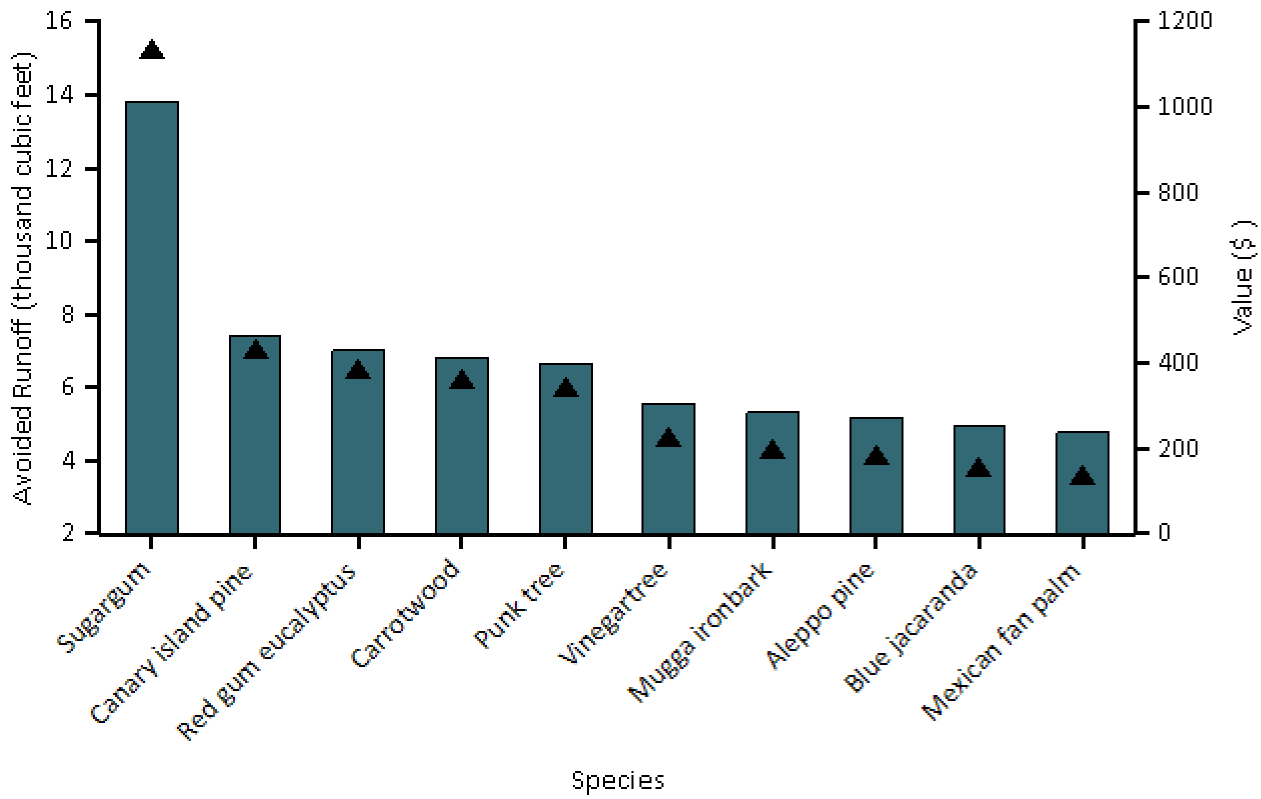


Figure 10. Avoided runoff (points) and value (bars) for species with greatest overall impact on runoff, City of Carlsbad

VII. Trees and Building Energy Use

Trees affect energy consumption by shading buildings, providing evaporative cooling, and blocking winter winds. Trees tend to reduce building energy consumption in the summer months and can either increase or decrease building energy use in the winter months, depending on the location of trees around the building. Estimates of tree effects on energy use are based on field measurements of tree distance and direction to space conditioned residential buildings (McPherson and Simpson 1999).

Because energy-related data were not collected, energy savings and carbon avoided cannot be calculated.

Table 3. Annual energy savings due to trees near residential buildings, City of Carlsbad

	Heating	*Cooling*	*Total*
MBTU[a]	0	N/A	0
MWH[b]	0	0	0
Carbon Avoided (pounds)	0	0	0

[a]MBTU - one million British Thermal Units

[b]MWH - megawatt-hour

Table 4. Annual savings [a]($) in residential energy expenditure during heating and cooling seasons, City of Carlsbad

	Heating	*Cooling*	*Total*
MBTU[b]	0	N/A	0
MWH[c]	0	0	0
Carbon Avoided	0	0	0

[b]Based on the prices of $154.533333333333 per MWH and $11.3778342925966 per MBTU (see Appendix I for more details)

[c]MBTU - one million British Thermal Units

[c]MWH - megawatt-hour

[5] Trees modify climate, produce shade, and reduce wind speeds. Increased energy use or costs are likely due to these tree-building interactions creating a cooling effect during the winter season. For example, a tree (particularly evergreen species) located on the southern side of a residential building may produce a shading effect that causes increases in heating requirements.

VIII. Structural and Functional Values

Urban forests have a structural value based on the trees themselves (e.g., the cost of having to replace a tree with a similar tree); they also have functional values (either positive or negative) based on the functions the trees perform.

The structural value of an urban forest tends to increase with a rise in the number and size of healthy trees (Nowak et al 2002a). Annual functional values also tend to increase with increased number and size of healthy trees. Through proper management, urban forest values can be increased; however, the values and benefits also can decrease as the amount of healthy tree cover declines.

Urban trees in City of Carlsbad have the following structural values:

- Structural value: $67.6 million
- Carbon storage: $1 million

Urban trees in City of Carlsbad have the following annual functional values:

- Carbon sequestration: $55.9 thousand
- Avoided runoff: $9.42 thousand
- Pollution removal: $41.3 thousand
- Energy costs and carbon emission values: $0

(Note: negative value indicates increased energy cost and carbon emission value)

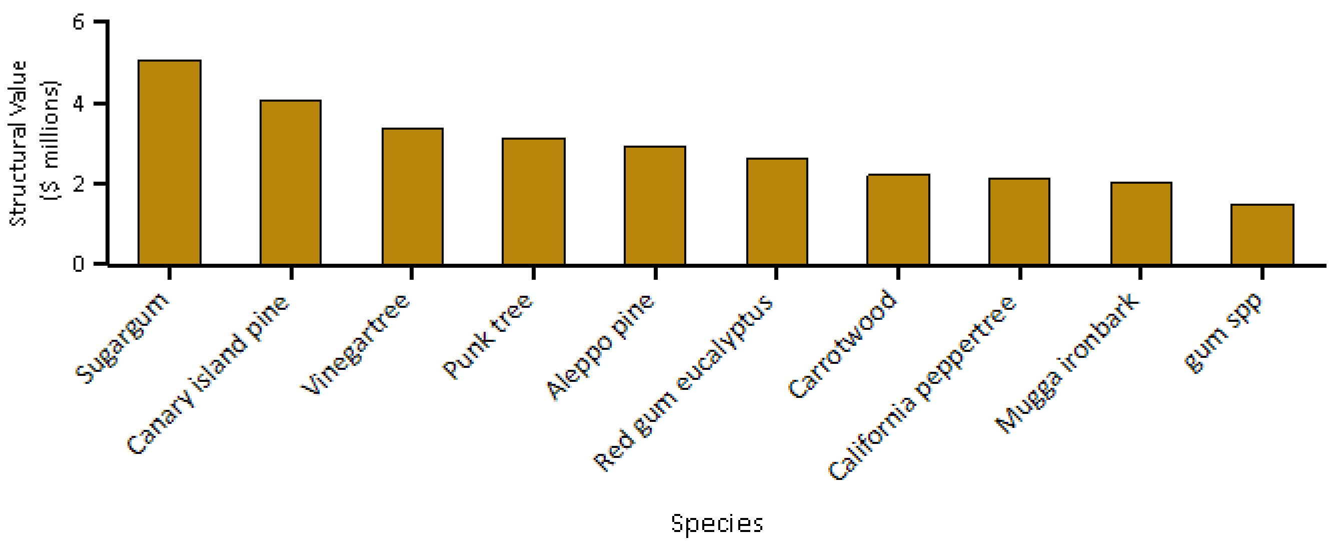


Figure 11. Tree species with the greatest structural value, City of Carlsbad

IX. Potential Pest Impacts

Various insects and diseases can infest urban forests, potentially killing trees and reducing the health, structural value and sustainability of the urban forest. As pests tend to have differing tree hosts, the potential damage or risk of each pest will differ among cities.Thirty-six pests were analyzed for their potential impact and compared with pest range maps (Forest Health Technology Enterprise Team 2014) for the conterminous United States to determine their proximity to San Diego County. Six of the thirty-six pests analyzed are located within the county. For a complete analysis of all pests, see Appendix VII.

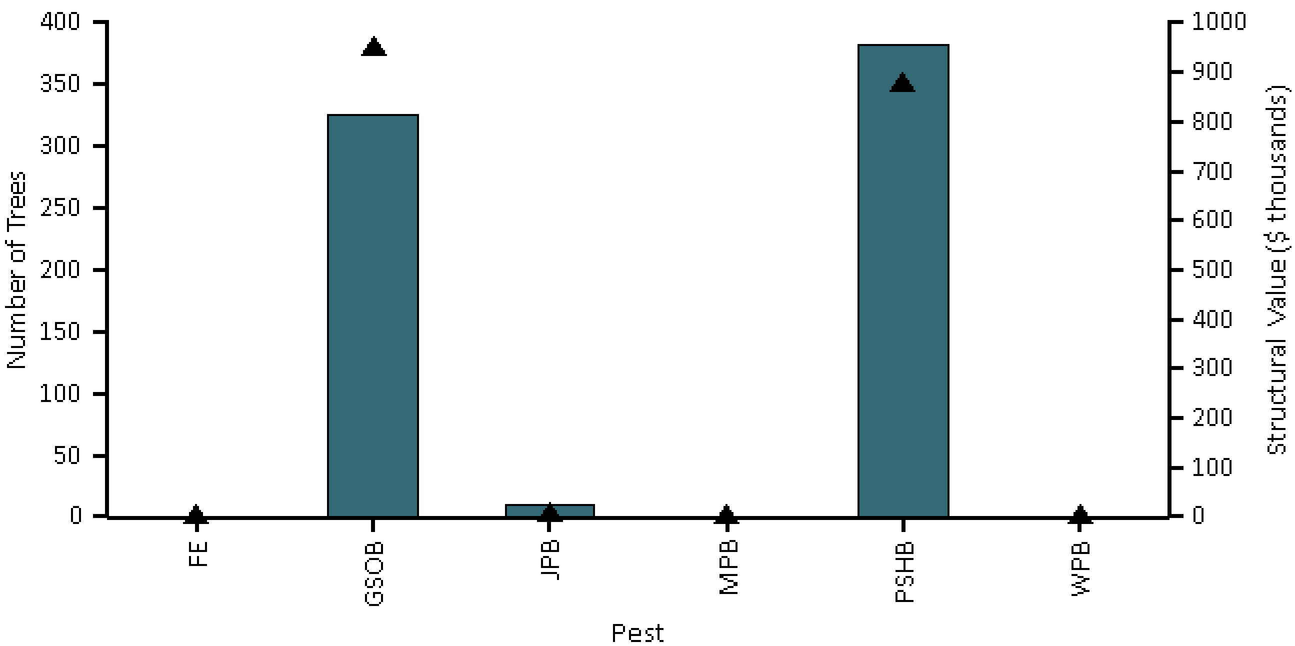


Figure 12. Number of trees at risk (points) and associated compensatory value (bars) for most threatening pests located in the county, City of Carlsbad

One common pest of white fir, grand fir, and red fir trees is the fir engraver (FE) (Ferrell 1986). FE poses a threat to 0.0 percent of the City of Carlsbad urban forest, which represents a potential loss of $0 in structural value.

Infestations of the goldspotted oak borer (GSOB) (Society of American Foresters 2011) have been a growing problem in southern California. Potential loss of trees from GSOB is 1.4 percent ($815 thousand in structural value).

The Jeffrey pine beetle (JPB) (Smith et al 2009) is native to North America and is distributed across California, Nevada, and Oregon where its only host, Jeffrey pine, also occurs. This pest threatens 0.0 percent of the population, which represents a potential loss of $25 thousand in structural value.

Mountain pine beetle (MPB) (Gibson et al 2009) is a bark beetle that primarily attacks pine species in the western United States. MPB has the potential to affect 0.0 percent of the population ($0 in structural value).

Polyphagous shot hole borer (PSHB) (University of California 2014) is a boring beetle that was first detected in California. City of Carlsbad could possibly lose 1.2 percent of its trees to this pest ($956 thousand in structural value).

The western pine beetle (WPB) (DeMars and Roettgering 1982) is a bark beetle and aggressive attacker of ponderosa and Coulter pines. This pest threatens 0.0 percent of the population, which represents a potential loss of $0 in structural value.

Appendix I. i-Tree Eco Model and Field Measurements

i-Tree Eco is designed to use standardized field data and local hourly air pollution and meteorological data to quantify urban forest structure and its numerous effects (Nowak and Crane 2000), including:

- Urban forest structure (e.g., species composition, tree health, leaf area, etc.).
- Amount of pollution removed hourly by the urban forest, and its associated percent air quality improvement throughout a year.
- Total carbon stored and net carbon annually sequestered by the urban forest.
- Effects of trees on building energy use and consequent effects on carbon dioxide emissions from power sources.
- Structural value of the forest, as well as the value for air pollution removal and carbon storage and sequestration.
- Potential impact of infestations by pests, such as Asian longhorned beetle, emerald ash borer, gypsy moth, and Dutch elm disease.

Typically, all field data are collected during the leaf-on season to properly assess tree canopies. Typical data collection (actual data collection may vary depending upon the user) includes land use, ground and tree cover, individual tree attributes of species, stem diameter, height, crown width, crown canopy missing and dieback, and distance and direction to residential buildings (Nowak et al 2005; Nowak et al 2008).

During data collection, trees are identified to the most specific taxonomic classification possible. Trees that are not classified to the species level may be classified by genus (e.g., ash) or species groups (e.g., hardwood). In this report, tree species, genera, or species groups are collectively referred to as tree species.

<u>Tree Characteristics:</u>

Leaf area of trees was assessed using measurements of crown dimensions and percentage of crown canopy missing. In the event that these data variables were not collected, they are estimated by the model.

An analysis of invasive species is not available for studies outside of the United States. For the U.S., invasive species are identified using an invasive species list (California Invasive Species Advisory Committee 2010)for the state in which the urban forest is located. These lists are not exhaustive and they cover invasive species of varying degrees of invasiveness and distribution. In instances where a state did not have an invasive species list, a list was created based on the lists of the adjacent states. Tree species that are identified as invasive by the state invasive species list are cross-referenced with native range data. This helps eliminate species that are on the state invasive species list, but are native to the study area.

<u>Air Pollution Removal:</u>

Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter less than 2.5 microns. Particulate matter less than 10 microns (PM10) is another significant air pollutant. Given that i-Tree Eco analyzes particulate matter less than 2.5 microns (PM2.5) which is a subset of PM10, PM10 has not been included in this analysis. PM2.5 is generally more relevant in discussions concerning air pollution effects on human health.

Air pollution removal estimates are derived from calculated hourly tree-canopy resistances for ozone, and sulfur and nitrogen dioxides based on a hybrid of big-leaf and multi-layer canopy deposition models (Baldocchi 1988; Baldocchi et al 1987). As the removal of carbon monoxide and particulate matter by vegetation is not directly related to transpiration, removal rates (deposition velocities) for these pollutants were based on average measured values from the literature (Bidwell and Fraser 1972; Lovett 1994) that were adjusted depending on leaf phenology and leaf area.

Particulate removal incorporated a 50 percent resuspension rate of particles back to the atmosphere (Zinke 1967). Recent updates (2011) to air quality modeling are based on improved leaf area index simulations, weather and pollution processing and interpolation, and updated pollutant monetary values (Hirabayashi et al 2011; Hirabayashi et al 2012; Hirabayashi 2011).

Trees remove PM2.5 when particulate matter is deposited on leaf surfaces (Nowak et al 2013). This deposited PM2.5 can be resuspended to the atmosphere or removed during rain events and dissolved or transferred to the soil. This combination of events can lead to positive or negative pollution removal and value depending on various atmospheric factors. Generally, PM2.5 removal is positive with positive benefits. However, there are some cases when net removal is negative or resuspended particles lead to increased pollution concentrations and negative values. During some months (e.g., with no rain), trees resuspend more particles than they remove. Resuspension can also lead to increased overall PM2.5 concentrations if the boundary layer conditions are lower during net resuspension periods than during net removal periods. Since the pollution removal value is based on the change in pollution concentration, it is possible to have situations when trees remove PM2.5 but increase concentrations and thus have negative values during periods of positive overall removal. These events are not common, but can happen.

For reports in the United States, default air pollution removal value is calculated based on local incidence of adverse health effects and national median externality costs. The number of adverse health effects and associated economic value is calculated for ozone, sulfur dioxide, nitrogen dioxide, and particulate matter less than 2.5 microns using data from the U.S. Environmental Protection Agency's Environmental Benefits Mapping and Analysis Program (BenMAP) (Nowak et al 2014). The model uses a damage-function approach that is based on the local change in pollution concentration and population. National median externality costs were used to calculate the value of carbon monoxide removal (Murray et al 1994).

For international reports, user-defined local pollution values are used. For international reports that do not have local values, estimates are based on either European median externality values (van Essen et al 2011) or BenMAP regression equations (Nowak et al 2014) that incorporate user-defined population estimates. Values are then converted to local currency with user-defined exchange rates.

For this analysis, pollution removal value is calculated based on the prices of \$1,380 per ton (carbon monoxide), \$5,673 per ton (ozone), \$743 per ton (nitrogen dioxide), \$274 per ton (sulfur dioxide), \$271,840 per ton (particulate matter less than 2.5 microns).

<u>Carbon Storage and Sequestration:</u>

Carbon storage is the amount of carbon bound up in the above-ground and below-ground parts of woody vegetation. To calculate current carbon storage, biomass for each tree was calculated using equations from the literature and measured tree data. Open-grown, maintained trees tend to have less biomass than predicted by forest-derived biomass equations (Nowak 1994). To adjust for this difference, biomass results for open-grown urban trees were multiplied by 0.8. No adjustment was made for trees found in natural stand conditions. Tree dry-weight biomass was converted to stored carbon by multiplying by 0.5.

Carbon sequestration is the removal of carbon dioxide from the air by plants. To estimate the gross amount of carbon sequestered annually, average diameter growth from the appropriate genera and diameter class and tree condition was added to the existing tree diameter (year x) to estimate tree diameter and carbon storage in year x+1.

Carbon storage and carbon sequestration values are based on estimated or customized local carbon values. For international reports that do not have local values, estimates are based on the carbon value for the United States (U.S. Environmental Protection Agency 2015, Interagency Working Group on Social Cost of Carbon 2015) and converted to local currency with user-defined exchange rates.

For this analysis, carbon storage and carbon sequestration values are calculated based on $171 per ton.

Oxygen Production:

The amount of oxygen produced is estimated from carbon sequestration based on atomic weights: net O2 release (kg/yr) = net C sequestration (kg/yr) × 32/12. To estimate the net carbon sequestration rate, the amount of carbon sequestered as a result of tree growth is reduced by the amount lost resulting from tree mortality. Thus, net carbon sequestration and net annual oxygen production of the urban forest account for decomposition (Nowak et al 2007). For complete inventory projects, oxygen production is estimated from gross carbon sequestration and does not account for decomposition.

Avoided Runoff:

Annual avoided surface runoff is calculated based on rainfall interception by vegetation, specifically the difference between annual runoff with and without vegetation. Although tree leaves, branches, and bark may intercept precipitation and thus mitigate surface runoff, only the precipitation intercepted by leaves is accounted for in this analysis.

The value of avoided runoff is based on estimated or user-defined local values. For international reports that do not have local values, the national average value for the United States is utilized and converted to local currency with user-defined exchange rates. The U.S. value of avoided runoff is based on the U.S. Forest Service's Community Tree Guide Series (McPherson et al 1999; 2000; 2001; 2002; 2003; 2004; 2006a; 2006b; 2006c; 2007; 2010; Peper et al 2009; 2010; Vargas et al 2007a; 2007b; 2008).

For this analysis, avoided runoff value is calculated based on the price of $0.07 per ft^3.

Building Energy Use:

If appropriate field data were collected, seasonal effects of trees on residential building energy use were calculated based on procedures described in the literature (McPherson and Simpson 1999) using distance and direction of trees from residential structures, tree height and tree condition data. To calculate the monetary value of energy savings, local or custom prices per MWH or MBTU are utilized.

For this analysis, energy saving value is calculated based on the prices of $154.53 per MWH and $11.38 per MBTU.

Structural Values:

Structural value is the value of a tree based on the physical resource itself (e.g., the cost of having to replace a tree with a similar tree). Structural values were based on valuation procedures of the Council of Tree and Landscape Appraisers, which uses tree species, diameter, condition, and location information (Nowak et al 2002a; 2002b). Structural value may not be included for international projects if there is insufficient local data to complete the valuation procedures.

Potential Pest Impacts:

The complete potential pest risk analysis is not available for studies outside of the United States. The number of trees at risk to the pests analyzed is reported, though the list of pests is based on known insects and disease in the United States.

For the U.S., potential pest risk is based on pest range maps and the known pest host species that are likely to experience mortality. Pest range maps for 2012 from the Forest Health Technology Enterprise Team (FHTET) (Forest Health Technology Enterprise Team 2014) were used to determine the proximity of each pest to the county in which the urban forest is located. For the county, it was established whether the insect/disease occurs within the county, is within 250 miles of the county edge, is between 250 and 750 miles away, or is greater than 750 miles away. FHTET did not have pest range maps for Dutch elm disease and chestnut blight. The range of these pests was based on known occurrence and the host range, respectively (Eastern Forest Environmental Threat Assessment Center; Worrall 2007).

Relative Tree Effects:

The relative value of tree benefits reported in Appendix II is calculated to show what carbon storage and sequestration, and air pollutant removal equate to in amounts of municipal carbon emissions, passenger automobile emissions, and house emissions.

Municipal carbon emissions are based on 2010 U.S. per capita carbon emissions (Carbon Dioxide Information Analysis Center 2010). Per capita emissions were multiplied by city population to estimate total city carbon emissions.

Light duty vehicle emission rates (g/mi) for CO, NOx, VOCs, PM10, SO2 for 2010 (Bureau of Transportation Statistics 2010; Heirigs et al 2004), PM2.5 for 2011-2015 (California Air Resources Board 2013), and CO2 for 2011 (U.S. Environmental Protection Agency 2010) were multiplied by average miles driven per vehicle in 2011 (Federal Highway Administration 2013) to determine average emissions per vehicle.

Household emissions are based on average electricity kWh usage, natural gas Btu usage, fuel oil Btu usage, kerosene Btu usage, LPG Btu usage, and wood Btu usage per household in 2009 (Energy Information Administration 2013; Energy Information Administration 2014)

- CO2, SO2, and NOx power plant emission per KWh are from Leonardo Academy 2011. CO emission per kWh assumes 1/3 of one percent of C emissions is CO based on Energy Information Administration 1994. PM10 emission per kWh from Layton 2004.
- CO2, NOx, SO2, and CO emission per Btu for natural gas, propane and butane (average used to represent LPG), Fuel #4 and #6 (average used to represent fuel oil and kerosene) from Leonardo Academy 2011.
- CO2 emissions per Btu of wood from Energy Information Administration 2014.
- CO, NOx and SOx emission per Btu based on total emissions and wood burning (tons) from (British Columbia Ministry 2005; Georgia Forestry Commission 2009).

Appendix II. Relative Tree Effects

The urban forest in City of Carlsbad provides benefits that include carbon storage and sequestration, and air pollutant removal. To estimate the relative value of these benefits, tree benefits were compared to estimates of average municipal carbon emissions, average passenger automobile emissions, and average household emissions. See Appendix I for methodology.

Carbon storage is equivalent to:
- Amount of carbon emitted in City of Carlsbad in 4 days
- Annual carbon (C) emissions from 4,160 automobiles
- Annual C emissions from 1,710 single-family houses

Carbon monoxide removal is equivalent to:
- Annual carbon monoxide emissions from 2 automobiles
- Annual carbon monoxide emissions from 6 single-family houses

Nitrogen dioxide removal is equivalent to:
- Annual nitrogen dioxide emissions from 57 automobiles
- Annual nitrogen dioxide emissions from 26 single-family houses

Sulfur dioxide removal is equivalent to:
- Annual sulfur dioxide emissions from 237 automobiles
- Annual sulfur dioxide emissions from 1 single-family houses

Annual carbon sequestration is equivalent to:
- Amount of carbon emitted in City of Carlsbad in 0.2 days
- Annual C emissions from 200 automobiles
- Annual C emissions from 100 single-family houses

Appendix III. Comparison of Urban Forests

A common question asked is, "How does this city compare to other cities?" Although comparison among cities should be made with caution as there are many attributes of a city that affect urban forest structure and functions, summary data are provided from other cities analyzed using the i-Tree Eco model.

I. City totals for trees

City	*% Tree Cover*	*Number of Trees*	*Carbon Storage (tons)*	*Carbon Sequestration (tons/yr)*	*Pollution Removal (tons/yr)*
Toronto, ON, Canada	26.6	10,220,000	1,221,000	51,500	2,099
Atlanta, GA	36.7	9,415,000	1,344,000	46,400	1,663
Los Angeles, CA	11.1	5,993,000	1,269,000	77,000	1,975
New York, NY	20.9	5,212,000	1,350,000	42,300	1,676
London, ON, Canada	24.7	4,376,000	396,000	13,700	408
Chicago, IL	17.2	3,585,000	716,000	25,200	888
Baltimore, MD	21.0	2,479,000	570,000	18,400	430
Philadelphia, PA	15.7	2,113,000	530,000	16,100	575
Washington, DC	28.6	1,928,000	525,000	16,200	418
Oakville, ON , Canada	29.1	1,908,000	147,000	6,600	190
Boston, MA	22.3	1,183,000	319,000	10,500	283
Syracuse, NY	26.9	1,088,000	183,000	5,900	109
Woodbridge, NJ	29.5	986,000	160,000	5,600	210
Minneapolis, MN	26.4	979,000	250,000	8,900	305
San Francisco, CA	11.9	668,000	194,000	5,100	141
Morgantown, WV	35.5	658,000	93,000	2,900	72
Moorestown, NJ	28.0	583,000	117,000	3,800	118
Hartford, CT	25.9	568,000	143,000	4,300	58
Jersey City, NJ	11.5	136,000	21,000	890	41
Casper, WY	8.9	123,000	37,000	1,200	37
Freehold, NJ	34.4	48,000	20,000	540	22

II. Totals per acre of land area

City	*Number of Trees/ac*	*Carbon Storage (tons/ac)*	*Carbon Sequestration (tons/ac/yr)*	*Pollution Removal (lb/ac/yr)*
Toronto, ON, Canada	64.9	7.8	0.33	26.7
Atlanta, GA	111.6	15.9	0.55	39.4
Los Angeles, CA	19.6	4.2	0.16	13.1
New York, NY	26.4	6.8	0.21	17.0
London, ON, Canada	75.1	6.8	0.24	14.0
Chicago, IL	24.2	4.8	0.17	12.0
Baltimore, MD	48.0	11.1	0.36	16.6
Philadelphia, PA	25.1	6.3	0.19	13.6
Washington, DC	49.0	13.3	0.41	21.2
Oakville, ON , Canada	78.1	6.0	0.27	11.0
Boston, MA	33.5	9.1	0.30	16.1
Syracuse, NY	67.7	10.3	0.34	13.6
Woodbridge, NJ	66.5	10.8	0.38	28.4
Minneapolis, MN	26.2	6.7	0.24	16.3
San Francisco, CA	22.5	6.6	0.17	9.5
Morgantown, WV	119.2	16.8	0.52	26.0
Moorestown, NJ	62.1	12.4	0.40	25.1
Hartford, CT	50.4	12.7	0.38	10.2
Jersey City, NJ	14.4	2.2	0.09	8.6
Casper, WY	9.1	2.8	0.09	5.5
Freehold, NJ	38.3	16.0	0.44	35.3

Appendix IV. General Recommendations for Air Quality Improvement

Urban vegetation can directly and indirectly affect local and regional air quality by altering the urban atmosphere environment. Four main ways that urban trees affect air quality are (Nowak 1995):

- Temperature reduction and other microclimate effects
- Removal of air pollutants
- Emission of volatile organic compounds (VOC) and tree maintenance emissions
- Energy effects on buildings

The cumulative and interactive effects of trees on climate, pollution removal, and VOC and power plant emissions determine the impact of trees on air pollution. Cumulative studies involving urban tree impacts on ozone have revealed that increased urban canopy cover, particularly with low VOC emitting species, leads to reduced ozone concentrations in cities (Nowak 2000). Local urban management decisions also can help improve air quality.

Urban forest management strategies to help improve air quality include (Nowak 2000):

Strategy	*Result*
Increase the number of healthy trees	Increase pollution removal
Sustain existing tree cover	Maintain pollution removal levels
Maximize use of low VOC-emitting trees	Reduces ozone and carbon monoxide formation
Sustain large, healthy trees	Large trees have greatest per-tree effects
Use long-lived trees	Reduce long-term pollutant emissions from planting and removal
Use low maintenance trees	Reduce pollutants emissions from maintenance activities
Reduce fossil fuel use in maintaining vegetation	Reduce pollutant emissions
Plant trees in energy conserving locations	Reduce pollutant emissions from power plants
Plant trees to shade parked cars	Reduce vehicular VOC emissions
Supply ample water to vegetation	Enhance pollution removal and temperature reduction
Plant trees in polluted or heavily populated areas	Maximizes tree air quality benefits
Avoid pollutant-sensitive species	Improve tree health
Utilize evergreen trees for particulate matter	Year-round removal of particles

Appendix V. Invasive Species of the Urban Forest

The following inventoried tree species were listed as invasive on the California invasive species list (California Invasive Species Advisory Committee 2010):

Species Name[a]	*Number of Trees*	*% of Trees*	*Leaf Area (ac)*	*Percent Leaf Area*
California peppertree	732	2.6	4.1	0.6
Brazilian peppertree	283	1.0	1.6	0.2
Blue gum eucalyptus	58	0.2	14.4	2.2
Tree of heaven	1	0.0	0.0	0.0
Total	**1,074**	**3.83**	**20.09**	**3.05**

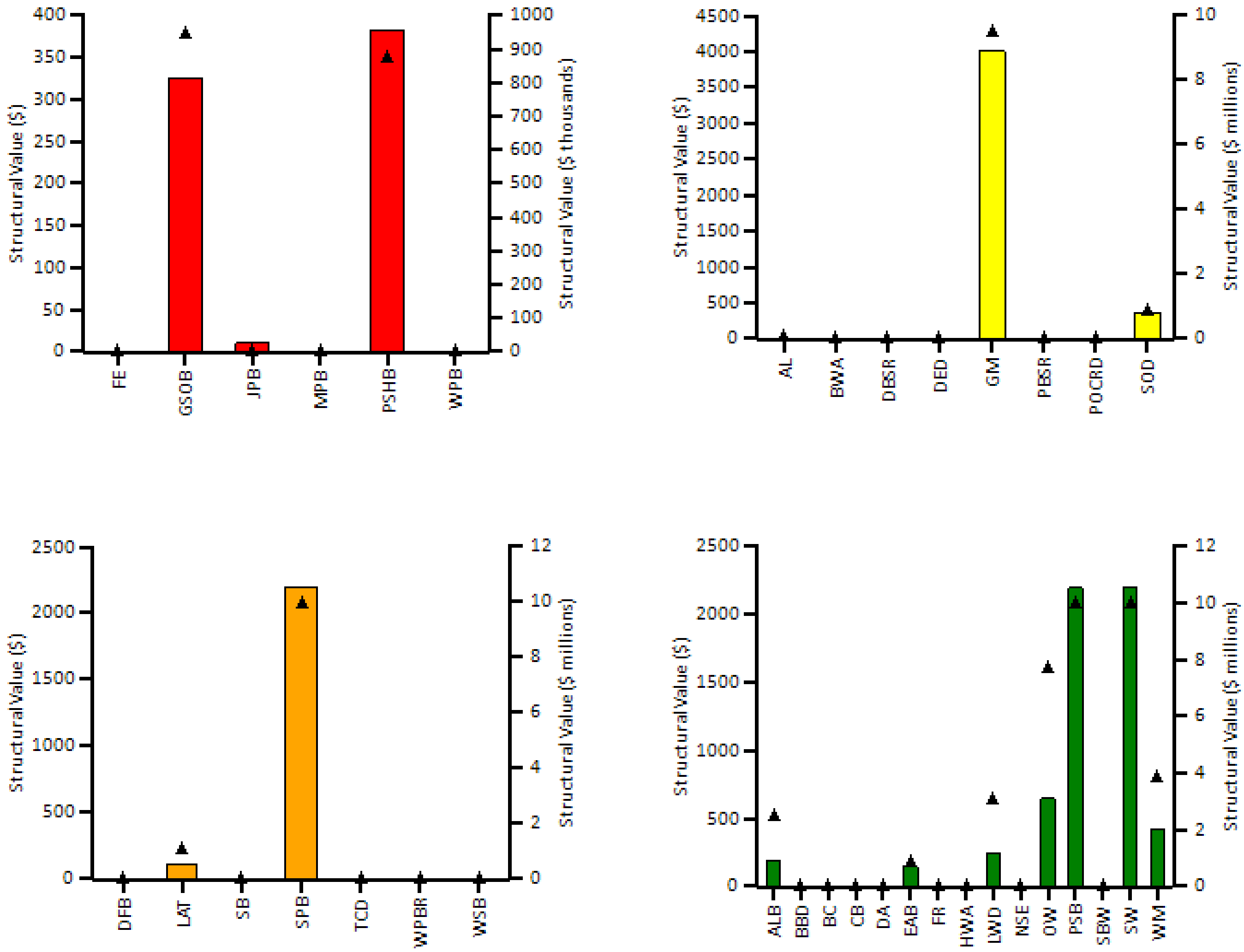
[a]Species are determined to be invasive if they are listed on the state's invasive species list

Appendix VI. Potential Risk of Pests

Thirty-six insects and diseases were analyzed to quantify their potential impact on the urban forest. As each insect/disease is likely to attack different host tree species, the implications for {0} will vary. The number of trees at risk reflects only the known host species that are likely to experience mortality.

Code	Scientific Name	Common Name	Trees at Risk (#)	Value ($ millions)
AL	Phyllocnistis populiella	Aspen Leafminer	15	0.02
ALB	Anoplophora glabripennis	Asian Longhorned Beetle	511	0.91
BBD	Neonectria faginata	Beech Bark Disease	0	0.00
BC	Sirococcus clavigignenti juglandacearum	Butternut Canker	0	0.00
BWA	Adelges piceae	Balsam Woolly Adelgid	0	0.00
CB	Cryphonectria parasitica	Chestnut Blight	0	0.00
DA	Discula destructiva	Dogwood Anthracnose	0	0.00
DBSR	Leptographium wageneri var. pseudotsugae	Douglas-fir Black Stain Root Disease	0	0.00
DED	Ophiostoma novo-ulmi	Dutch Elm Disease	0	0.00
DFB	Dendroctonus pseudotsugae	Douglas-Fir Beetle	0	0.00
EAB	Agrilus planipennis	Emerald Ash Borer	172	0.71
FE	Scolytus ventralis	Fir Engraver	0	0.00
FR	Cronartium quercuum f. sp. Fusiforme	Fusiform Rust	0	0.00
GM	Lymantria dispar	Gypsy Moth	4,278	8.90
GSOB	Agrilus auroguttatus	Goldspotted Oak Borer	379	0.81
HWA	Adelges tsugae	Hemlock Woolly Adelgid	0	0.00
JPB	Dendroctonus jeffreyi	Jeffrey Pine Beetle	1	0.03
LAT	Choristoneura conflictana	Large Aspen Tortrix	218	0.54
LWD	Raffaelea lauricola	Laurel Wilt	632	1.14
MPB	Dendroctonus ponderosae	Mountain Pine Beetle	0	0.00
NSE	Ips perturbatus	Northern Spruce Engraver	0	0.00
OW	Ceratocystis fagacearum	Oak Wilt	1,597	3.11
PBSR	Leptographium wageneri var. ponderosum	Pine Black Stain Root Disease	1	0.03
POCRD	Phytophthora lateralis	Port-Orford-Cedar Root Disease	0	0.00
PSB	Tomicus piniperda	Pine Shoot Beetle	2,075	10.55
PSHB	Euwallacea nov. sp.	Polyphagous Shot Hole Borer	350	0.96
SB	Dendroctonus rufipennis	Spruce Beetle	0	0.00
SBW	Choristoneura fumiferana	Spruce Budworm	0	0.00
SOD	Phytophthora ramorum	Sudden Oak Death	379	0.81
SPB	Dendroctonus frontalis	Southern Pine Beetle	2,075	10.55
SW	Sirex noctilio	Sirex Wood Wasp	2,075	10.55
TCD	Geosmithia morbida	Thousand Canker Disease	0	0.00
WM	Operophtera brumata	Winter Moth	802	2.05
WPB	Dendroctonus brevicomis	Western Pine Beetle	0	0.00
WPBR	Cronartium ribicola	White Pine Blister Rust	0	0.00
WSB	Choristoneura occidentalis	Western Spruce Budworm	0	0.00

In the following graph, the pests are color coded according to the county's proximity to the pest occurrence in the United States. Red indicates that the pest is within the county; orange indicates that the pest is within 250 miles of the county; yellow indicates that the pest is within 750 miles of the county; and green indicates that the pest is outside of these ranges.



Note: points - Number of trees, bars - Structural value

Based on the host tree species for each pest and the current range of the pest (Forest Health Technology Enterprise Team 2014), it is possible to determine what the risk is that each tree species in the urban forest could be attacked by an insect or disease.

Spp. Risk	Risk Weight	Species Name	AL	ALB	BBD	BC	BWA	CB	DA	DBSR	DED	DFB	EAB	FE	FR	GM	GSOB	HWA	JPB	LAT	LWD	MPB	NSE	OW	PBSR	POCRD	PSB	PSHB	SB	SBW	SOD	SPB	SW	TCD	WM	WPB	WPBR	WSB
	12	Red willow																																				
	11	Jeffery pine																																				
	10	Coastal live oak																																				
	7	White alder																																				
	6	European white birch																																				
	5	Canary island pine																																				
	5	Aleppo pine																																				
	5	Monterey pine																																				
	5	Italian stone pine																																				
	5	Chir pine																																				
	5	Afghan pine																																				
	5	Torrey pine																																				
	5	Japanese pine																																				
	5	pine spp																																				
	5	Turkish pine																																				
	4	Live oak																																				
	4	California sycamore																																				
	4	Engelmann oak																																				
	3	Holly oak																																				
	3	Camphor tree																																				
	3	Chinese elm																																				
	3	Cork oak																																				
	3	Italian alder																																				
	3	alder spp																																				
	2	California peppertree																																				
	2	Callery pear																																				
	2	Evergreen pear																																				
	2	Sweetgum																																				
	2	Lombardy poplar																																				
	2	Silver dollar eucalyptus																																				
	2	Velvet ash																																				
	2	European crabapple																																				
	2	Asian pear																																				

	2	Chanticleer callery pear
	1	Shamel ash
	1	Persian silk tree
	1	Avocado
	1	Fremont cottonwood
	1	ash spp
	1	Japanese maple
	1	Peach
	1	Caucasian ash

Note:
Species that are not listed in the matrix are not known to be hosts to any of the pests analyzed.

Species Risk:

- Red indicates that tree species is at risk to at least one pest within county
- Orange indicates that tree species has no risk to pests in county, but has a risk to at least one pest within 250 miles from the county
- Yellow indicates that tree species has no risk to pests within 250 miles of county, but has a risk to at least one pest that is 250 and 750 miles from the county
- Green indicates that tree species has no risk to pests within 750 miles of county, but has a risk to at least one pest that is greater than 750 miles from the county

Risk Weight:
Numerical scoring system based on sum of points assigned to pest risks for species. Each pest that could attack tree species is scored as 4 points if red, 3 points if orange, 2 points if yellow and 1 point if green.

Pest Color Codes:

- Red indicates pest is within San Diego county
- Red indicates pest is within 250 miles county
- Yellow indicates pest is within 750 miles of San Diego county
- Green indicates pest is outside of these ranges

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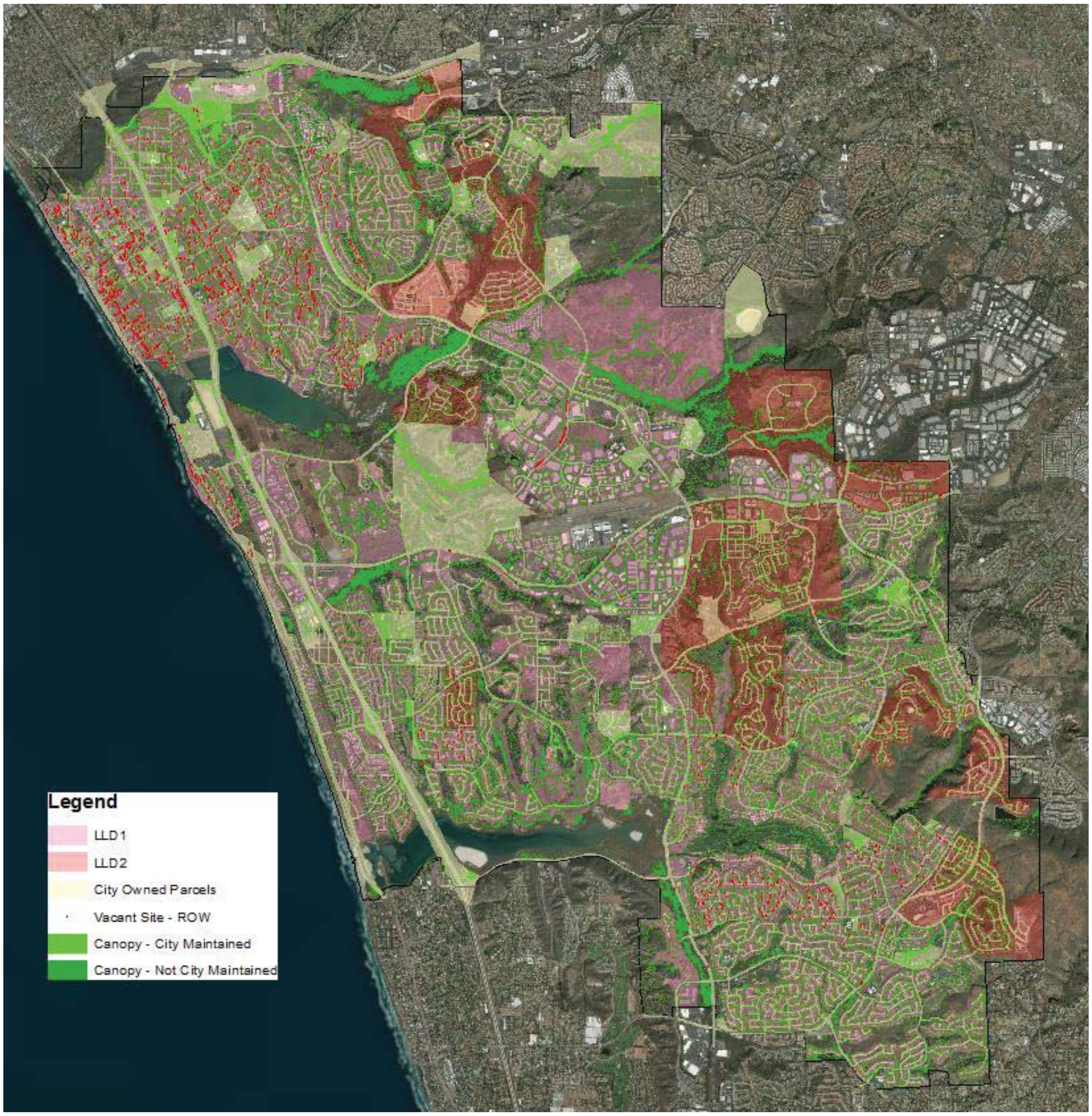
City of Carlsbad

APPENDIX B
Tree Canopy LIDAR Maps

CARLSBAD - TREE CANOPY ZOOM-IN

Tree canopy assessment for Carlsbad, CA. The canopy layer is based on 2014 high resolution land cover (landcover_2014_sandiego_13b.img). Per SanGIS, City of San Diego Department of Information Technology, and University of Vermont Spatial Analysis Laboratory *'The TC (Tree Canopy) Assessment is a top-down approach to analyzing the forest. Its purpose is to integrate high resolution land cover data with other GIS datasets to produce a set of detailed metrics on the forest that allow decision makers to know how much tree canopy currently exists . . . [tree canopy] is determined by extracting all features classified as tree canopy from a high-resolution land cover dataset'.*

The City of Carlsbad is divided into three areas: Landscape Lighting District 1 (LLD1), Landscape Lighting District 2 (LLD2), and City Owned Parcels (Public Right of Way, Park Growth Management, and City Owned Parcels February 2019). The City's overall tree canopy is represented by the two shades of green – the darker green for canopy on parcels that are not city maintained and lighter green for canopy on parcels that are city maintained i.e. public property, parks, city facilities, right of way, etc.



Carlsbad - Urban Tree Canopy Overview

The City of Carlsbad is divided into three areas: Landscape Lighting District 1 (LLD1), Landscape Lighting District 2 (LLD2), and City Owned Parcels (Public Right of Way, Park Growth Management, and City Owned Parcels February 2019). The City's overall tree canopy is represented by the two shades of green – the darker green for canopy on parcels that are not city maintained and lighter green for canopy on parcels that are city maintained i.e. public property, parks, city facilities, right of way, etc. Vacant sites are displayed as red points. Note: vacant sites need to be field verified in order to assess the suitability of the vacant site i.e. soil, irrigation, above and below ground utilities, planting space, etc. The percent canopy cover is based on landcover and excludes bodies of water.

Carlsbad – Percent Canopy Cover

	Area in SQ FT	% Canopy Cover
Canopy City Managed	41,724,887.29	4.03 ± 1.5
Canopy Non-City Managed	130,869,339.98	12.63 ± 1.5
Canopy Total	172,594,227.27	16.66 ± 1.5
City of Carlsbad	1,035,769,680.00	

City of Carlsbad

APPENDIX C
Carlsbad City Council Policy Statement No. 4 – Street Trees

	Policy No. 4
	Issued Date December 8, 2009
CITY OF CARLSBAD	Effective Date December 8, 2009
	Cancellation Date
COUNCIL POLICY STATEMENT	Supersedes No. 4 (06-13-2000)

General Subject: STREETS

Specific Subject: Street Trees

Copies to: City Council, City Manager, City Attorney, Department and Division Heads, Employee Bulletin Boards, Press, File

BACKGROUND

The City Council determined that the Street Tree Policy needed to be updated to ensure the preservation, proper maintenance and continued enhancement of public trees.

PURPOSE

Establishing a policy for the preservation, proper maintenance and continued enhancement of street trees in the City of Carlsbad.

POLICY

The following street tree policy shall be established

I. **Tree Planting**

A. It shall be the goal of the City to maintain a tree population approaching 90% of all qualified (valid) tree sites within the developed right-of-way of the City.

B. The City's Community Forest Management Plan shall set forth standards for planting, removal, replacement, maintenance and the preservation of street trees. The Plan will also target reforestation in areas of the City that do not have a healthy tree population.

II. **Tree Removal**

A. The City will not remove any tree for the purpose of installation of a new sidewalk, or for street widening, until viable alternatives to tree removal have been investigated. Alternative to tree removal will be referred to the Parks and Recreation Director, or his/her designee, to allow for such alternatives to be considered prior to the removal of such a tree.

B. It shall be the intent of the City not to remove any tree solely for the cause of damage to hardscape or for the cause of routing underground or overhead utility lines. Trees causing damage to sidewalks, curbs, gutters or pavement shall be inspected by a City arborist. Alternatives to tree removal, if any, will be included in a written report by the City arborist. The written report will be submitted to the Parks and Recreation Director, or his/her designee. The Parks and Recreation Director, or his/her designee, will decide which alternative, if any, to implement.

C. The City will not remove existing street trees on the basis of individual or group preference for a specific species of tree.

D. Any person may request the removal of a street tree, which is not dead, dying, hazardous or in such a condition that the City would not normally remove the tree by making a formal appeal to the Parks and Recreation Commission. Such a request shall include the reason for the request for removal.

E. Potentially hazardous, dead, dying or diseased trees shall be inspected by a City arborist. Upon the written recommendation of the arborist for the removal of hazardous, dead, dying or diseased trees, a Letter of Notification will be posted in accordance with Section II.I.

F. The City will not remove any tree solely for the cause of view restoration.

G. Consideration for tree removal will be given a priority rating depending on the following factors:
    1. Service Life
    2. Damage to utilities and/or sewer lines
    3. Damage to hardscape
    4. Conformity of the existing tree to recommended species list

   The highest priority removal shall be given to trees meeting all four factors. The second priority will be given to trees meeting three factors, etc.

H. All tree removals, whether by the City, contractor, or resident shall include the removal of the tree stump and the removal of all stump grinding chips and the back-filling of the hole created by stump removal with a good quality top soil suitable for the replanting of a replacement tree.

I. All trees recommended for removal shall be posted by attaching the Letter of Notification and a non-removable marking upon the subject tree a minimum of 30 days prior to their removal. In addition, notification in the form of a written notice shall be given to the owner of the property where the tree will be removed, and the owner on the adjacent properties and the owners on the property directly opposite, and the owners of the properties adjacent to the opposite property. Notification shall include, but not be limited to the following information:

1. The location of the tree
2. The reason for the tree's removal
3. The date of the scheduled removal
4. The species of tree to be planted
5. The size of the tree to be replanted
6. The date by which an appeal must be made to the Parks and Recreation Commission
7. A description of the appeal process

J. The City will not use a clear-cut tree replacement strategy for the management of street trees. Where practicable, and when adequately planned, alternative tree sites will be planted a minimum of five years prior to the removal of reforestation.

K. No Heritage Tree shall be removed except if it is determined by a City arborist that such a tree is creating a hazard to life or property, or by formal appeals process.

III. **<u>Tree Replacement</u>**

A. It shall be the goal of the City to replace all removed street trees. The species and approximate date of the replanting shall be included on the notice of tree removal as specified in Section II.I.

B. It shall be the goal of the City to replace all removed trees within 45 days of their removal if the tree site meets the minimum specifications for a valid tree site.

C. Tree sites not meeting the minimum specifications for a valid tree site will not be planted.

D. All removed trees shall be replaced with a tree of the same species as removed, except where the removed species does not conform to the recommended species approved by the City, or the conditions existing at the valid site. No tree shall be planted into the public right-of-way that does not comply with the "*Uniform Street Planting Map"* approved by the City.

E. Trees touching or nearly touching high-voltage utility lines shall be replaced with a recommended species.

F. All tree replanting shall be with a minimum 15-gallon container tree, except when a person agrees to pay the difference in cost of a larger replacement tree size and any additional costs associated with the planting of a larger tree.

G. A person may request replacement of a street tree species specified by the *"Uniform Street Planting Map*", with another species, only when there is a medical allergy certified by a medical doctor. The replacement tree will be approved by the City arborist and the Parks and Recreation Director, or his/her designee. All trees removed for this reason must be replaced with a tree listed as an approved species by the City.

H. The City will allow short-term rotational plantings.

I. The Parks and Recreation Director, or his/her designee will review the approved species list annually and will add and delete tree species based on their adaptability to street tree sites in Carlsbad.

IV. <u>Tree Maintenance</u>

Standards for tree maintenance shall be developed and incorporated into the City's Community Forest Management Plan, which shall be adopted by resolution of the City Council.

V. <u>Appeals</u>

A. Any person may request a formal appeal to the Parks and Recreation Commission within thirty (30) calendar days of the posting of a City Tree for:

1. the location or species of any street tree selected by City staff for planting at a specific location; and/or

2. a staff recommendation for the removal of any non-hazardous street tree.

B. Any person may request a formal appeal to the Parks and Recreation Commission for:

1. the removal of a street tree which is not dead, dying or diseased; and/or

2. the removal of a street tree that is listed as a Heritage Tree; and/or

3. the removal of a street tree that is causing damage to hardscape or for the cause of routing underground or overhead utilities.

C. If the Parks and Recreation Commission denies an appeal, the applicant may request a final appeal to the City Council within ten (10) calendar days of the Commission's decision.

D. Fees for an appeal shall be determined by resolution of the City Council.

E. Appeals will be made by submitting a Tree Appeal Form available from the office of the City Clerk.

City of Carlsbad

APPENDIX D
Carlsbad Municipal Code Chapter 11.12 Trees and Shrubs

Chapter 11.12

TREES AND SHRUBS

Sections:

11.12.010 Purpose and intent.

The public interest and welfare require that the city establish, adopt and maintain a comprehensive program for installing, maintaining and preserving trees within the city.

This chapter establishes policies, regulations and specifications necessary to govern installation, maintenance and preservation of trees to beautify the city, to purify the air, to provide shade and wind protection, and to preserve trees with historic or unusual value.

It is the policy of the city to line its streets with trees and to conduct a consistent and adequate program for maintaining and preserving these trees. It is the goal of this policy to provide for planting trees in all areas of the city and for selecting appropriate species to achieve as much beauty and economy as possible. It is also the policy of the city to protect and preserve all desirable trees that are located on the city's right-of-way.

It is the policy of the city to encourage new tree planting on public and private property and to cultivate a flourishing urban forest. (Ord. NS-545 § 2 (part), 2000)

11.12.020 Definitions.

A. For purposes of this chapter the following words and phrases shall have the meanings respectively ascribed to them by this section, unless it is obvious from the context that another meaning is intended:

1. "Certified arborist" means an arborist certified by the International Society of Arboriculture.
2. "Community forest management plan" means a document that contains goals and policies that will guide the city in its actions and decisions affecting trees within the city limits.
3. "Hazardous tree" means any tree or tree condition which represents a danger to persons, property or other healthy trees.
4. "Heritage tree" means any tree existing within the city limits which has been so designated by resolution by the city council. Heritage trees shall be trees with notable historic interest or trees of an unusual species or size.
5. "Maintain" or "maintenance" means the entire care of trees including ground preparation, fertilizing, mulching, trimming and watering.
6. "Plant" means an herb that lacks a permanent woody stem.
7. "Shrub" means a low woody plant having several stems and a trunk less than three inches in diameter at a height less than four and half feet above the ground.
8. "Tree" means any perennial woody plant having a trunk at least three inches in diameter at a height four and one-half feet above the ground. This definition shall include any tree planted by or required to be planted by the city which will attain the stated size and maturity.

9. "Tree service life" means the number of years that the tree provides the most benefits with the least amount of costs.

10. "Valid tree site" means a tree site in that area of the public right-of-way where a tree can be planted. The requirement shall be one tree per residence or forty feet between trees for a large tree site, thirty feet for a medium tree site and twenty feet for a small tree site. All tree sites beneath a high voltage electrical line shall be considered a small tree site. Tree sites shall be planted with a large, medium or small tree listed and approved by the city. (Ord. NS-545 § 2 (part), 2000)

11.12.030 Jurisdiction of public works department.

A. The city manager, acting through the parks and recreation director or his/her designee, shall exercise exclusive jurisdiction and control over the planting, maintenance, removal and replacement of trees, shrubs or plants in all streets, sidewalks, medians or other public rights-of-way of the city, and shall have such power, authority, jurisdiction and duties as are prescribed in this chapter. (Ord. NS-747 § 1, 2005: Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.040 Master tree list.

A. The city manager, acting through the parks and recreation director or his/her designee, shall develop and maintain a master tree list, which shall be adopted by resolution of the city council and shall be on file in the office of the city clerk. These documents shall specify the species of trees suitable and desirable for planting in certain areas in order to establish a wide ranging urban forest. (Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.050 Street tree planting and maintenance procedures.

A. The city manager, acting through the parks and recreation director or his/her designee, shall develop and implement policies and standards for street tree planting and maintenance required of all tree planting and maintenance throughout the city. (Ord. NS-747 § 2, 2005: Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.060 Approval prior to planting.

A. No tree, shrub or plant shall be planted in any street, sidewalk, median or other public right-of-way of the city until the city manager, acting through the parks and recreation director or his/her designee, first approves the kind and variety, designates the location therefor and grants the permit for planting. (Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.070 Street tree maintenance.

A. It shall be the obligation of the city manager, acting through the parks and recreation director or his/her designee, to assign appropriate scheduled tree, shrub or plant maintenance, including but not limited to pruning, fertilization, irrigation and pest control based on age, species, size and location to assure the proper maintenance of all street trees, shrubs or plants. (Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.080 Protection of trees.

A. No person shall remove, trim, prune or cut any street tree, shrub or plant now or hereafter growing in any street, sidewalk, median or other public right-of-way of the city.

B. No person shall remove, injure or misuse any guard or device placed to protect any tree, shrub or plant now or hereafter growing in any street, sidewalk, median or other public right-of-way of the city.

C. No person shall hitch or fasten any kind of animal to any tree, shrub or plant now or hereafter growing in any street, sidewalk, median or other public right-of-way of the city; nor shall any person place a post for hitching of animals within five feet of any tree, shrub or plant now or hereafter growing in any street, sidewalk, median or other public right-of-way of the city.

D. No person shall trim, cut, prune, injure or remove by any means any tree, shrub or plant growing in any street, sidewalk, median or other public right-of-way of the city.

E. No person shall:

1. Construct a concrete, asphalt, brick or gravel sidewalk, or otherwise fill up the ground area near any tree, shrub or plant growing in any street, sidewalk, median or other public right-of-way of the city, to shut off air, light or water from the roots, except under written authority from the city manager, acting through the parks and recreation director or his/her designee;

2. Place building material, equipment or other substances likely to cause injury to a tree near any tree, shrub or plant growing in any street, sidewalk, median or other public right-of-way of the city, which might cause injury to the tree;

3. Post any sign on any tree that is not scheduled for removal as described in Section 11.12.090 of this chapter, tree-stake or guard, or fasten any electric wire, insulator or any other device for holding electric, telephone, television or conductor wires to any tree, shrub or plant now or hereafter growing in any street, sidewalk, median or other public right-of-way of the city.

F. No person shall interfere, or cause any other person to interfere, with employees of the city, or contractors employed by the city, who are engaged in planting, maintaining, treating, removing or replacing any street tree, shrub or plant or removing or replacing any material which is likely to cause injury to the tree, shrub or plant.

G. No person shall plant any street tree, shrub or plant except according to policies, regulations and specifications established pursuant to this chapter or any currently applicable ordinances or code sections. (NS-747 §§ 3, 4, 2005; Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.090 Permits required for tree removal and maintenance.

A. Policy. The city values trees as an important part of the environment and shall strive to preserve them whenever possible and feasible. When reviewing requests for a street tree removal permit, the city shall discourage removing desirable trees, and shall consider approving removal of desirable trees only as a last resort alternative for the applicant.

B. Permits for Removal or Maintenance. Except as otherwise provided in this chapter, pruning, cutting, trimming or removing any street tree in the city shall require a permit issued by the city manager, acting through the parks and recreation director or his/her designee.

C. Review of the application to remove a tree shall proceed as follows:

1. A city arborist shall inspect the property and recommend approving or denying the application in a written report submitted to the city manager, acting through the parks and recreation director or his/her designee.

2. The city arborist may authorize a tree's removal after finding either of the following circumstances:

a. The tree is a hazard to life or property, and removing it is the only feasible way to eliminate the hazard;

b. The tree is dead, dying, diseased or damaged beyond reclamation.

3. If the city arborist does not find either of the above circumstances for removing a tree, a priority rating depending on the following factors can be considered for a tree removal.

a. Service life;

b. Damage to utilities and/or sewer lines;

c. Damage to hardscape;

d. Conformity of the existing tree to recommended species list.

The highest priority removal shall be given to trees meeting all four factors. The second priority will be given to trees meeting three factors, etc.

4. If the city arborist has recommended denying the application, the applicant may request the parks and recreation commission to review the arborist's decision.

5. If the parks and recreation commission concurs with the city arborist's recommendation to

deny the application, the applicant may request the city council to review the matter for final action.

D. All tree removal, whether by city or applicant, shall include the removal of the stump and the removal of all stump grinding chips and the backfilling of the hole created by stump removal with a good quality top soil suitable for the replanting of a replacement tree.

E. Notification of Tree Removal.

1. The city shall post a letter of notification and a non-removable marking upon the subject tree a minimum of thirty days prior to its removal. The letter will be posted in a prominent location, visible from a public street and will include, but not be limited to the following information:

a. The location of the tree;

b. The reason for the tree's removal;

c. The date of the scheduled removal;

d. The species of tree to be replanted;

e. The size of the tree to be replanted;

f. The date by which an appeal must be made to the parks and recreation commission;

g. A description of the appeal process.

2. The letter of notification shall also be given to the owner of the property where the tree is scheduled be removed, and to the adjacent property owners, as well as to the property owners directly opposite and to the owners of the properties adjacent to the opposite property.

3. The city manager, acting through the parks and recreation director or his/her designee, may waive notification requirements for a tree removal in either of the following circumstances:

a. When the city manager, acting through the parks and recreation director or his/her designee determines that a tree's condition threatens public health, safety or welfare;

b. When local, state or federal authorities have declared a state of emergency and a tree's condition threatens public health, safety or welfare.

F. No heritage tree shall be removed except if it is determined by a city arborist that such a tree is creating a hazard to life or property, or by formal appeals process. (NS-747 § 5, 2005; Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, §§ 2, 4, 12-22-2009)

11.12.100 Tree replacement.

A. It shall be the goal of the city to replace all removed street trees within forty-five days of their removal if the tree site meets the minimum specifications for a valid tree site.

B. All removed trees shall be replaced with a tree of the same species as removed, except where the removed species does not conform to the recommended species approved by the city, or the conditions existing at the valid site. No tree shall be planted into the public right-of-way that does not comply with the uniform street planting map as described in Section 11.12.120 of this chapter.

C. Trees that are touching or nearly touching high-voltage utility lines shall be replaced with a recommended species.

D. All tree replanting shall be with a minimum fifteen-gallon container tree, except when a person agrees to pay the difference in cost of a larger replacement tree size and any additional costs associated with the planting of a larger tree.

E. A person may request replacement of a street tree species specified in the uniform street planting map with another species only when there is a medical allergy certified by a medical doctor. The replacement tree will be approved by the city arborist and the city manager, acting through the parks and recreation director or his/her designee. All trees removed for this reason must be replaced with a tree listed as an approved species by the city. (Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.110 Overhanging trees.

A. The owner or his/her agent of every lot or parcel of land in the city upon which any trees, shrubs or plants are now or may be hereafter standing shall trim, or cause to be trimmed, the branches thereof so that the same shall not obstruct the adequate passage of light from any street light located in any street, sidewalk, median or other public right-of-way of the city and such owner or his/her agent shall trim all branches of any trees, shrubs or plants which overhang any street, sidewalk, median or other public right-of-way of the city so that there shall be a clear height of eight feet above the surface of the street, sidewalk, median or other public right-of-way of the city unobstructed by branches; and such owner or his/her agent shall remove from such trees, shrubs or plants all dead, decayed or broken limbs or branches that overhang such street, sidewalk, median or other public right-of-way of the city, and when any such trees, shrubs or plants are dead, such owner or his/her agent shall remove the same so that they shall not fall in the street, sidewalk, median or other public right-of-way of the city. (Ord. NS-545 § 2 (part), 2000)

11.12.120 Uniform street planting map.

A. Upon the recommendation of the parks and recreation commission, the city council shall adopt a uniform street tree planting map that will depict a uniform method of tree plantings on city streets. The city manager, acting through the parks and recreation director or his/her designee, shall have copies of this map made and the same shall be kept on file in the office of the city clerk and may be obtained by the public. (Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.130 Community forest management plan.

A. Upon the recommendation of the parks and recreation commission, the city council shall adopt a community forest management plan that provides direction to develop goals and policies that will guide the city to manage tree-related issues in a proactive manner. The plan will address trees on public property and will discuss planting, removal, replacement, maintenance and the preservation of trees growing on any public property or in any street, sidewalk, median or other public right-of-way of the city.

B. When the management plan in its original or modified form is adopted by the city council, it shall become the tree planting plan for public streets of the city and shall be strictly adhered to in all future street planting improvement projects and in the removal, replacement and maintenance of trees, shrubs or plants in public streets in the city. The management plan for the entire city does not need to be adopted by the city council at one time. Instead, council may adopt the community forest management plan for different portions of the city within a reasonable length of time after the completed plan for any particular portion of the city has been submitted to the city council for adoption.

C. The city manager, acting through the parks and recreation director or his/her designee, shall have copies of this plan made and the same shall be kept on file in the office of the city clerk and may be obtained by the public. (Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 2, 12-22-2009)

11.12.140 Heritage trees.

A. The city council recognizes the important role trees have played in the history and development of Carlsbad and recognizes that a wide variety of trees can grow in its unique and temperate climate. The city may officially designate as heritage trees those trees in the community which have significant historical or arboricultural interest. It is the policy of the city council that all designated heritage trees that are on public streets shall be protected. (Ord. NS-545 § 2 (part), 2000)

11.12.150 Appeals.

A. Any person may request a formal appeal to the parks and recreation commission within thirty calendar days of the posting of a city tree for:

1. The location or species of any street tree selected by the city for planting at a specific location; and/or

2. The city aborist's recommendation for the removal of any nonhazardous street tree.

B. Any person may request a formal appeal to the parks and recreation commission for:

1. The removal of a street tree which is not dead, dying or diseased; and/or

2. The removal of a street tree that is listed as a heritage tree; and/or

3. The removal of a street tree that is causing damage to hardscape or for the cause of routing underground or overhead utilities.

C. If the parks and recreation commission denies an applicant's appeal, the applicant may request a final appeal to the city council within ten calendar days of the commission's decision.

D. Fees for an appeal shall be determined by resolution of the city council.

E. Appeals will be made by submitting a tree appeal form available from the office of the city clerk. (Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 3, 12-22-2009)

11.12.160 Violation.

A. A violation of this chapter may be prosecuted either as a misdemeanor or an infraction pursuant to the provisions of Chapter 1, Section 1.08.010 of this code. The city attorney shall have the discretion to reduce to an infraction any act made unlawful pursuant to this Chapter if such reduction is warranted in the interest of justice.

B. In addition to any criminal penalty, the city may, pursuant to Government Code Section 36901, impose a civil penalty for any violation of this chapter in an amount not to exceed one thousand dollars.

C. In addition to any other remedy provided by this code, any provision of this code may be enforced by civil action and an injunction; any violation of this code may result in civil penalties, monetary damages, attorney's fees, and investigatory costs. (Ord. NS-762 § 1, 2005; Ord. NS-545 § 2 (part), 2000)
(Ord. No. CS-072, § 5, 12-22-2009)

City of Carlsbad

APPENDIX E

Carlsbad Municipal Ordinance Nos. 43, 44, & 46 - Water Conservation

EXHIBIT 1

ORDINANCE NO. 46

AN ORDINANCE OF THE BOARD OF DIRECTORS OF THE CARLSBAD MUNICIPAL WATER DISTRICT AMENDING ORDINANCE NO. 44. TO AUTHORIZE THE GENERAL MANAGER TO SET WATERING SCHEDULES

WHEREAS, article 10, section 2 of the California Constitution declares that waters of the State are to be put to beneficial use, that waste, unreasonable use, or unreasonable method of use of water be prevented, and that water be conserved for the public welfare; and

WHEREAS, conservation of current water supplies and minimization of the effects of water supply shortages that are the result of drought are essential to the public health, safety and welfare; and

WHEREAS, regulation of the time of certain water use, manner of certain water use, design of rates, method of application of water for certain uses, installation and use of water-saving devices, provide an effective and immediately available means of conserving water; and

WHEREAS, California Water Code sections 375 et seq. authorize water suppliers to adopt and enforce a comprehensive water conservation program; and

WHEREAS, adoption and enforcement of a comprehensive water conservation program will allow the Carlsbad Municipal Water District (CMWD) to delay or avoid implementing measures such as water rationing or more restrictive water use regulations pursuant to a declared water shortage emergency as authorized by California Water Code sections 350 et seq.; and

WHEREAS, San Diego County is a semi-arid region and local water resources are scarce. The region is dependent upon imported water supplies provided by the San Diego County Water Authority, which obtains a substantial portion of its supplies from the Metropolitan Water District of Southern California. Because the region is dependent upon imported water supplies, weather and other conditions in other portions of this State and of the Southwestern United States affect the availability of water for use in San Diego County; and

WHEREAS, the San Diego County Water Authority has adopted an Urban Water Management Plan that includes water conservation as a necessary and effective component of the Water Authority's programs to provide a reliable supply of water to meet the needs of the

Water Authority's 24 member public agencies, including the CMWD. The Water Authority's Urban Water Management Plan also includes a contingency analysis of actions to be taken in response to water supply shortages. This ordinance is consistent with the Water Authority's Urban Water Management Plan; and

WHEREAS, as anticipated by its Urban Water Management Plan, the San Diego County Water Authority, in cooperation and consultation with its member public agencies, has adopted a Drought Management Plan, which establishes a progressive program for responding to water supply limitations resulting from drought conditions. This ordinance is intended to be consistent with and to implement the Water Authority's Drought Management Plan; and

WHEREAS, the Water Authority's Drought Management Plan contains three stages containing regional actions to be taken to lessen or avoid supply shortages. This ordinance contains drought response levels that correspond with the Drought Management Plan stages; and

WHEREAS, the CMWD, due to the geographic and climatic conditions within its territory and its dependence upon water imported and provided by the San Diego County Water Authority, may experience shortages due to drought conditions, regulatory restrictions enacted upon imported supplies and other factors. The Board of Directors of CMWD has adopted an Urban Water Management Plan that includes water conservation as a necessary and effective component of its programs to provide a reliable supply of water to meet the needs of the public within its service territory. The CMWD's Urban Water Management Plan also includes a contingency analysis of actions to be taken in response to water supply shortages. This ordinance is consistent with the Urban Water Management Plan adopted by the Board of Directors of CMWD; and

WHEREAS the water conservation measures and progressive restrictions on water use and method of use identified by this ordinance provide certainty to water users and enable CMWD to control water use, provide water supplies, and plan and implement water management measures in a fair and orderly manner for the benefit of the public;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Carlsbad

Municipal Water District of the City of Carlsbad, California, as follows:

1. That the above recitations are true and correct.

2. The Board of Directors of the Carlsbad Municipal Water District of the City of Carlsbad, California, hereby ordains as follows:

SECTION 7.0 DROUGHT RESPONSE LEVEL 2 – DROUGHT ALERT CONDITION

(a) A Drought Response Level 2 condition is also referred to as a "Drought Alert" condition. A Level 2 condition may apply when the Water Authority notifies its member agencies that due to cutbacks caused by drought or other reduction in supplies, a consumer demand reduction of up to 20 percent is required in order to have sufficient supplies available to meet anticipated demands. The CMWD Board of Directors shall declare the existence of a Drought Response Level 2 condition and implement the mandatory Level 2 conservation measures identified in this ordinance.

(b) All persons using CMWD water shall comply with Level 1 Drought Watch water conservation practices during a Level 2 Drought Alert, and shall also comply with the following additional conservation measures:

1. Limit residential and commercial landscape irrigation to assigned days per week on a schedule established by the General Manager. Within five (5) days following the declaration of the response level, the CMWD shall publish a notice of the assigned days in one or more newspapers, including a newspaper of general circulation within the CMWD. The CMWD may also post notice of the condition on its website. This section shall not apply to commercial growers and nurseries.

2. Limit lawn watering and landscape irrigation using sprinklers to time limits per watering station per assigned day as established by the General Manager. Within five (5) days following the declaration of the response level, the CMWD shall publish a notice of the assigned time limits in one or more newspapers, including a newspaper of general circulation within the CMWD. The CMWD may also post notice of the condition on its website. This provision does not apply to landscape irrigation systems using water efficient devices, including but not limited to: weather based controllers, drip/micro-irrigation systems and stream rotor sprinklers.

3. Water landscaped areas, including trees and shrubs located on residential and commercial properties, and not irrigated by a landscape irrigation system governed by section 5 (b) (1), on the same schedule set forth in section 5 (b) (1) by using a bucket, hand-held hose with positive shut-off nozzle, or low-volume non-spray irrigation.

4. Repair all leaks within seventy-two (72) hours of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

5. Stop operating ornamental fountains or similar decorative water features unless recycled water is used.

SECTION 8.0 DROUGHT RESPONSE LEVEL 3 – DROUGHT CRITICAL CONDITION

(a) A Drought Response Level 3 condition is also referred to as a "Drought Critical" condition. A

Level 3 condition may apply when the Water Authority notifies its member agencies that due to increasing cutbacks caused by drought or other reduction of supplies, a consumer demand reduction of up to 40 percent is required in order to have sufficient supplies available to meet anticipated demands. The CMWD Board of Directors shall declare the existence of a Drought Response Level 3 condition and implement the Level 3 conservation measures identified in this ordinance.

(b) All persons using CMWD water shall comply with Level 1 Drought Watch and Level 2 Drought Alert water conservation practices during a Level 3 Drought Critical condition and shall also comply with the following additional mandatory conservation measures:

1. Limit lawn watering and landscape irrigation using sprinklers to time limits per watering station per assigned day as established by the General Manager. Within five (5) days following the declaration of the response level, the CMWD shall publish a notice of the assigned days in one or more newspapers, including a newspaper of general circulation within the CMWD. The CMWD may also post notice of the condition on its website. This section shall not apply to commercial growers or nurseries.

2.Water landscaped areas, including trees and shrubs located on residential and commercial properties, and not irrigated by a landscape irrigation system governed by section 6 (b) (1), on the same schedule set forth in section 6 (b) (1) by using a bucket, hand-held hose with a positive shut-off nozzle, or low-volume non-spray irrigation.

3.Stop filling or re-filling ornamental lakes or ponds, except to the extent needed to sustain aquatic life, provided that such animals are of significant value and have been actively managed within the water feature prior to declaration of a drought response level under this ordinance.

4.Stop washing vehicles except at commercial carwashes that re-circulate water, or by high pressure/low volume wash systems.

5.Repair all leaks within forty-eight (48) hours of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

(c) Upon the declaration of a Drought Response Level 3 condition, no new potable water service shall be provided, no new temporary meters or permanent meters shall be provided, and no statements of immediate ability to serve or provide potable water service (such as, will serve letters, certificates, or letters of availability) shall be issued, except under the following circumstances:

1. A valid, unexpired building permit has been issued for the project; or

2. The project is necessary to protect the public's health, safety, and welfare; or

3. The applicant provides substantial evidence of an enforceable commitment that water demands for the project will be offset prior to the provision of a new water meter(s).

This provision shall not be construed to preclude the resetting or turn-on of meters to provide continuation of water service or to restore service that has been interrupted for a period of one year or less.

(d) Upon the declaration of a Drought Response Level 3 condition, the Board of Directors of CMWD will suspend consideration of annexations to its service area.

(e) The Board of Directors of CMWD may establish a water allocation for property served by the CMWD taking into consideration a method that does not penalize persons for the implementation of conservation methods or the installation of water saving devices. If the Board of Directors of CMWD establishes a water allocation notice of the allocation shall be provided by including it in the regular billing statement for the fee or charge or by any other mailing to the address to which the CMWD customarily mails the billing statement for fees or charges for on-going water service. Following the effective date of the water allocation as established by the Board of Directors of CMWD, any person that uses water in excess of the allocation shall be subject to a penalty in the amount equal to the penalty rate established by the Metropolitan Water District for each billing unit of water in excess of the allocation.
The penalty for excess water usage shall be cumulative to any other remedy or penalty that may be imposed for violation of this ordinance.

EFFECTIVE DATE: This ordinance shall be effective thirty days after its adoption; and the Secretary shall certify the adoption of this ordinance and cause it to be published at least once in a newspaper of general circulation in the City of Carlsbad within fifteen days after its adoption.

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INTRODUCED AND FIRST READ at a Special Meeting of the Carlsbad Municipal Water District Board of Directors on the 10th day of November 2009, and thereafter;

PASSED, APPROVED AND ADOPTED at a Special Meeting of the Board of Directors of the Carlsbad Municipal Water District on the 1st day of December 2009 by the following vote to wit:

AYES: Board Members Lewis, Kulchin, Hall, Packard and Blackburn.

NOES: None.

ABSENT: None.

ABSTAIN: None.

APPROVED AS TO FORM AND LEGALITY

RONALD R. BALL, General Counsel
12/2/2009.

CLAUDE A. LEWIS, President

ATTEST:

Assistant Secretary
LORRAINE M. WOOD, Secretary

(SEAL)

CARLSBAD MUNICIPAL WATER DISTRICT
ORGANIZED MAR. 22, 1954
CALIFORNIA

APPENDIX F
American National Standard Institute Section A300 - Tree Care

ANSI A300 (Part 1)-2008 Pruning
Revision of ANSI A300 (Part 1)-2001

American National Standard

for Tree Care Operations —

Tree, Shrub, and Other Woody Plant Management — Standard Practices (Pruning)

TCIA®
VOICE OF TREE CARE

Approved American National Standard
ANSI

Revision of ANSI A300 (Part 1)-2001

ANSI®
A300 (Part 1)-2008

for Tree Care Operations —
Tree, Shrub, and Other Woody Plant Management — Standard Practices *(Pruning)*

Secretariat
Tree Care Industry Association, Inc.

Tree Care Industry Association, Inc.
136 Harvey Road - Suite B101-B110
Londonderry, NH 03053
1-800-733-2622
(603) 314-5380
Fax: (603) 314-5386
E-mail: Rouse@tcia.org
Web: www.tcia.org

American National Standard

Approval of an American National Standard requires review by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgement of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing or using products, processes or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by

Tree Care Industry Association, Inc.,
136 Harvey Road - Suite B101-B110, Londonderry, NH 03053
Phone:1-800-733-2622 or (603) 314-5380 Fax: (603) 314-5386
E-mail: tcia@tcia.org
Web: www.tcia.org

Printed in the United States of America

Contents

* The term pruning type is replaced with the term pruning method. The purpose of this is to label the processes detailed in section 6 with greater accuracy.

Foreword This foreword is not part of American National Standard A300 (Part 1)-2008 *Pruning*

ANSI A300 Standards are divided into multiple parts, each focusing on a specific aspect of woody plant management (e.g. Pruning, Fertilization, etc).

These standards are used to develop written specifications for work assignments. They are not intended to be used as specifications in and of themselves. Management objectives may differ considerably and therefore must be specifically defined by the user. Specifications are then written to meet the established objectives and must include measurable criteria.

ANSI A300 standards apply to professionals who provide for or supervise the management of trees, shrubs, and other woody landscape plants. Intended users include businesses, government agencies, property owners, property managers, and utilities. The standard does not apply to agriculture, horticultural production, or silviculture, except where explicitly noted otherwise.

This standard has been developed by the Tree Care Industry Association (TCIA), an ANSI-accredited Standards Developing Organization (SDO). TCIA is secretariat of the ANSI A300 standards, and develops standards using procedures accredited by the American National Standards Institute (ANSI).

Consensus for standards writing was developed by the Accredited Standards Committee on Tree, Shrub, and Other Woody Plant Management Operations – Standard Practices, A300 (ASC A300).

Prior to 1991, various industry associations and practitioners developed their own standards and recommendations for tree care practices. Recognizing the need for a standardized, scientific approach, green industry associations, government agencies and tree care companies agreed to develop consensus for an official American National Standard.

The result – ANSI A300 standards – unify and take authoritative precedence over all previously existing tree care industry standards. ANSI requires that approved standards be developed according to accepted principles, and that they be reviewed and, if necessary, revised every five years.

TCIA was accredited as a standards developing organization with ASC A300 as the consensus body on June 28, 1991. ASC A300 meets regularly to write new, and review and revise existing ANSI A300 standards. The committee includes industry representatives with broad knowledge and technical expertise from residential and commercial tree care, utility, municipal and federal sectors, landscape and nursery industries, and other interested organizations.

Suggestions for improvement of this standard should be forwarded to: A300 Secretary, c/o Tree Care Industry Association, Inc., 136 Harvey Road - Suite B101-B110, Londonderry, NH, 03053.

ANSI A300 (Part 1)-2008 Pruning was approved as an American National Standard by ANSI on May 1, 2008. ANSI approval does not require unanimous approval by ASC A300. The ASC A300 committee contained the following members at the time of ANSI approval:

Tim Johnson, Chair
(Artistic Arborist, Inc.)

Bob Rouse, Secretary
(Tree Care Industry Association, Inc.)

(Continued)

Organizations Represented	*Name of Representative*
American Nursery and Landscape Association	Warren Quinn
	Craig J. Regelbrugge (Alt.)
American Society of Consulting Arborists	Donald Zimar
American Society of Landscape Architects	Ron Leighton
Asplundh Tree Expert Company	Geoff Kempter
	Peter Fengler (Alt.)
Bartlett Tree Expert Company	Peter Becker
	Dr. Thomas Smiley (Alt.)
Davey Tree Expert Company	Joseph Tommasi
	R.J. Laverne (Alt.)
International Society of Arboriculture	Bruce Hagen
	Sharon Lilly (Alt.)
National Park Service	Robert DeFeo
	Dr. James Sherald (Alt.)
Professional Grounds Management Society	Thomas Shaner
Professional Land Care Network	Preston Leyshon
Society of Municipal Arborists	Gordon Mann
	Andy Hillman (Alt.)
Tree Care Industry Association	Dane Buell
	James McGuire (Alt.)
USDA Forest Service	Ed Macie
	Keith Cline (Alt.)
Utility Arborist Association	Matthew Simons
	Jeffrey Smith (Alt.)

Additional organizations and individuals:

American Forests (Observer)
Mike Galvin (Observer)
Peter Gerstenberger (Observer)
Dick Jones (Observer)
Myron Laible (Observer)
Beth Palys (Observer)
Richard Rathjens (Observer)
Richard Roux (NFPA-780 Liaison)

ASC A300 mission statement:

Mission: To develop consensus performance standards based on current research and sound practice for writing specifications to manage trees, shrubs, and other woody plants.

American National Standard for Tree Care Operations –

Tree, Shrub, and Other Woody Plant Management – Standard Practices *(Pruning)*

1 ANSI A300 standards

1.1 Scope

ANSI A300 standards present performance standards for the care and management of trees, shrubs, and other woody plants.

1.2 Purpose

ANSI A300 performance standards are intended for use by federal, state, municipal and private entities including arborists, property owners, property managers, and utilities for developing written specifications.

1.3 Application

ANSI A300 performance standards shall apply to any person or entity engaged in the management of trees, shrubs, or other woody plants.

2 Part 1 – Pruning standards

2.1 Purpose

The purpose of Part 1 – *Pruning* is to provide performance standards for developing written specifications for pruning.

2.2 Reasons for pruning

The reasons for tree pruning may include, but are not limited to, reducing risk, managing tree health and structure, improving aesthetics, or achieving other specific objectives. Pruning practices for agricultural, horticultural production, or silvicultural purposes are exempt from this standard unless this standard, or a portion thereof, is expressly referenced in standards for these other related areas.

2.3 Implementation

2.3.1 Specifications for pruning should be written and administered by an arborist.

2.3.1.1 Specifications should include location of tree(s), objectives, methods (types), and extent of pruning (location, percentage, part size, etc).

2.3.2 Pruning specifications shall be adhered to.

2.4 Safety

2.4.1 Pruning shall be implemented by an arborist, familiar with the practices and hazards of pruning and the equipment used in such operations.

2.4.2 This performance standard shall not take precedence over applicable industry safe work practices.

2.4.3 Performance shall comply with applicable Federal and State Occupational Safety and Health standards, ANSI Z133.1, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and other Federal Environmental Protection Agency (EPA) regulations, as well as state and local regulations.

3 Normative references

The following standards contain provisions, which, through reference in the text, constitute provisions of this American National Standard. All standards are subject to revision, and parties to agreements based on this American National Standard shall apply the most recent edition of the standards indicated below.

ANSI Z60.1, Nursery stock
ANSI Z133.1, Arboriculture – Safety requirements
29 CFR 1910, General industry [1)]
29 CFR 1910.268, Telecommunications [1)]
29 CFR 1910.269, Electric power generation, transmission, and distribution [1)]
29 CFR 1910.331 - 335, Electrical safety-related work practices [1)]

4 Definitions

4.1 arboriculture: The art, science, technology, and business of commercial, public, and utility tree care.

1) Available from U.S. Department of Labor, 200 Constitution Avenue, NW, Washington, DC 20210

4.2 arborist: An individual engaged in the profession of arboriculture who, through experience, education, and related training, possesses the competence to provide for or supervise the management of trees and other woody plants.

4.3 arborist trainee: An individual undergoing on-the-job training to obtain the experience and the competence required to provide for or supervise the management of trees and other woody plants. Such trainees shall be under the direct supervision of an arborist.

4.4 branch: A shoot or stem growing from a parent branch or stem (See Fig. 4.4).

4.4.1 codominant branches/codominant leaders: Branches or stems arising from a common junction, having nearly the same size diameter (See Fig. 4.4).

4.4.2 lateral branch: A shoot or stem growing from another branch (See Fig. 4.4).

4.4.3 parent branch or stem: A tree trunk or branch from which other branches or shoots grow (See Fig. 4.4).

4.4.4 scaffold branch: A primary branch that forms part of the main structure of the crown (See Fig. 4.4).

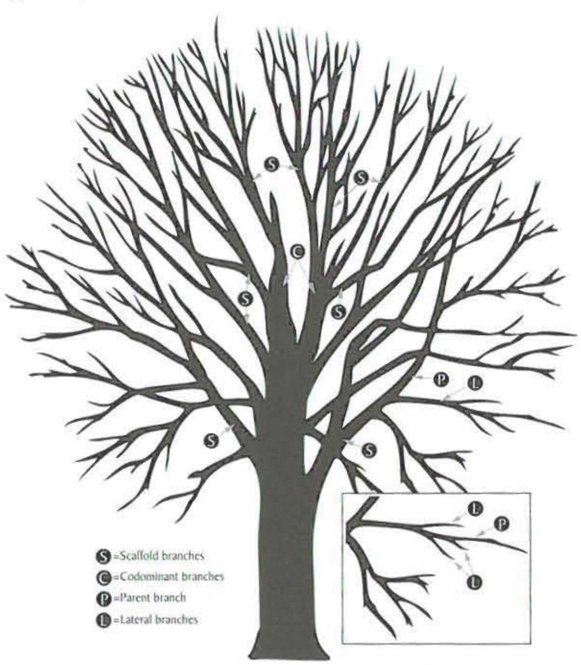

Figure 4.4 Standard branch definitions.

4.5 branch bark ridge: The raised area of bark in the branch crotch that marks where the branch and parent stem meet. (See Figs. 5.3.2 and 5.3.3).

4.6 branch collar: The swollen area at the base of a branch.

4.7 callus: Undifferentiated tissue formed by the cambium around a wound.

4.8 cambium: The dividing layer of cells that forms sapwood (xylem) to the inside and inner bark (phloem) to the outside.

4.9 clean: Selective pruning to remove one or more of the following non-beneficial parts: dead, diseased, and/or broken branches (7.2).

4.10 climbing spurs: Sharp, pointed devices strapped to a climber's lower legs used to assist in climbing trees. (syn.: gaffs, hooks, spurs, spikes, climbers)

4.11 closure: The process in a woody plant by which woundwood grows over a pruning cut or injury.

4.12 crown: Upper part of a tree, measured from the lowest branch, including all the branches and foliage.

4.13 decay: The degradation of woody tissue caused by microorganisms.

4.14 espalier: The combination of pruning, supporting, and training branches to orient a plant in one plane (6.5).

4.15 establishment: The point after planting when a tree's root system has grown sufficiently into the surrounding soil to support growth and anchor the tree.

4.16 facility: A structure or equipment used to deliver or provide protection for the delivery of an essential service, such as electricity or communications.

4.17 frond: A leaf structure of a palm.

4.18 heading: The reduction of a shoot, stem, or branch back to a bud or to a lateral branch not large enough to assume the terminal role.

4.19 interfering branches: Crossing, rubbing, or upright branches that have the potential to damage tree structure and/or health.

4.20 internode: The area between lateral branches or buds.

4.21 job briefing: The communication of at least the following subjects for arboricultural operations: work specifications, hazards associated with the job, work procedures involved, special precautions, electrical hazards, job assignments, and personal protective equipment.

4.22 leader: A dominant, typically upright, stem – usually the main trunk. There can be several leaders in one tree.

4.23 lion's tailing: The removal of an excessive number of inner and/or lower lateral branches from parent branches. Lion's tailing is not an acceptable pruning practice (6.1.7).

4.24 live crown ratio: Crown height relative to overall plant height.

4.25 mechanical pruning: A pruning technique where large-scale power equipment is used to cut back branches (9.3.2).

4.26 method: A procedure or process for achieving an objective.

4.27 peeling: The removal of dead frond bases without damaging living trunk tissue at the point they make contact with the trunk. (syn.: shaving)

4.28 petiole: A stalk of a leaf or frond.

4.29 pollarding: Pruning method in which tree branches are initially headed and then reduced on a regular basis without disturbing the callus knob (6.6).

4.30 pruning: The selective removal of plant parts to meet specific goals and objectives.

4.31 qualified line-clearance arborist: An individual who, through related training and on-the-job experience, is familiar with the equipment and hazards in line clearance and has demonstrated the ability to perform the special techniques involved. This individual may or may not be currently employed by a line-clearance contractor.

4.32 qualified line-clearance arborist trainee: An individual undergoing line-clearance training under the direct supervision of a qualified line-clearance arborist. In the course of such training, the trainee becomes familiar with the equipment and hazards in line clearance and demonstrates ability in the performance of the special techniques involved.

4.33 raise: Pruning to provide vertical clearance (7.3).

4.34 reduce: Pruning to decrease height and/or spread (7.4).

4.35 remote area: As used in the utility pruning section of this standard, an unpopulated area.

4.36 restoration: Pruning to redevelop structure, form, and appearance of topped or damaged trees (6.3).

4.37 rural area: As used in the utility pruning section of this standard, a sparsely populated place away from large cities, suburbs, or towns but distinct from remote areas.

4.38 shall: As used in this standard, denotes a mandatory requirement.

4.39 shoot: Stem or branch and its leaves, especially when young.

4.40 should: As used in this standard, denotes an advisory recommendation.

4.41 specifications: A document stating a detailed, measurable plan or proposal for provision of a product or service.

4.42 sprouts: New shoots originating from epicormic or adventitious buds, not to be confused with suckers. (syn.: watersprouts, epicormic shoots)

4.43 standard, ANSI A300: The performance parameters established by industry consensus as a rule for the measure of extent, quality, quantity, value or weight used to write specifications.

4.44 stem: A woody structure bearing buds, foliage, and giving rise to other stems.

4.45 structural pruning: Pruning to improve branch architecture (6.2).

4.46 stub: Portion of a branch or stem remaining after an internodal cut or branch breakage.

4.47 subordination: Pruning to reduce the size and ensuing growth rate of a branch or leader in relation to other branches or leaders.

4.48 sucker: Shoot arising from the roots.

4.49 thin: pruning to reduce density of live branches (7.5).

4.50 throw line: A small, lightweight line with a weighted end used to position a climber's rope in a tree.

4.51 topping: Reduction of tree size using internodal cuts without regard to tree health or structural integrity. Topping is not an acceptable pruning practice (6.1.7).

4.52 tracing: The removal of loose, damaged tissue from in and around the wound.

4.53 trunk: The main woody part of a tree beginning at and including the trunk flare and extending up into the crown from which scaffold branches grow.

4.54 trunk flare: 1. The area at the base of the plant's trunk where it broadens to form roots. 2. The area of transition between the root system and trunk (syn.: root flare).

4.55 urban/residential areas: Populated areas including public and private property that are normally associated with human activity.

4.56 utility: A public or private entity that delivers a public service, such as electricity or communications.

4.57 utility space: The physical area occupied by a utility's facilities and the additional space required to ensure its operation.

4.58 vista/view prune: Pruning to enhance a specific view without jeopardizing the health of the tree (6.4).

4.59 wound: An opening that is created when the bark of a live branch or stem is cut, penetrated, damaged, or removed.

4.60 woundwood: Partially differentiated tissue responsible for closing wounds. Woundwood develops from callus associated with wounds.

5 Pruning practices

5.1 Tree inspection

5.1.1 An arborist or arborist trainee shall visually inspect each tree before beginning work.

5.1.2 If a condition is observed requiring attention beyond the original scope of the work, the condition should be reported to an immediate supervisor, the owner, or the person responsible for authorizing the work.

5.1.3 Job briefings shall be performed as outlined in ANSI Z133.1, subclause 3.1.4.

5.2 Tools and equipment

5.2.1 Equipment, tools, and work practices that damage living tissue and bark beyond the scope of normal work practices shall be avoided.

5.2.2 Climbing spurs shall not be used when entering and climbing trees for the purpose of pruning.

Exceptions:
- when branches are more than throw-line distance apart and there is no other means of climbing the tree;
- when the outer bark is thick enough to prevent damage to the inner bark and cambium;
- in remote or rural utility rights-of-way.

5.3 Pruning cuts

5.3.1 Pruning tools used in making pruning cuts shall be sharp.

5.3.2 A pruning cut that removes a branch at its point of origin shall be made close to the trunk or parent branch without cutting into the branch bark ridge or branch collar or leaving a stub (see Figure 5.3.2).

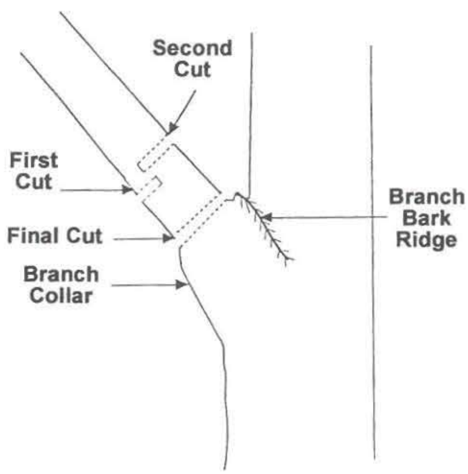

Figure 5.3.2. A cut that removes a branch at its point of origin. (See Annex A – Pruning cut guideline).

5.3.3 A pruning cut that reduces the length of a branch or parent stem shall be made at a slight downward angle relative to the remaining stem and not damage the remaining stem. Smaller cuts shall be preferred (see Fig. 5.3.3).

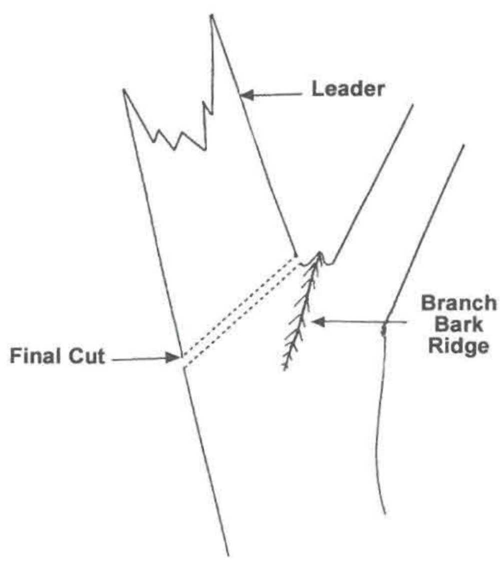

Figure 5.3.3. A cut that reduces the length of a branch or parent stem.

5.3.4 When pruning to a lateral, the remaining lateral branch should be large enough to assume the terminal role.

5.3.5 The final cut should result in a flat surface with adjacent bark firmly attached.

5.3.6 When removing a dead branch, the final cut shall be made just outside the collar of living tissue.

5.3.7 Tree branches shall be removed in such a manner so as to avoid damage to other parts of the tree or to other plants or property. Branches too large to support with one hand shall be precut to avoid splitting of the wood or tearing of the bark (see Figure 5.3.2). Where necessary, ropes or other equipment shall be used to lower large branches or portions of branches to the ground.

5.3.8 A cut that removes a branch with a narrow angle of attachment should be made from the outside of the branch to prevent damage to the parent branch (see Figure 5.3.8).

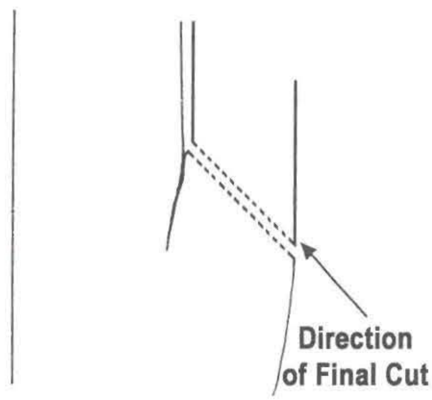

Figure 5.3.8. A cut that removes a branch with a narrow angle of attachment.

5.3.9 Severed branches shall be removed from the crown upon completion of the pruning, at times when the tree would be left unattended, or at the end of the workday.

5.4 Wound treatment

5.4.1 Wound treatments shall not be used to cover wounds or pruning cuts, except when necessary for disease, insect, mistletoe, or sprout control, or for cosmetic reasons.

5.4.2 Wound treatments that are damaging to tree tissues shall not be used.

5.4.3 When tracing wounds, only loose, damaged tissue shall be removed.

6 Pruning objectives

6.1 Pruning objectives shall be established prior to beginning any pruning operation.

6.1.1 Objectives should include, but are not limited to, one or more of the following:

- Risk reduction
- Manage health
- Clearance
- Structural improvement/correction
- View improvement/creation
- Aesthetic improvement
- Restoration

6.1.2 Established objectives should be specified in writing (See Annex B – *Specification writing guideline*).

6.1.3 To obtain the defined objective, the growth cycles, structure, species, and the extent of pruning to be performed shall be considered.

6.1.4 Not more than 25 percent of the foliage should be removed within an annual growing season. The percentage and distribution of foliage to be removed shall be adjusted according to the plant's species, age, health, and site.

6.1.5 When frequent excessive pruning is necessary for a tree to avoid conflicts with elements such as infrastructure, view, traffic, or utilities, removal or relocation of the tree shall be considered.

6.1.6 Pruning cuts should be made in accordance with section 5.3 *Pruning cuts*.

6.1.7 Topping and lion's tailing shall be considered unacceptable pruning practices for trees.

6.2 Structural: Structural pruning shall consist of selective pruning to improve tree and branch architecture primarily on young- and medium-aged trees.

6.2.1 Size and location of leaders or branches to be subordinated or removed should be specified.

6.2.2 Dominant leader(s) should be selected for development as appropriate.

6.2.3 Strong, properly spaced scaffold branch structure should be selected and maintained by reducing or removing others.

6.2.4 Temporary branches should be retained or reduced as appropriate.

6.2.5 Interfering, overextended, defective, weak, and poorly attached branches should be removed or reduced.

6.2.6 At planting, pruning should be limited to cleaning (7.2).

6.3 Restoration: Restoration shall consist of selective pruning to redevelop structure, form, and appearance of severely pruned, vandalized, or damaged trees.

6.3.1 Location in tree, size range of parts, and percentage of sprouts to be removed should be specified.

6.4 Vista/view: Vista/view pruning shall consist of the use of one or more pruning methods (types) to enhance a specific line of sight.

6.4.1 Pruning methods (types) shall be specified.

6.4.2 Size range of parts, location in tree, and percentage of foliage to be removed should be specified.

6.5 Espalier

6.5.1 Branches that extend outside the desired plane of growth shall be pruned or tied back.

6.5.2 Ties should be replaced as needed to prevent girdling the branches at the attachment site.

6.6 Pollarding

6.6.1 Consideration shall be given to the ability of the individual tree to respond to pollarding.

6.6.2 Management plans shall be made prior to the start of the pollarding process for routine removal of sprouts.

6.6.3 Heading cuts shall be made at specific locations to start the pollarding process. After the initial cuts are made, no additional heading cuts shall be made.

6.6.4 Sprouts growing from the cut ends of branches (knuckles) should be removed annually during the dormant season.

7 Pruning methods (types)

7.1 One or more of the following methods (types) shall be specified to achieve the objective.

7.2 **Clean:** Cleaning shall consist of pruning to remove one or more of the following non-beneficial parts: dead, diseased, and/or broken branches.

7.2.1 Location of parts to be removed shall be specified.

7.2.2 Size range of parts to be removed shall be specified.

7.3 **Raise:** Raising shall consist of pruning to provide vertical clearance.

7.3.1 Clearance distance shall be specified.

7.3.2 Location and size range of parts to be removed should be specified.

7.3.3 Live crown ratio should not be reduced to less than 50 percent.

7.4 **Reduce:** Reducing shall consist of pruning to decrease height and/or spread.

7.4.1 Consideration shall be given to the ability of a species to tolerate this type of pruning.

7.4.2 Location of parts to be removed or clearance requirements shall be specified.

7.4.3 Size of parts should be specified.

7.5 **Thin:** Thinning shall consist of selective pruning to reduce density of live branches.

7.5.1 Thinning should result in an even distribution of branches on individual branches and throughout the crown.

7.5.2 Not more than 25 percent of the crown should be removed within an annual growing season.

7.5.3 Location of parts to be removed shall be specified.

7.5.4 Percentage of foliage and size range of parts to be removed shall be specified.

8 Palm pruning

8.1 Palm pruning should be performed when fronds, fruit, or loose petioles may create a dangerous condition.

8.2 Live healthy fronds should not be removed.

8.3 Live, healthy fronds above horizontal shall not be removed. Exception: Palms encroaching on electric supply lines (see Fig. 8.3a and 8.3b).

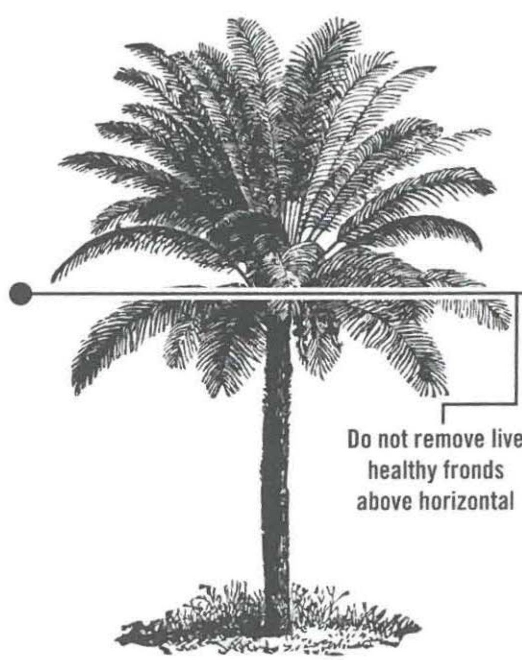

Figure 8.3a Frond removal location.

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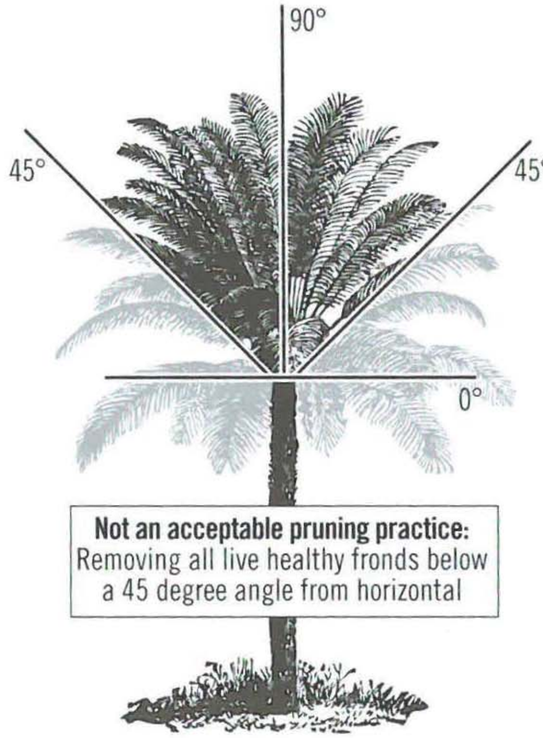


Figure 8.3b An overpruned palm (not an acceptable pruning practice).

8.4 Fronds removed should be severed close to the petiole base without damaging living trunk tissue.

8.5 Palm peeling (shaving) should consist of the removal of only the dead frond bases at the point they make contact with the trunk without damaging living trunk tissue.

9 Utility pruning

9.1 Purpose

The purpose of utility pruning is to prevent the loss of service, comply with mandated clearance laws, prevent damage to equipment, maintain access, and uphold the intended usage of the facility/utility space while adhering to accepted tree care performance standards.

9.2 General

9.2.1 Only a qualified line-clearance arborist or line-clearance arborist trainee shall be assigned to line clearance work in accordance with ANSI Z133.1, 29 CFR 1910.331 – 335, 29 CFR 1910.268 or 29 CFR 1910.269.

9.2.2 Utility pruning operations are exempt from requirements in subclause 5.1, *Tree Inspection*, for conditions outside the utility pruning scope of work.

9.2.3 Job briefings shall be performed as outlined in ANSI Z133.1, subclause 3.1.4.

9.3 Utility crown reduction pruning

9.3.1 Urban/residential areas

9.3.1.1 Pruning cuts should be made in accordance with subclause 5.3, *Pruning cuts*. The following requirements and recommendations of 9.3.1.1 are repeated from subclause 5.3 *Pruning cuts*.

9.3.1.1.1 A pruning cut that removes a branch at its point of origin shall be made close to the trunk or parent branch, without cutting into the branch bark ridge or collar, or leaving a stub (see Figure 5.3.2).

9.3.1.1.2 A pruning cut that reduces the length of a branch or parent stem shall be made at a slight downward angle relative to the remaining stem and not damage the remaining stem. Smaller cuts shall be preferred (see Fig. 5.3.3).

9.3.1.1.3 The final cut shall result in a flat surface with adjacent bark firmly attached.

9.3.1.1.4 When removing a dead branch, the final cut shall be made just outside the collar of living tissue.

9.3.1.1.5 Tree branches shall be removed in such a manner so as not to cause damage to other parts of the tree or to other plants or property. Branches too large to support with one hand shall be precut to avoid splitting of the wood or tearing of the bark (see Figure 5.3.2). Where necessary, ropes or other equipment shall be used to lower large branches or portions of branches to the ground.

9.3.1.1.6 A cut that removes a branch with a narrow angle of attachment should be made from the outside of the branch to prevent damage to the parent branch (see Figure 5.3.8).

9.3.1.2 A minimum number of pruning cuts should be made to accomplish the purpose of facility/utility pruning. The structure and growth habit of the tree should be considered.

9.3.1.3 Trees directly under and growing into facility/utility spaces should be removed or pruned. Such pruning should be done by removing entire branches or leaders or by removing branches that have laterals growing into (or once pruned, will grow into) the facility/utility space.

9.3.1.4 Trees growing next to, and into or toward, facility/utility spaces should be pruned by reducing branches to laterals (5.3.3) to direct growth away from the utility space or by removing entire branches. Branches that, when cut, will produce sprouts that would grow into facilities and/or utility space should be removed.

9.3.1.5 Branches should be cut to laterals or the parent branch and not at a pre-established clearing limit. If clearance limits are established, pruning cuts should be made at laterals or parent branches outside the specified clearance zone.

9.3.2 Rural/remote locations – mechanical pruning

Cuts should be made close to the main stem, outside of th branch bark ridge and branch collar. Precautions should be taken to avoid stripping or tearing of bark or excessive wounding.

9.4 Emergency service restoration

During a utility-declared emergency, service must be restored as quickly as possible in accordance with ANSI Z133.1, 29 CFR 1910.331 – 335, 29 CFR 1910.268, or 29 CFR 1910.269. At such times, it may be necessary, because of safety and the urgency of service restoration, to deviate from the use of proper pruning techniques as defined in this standard. Following the emergency, corrective pruning should be done as necessary.

Annex A
Pruning cut guideline

A-1 Three-cut method
Multiple cutting techniques exist for application of a three-cut method. A number of them may be used to implement an acceptable three-cut method.

A-1.1 The technique depicted in *Figure 5.3.2* demonstrates one example of a three-cut method that is common to hand-saw usage. It is not intended to depict all acceptable three-cut method techniques.

Annex B
Specification writing guideline

A300 (Part 1)-2008 *Pruning* standards are performance standards, and shall not be used as job specifications. Job specifications should be clearly detailed and contain measurable criteria.

The words "should" and "shall" are both used when writing standards. The word "shall" is used when writing specifications.

Writing specifications can be simple or complex and can be written in a format that suits your company/the job. The specifications consist of two sections.

I. General:

This section contains all aspects of the work to be performed that needs to be documented, yet does not need to be detailed.

Saying under the General section that "all work shall be completed in compliance with A300 Standards" means the clauses covering safety, inspections, cuts, etc. will be adhered to. There is no need to write each and every clause into every job specification.

Other items that may be covered in the General section could be: work hours and dates, traffic issues, disposal criteria, etc.

The second section under Job Specifications would be:

II. Details:

This section provides the clear and measurable criteria; the deliverables to the client.

This section, to be written in compliance with A300 standards, shall contain the following information:

1. **Objective – Clause 6**
   These objectives originate from/with the tree owner or manager. The arborist shall clearly state what is going to be done to achieve the objective(s).

   Objectives can be written for the entire job or individual trees. Rarely can one or two words clearly convey an objective so that all parties involved (client, sales, crew, etc.) can visualize the outcome.
2. **Method – Clause 7**
   Here the method(s) to be used to achieve the objective are stated. Again, depending on the type of job, this can be stated for the individual tree or a group of trees.
3. **Location – Clause 7.2.1, 7.3.2, 7.4.2, 7.5.3**
   This is the location in the tree(s) that the work methods are to take place.
4. **Density – Clause 7.3.1, 7.3.3, 7.5.1, 7.5.2, 7.5.4**
   This is the amount or volume of parts that are to be removed and can be stated exactly or in ranges.
5. **Size – Clause 7.2.2, 7.3.2, 7.4.3, 7.5.4**
   This is the size or range of sizes of cut(s) utilized to remove the volume specified.

   NOTE: Items # 4 & 5 are directly related to resource allocation, staffing and dollars.

SAMPLE PRUNING SPECIFICATIONS

#1. **Scope:** Large live oak on west side of pool

Objectives: Increase light penetration through east side of tree. Reduce risk potential of 1-inch-diameter branches falling.

Specifications: All broken branches and 1-inch-plus diameter dead branches shall be removed from the crown.

The three lowest 8-inch-plus diameter branches on the east side shall be thinned 25 percent with 1-inch- to 3-inch-diameter cuts.

NOTE: All work shall be completed in compliance with ANSI A300 and Z133.1 Standards.

#2. Scope: 1 Arizona ash

Objective: Enhance structure/structural development.

Specifications: General:

All pruning shall be completed in compliance with A300 Standards.

Detail:

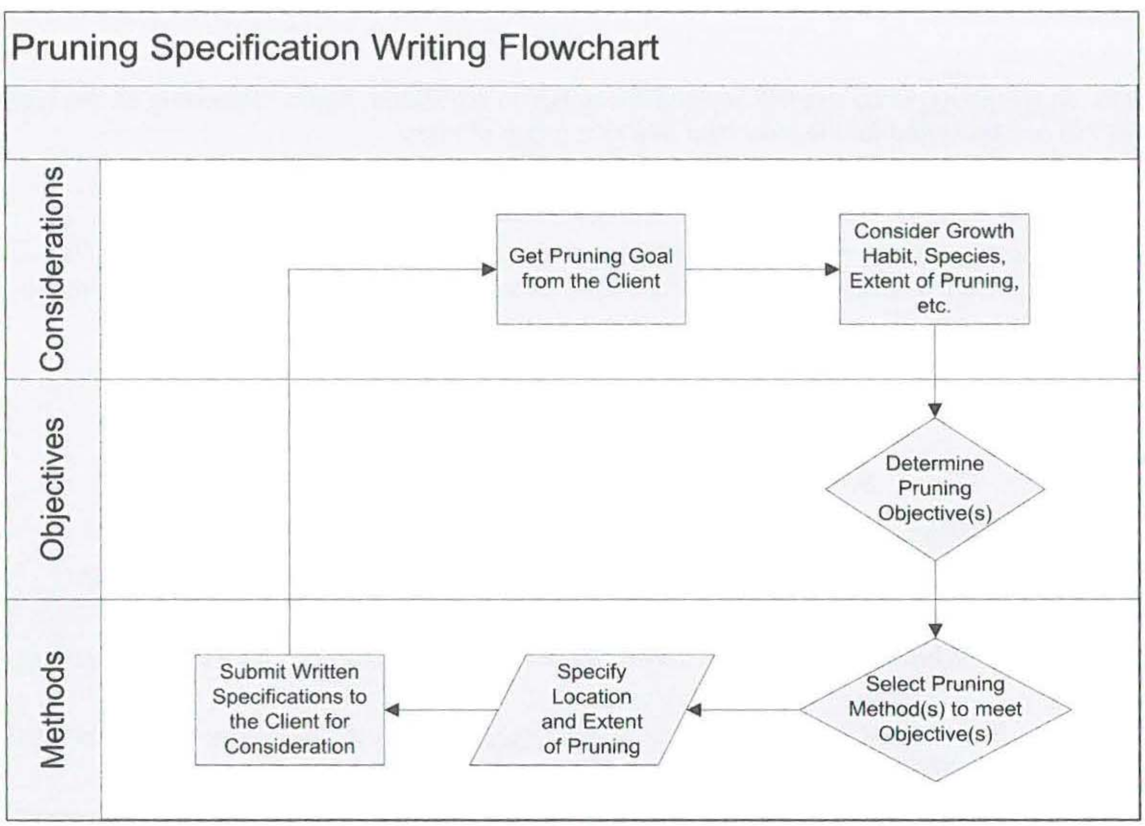
Thin crown 20-25 percent with 1-inch- to 4-inch-diameter cuts. Reduce west codominant leader by approximately 12 feet.

#3. Scope: Twenty-three newly installed evergreen elms

Objective: Maximize establishment – reduce nuisance while enhancing natural growth habit.

All work shall be completed in compliance with A300 Standards and the following specifications.

Specifications:
- Retain as much size as possible and 80-90 percent density of foliage.
- Lowest permanent branch will be 6 feet above grade in four to five years.
- Retain all sprout growth originating 18 inches above grade on trunk and 4 inches out from branch attachments throughout crown.
- Remove weakest rubbing branches.
- Remove dead branches.
- Reduce broken branches or branches with dead ends back to live laterals or buds. Heading cuts can be used.
- Maintain 6 inches behind adjacent edge of walks all growth that originates between 1.5 feet (18 inches) and 6 feet (72 inches) above grade. Heading cuts are acceptable.



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Annex C
Applicable ANSI A300 interpretations

The following interpretations apply to Part 1 – *Pruning:*

C-1 Interpretation of "should" in ANSI A300 standards

"An advisory recommendation" is the common definition of "should" used in the standards development community and the common definition of "should" used in ANSI standards. An advisory notice is not a mandatory requirement. Advisory recommendations may not be followed when defensible reasons for non-compliance exist.

C-2 Interpretation of "shall" in ANSI A300 standards

"A mandatory requirement" is the common definition of "shall" used in the standards development community and the common definition of "shall" used in ANSI standards. A mandatory requirement is not optional and must be followed for ANSI A300 compliance.

City of Carlsbad

APPENDIX G

International Society of Arboriculture Best Management Practices - Pruning

Pruning, 3rd Edition

Best Management Practices

Companion publication to the ANSI A300 Part 1:
Tree. Shrub, and Other Woody Plant Maintenance
– Standard Practices, Pruning

Best Management Practices

Tree Pruning

Third Edition

Sharon J. Lilly, Edward F. Gilman, & E. Thomas Smiley

Companion publication to the ANSI A300 Part 1:
Tree, Shrub, and Other Woody Plant Maintenance
– Standard Practices, Pruning

ISA

International Society of Arboriculture

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Contents

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Purpose

Professionals in the field of arboriculture established committees in the United States, the United Kingdom, and Germany to develop standards for tree maintenance designed to provide a more uniform level of service and to help ensure public safety. The U.S. committee, working under the auspices of the American National Standards Institute (ANSI), developed standards for pruning, planting, support systems, risk assessment, and other aspects of tree care. *The American National Standard for Tree Care Operations—Tree, Shrub, and Other Woody Plant Management—Standard Practices* (ANSI A300) was written to provide minimal performance standards for work practices and writing specifications.

The International Society of Arboriculture (ISA) has developed companion publications known as *Best Management Practices* to aid in the interpretation and implementation of ANSI A300 standards and to provide guidance to practitioners. These publications are intended as guides for practicing arborists, tree workers, their supervisors, and the people who employ their services.

Because trees and shrubs are unique living organisms, not all practices can be applied to all trees. It is important that contracts and specifications developed using these guidelines and the ANSI A300 standards are written or reviewed by a knowledgeable arborist. Departures from the standards should be made with careful consideration of the objectives and with supporting rationale.

This BMP is the companion publication to *ANSI A300 Part 1—Tree, Shrub, and Other Woody Plant Management—Standard Practices, Pruning (2017).* Root pruning standards are included in *ANSI A300 Part 8, Root Management*, and its companion publication the ISA *Best Management Practices: Root Management.*

Introduction

This *Best Management Practice* is intended to assist arborists to achieve industry standards and meet client expectations when pruning trees and shrubs. It provides reasons why pruning is undertaken; explains pruning systems and amounts; provides background and instruction on pruning cuts; reviews sample specifications; and comments on timing of these operations. Experience and observation teach the truth in Alex Shigo's observation: "Pruning is one of the best things an arborist can do for a tree but one of the worst things we can do to a tree." Pruning is a double-edged sword, either helping or hurting—depending on where, when, how, and why it is applied.

Pruning that is well executed results in a variety of benefits, including: reduced likelihood of whole tree, branch, and stem failure; appropriate (or required) clearance for utilities, buildings, vehicles, and pedestrians; improved health and appearance; and enhanced view. When poorly performed, pruning can harm the tree's health, stability, and appearance. Negative consequences can also occur when pruning is not performed at all (Figure 1).

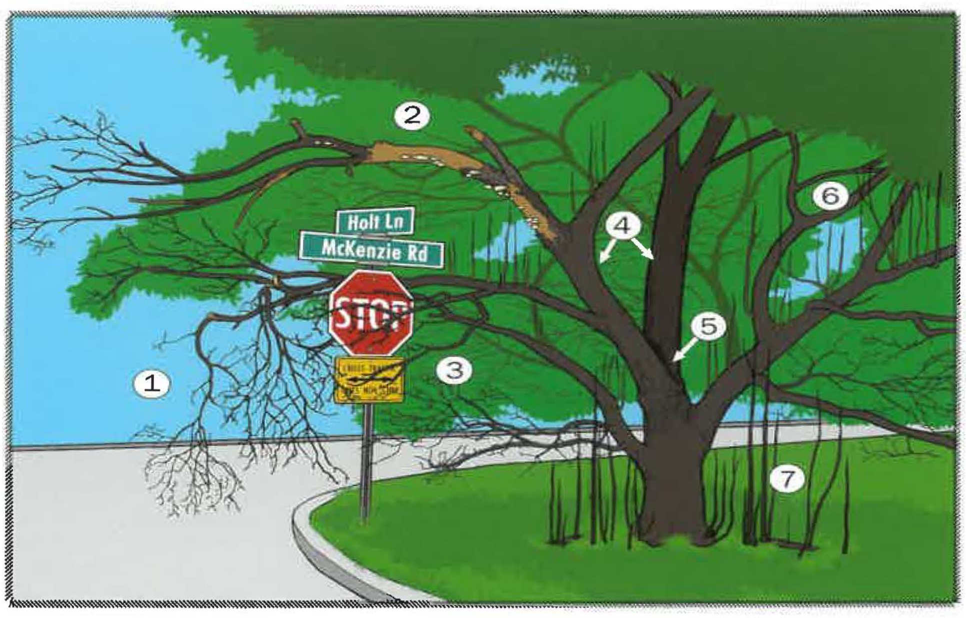


Figure 1. Several consequences can occur when pruning is not performed at all. These consequences include: 1) an accumulation of broken branches; 2) dead branches; 3) branches that interfere with site function; 4) weak, codominant stems; 5) defects such as included bark; and in some species, development of 6) watersprouts; and 7) suckers.

These consequences include development of branches that interfere with people or structures; weak, codominant stems; defects such as overextended branches; and accumulation of dead branches. In a forest these conditions may not be a concern, but in an urban environment they can pose risks to public safety, can threaten the health of trees, and may become unsightly.
It is best to prune trees when they are young to establish strong branch architecture. Young trees can readily respond to pruning wounds. Reducing or removing diseased, infested, or broken branches is a common practice on mature trees. Often trees must be pruned when they are mature to reduce the likelihood of live or dead branch failure, whole tree failure, or to mitigate interference with infrastructure, buildings, other plants, or human activities.

Pruning live branches reduces a tree's capacity to photosynthesize and manufacture sugar. Pruning also creates wounds the tree must expend energy to close and defend. Therefore, the costs and benefits of pruning healthy branches should be assessed when developing pruning objectives. Routine live-branch removal does not improve tree health, and some practices, such as lion-tailing, can have adverse effects on tree health and can increase the likelihood of branch failure.

Inspection

Prior to beginning any pruning operation, an arborist or qualified professional should visually inspect the plants to be pruned and understand the client's desires. Inspection should include:

- general condition/branch architecture/health,
- identification of the type of branches to reduce or remove (e.g., dead, overextended, interfering, needing clearance) and location (e.g., over house, under wires),
- amount of branches to be removed or reduced (number, diameter, or percentage),
- type of cuts to use (branch removal, reduction, heading, or shearing),
- signs of wildlife nesting, and
- worker safety concerns (e.g., root collar buried, powerlines, bees, tree defects).

This inspection should be the basis for establishing the objective and writing the proposal or specifications for work. In addition, the observation can be used to develop a job site safety analysis as specified by ANSI Z133 or other local regulations.

Arborists should be aware of national and local wildlife regulations and should strive to remain in compliance. Most birds and endangered species are protected from disturbance, and violators may be subject to significant penalties. When pruning during the spring and summer, check trees and shrubs for any signs of wildlife nests. Examine holes and cavities for woodpeckers, owls, and other cavity-nesting animals. If nests are present, do not disturb them. It is best to return at a later date to complete the work. If that is not possible, avoid disturbing the portion of the tree that contains the nest.

Working arborists arriving on the job site should conduct another inspection of the tree before entering it. If conditions are found that are not consistent with the initial inspection, they should be reported to a supervisor and/or the client and appropriate measures should be taken to mitigate the risk or amend the scope of work.

Pruning Systems

One of the overarching factors to consider prior to pruning trees or shrubs is the pruning system that will be applied. The pruning system defines the desired long-term form of the plant. In choosing a pruning system, the style and design of the landscape plus the client's goals need to be considered. The landscape design may be formal, semiformal, or informal. Often landscapes are a mixture of styles (e.g., formal at the entry to a building and informal on the periphery of a property). Various pruning systems have been used in arboriculture, fruit production, and landscaping; they include natural, topiary, pollard, espalier, pleach, fruit production, and bonsai.

Natural

The natural pruning system is an informal style used to retain and promote the characteristic form of the species or cultivar in its current location (Figure 2).

Arborists pruning street, landscape, and forest edge trees typically focus on the plant's natural form. Within this system, however, trees are often pruned to coexist with people and the urban environment, so trees may not have a completely natural appearance as they would have in an open field. Pruning within the natural system may involve branch removal and/or reduction that can alter the form of a tree to avoid conflict with infrastructure, encourage strong architecture, allow desirable views, and provide clearance.

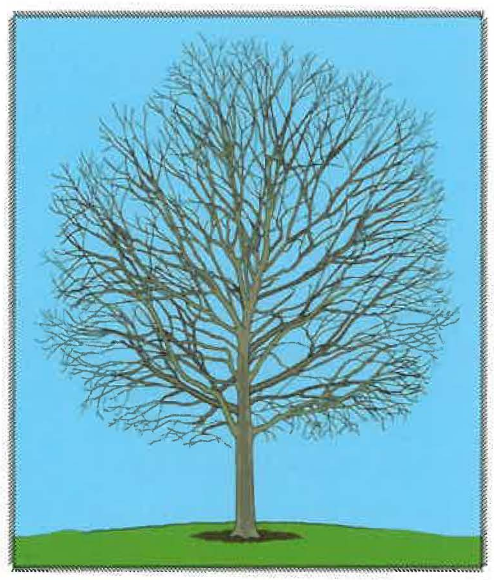


Figure 2. The natural system retains the characteristic form of the species, often with variations needed to avoid conflicts.

The pruning interval for the natural system is often longer than that of other systems. The natural system may require re-pruning every one to five years, while other systems may require re-pruning every few months or annually.

Topiary

Topiary is a formal pruning system in which shrubs, vines, or trees are pruned into a specified shape by shearing and/or pruning (Figure 3).

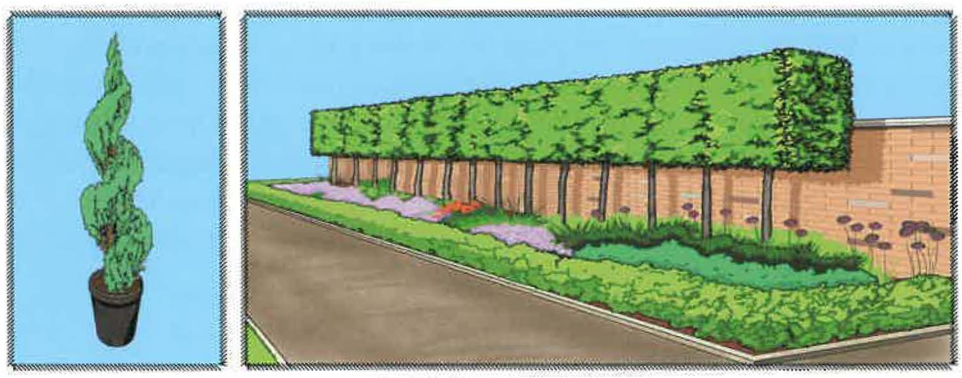


Figure 3. Topiary is a formal pruning system in which plants are pruned to the desired shape such as the spiral topiary (left) or aerial hedge (right).

Hedges and geometrically shaped trees and shrubs are forms of topiary. Sheared hedges and foundation plantings are common in urban and suburban landscapes. Topiary pruning is also used to create artistic forms and shapes, though this is usually reserved for high-visibility sites, specimen plantings, and formal landscapes.

The plant species that work best for this system are typically slow-growing, small-leaved evergreens. Species with fast growth rates require a shorter pruning interval. Growth regulators may be used on some species to extend the pruning interval.

Pollard

Pollarding is used to maintain trees in a certain size range, often with a semiformal appearance (Figure 4). Pollarded trees can live as long as or longer than trees maintained with the natural system.

Pollarding historically was used to generate epicormic sprouts for fuel, shelter, fodder, and other products, at a height where grazing animals could not reach them.

This type of pruning is primarily applied to deciduous trees that are known to tolerate this system (Table 1). Pollarding is not the same as the unacceptable practice of topping. Topping is the reduction of tree size by heading many or most large, live branches and leaders, without regard to long-term tree health or structural integrity.

Pollarding is a long-term process that involves heading followed by regular sprout removal. The process is usually started on young trees with heading cuts made on stems and branches that are about three years old. Heading older branches may kill or start the decline of some species. After these cuts, no additional heading cuts should be necessary. The tree should respond to the heading by producing an abundance of sprouts just below the cut surface.

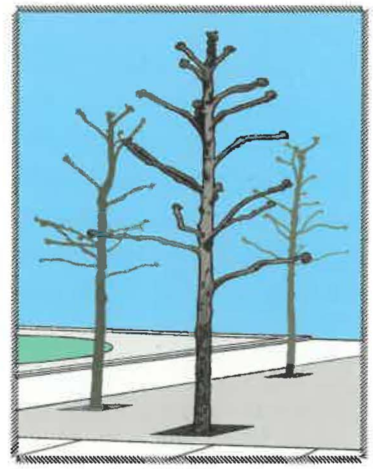


Figure 4. Pollarding is a semiformal pruning system. After years of sprout removal, pollard heads develop at the end of the branch.

Generally, all of these new sprouts are removed on an annual basis. However, the pruning interval can sometimes be extended up to three years, depending on species, climate, growth rate, and objectives.

After a few pruning cycles, pollard heads (also called knobs or knuckles) develop, and the tree produces sprouts primarily from these knobs. Knobs function in compartmentalization to reduce decay movement down the stems and branches. Sprouts that grow from knobs should be removed during the dormant season, taking care not to cut into or below the knobs. The knobs are the key differentiating factor between pollarding and topping. If knobs are damaged or removed in subsequent pruning, the cut branches react as they would on a topped tree. Once trees are pollarded, they usually should be maintained as pollards.

Table 1. Some species in these genera are known to tolerate pollarding.

Ash (*Fraxinus*)	Beech (*Fagus*)
Catalpa (*Catalpa*)	Crapemyrtle (*Lagerstroemia*)
Elm (*Ulmus*)	Coraltree (*Erythrina*)
Hawthorn (*Crataegus*)	Horsechestnut (*Aesculus*)
Japanese quince (*Chaenomales*)	Linden (*Tilia*)
Maple (*Acer*)	Oak (*Quercus*)
Pear (*Pyrus*)	Plane tree (*Platanus*)
Sweetgum (*Liquidambar*)	

Espalier

Espalier is a formal system for developing plants in a two-dimensional plane, such as along a wall or a fence (Figure 5).

This type of pruning was developed to maximize use of space and to create a visual effect. Sometimes fruit trees could be grown outside their natural hardiness range by growing them against south-facing walls (north-facing walls in southern hemispheres). The system is also used in commercial grape and modern apple production to promote uniform ripening, easier pesticide application, and easier harvesting.

Espalier is developed by selectively pruning branches and tying twigs to a vertical framework. Branches that do not fit the desired form are removed when they are small. As the espaliered plant matures, ties are removed or replaced to prevent girdling.

Figure 5. Espalier is a formal system for developing plants in a two-dimensional plane.

Pleach

Pleaching is a system that involves interweaving branches horizontally, to form an arbor, wall, allée, or arching tunnel.

This is usually accomplished using multiple plants and pruning, weaving, and tying branches together to create the desired effect. Pleaching, like espalier and topiary, requires frequent pruning and management to maintain plants in the desired form. The frequency of maintenance depends largely on the species, growth rate, climate, and intricacy of the design. Branches that do not fit the desired form are removed or bent when they are small. As the pleached plants mature and branches graft or grow together, ties are removed or adjusted to prevent girdling.

Fruit Production

There are numerous subsystems used in the commercial production of tree fruit. These systems are specific to the tree species, but the intent of all of them is to maximize fruit production. Examples of subsystems include central leader, modified central leader, bi-axis, espalier on a trellis, slender spindle, vertical axis, and open-center. Fruit tree pruning is not within the scope of this publication, but many publications are available on this topic.

Bonsai

Bonsai is a general term for a system that maintains container-grown trees at a small size. It is based on the Chinese *penjing* and the Japanese *bonsai* art forms for miniature, containerized trees.

In arboriculture, this system is intended mainly for trees that have confined root space, where a natural form is desired, and where the tree is to be maintained at a fixed or limited size.

Bonsai trees are maintained by regular leaf, twig, and root pruning, sometimes with the application of growth regulators. A detailed description of bonsai pruning is outside the scope of this publication, but there are many publications available on this topic.

Pruning Objectives

No tree should be pruned without a clearly defined objective. The objective is often determined by discussing with the client what they want to achieve with the pruning. Establishment of objectives must consider pruning system, plant health, growth habit, plant size, structure, species characteristics, expected growth response, client expectations, location, and site usage. After considering the above, a specification should be developed that states one or more pruning objective(s).

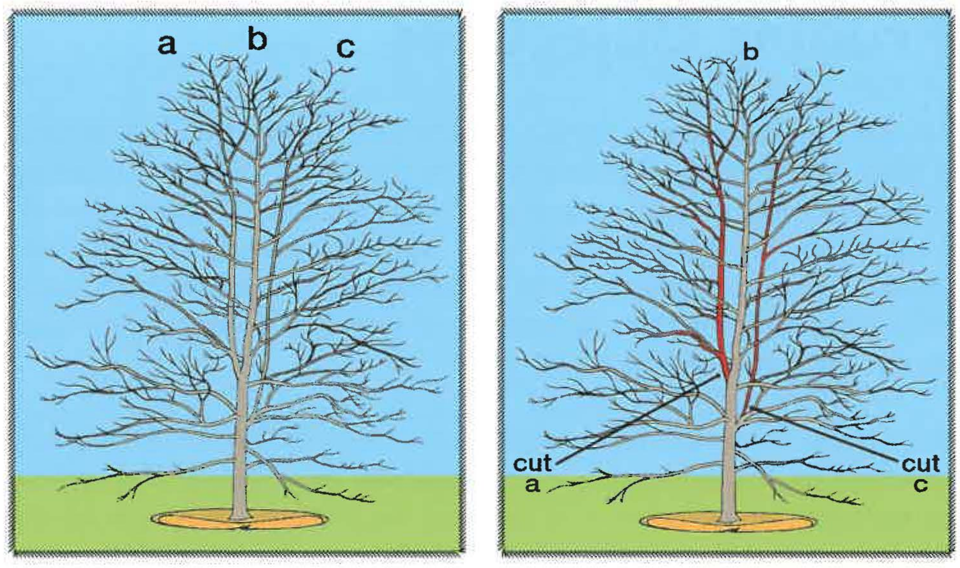
The most common and important objectives are described here along with guidelines for implementation. These objectives serve as examples and can be expanded or shortened to account for site conditions and expectations. Removing the correct stems and branches to accomplish specified objectives is as important as making correct pruning cuts. Even with good pruning cuts, if the wrong branches, too few branches, or too many branches are removed, nothing of merit is accomplished.

Improving Structure

Trees that have branch architecture or structure that is compatible with their site and intended use will provide more benefits for a longer time. Pruning can improve tree structure by establishing a trunk larger in diameter than all branches. In addition to developing strong architecture, structural pruning can promote or discourage branch growth in a certain direction (directional pruning). This can help minimize future interference with people, traffic, lines-of-sight, powerlines, buildings, lighting, or other plants. Structural pruning should be performed on young and semimature trees. Young trees have a larger proportion of sapwood, which results in plentiful energy reserves and the ability to quickly close pruning wounds.

Excurrent species will naturally tend to develop one dominant leader, unless codominant stems arise from injury or other causes. In contrast, species with a decurrent form usually do not develop a dominant leader in the landscape unless pruned to develop that structure.

Trees that are planted in clumps or that have a multistemmed natural growth habit can be maintained with several trunks where this shape fits the location. Moreover, even excurrent species may become decurrent over time.



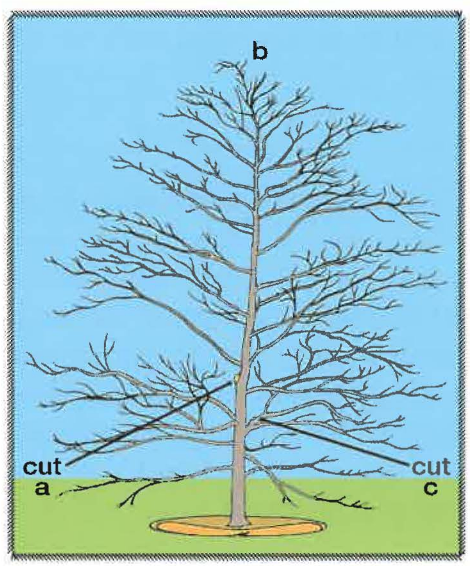


Figure 6. Pruning to improve structure is a common objective. On this young tree, a competing codominant steam (*a*) and a large lateral branch (*c*) were removed at their points of attachment (cut *a* and *c*) to clearly define the dominant leader.

For most tree species, the first step in structural pruning is to identify and establish one dominant leader. The dominant leader is the main stem that is or has the potential to be the tallest growing point. This leader is typically near the center of the crown, but it may be off-center to direct future growth away from a powerline or other obstruction. Stems and branches that are taller than or nearly as large in diameter as the desired dominant leader are reduced in length (subordinated) or removed (Figure 6).

Removal of these competing stems is the preferred option on small trees, especially those that may not be pruned again in the foreseeable future. Subordination is preferred when a minimal change in appearance is

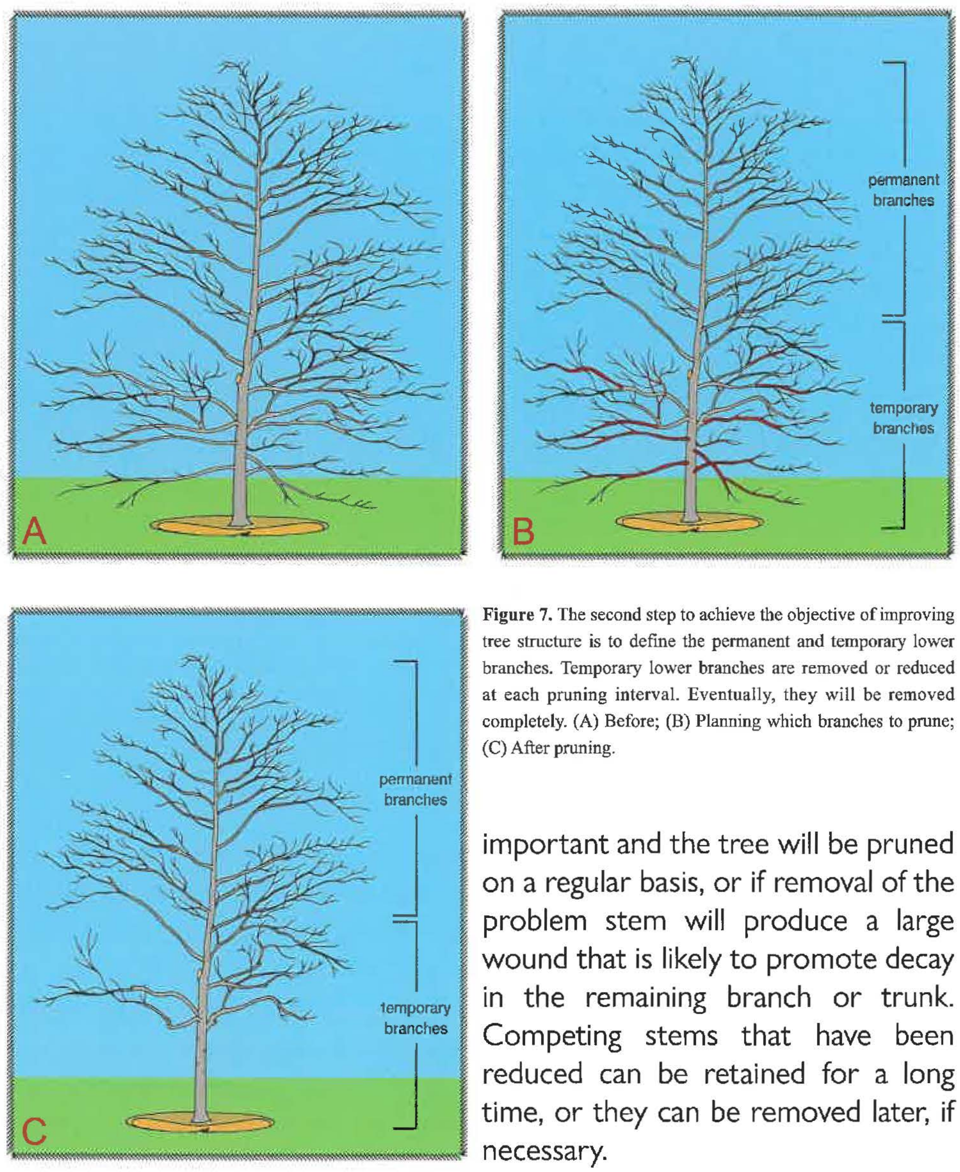
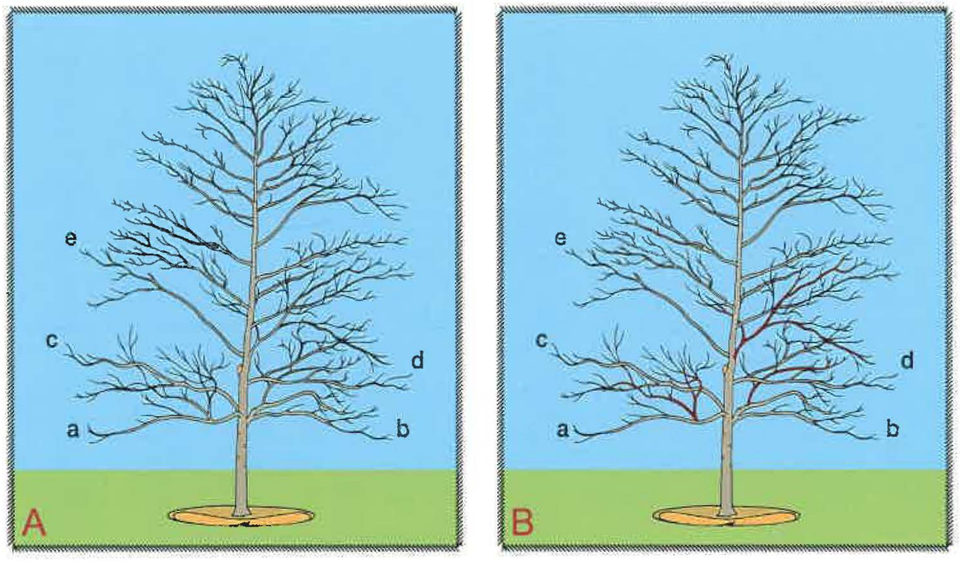


Figure 7. The second step to achieve the objective of improving tree structure is to define the permanent and temporary lower branches. Temporary lower branches are removed or reduced at each pruning interval. Eventually, they will be removed completely. (A) Before; (B) Planning which branches to prune; (C) After pruning.

important and the tree will be pruned on a regular basis, or if removal of the problem stem will produce a large wound that is likely to promote decay in the remaining branch or trunk. Competing stems that have been reduced can be retained for a long time, or they can be removed later, if necessary.

Reducing larger-diameter competing stems results in less decay potential in the parent stem than removal. To minimize the need to make large-diameter cuts, a short pruning interval (increased pruning frequency) and multiple prunings over a period of five to twenty years may be required.

The second step in structural pruning is the identification of the lowest permanent branches (Figure 7). The height of these branches from the



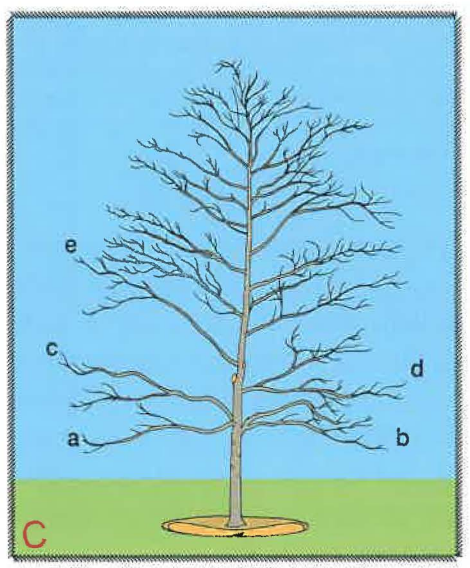


Figure 8. The third step to achieve the objective of improving tree structure is to remove or reduce branches that are arising too close to an adjacent branch and may interfere with future tree development. Here, the highlighted branches are removed to provide better vertical spacing. In future pruning cycles, branches *a* and *b* will also be removed. (A) Before; (B) Planning which branches to prune; (C) After pruning.

ground is dependent on location and function of the tree (Table 2). Shrubs and some open-grown trees have permanent branches all the way to the ground. Branches arising below the lowest permanent branch are considered temporary branches and should be reduced in length so they don't shade and interfere with the permanent branches; they should all be removed over time. In the short-term, temporary branches can be retained or reduced to promote growth and trunk taper development and to protect the trunk.

The third step is to begin establishing permanent tree architecture by considering vertical spacing of scaffold branches. Scaffold branches are the main outward/upward-growing branches on which other branches will develop to define the tree's crown.

Sustainable scaffold branches are those that are:

- located high enough aboveground to become a permanent part of the tree,
- strongly attached to the trunk,
- free of serious defects such as included bark, cracks, large wounds, and sharp bends,
- among the largest on the tree but less than the trunk diameter measured above the union,
- growing in a radial direction, outward from the stem, and
- appropriately spaced vertically apart.

A guideline for vertical spacing is about 8 inches (20 cm) for smaller trees and 18 to 24 inches (45 to 61 cm) or more for large-maturing trees, although this guideline varies with tree maturity and among species.

Spacing is established by reducing or removing competing stems or branches (Figure 8). Scaffold selection can take ten years or more depending on climate, species, and location.

During the structural pruning process, broken, dead, diseased, or damaged branches are typically removed, whereas the largest and competing branches are reduced. These three steps should be considered and can be performed at each pruning interval.

Table 2. Typical clearance distances as measured from the object or area of concern to the branch.

Object or area of concern	*Typical clearance distance*	
Sidewalk clearance	8 ft	2.4 m
Residential street clearance	14 to 18 ft	4.3 to 5.5 m
Arterial road (bus or truck route)	15 to 20 ft	4.6 to 6 m
Residential roof	6 ft	1.8 m
Building side clearance	3 ft	0.9 m

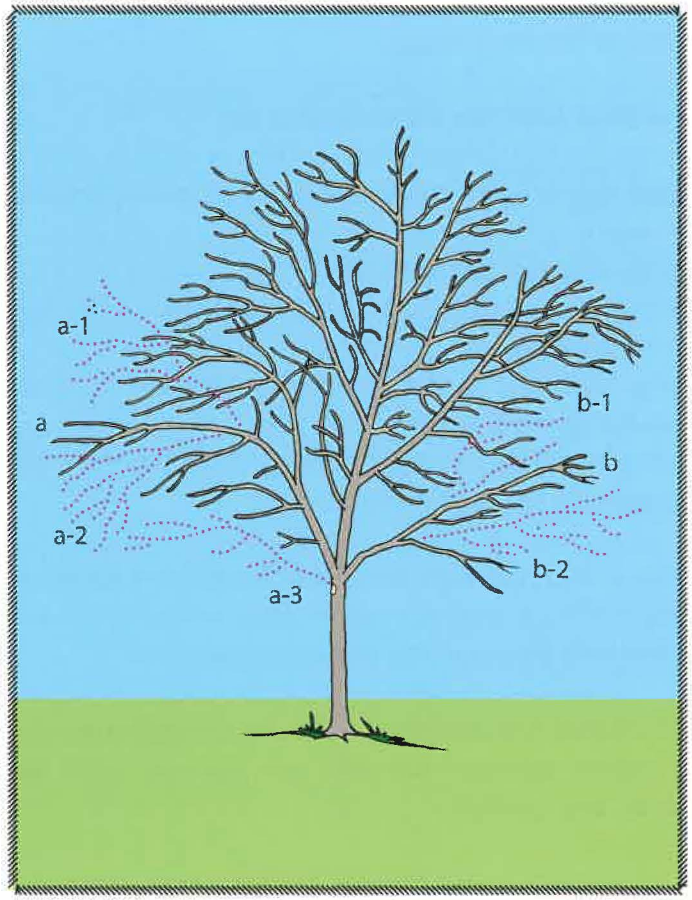


Figure 9. To achieve the objective of providing clearance, lower (temporary) branches are removed at the trunk (a-3) or reduced (a-1, a-2, b-1, b-2) to lighten their weight so they will spring upward.

Risk Mitigation Pruning (Reduce Likelihood of Failure)

Pruning to reduce the likelihood for branch or whole tree failure should be a primary consideration for large trees in urban areas. Branch, stem, and whole tree failures are influenced by many factors including species, defects or conditions, site conditions, loads, size, and response growth (see ISA's *Best Management Practices: Tree Risk Assessment*). Conditions and defects to consider for risk mitigation pruning are presented in Table 3 and Table 4.

The best way to reduce likelihood of failure in the future is to routinely structurally prune trees when they are young through middle age to develop strong architecture. As trees grow larger and branch architecture is established, risk mitigation has a different emphasis. To reduce the likelihood of trunk and root failure, it may be necessary to reduce the height and/or spread of the entire crown or certain sections of it. In some cases, whole tree removal may be the only option to reduce the likelihood of whole tree failure to an acceptable degree. The choice among these depends on the tree, site, and the type and consequence of failure.

When pruning trees that drop large fruit, removal of the fruit or developing inflorescence may be included in risk mitigation pruning. Examples of these species that produce large fruit include: osage orange (*Maclura pomifera*), coconuts (*Cocos nucifera*), Coulter and Bunya pines (*Pinus coulteri* and *Araucaria bidwillii*), and some tropical fruit trees.

Topping trees as a means to reduce height and/or spread is considered an unacceptable practice, as it causes decay, the development of branches with poor attachment to parent branches, and greater likelihood of branch failure.

Table 3. Some defects and conditions that increase the likelihood of branch failure that can be mitigated by branch removal or reduction include branches that are:

• dead	• dying
• diseased	• cracked
• decayed	• broken or detached
• hanging	• excessively long
• large in diameter (>50% of parent)	• outside of the normal shape of the crown

Table 4. Some conditions that may increase the likelihood of trunk or root failure are:

• trunk decay	• root decay
• buried root collar	• shallow root system
• girdling roots	• cut, missing, or restricted roots
• excessive lean	• asymmetrical crown
• cracks	• low live crown ratio
• excessive height	• excessive soil moisture

Provide Clearance

The objective of clearance pruning is to reduce interference with people, activities, infrastructure, buildings, traffic, lines-of-sight, desired views, or health and growth of other plants. Clearance pruning plays an important role in ensuring safe and reliable electrical utility services and, in some cases, compliance with regulatory and other requirements. Typical clearance distances are defined in Table 2.

Directional pruning is the preferred way to direct branch growth, often well in advance of growth within the clearance area. Branches that are causing or will cause interference should be removed or reduced. When reducing these branches, make the cut to a lateral branch that is not growing in the direction of the clearance zone when possible. This directs growth away from the specified clearance area and promotes compatible branch structure (Figure 9). Clearance pruning often must be done on a regular cycle because new growth eventually will fill the void created by pruning.

To slow regrowth after pruning, application of a tree growth regulator can be considered. When growth within the clearance area cannot be reliably prevented by pruning or using tree growth regulators, whole tree relocation or removal may be required.

Maintain Health

The objective of pruning to maintain tree health typically includes the removal of infested, infected, damaged, or rubbing branches. The removal or reduction of diseased or insect-infested branches has been called sanitation pruning. Sanitation pruning may reduce the spread of pests within the tree or to adjacent trees, especially when combined with pest management practices.

Reducing branch density at the crown periphery can allow more wind to pass through the crown and can provide more light penetration that can promote drying to reduce foliar diseases; this type of pruning is considered in the next section.

Reduce Density

Reducing density of foliage at the crown periphery (previously called *thinning*) is sometimes performed to increase wind or light penetration for aesthetic reasons and to promote interior foliage development. This objective is accomplished by selective removal (young trees) or reduction (mature trees) of the longest and largest branches. The dominant leader is rarely reduced or removed. Vines and some epiphytes may also excessively shade tree foliage and may be included in this objective or as its own objective. The objective of reducing density may be achieved in combination with improving tree structure. When large competing branches are reduced or removed, the effect will be to reduce foliar density. Improving tree structure is an objective that is usually considered more important than reducing density. Moreover, pruning to improve structure often serves to reduce density.

The removal of live interior and lower lateral branches should be avoided. Removal of a majority of lower or interior branches results in a concentration of growth at branch ends (lion-tailing) and is an unacceptable practice.

Restoration

The objective of restoration is to improve a tree or shrub's structure, form, or appearance after it has been topped, severely headed, vandalized, lion-tailed, broken in a storm, or otherwise damaged. This is done through the selective removal and/or reduction of branches, sprouts, and stubs to encourage growth in a more natural form. Crown restoration is usually accomplished over several pruning cycles. Trees that have been restored may require routine risk mitigation pruning to manage loads on sprouts, scaffold branches, and/or stems that have previously failed or been damaged.

On trees with many sprouts originating near the ends of branch stubs, some sprouts are selected to become permanent branches and to reform a more natural-appearing crown. To accomplish this objective, consider shortening some sprouts, removing others, and leaving some untouched. Some vigorous sprouts that will remain as branches may need to be shortened to control growth and ensure adequate attachment for the size of the sprout. To develop one dominant sprout to replace the broken branch requires two or more prunings. Often two or more sprouts are needed to resume the natural growth habit.

Lion-tailed trees can be restored by first allowing sprouts to develop along the interior portion of a branch for one to several years depending on the size, age, health, climate, and condition of the tree. After the rate of sprout growth slows, some of the sprouts are removed and/or reduced along the entire length of the branch, such that they are evenly distributed and spaced.

Restoration may require a variety of types of cuts. At times, heading cuts may be preferable to branch removal cuts or reduction cuts to preserve as much of a damaged branch as practical. This is sometimes the case in restoration after storm damage.

Size Management

When the objective is to make a tree or shrub smaller while maintaining its natural shape, size management pruning strategies are applied.

Size management may be done for aesthetic reasons, when the tree has overgrown its site, when it obstructs a line-of-sight, to reduce loads (as in risk mitigation pruning), or to remove branches that will interfere with powerlines or other structures. In the past, this has been termed *crown reduction*.

Size management is accomplished with branch removal cuts, reduction cuts, or rarely, heading cuts (Figure 10). The size of cuts should be as small as possible to reduce risk of decay entry. On decay-prone species, cuts less than 4 inches (10 cm) in diameter are preferred.

A particular application of size management is retrenchment. The objective of the retrenchment process is to preserve declining overmature trees by mimicking the natural process sometimes seen in certain species of trees as they age, losing their upper branches/trunk and shedding overextended, decayed, weakly attached, or damaged branches.

With branch loss, energy is redirected into epicormic sprout growth on interior and lower portions of the crown. Retrenchment is sometimes performed to preserve trees of high value or special heritage, while minimizing the likelihood of failure. Arborists should determine whether retrenchment is appropriate, considering factors such as species, size, condition, branch architecture, placement, aesthetics, and expected response.

Shrub Rejuventation

The objective of shrub rejuvenation is to improve the health and appearance of especially large-growing mature plants that are overly dense or declining in health due to the size or age of some of the stems.

Rejuvenation, reduction, and even density reduction pruning are often joint strategies for mature shrub pruning.

Rejuvenation is accomplished by removing or reducing large or declining stems to near ground level to allow space and energy for new sprout development. This is done with removal, reduction, or heading cuts on older stems near ground level. Cuts are made as low as possible and depend on vitality, location, and species. Some species are more able to withstand cuts lower on the stem than others, and heavily shaded stubs may not produce sprouts. Excessive new sprouts may need to be removed or reduced to manage their growth the next time the shrub is pruned. Plant growth regulators can reduce excessive sprout growth on some species.

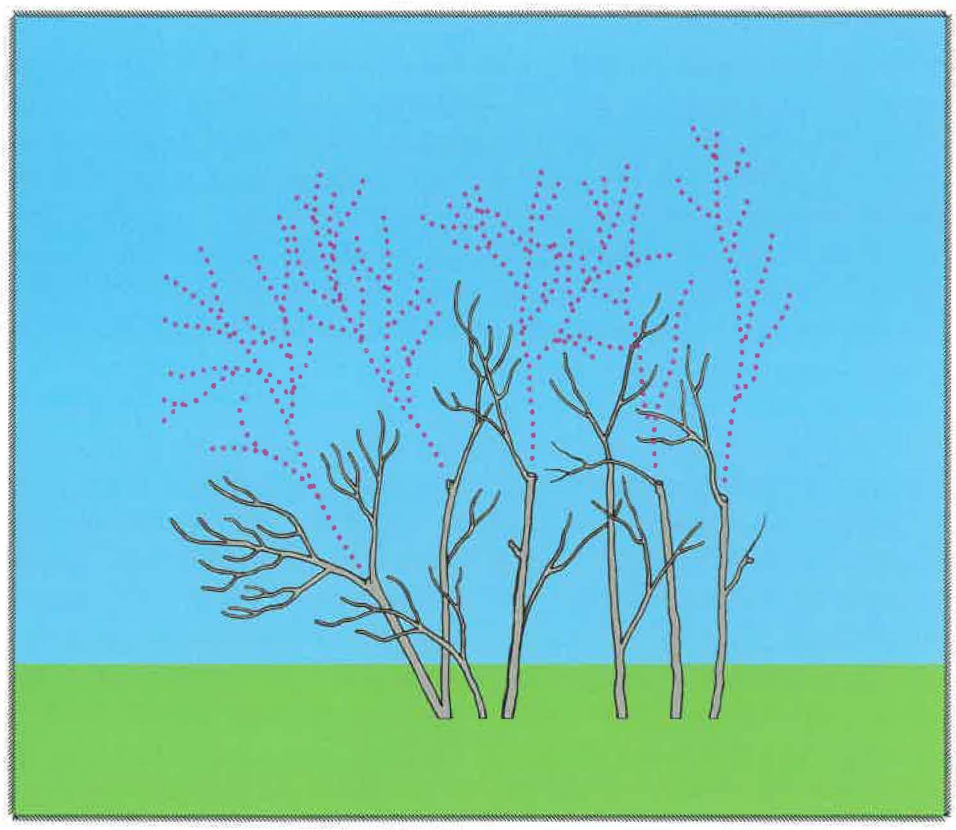


Figure 10. Size management can be achieved with a combination of branch removal and reduction cuts or, rarely, heading cuts. With these shrubs, mainly small-diameter reduction cuts were made.

Flower or Fruit Production

The objective of increasing or decreasing the number or size of fruit or flowers can be addressed, in some cases, with pruning. When fruit density is too great, branch failure or large fruit drop can occur. Reduction cuts or shearing done when flower buds are present will greatly reduce the number of flowers and subsequent fruit. In addition to pruning to manage fruit density, there are chemical treatments available in some areas that can reduce fruit production.

Fruit production can be increased by pruning to create a strong structure with adequate sunlight exposure. Fruit tree pruning for commercial production is not within the scope of this publication, but there are numerous other publications on this topic. The timing of pruning can greatly affect flower production. This topic is covered under "When to Prune."

Improve a View

When pruning to improve a view, branches are removed to create or enlarge a space allowing people to look through, over, or under the crown of a tree to a specific feature such as water, mountains, orchards, or a city. In many cases, an unobstructed view over the top of the trees or shrubs may be desired. This objective should not be accomplished through the unacceptable practice of topping or lion-tailing. The preferred approach is crown size or density reduction or, in some cases, pollarding. Arborists should be aware that view pruning involving topping or reduction is prohibited or controlled in some areas or for certain species.

Most professionals prefer to create view spaces or "windows" though a crown to conserve a more natural growth habit. This involves the reduction or removal of individual live branches within the crown. The vantage point from which the views are sought and the desired landmarks should be identified. Often an arborist will stand with the client at the preferred viewing area and identify individual branches with a laser pointer so another arborist in the tree can target specific branches for pruning. If all of the parties are not present, a photograph may be included in the specifications illustrating which branches are to be removed. The number and location of the branches to remove will depend on the preferred view, the tree's tolerance of branch loss, and the client's tolerance for obstructing branches. Maintaining window-like views generally requires less frequent pruning than crown reduction. Tree growth regulators are sometimes used in conjunction with view-pruning to extend the pruning interval.

Improve Aesthetics

When the objective is to improve aesthetics, this often involves shaping or balancing the crown of shrubs and, in some cases, trees. Other times some small ornamental trees are pruned to remove some small upward- and downward-growing branches to create a horizontal, layered effect.

Pruning to improve aesthetics typically includes the removal or reduction of undesirable branches such as dead, diseased, broken, crossing, or those growing outside of the desired shape of the crown. Branches to be removed will be highly dependent on the pruning systems employed such as natural, pollarding, topiary, and espalier.

Manage Wildlife Habitat

A consideration with any pruning objective can be managing wildlife habitat. Pruning can have a positive or negative impact on habitat. Tradeoffs between habitat and other pruning objectives therefore need to be balanced. Pruning can decrease wildlife cover, food supplies, and nesting sites. For example, many wildlife species are reliant on fruit and dead, dying, or decayed branches. Removing these can reduce wildlife habitat. In addition, removal of active bird nests is illegal in most countries.

If one of the objectives is to maintain or promote wildlife habitat, not all dead, dying, and decayed branches should be removed. In some cases, branches can be intentionally wounded to encourage decay and create cavities intended for nesting. Some arborists have gone as far as installing decayed logs or boxes in the tree to promote wildlife nesting.

Pruning Cuts

Tree Biology

To predict and appreciate how trees will respond to different types of pruning cuts, it is necessary to understand some tree biology. Pruning live branches reduces a tree's ability to photosynthesize and manufacture sugar, at least for a short period. Pruning live branches converts live wood behind the pruning cut to nonliving wood. Pruning also creates wounds that the tree must expend energy to close and defend. Routine live-branch removal does not necessarily improve tree health, and some practices, such as topping, can have adverse effects on both tree health and structure. In addition, excessive branch removal from the interior of the crown (lion-tailing) can actually increase the likelihood of branch failure. These are the costs of removing live branches. The costs and benefits of pruning, such as improved branch architecture and reduced failure potential, should be assessed when developing pruning objectives and deciding on pruning amounts.

Compartmentalization or CODIT (compartmentalization of decay in trees) is a model that illustrates the defense processes that limit the spread of damage/decay based on physical and chemical properties of the wood. Compartmentalization relies on both pre-existing defense strategies and active responses in living cells. If large cuts are made exposing heartwood there will be no active response, leaving only pre-existing defense mechanisms to slow or stop decay movement. In decay-prone tree and shrub species, the more wood exposed the greater the potential for decay. Smaller wounds will typically be closed more readily, resulting in less decay over time. Wound closure occurs when woundwood around the edges of the cut covers the wound.

When branches remain small relative to the trunk diameter, a swollen collar often develops around the base of the branch. The collar is formed by overlapping and intermingled branch and trunk wood (Figure 11). The overlapping and intermingled wood makes a strong union. Inside the collar on most trees is a chemical barrier called the branch protection zone. Its function is to retard the spread of air and decay organisms into the trunk. If the collar is removed or severely damaged, decay can more readily spread into the wood of the stem or parent branch behind the pruning cut.

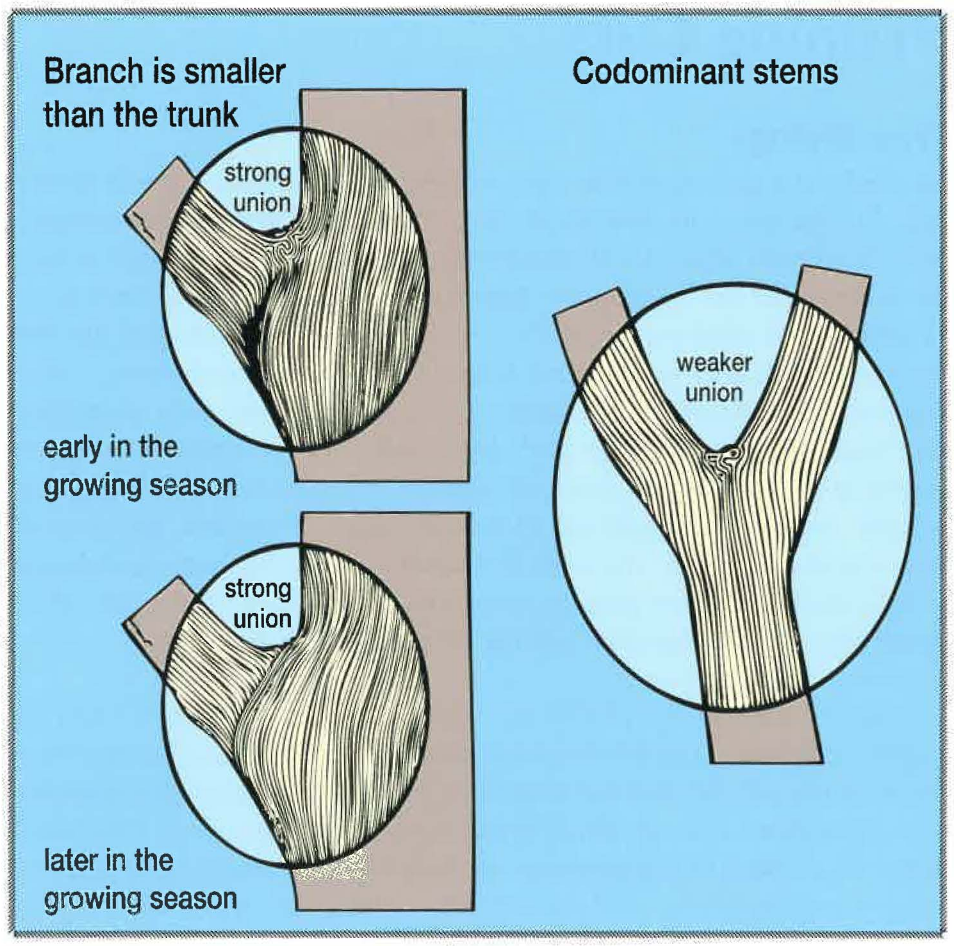


Figure 11. Small branches are well connected to the trunk as a result of overlapping and intermingled trunk and branch tissue in the union (left). Codominant stems are not as well connected because wood tissue does not overlap in the union (right).

A branch bark ridge (Figure 12) is the area of bark at the top of a branch union where the growth and expansion of the trunk or parent stem and adjoining branch push the bark into a ridge. The branch bark ridge should not be damaged during pruning.

When two or more stems of approximately equal size (codominant stems, with diameter ratios greater than 80 percent) arise from a union, there is little overlapping or intermingled wood, at least on young stems. The result is a weaker union. Decay can enter when one stem is removed because there is no branch protection zone at the base of a codominant stem (Figure 11).

The union is structurally even weaker when bark is included in the attachment. Included bark is bark that is imbedded inside the union as the closely spaced stems increase in size. This condition further weakens the union, making the tree prone to failure at that point. A normal branch bark ridge is not formed at the top of the union when included bark is present.

Pruning is a growth-retarding process that removes stored energy and growing points from the pruned portion of a plant. Energy in the form of starch, sugars, and oils is stored in branches, stems, trunk, and roots. This energy can be conserved by removing the fewest number of living branches necessary to accomplish the objective. Excessive branch removal depletes these reserves and reduces the ability of the tree to produce more energy through photosynthesis.

In deciduous species (angiosperms), pruning is a bud-triggering process. Latent buds are stimulated by an increase in sunlight and the removal of buds that produce growth-regulating hormones. Many trees generate sprouts in response to excessive pruning. Sprouting generates new growth to replace foliage to photosynthesize and replace the energy. Many conifers (gymnosperms) will not produce sprouts following pruning.

Although pruning live branches has a cost, it is essential to forming good structure, maintaining clearances, mitigating risk, and to meeting other objectives, so it is a necessary part of a tree care program.

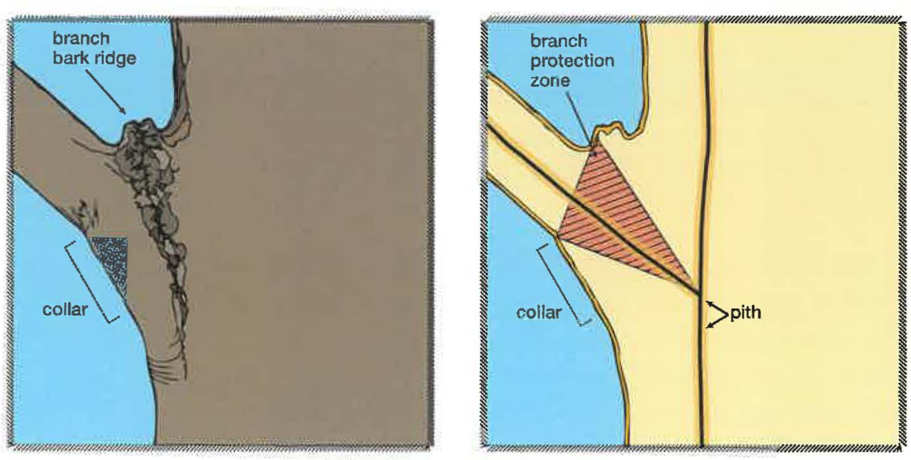


Figure 12. A branch protection zone at the base of branches reduces the spread of decay into the stem.

Types of Pruning Cuts

There are four types of pruning cuts in arboriculture: branch removal cut, reduction cut, heading cut, and shearing cut.

Branch Removal Cut

A branch removal cut (previously termed a *thinning cut* or *removal cut*) removes the smaller of two branches at a union with the parent stem (Figure 13). Removal cuts retain the branch bark ridge and branch collar (when present) and do not create a stub. Branch removal cuts are more likely than reduction and heading cuts to allow a tree's branch protection zone and compartmentalization strategies to work. In this publication and when writing specifications, branch removal cuts are referred to as *branch removal* or simply *remove*.

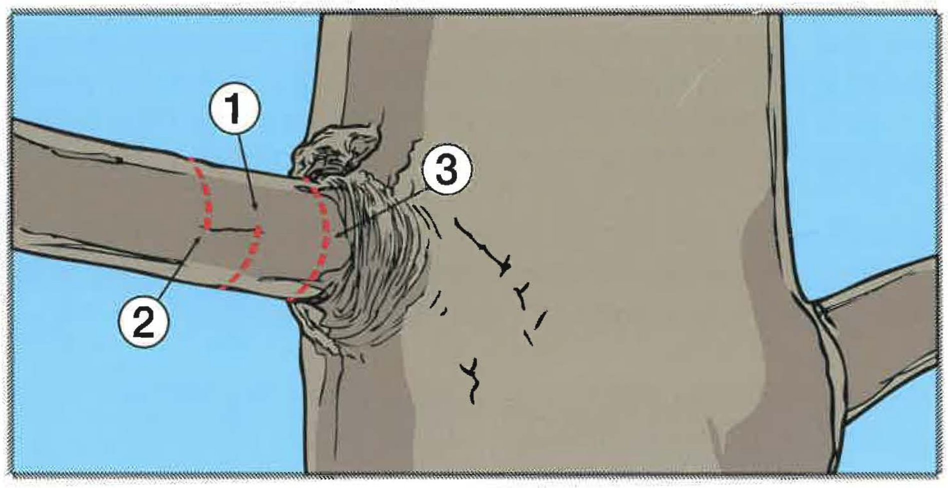


Figure 13. A branch removal cut removes the branch at the parent stem without cutting into the branch bark ridge, branch collar, or leaving a stub. Here the 3-cut method is illustrated. This method reduces the likelihood of tearing the stem bark when the cut is made.

The cut should leave a smooth surface with no jagged edges or torn bark. If there is no collar, the top of the cut should be located where the top of the branch makes an abrupt upward turn at the union. The correct position varies among trees and branches. If there is a bark inclusion in the union, cut as far down into the union as possible without injuring trunk or parent branch wood. Making cuts flush to the parent stem or branch is not an acceptable practice.

Reduction Cut

A reduction cut (previously called *cutting to a lateral*) removes the larger of two or more branches, stems, or codominant stems to a live lateral branch or stem, typically at least one-third the diameter of the stem being removed (Figure 14). Cutting back to a lateral that is smaller in size is considered a heading cut. Reduction cuts are commonly used in structural pruning, subordination, directional pruning, density reduction, risk mitigation, or when reducing plant size. Reduction cuts are referred to in specifications as *branch reduction*, *reduction*, or *reduce*.

Reduction cuts are typically made at an angle relative to the remaining stem. When possible, avoid large (greater than 4 inches [10 cm] diameter) reduction cuts and cuts that expose heartwood on species that are poor compartmentalizers. Cut size is less important on temporary branches that will be removed later.

Trees do not always compartmentalize reduction cut wounds as well as wounds from branch removal cuts. The ability of the tree to compartmentalize wounds is a function of the size of the cut, the age of the cut stem or branch, tree vitality, species, and the time of year. The smaller the cut and the more vigorous the tree, the better the wound closure and compartmentalization.

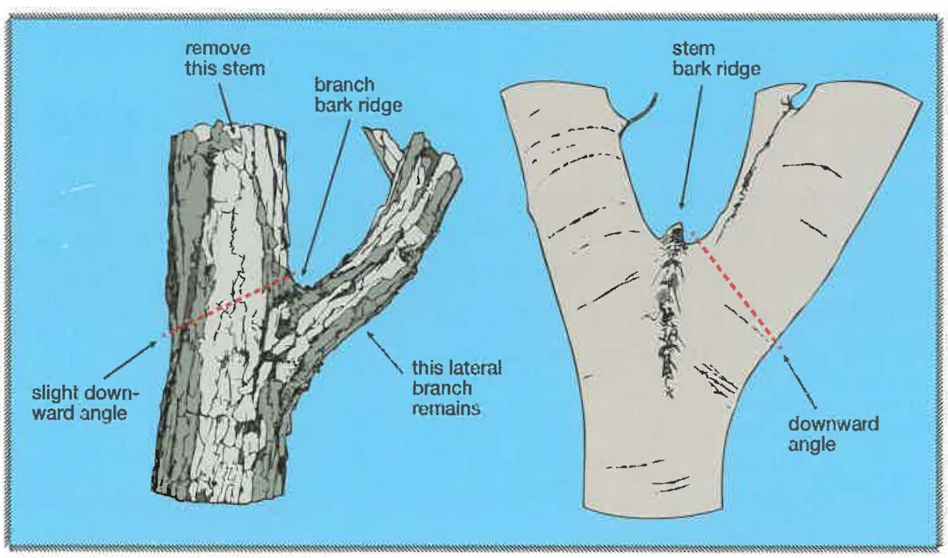


Figure 14. A reduction cut removes the larger of two or more branches, stems, or codominant stems to a branch or stem that is typically at least one-third the diameter of the stem being removed.

Heading Cut

A heading cut removes a branch or stem between nodes, to a bud, or to a live branch less than one-third the diameter of the branch or stem being removed. Except when cutting back to a small lateral branch, this type of cut leaves a stub. Heading cuts are rarely appropriate on established trees.

Heading cuts can, however, be used:

- on current season's growth, especially when shearing within the topiary system,
- to remove old flower heads,
- to remove developing fruit,
- to reduce the length of a young sprout,
- to start a pollard,
- to rejuvenate or manage the size of a shrub,
- to create or preserve wildlife habitat,
- for structural development on young plants, and
- to avoid the removal of a large branch where the alternative is making a large cut on the trunk or scaffold branch.

A heading cut should only be made if the remaining lateral(s) or shoots that grow from retained buds are expected to sustain the remaining branch. Heading should not be used to reduce the height or size of trees in other instances. This practice is called *topping* and can be damaging.

Shearing Cut

Shearing is cutting of leaves, sprouts, and branches to a desired plane, shape, or form, as within the topiary system. Shearing should be employed only with species tolerant of this type of pruning and only on stems and branches capable of generating new sprouts. Only a portion of the new growth should be removed, so that some new leaves will continue producing energy for plant development. Shearing tends to produce a dense outer crown that causes loss of foliage in the inner crown.

Shearing can be combined with branch removal or reduction to manage plant size. Shearing is appropriate and commonly practiced with topiary shrubs, hedges, and some trees. This type of pruning is accomplished with tools designed for that purpose. Converting from the natural system to a topiary system by "rounding over" large trees is usually not appropriate.

Making Pruning Cuts

Because a tree's ability to close pruning wounds and compartmentalize decay is crucial to the long-term health and stability of a tree, the smallest diameter cuts that meet the objective are preferred. The number and size of cuts that expose heartwood should be minimized.

Large or heavy branches should be precut using three cuts to avoid splitting the wood or tearing the bark (Figure 13). The first cut undercuts a large branch 1 to 2 feet (0.3 to 0.6 m) out from the parent branch or trunk. The undercut reduces the chance of the branch tearing bark as it is removed. The second cut is made from the top directly above the undercut or farther out on the branch. The third and final cut is to remove the stub without tearing bark below the cut and should leave adjacent bark firmly attached.

With large trees, branches often need to be lowered rather than dropped to the ground to reduce damage to the tree and objects below the tree. This procedure is done with ropes, cranes, or other equipment. Details on these procedures can be found in *The Art and Science of Practical Rigging*.

When removing a branch with a narrow angle of attachment, the cut should be made from the outside (underside) of the branch to prevent damage to the remaining branch or stem. When removing a branch with included bark, the cut should be made as close as possible to the point where the wood of the stems joins without damaging the remaining stem. When removing a dead branch or stem, the final cut is made just outside the collar of living tissue, without leaving a dead stub. If the collar has grown along a dead branch stub, only the dead stub should be removed. The collar contains live tissue and should not be injured or removed.

When treating damaged bark (bark tracing), only loose or damaged tissue should be removed. Cutting into living tissue increases wound size and should be avoided.

Wound Dressing

Wound dressings are treatments applied to pruning cuts or other tree wounds. Traditionally, they were formulated with asphalt-based products in paint or spray form. Asphalt wound dressings were once thought to accelerate wound closure and reduce decay. Research shows asphalt products do not reduce the spread of decay. However, studies have shown the beneficial effects of wound dressings in reducing insect attraction. This is the case for the oak wilt vector and some boring insects at certain times of the year. Chemical wound treatment can also suppress sprout production and mistletoe.

Wound dressings are occasionally used for cosmetic purposes. If a dressing must be applied, use only a light coating of a nonphytotoxic material. Examples include many spray paints or brushed-on latex paint. Wound dressings and especially sealants should not be applied to decayed wood due to their potential for keeping the area moist and promoting decay.

Pruning Practices

How Much to Prune

The amount of material to be removed should be governed by client objectives, condition of the tree, the pruning cycle, and the tree's ability to tolerate pruning. The pruning amount should be included in the scope of work, proposal, or work order. It can be a specified number of pruning cuts of certain sizes and types. For example, "remove the 6-inch (15-cm) diameter[1] branch over the house," or "reduce three 4-inch (10-cm) diameter branches growing toward the street by making 2- to 2.5-inch (5-6 cm) cuts."

The amount of foliage to be removed is sometimes expressed as the percentage of foliage or buds to be removed. The goal is to avoid removing more live branches than necessary to achieve the objective. Some guidelines suggest not removing more than 25 percent within a growing season. This guideline may be helpful as a starting point for thought, but it is too broad to apply to all trees. Vigorous, young trees usually tolerate more branch removal. Conversely, mature, stressed, or sensitive trees may tolerate only minimal removal of live branches. Excessive removal could stress some trees, causing decline, reduced defense against pests, or sunburned bark tissue. In some cases, such as for clearance or risk reduction, a large amount of foliage may need to be removed from a section of the crown to meet the objective.

For managing height and spread of the crown or managing length of individual branches, the amount to remove may be expressed as the length of the branch section to be removed and/or with the size and type of pruning cut to make. When pruning for clearance, quantity may be expressed as removal of enough branches or branch length to provide a specified clearance distance.

Cut sizes can be included to guide the working arborist as to which branches to remove or reduce.

For dead, dying, cracked, and broken branches, quantity is often not specified, but it is implied to be all that can be found. A minimum and sometimes a maximum diameter should be specified (e.g., remove all dead branches 2 inches [5 cm] in diameter or larger). This may be from the entire crown or

1. Branch diameter is estimated at the point of attachment to the parent branch or stem.

from a more limited area within the crown such as above a "target" or up to a specified height.

When to Prune

Removal of dead, dying, diseased, or broken branches can be accomplished any time with little negative effect on the tree. Trees with Dutch elm disease (*Ophiostoma* spp.) or other vascular and canker diseases should have symptomatic branches removed as soon as they are identified to limit the spread of the pathogen. Healthy, live branches can also be pruned in any season, but there are some short-term differences in tree response.

Wound closure is generally fastest if pruning is done in the spring and early summer. Spring growth can be maximized and defects are easier to see on deciduous trees if they are pruned in the winter or before growth resumes in early spring. Pruning certain species when dormant can minimize the likelihood of insect pest problems associated with wounding.

In early spring, when there is root pressure pushing sap flow in certain deciduous species, such as maples (*Acer*), birches (*Betula*), and hornbeam (*Carpinus*), there can be significant sap flow from pruning wounds (Table 5). Although unattractive, sap drainage has little negative effect on tree growth or health. Sap dripping can be avoided by pruning in summer or fall.

The timing of pruning can be an important part of a Plant Health Care program. For example, one way to reduce the spread of oak wilt and Dutch elm disease is to prune when the vector insect is not active. This can be region dependent; for example, where oak wilt is present in Texas, pruning susceptible trees is best performed in the summer months. In the Northern United States, oaks are

Table 5. Trees that often drip sap (bleed) during late winter, early spring.

- Avocado (*Persea americana*)
- Cottonwood (*Populus spp.*)
- Flowering dogwood (*Cornus florida*)
- Honeylocust (*Gleditsia triacanthos*)
- Magnolia (*Magnolia spp.*)
- Mesquite (*Prosopis spp.*)
- Silk-oak (*Grevillea robusta*)
- Willow (*Salix spp.*)
- Birch (*Betula spp.*)
- Elm (*Ulmus spp.*)
- Hackberry (*Celtis spp.*)
- Hornbeam (*Carpinus*)
- Maple (*Acer spp.*)
- Poplar (*Populus spp.*)
- Walnut (*Juglans spp.*)

pruned in the winter to reduce the likelihood of infection. Arborists should comply with any local or regional regulations.

Plant growth rate can be reduced if live-branch pruning takes place during or soon after the initial growth flush. This is the period when trees have just expended a great deal of stored energy to produce roots, foliage, and early shoot growth. In some cases, slowing of growth is a goal; however, pruning live branches from stressed trees at this time can reduce their energy reserves even further, leading to decline or death.

Flowering can be prevented or enhanced by pruning at a certain time of year. To retain the most flowers on plants that bloom on current season's growth (new wood), such as crapemyrtle (*Lagerstroemia*) or linden (*Tilia*), prune in winter or in the summer just after bloom. Plants that bloom on the previous season's growth (old wood), such as crabapples (*Malus*), cherries (*Prunus*), and hydrangeas (*Hydrangea*), prune just after bloom to preserve the flower display.

Fruit trees can be pruned after bloom to thin fruit or during the dormant season to enhance structure and distribute fruiting wood.

Work Practices

Equipment and work practices that damage living tissue and bark beyond the scope of the work should be avoided. At times it may be necessary to use rigging equipment to lower branches to protect structures, property, or other parts of the tree.

Cut or detached branches should always be removed from the crown upon completion of pruning, whenever trees are left unattended, or at the end of the workday, unless otherwise specified in the scope of work.

When pruning has a high potential to spread pests, appropriate precautions should be taken. Precautions may include avoiding pruning during certain times of year, sterilizing tools, or applying pest management measures. If pruning exposes thin bark and has a high potential to result in sunscald, consider using a temporary protective covering for vulnerable areas or pruning fewer branches so as to minimize bark exposure to direct sun.

When frequent or excessive pruning is required to achieve objectives, alternatives should be considered. Alternatives may include relocation of the plant, treatment with growth regulators, or removal and replacement with an appropriate plant. With tree removal, the increased exposure of adjacent trees may affect their likelihood of failure.

Tools and Equipment

Select pruning tools appropriate for the size of cuts being made. Scissor-type pruning tools (Figure 15) such as pruning shears (secateurs) and lopping shears (loppers) are preferred for smaller branches, typically less than 1-inch (2.5 cm) in diameter.

Dull, anvil-type pruning tools, with a blade that cuts to a flat surface, should be avoided because they crush tissue. To avoid leaving a small stub, place the blade side of the pruner against the stem. For larger cuts, handsaws or chainsaws are preferred. Pruners, handsaws, and chainsaws should be sharp and maintained according to manufacturer's recommendations so as to make clean cuts with a smooth surface without jagged edges or tears.

In the majority of cases, climbing spurs should not to be used for pruning operations. The exceptions are: when branches are more than a throwline distance apart and there are no other means of climbing the tree, or when the bark is thick enough to prevent damage to the cork cambium (for example, on thick-barked species such as mature redwoods). It is acceptable to use climbing spurs to reach an injured coworker.

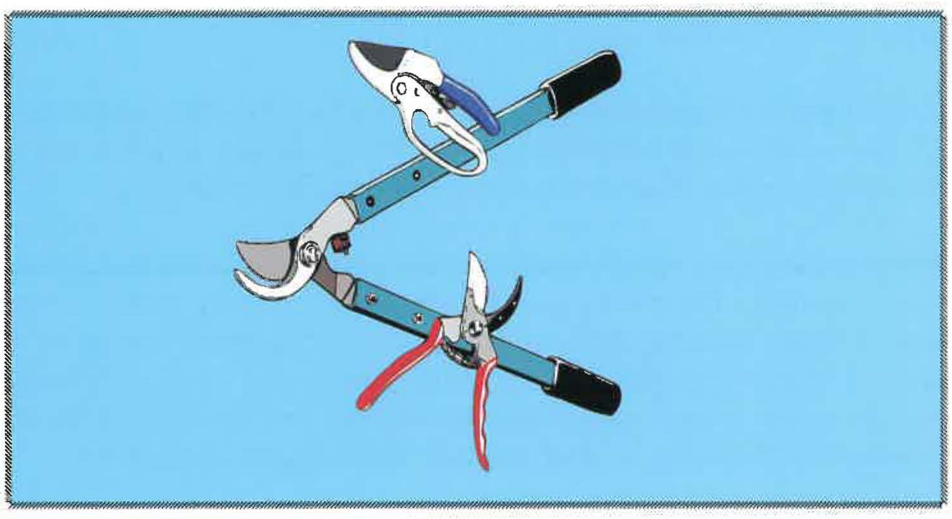


Figure 15. Scissor-type pruning tools such as pruning shears (secateurs) and lopping shears (loppers) are preferred when making smaller cuts

Although a rare occurrence, the likelihood of spreading pathogens on pruning tools varies with the disease, plant species, tools, environmental conditions, and timing. Chainsaws are difficult, if not impossible, to sterilize during pruning operations. If tools are sterilized, it is important to use a material that will not injure plant tissues or damage the equipment. Materials commonly used to sterilize tools include bleach (10 percent solution) or Lysol™ (Figure 16). Handsaw blades can be sterilized by heating the blade with a propane torch, stopping well before the blade turns red. For specific disease–host plant recommendations, check the local land grant university website, or consult with an extension agent to determine whether such procedures are necessary.

Mechanical Pruning

Mechanical pruning is performed with heavy equipment that is fitted with power saws or other cutting devices (e.g., saws mounted on tractor booms or suspended from a helicopter). Mechanical pruning is often used in orchards, on long sections of right-of-way, and along highways to provide clearance and reduce labor costs. Because mechanical tree pruning is not as selective as manual methods, it should be restricted to remote/rural locations, away from settled areas and dwellings, or during emergency situations. Mechanical pruning cuts made to provide clearance should be made close to the main stem, outside of the branch bark ridge and branch collar. Precautions should be taken to avoid trunk wounding.

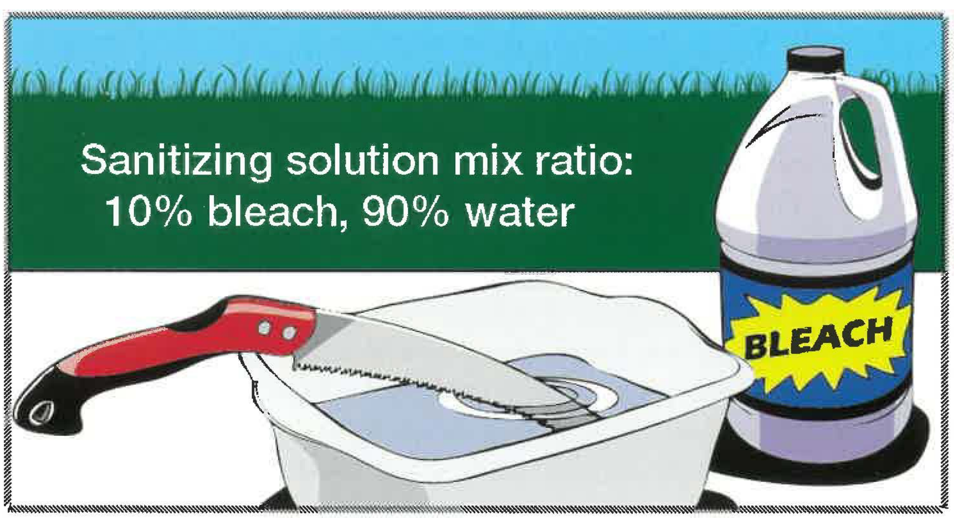


Figure 16. It is difficult and usually unnecessary to sterilize pruning tools. When it needs to be done, dipping into a bleach or Lysol™ solution can be effective treatments

Poor Pruning Practices

Various pruning practices can be harmful to plants, for example: making flush cuts; unnecessarily leaving a stub; removing an excessive number of live branches; or pruning at a time or in a manner that spreads disease.

Some specific pruning practices known to be damaging to trees are topping, lion-tailing, and excessive thinning, raising, or reduction. Topping is the reduction of tree size done by cutting to stubs without regard for long-term tree health or structural integrity. Lion-tailing is the removal of lower and interior branches on main scaffolds that results in a concentration of growth at branch ends. Both of these practices are considered unacceptable. Excessive thinning can result in similar problems to lion-tailing along with excessive wounding, sunscald, and temporarily increasing loads. Removal of too much of the lower crown moves the center of force farther up and out and reduces a tree's ability to dissipate energy through branch movement. This can result in greater forces on the crown and more branch or whole-tree failures.

Conifers

Conifers benefit from the removal of dead, dying, and diseased branches, as do other trees. They can also benefit from structural pruning after the dominant leader is damaged. At times, they may need clearance pruning. However, some pruning strategies are not appropriate for conifers. For example, pruning for branch spacing and scaffold branch development is usually not necessary. Reducing density on spruces and firs rarely is needed, although in windy areas branch and/or crown reduction can reduce wind resistance and, therefore, whole-tree failures. Removing entire branches to the stem as a means to reduce wind resistance may increase the likelihood of failure of the remaining branches and is seldom recommended on conifers with low live crown ratios. Pine growth may be managed by shortening new growth (candles) rather than branch removal. Few conifer tree species respond well to pollarding; some tolerate reduction. Reducing branch length beyond the zone of live foliage usually results in branch death, unless the species (such as Canary Island pine) is capable of sprouting. Few fir and spruce (*Picea*) produce sprouts; pine species vary widely in sprout production; and new growth on old branches is common in coast redwood and cypress (*Cupressus*).

Palms

Palms do not require pruning to remain healthy; they do not require pruning to prevent storm damage; in fact, there is evidence they may be damaged more when a storm follows recent pruning to remove older (lower) fronds. Palm pruning is the removal of fronds, flowers, fruit, stems, or loose petioles that may pose a danger to structures, climbers, electrical facilities, and people nearby. Palms also may be pruned for aesthetic reasons to eliminate basal sprouts, dead fronds, and seedpods. Live, healthy fronds should not be removed except when necessary to provide clearance. If live, healthy fronds must be removed, avoid removing those that initiate above horizontal. Since palms extract nutrients from declining fronds, nutrient deficient plants should be fertilized before declining fronds are removed to reduce the impact of nutrient loss than may accelerate the decline (Figure 17).

Fronds to be removed should be cut close to the petiole base without damaging living trunk tissue. Removing dead petiole bases by cutting into live tissue (a procedure called shaving, skinning, peeling, or sanding) is not an acceptable practice because it often allows the entry of disease that will shorten plant life expectancy. When pruning large specimens such as date palms (*Phoenix*), the three-cut pruning technique should be used to avoid heavy fronds ripping down the trunk.

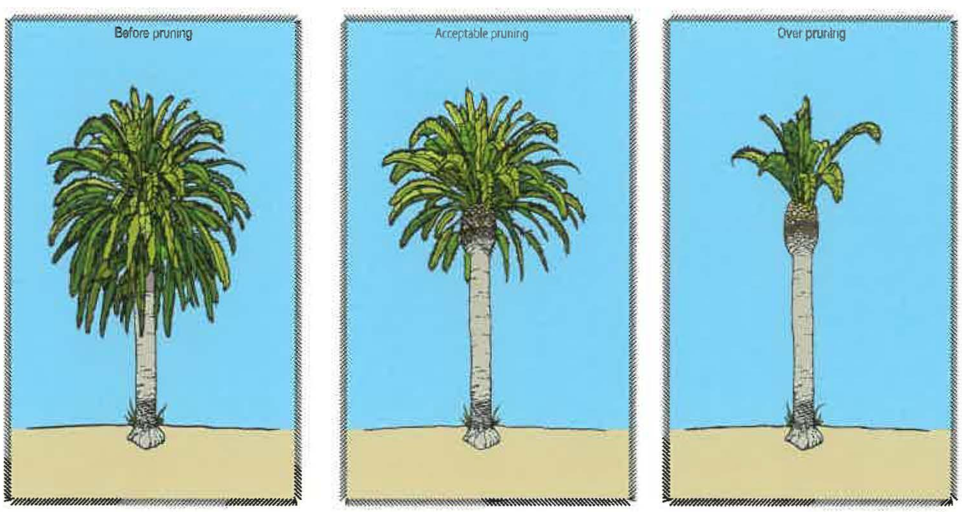


Figure 17. Palm pruning primarily removes dead or dying fronds. When live fronds are removed, it should only be those that are below horizontal.

When pruning palms infected by or susceptible to *Fusarium* wilt, the use of chainsaws should be avoided. Handsaws should be sterilized or a new blade should be used between trees to avoid spreading the disease.

Climbing spikes should not be used to ascend palms for pruning. Only climbing lines, ladders, pole tools, or aerial lift equipment should be employed to maintain palms. To ensure worker safety, removal of palm frond skirts should be performed from the top down (ANSI Z133).

Bamboo

Pruning bamboo is generally not necessary, but it can improve the aesthetics of a stand. Culms and branches should be pruned by making cuts just above nodes, without leaving a stub. The plant will not grow back from the point of the cut, but branch development below the cut will be enhanced on certain species. Bamboo is best pruned in late summer or fall after sprouts have been formed. If pruning is done while sprouts are being produced, energy reserves can be reduced.

Pruning Specifications

Written specifications are key to good pruning because they communicate what is to be done. Specifications protect both the client and the arborist by ensuring that everyone clearly understands the objectives and scope of the work. Municipalities, utilities, commercial arborists, and property owners all benefit from using specifications. Commercial tree care companies should apply their national standards when writing pruning specifications. The United States, Germany, England, and other countries have national standards for tree pruning.

Specifications should include the pruning systems, objectives, pruning cut type(s), size range of branches to remove, amount to remove, and location of branches (Table 6). Amount can be expressed as a percentage, size, length, or number of branches to be removed. Specifications should also include the time frame for completion, the plan for disposal or repurposing of debris, and a recommendation for re-inspection or re-pruning (pruning interval).

The following are examples of pruning specifications. The specifications you develop should be based on client objectives and on the species, condition, and size of the trees to be pruned.

Table 6. Information that should be included in written pruning specifications.

- Plant name (common or genus and species)
- Location (address and place in the landscape)
- Pruning system to be applied (e.g., natural, pollard, topiary [hedge, shape])
- Pruning objective (e.g., manage risk, improve structure, clearance, manage size)
- Type of parts to remove (e.g., live or dead branches, fruit, mistletoe)
- Size range of branches to remove (e.g., diameter range, maximum or minimum diameter, length)
- Location within the crown of the parts (e.g., whole crown, near house, over street)
- Amount to remove (e.g., all [as with dead branches over 2 inches {5 cm} in diameter], number of branches, or a percentage of foliage [as with ~ten percent of live branches])
- Plan for disposal of debris (e.g., remove all debris, chip brush, and leave wood chips, leave firewood)
- Time frame for completion of the work (e.g., 2 weeks, over the winter, July)
- Re-inspection or pruning interval (e.g., 5 years, annual, monthly during the growing season)
- Additional information as needed (e.g., topiary shape, clearance distances, desired view)

Specification Examples

EXAMPLE ONE:
Specification for pruning young street trees

Trees to prune: Twenty-seven oak (*Quercus*) street trees that are 4- to 8-inch (10- to 20-cm) diameter at breast height (dbh) and 20 to 30 feet (6 to 9 m) tall along Sweetwater Lane from the 1600 block to the 1800 block.

Personnel qualifications: All work shall be performed under the supervision of an ISA Certified Arborist®, an ISA Board Certified Master Arborist®, or equivalent.

Pruning system: Natural.

Objective: To improve crown structure and provide clearance for adjacent sidewalk and street.

Branches to prune:

1. Reduce length by two-thirds of any codominant stems or upright branches that compete with the dominant leader; if there is no dominant leader, create one by reducing or removing all upright stems except one that is located in the dominant part of the crown.
2. For trees greater than 25 feet (7.6 m) tall, remove all branches that originate from the lower 8 feet (2.4 m) of trunk.
3. Reduce by two-thirds or remove branches at the trunk that are lower than 8 feet (2.4 m) over the sidewalk.
4. Reduce by two-thirds or remove branches at the trunk that are lower than 14 feet (4.3 m) over the street.
5. Remove dead, dying, diseased, and broken branches greater than half an inch (1 cm) in diameter at the point of attachment.
6. Remove sprouts originating on the trunk below 8 feet (2.4 m) including from the root collar.

Limitations:

1. No tree shall be climbed using climbing spurs.

2. All cuts shall be made in accordance with the ANSI A300 pruning standard section 7.
3. No heading or shearing cuts shall be made without authorization.
4. No more than one-third of the foliage shall be removed from an individual tree without authorization.
5. All severed branches shall be removed by the end of the workday.
6. Work practices shall be consistent with the current ANSI A300 Part 1 pruning standard section 8 and the ANSI Z133 Standard.

Debris disposal: All debris will be removed from the work area and recycled as mulch or disposed of at the City green waste recycling center.

Completion date: March 15.

EXAMPLE TWO:
Mature street tree pruning

Trees to prune: All street trees greater than 8-inch (20 cm) dbh on Longpond Drive.

Personnel qualifications: All work shall be performed under the supervision of an ISA Certified Arborist®, an ISA Board Certified Master Arborist®, or equivalent.

Pruning system: Natural.

Objective: Reduce the likelihood of live and dead branch failure.

Branches to remove:
Remove dead, dying, diseased and broken branches 2 inches (5 cm) or larger in diameter at the point of attachment. No branch removal cuts shall be used on any other live branches.

Branches to reduce in length by one-third to one-half:

1. Codominant stems that compete with the dominant leader. Stems that compete with the leader are those with a diameter more than half the trunk diameter measured just beyond the union.
2. Overextended branches that are unusually long or are outside of the shape of the main crown.
3. Branch reduction shall be accomplished using reduction cuts 3 to 4 inches (8 to 10 cm) in diameter, not branch removal cuts. An average of 15 (range of 10 to 20) cuts shall be applied to each tree.

Limitations:

1. No tree shall be climbed using climbing spurs.
2. All cuts shall be made in accordance with the ANSI A300 Part 1 pruning standard section 7.
3. No heading or shearing cuts shall be made without authorization.
4. No more than one-fourth of the foliage shall be removed from an individual tree without authorization.
5. All severed branches shall be removed by the end of the workday.

6. Work practices shall be consistent with the current ANSI A300 Part 1 pruning standard section 8 and the ANSI Z133 standard.

Debris disposal: All debris will be removed from the work area and recycled as mulch or disposed of at the City green waste recycling center.

Completion date: March 15.

EXAMPLE THREE:
Proposal for residential tree work – single tree

Tree to prune: Large valley oak (*Quercus lobata*) in the front yard.

Personnel qualifications: All work will be performed under the supervision of an ISA Certified Arborist®, an ISA Board Certified Master Arborist®, or equivalent.

Pruning system: Natural.

Objective: Reduce the risk of live and dead branch failure.

Branches to prune:

1. Remove dead, dying, diseased, and broken branches greater than 1 inch (25 mm) in diameter at the point of attachment.
2. Reduce the ~8-inch (200 mm) diameter branch on the north side with crack and dead twigs using a 3-inch (75 mm) reduction cut.
3. Reduce the five largest upright-growing branches using two 2.5- to 3-inch (60 to 175 mm) diameter reduction cuts on each branch.

Debris disposal: All debris will be removed from the work area.

Completion date: Spring of this year.

Re-inspection: 5 years.

EXAMPLE FOUR:
Proposal for residential tree work – multiple trees

Trees to prune:	Diameter	Location
London planetree (*Platanus* x *acerifolia*)	18-inch (460 mm)	rear of house
Linden/Lime (*Tilia spp.*)	18- to 24-inch (460 to 610 mm)	right rear of yard
Horsechestnut (*Aesculus hippocastanum*)	16- to 18-inch (400 to 460 mm)	rear yard

Personnel qualifications: All work shall be performed under the supervision of an ISA Certified Arborist®, an ISA Board Certified Master Arborist®, or state-licensed arborist.

Pruning system: Natural.

Objectives:

1. Reduce likelihood of failure in wind events.
2. Sanitation to reduce risk of boring insect infestations.
3. Provide 6 to 8 feet (1.8 to 2.4 m) of clearance from house.

Branches to prune:

1. Remove dead branches, greater than 2 inches (50 mm) in diameter, extending over yard on all listed trees.
2. On the *Tilia*, reduce one 10-inch (250 mm) diameter live branch over house by 10 to 12 feet (3 to 3.7 m) using three reduction cuts with 3- to 3.5-inch (75 to 90 mm) diameter reduction cuts.
3. Remove or reduce length by one-half all branches greater than 1-inch (25.4 mm) in diameter that have evidence of a borer infestation.

Limitations:

1. No tree shall be climbed using climbing spurs.
2. All cuts shall be made in accordance with the ANSI A300 Pruning standard, section 7.

3. No heading or shearing cuts shall be made.
4. No more than one-third of the foliage or buds shall be removed from an individual tree.
5. All severed branches shall be removed by the end of the workday.
6. Work practices shall be consistent with the current ANSI A300 Part 1 Pruning standard, section 8, and with the ANSI Z133 standard.

Debris removal: All debris will be removed from the work area.

Completion date: Fall of this year.

Re-inspection: 3 years.

EXAMPLE FIVE:
Proposal for residential work – shrubs and hedge

Shrubs to prune: Five Chinese privet (*Ligustrum sinense*) in the front yard and Boxwood (*Buxus*) hedge on right side.

Pruning system: Topiary.

Objective: Maintain current shape, reduce in size.

Shear:
1. New growth that is outside the desired shape of the crown.
2. Do not cut to expose interior branches that do not have live leaves.

Branches to remove:
1. Dead, dying, diseased, and broken branches.
2. Larger stubs.

Debris disposal: Remove all debris.

Completion date: Spring of this year.

Re-inspection: 3 months.

EXAMPLE SIX:
Proposal for residential tree work

Trees to prune:
Two coast redwoods (*Sequoia sempervirens*) in the northeast corner of the property.

Pruning system: Natural.

Objective: Provide clearance for construction of the proposed building.

Branches to prune:

1. Reduce branches on the north side of the tree by 8 to 10 feet (2.4 to 3 m).
2. Reduce lower branches on the west side by 8 to 10 feet (2.4 to 3 m) to a height of 35 feet (10.7 m).

Limitations:

1. No branch removal cuts shall be used at the main stem.
2. No reduction cuts shall be made greater than 4 inches (100 mm) in diameter without approval from the project arborist.
3. Do not reduce tree height.

Debris disposal: The brush is to be chipped and left onsite under the trees for mulch.

Completion date: Within the next two weeks to comply with the nesting bird study recommendations.

The following Pruning Specification Worksheet is also available at www.isa-arbor.com.

Appendix

International Society of Arboriculture - Best Management Practices

Pruning Prescription

Client ______________________________ Date ______________

Client Contact ______________________________

Arborist ______________ Tree Location ______________________________

Number of trees_____ Species ____________________ DBH ____ - ____ Tag no. _____ - _____

Pruning Objectives ______________________________

____

______________________________ Trees marked with ______________

Pruning System ☐Natural ☐Pollard ☐Topiary ☐Hedge ☐Espalier ☐Bonsai ☐Pleach ☐Fruit Details______________

Remove:

☐ **Dead branches** with cut types: ☐Branch removal ☐Reduction ☐Heading Cut size: ☐Min_________ to ________ Max

☐Whole crown ☐Outer ☐Center ☐Lower ☐Upper ☐Over/direction______________________________

Amount: ☐All ☐Number ~______-______ ☐______% ☐Specific ______________________________

☐ **Live branches** with cut types: ☐Branch removal ☐Reduction ☐Heading ☐Shearing ______________

Cut size: Min _____to_____Max;; or Length of branches kept __________ Details ______________

Location: ☐Whole crown ☐Lower ☐Upper ☐Outer ☐Center ☐Largest ☐Co-dom ☐Over/direction______________

☐Clearance distance ____ from ______________ ☐View _____________ Details ______________

Amount: ☐Number of branches ~ _____-_____ ☐____% ☐Details______________________________

☐ **Other** parts:______________ ☐All ☐Number ____ ☐ _____% ☐Details ______________________________

☐ **Remove sprouts**/branches from lower trunk/root collar: Max height _____ ☐ All ☐Toward ______________

Specifics ______________________________

Debris: ☐Remove all ☐Leave all ☐Remove brush ☐Leave wood chips ☐Leave wood ____ ☐____ dia. cut to ________length

Completion: Date/season __________________________ ☐Call ☐Text ☐Email before coming ______________

Re-inspection/Re-pruning interval ______________________________

Additional information ______________________________

____

Cost Estimate _________ **Signature** ______________________ **Date** ______________

This is a proposal for pruning only, it should not be considered a tree risk assessment, if a full risk assessment is desired, contact me for a price and details. Arborist will attempt to remove all of the specified branches, however it cannot be guaranteed that all of the described branches will be seen and removed. Arborists in the tree have the discretions to modify these specifications depending on conditions they observe. Every attempt will be made to deliver this service on the specified date or season, but if weather conditions do not permit, the service may be delayed.

This document was developed by the International Society of Arboriculture in 2019 and is available for all to modify or use in their business.

Glossary

ANSI A300–in the United States, industry-developed, national consensus standards of practice for tree care.

ANSI Z133–in the United States, industry-developed, national consensus safety standards of practice for tree care.

arboriculture–practice and study of the care of trees and other woody plants in the landscape.

arborist–an individual engaged in the profession of arboriculture who, through experience, education, and related training, possesses the competence to provide for or supervise the management of trees and other woody plants.

BS3998–in the United Kingdom, industry-developed, national consensus standards of practice for tree care.

bark inclusion–see *included bark*.

best management practices–best-available, industry-recognized courses of action, in consideration of the benefits and limitations, based on scientific research and current knowledge.

branch–a shoot or stem arising from another branch or stem.

branch bark ridge–raised strip of bark at the top of a branch union where the growth and expansion of the trunk or parent stem and adjoining branch push the bark into a ridge.

branch collar–the area of swelling at the union between a parent stem and a smaller branch.

branch protection zone–chemically and physically modified tissue within the trunk and parent branch at the base of a smaller, subordinate branch that retards the spread of discoloration and decay from the subordinate stem into the trunk or parent branch.

branch removal cut (previously termed a *thinning cut* or *removal cut*)–pruning cut that removes the smaller of two branches at a union, or a parent stem. Removal cuts retain the branch bark ridge or branch collar and do not create a stub.

cambium–thin layer(s) of meristematic cells that give rise (outward) to the phloem and (inward) to the xylem, increasing stem and root diameter.

clean–arboricultural term used to describe selective pruning to remove one or more of the following: dead, diseased, infested, and/or broken branches.

climbing spurs–sharp, pointed devices strapped to a climber's lower legs to assist in climbing poles or trees being removed. Also called *spikes*, *gaffs*, *irons*, *hooks*, or *climbers*.

closure (wound closure, close)–the process in a woody plant by which woundwood grows over a pruning cut or injury.

codominant stem/codominant branch–two or more branches of similar diameter arising from a common union and lacking a collar.

compartmentalization–natural defense process in trees by which chemical and physical boundaries are created that act to limit the spread of disease and decay organisms.

crown–upper part of a tree, measured from the lowest branch, including all the branches and foliage.

culm–the stem of a grass or sedge, including the woody, hollow aerial stem of bamboo.

decay–(1) (*noun*) an area of wood that is undergoing decomposition. (2) (*verb*) decomposition of organic tissues by fungi or bacteria.

directional pruning–selective removal of branches to guide and/or discourage growth in a particular direction.

dominant leader/trunk/stem–the stem that grows much larger than all other stems and branches.

frond–large, divided leaf structure found in palms and ferns.

espalier–a pruning system that trains plants to grow within a plane, such as along a wall or a fence.

flush cut–a pruning cut that removes the branch bark ridge and/or branch collar, damaging the trunk or parent branch.

good structure/architecture/form–branch and trunk architecture resulting in a canopy form that resists failure.

heading–a pruning cut that removes a branch or stem between nodes (leaving a stub), to a bud, or to a live branch that is less than one-third the diameter of the branch or stem being removed.

included bark–bark that becomes embedded in a union (crotch) between branch and trunk or between codominant stems. Causes a weakness in the union.

lateral–a branch arising from a larger stem or branch.

leader–primary terminal shoot or trunk of a tree. Large, usually upright stem. A stem that dominates a portion of the crown by suppressing lateral branches.

lion-tailing–excessive removal of lower or interior branches on main scaffolds that results in a concentration of growth and foliage at branch ends. It is considered an unacceptable practice.

live crown ratio–the ratio of the height of the crown containing live foliage to the overall height of the tree.

mature trees–trees that have reached at least 75 percent of their typical final height and spread.

mechanical pruning–pruning with heavy equipment (not handheld) fitted with power saws or other cutting devices (e.g., saws mounted on booms or suspended from a helicopter).

natural growth habit–the inherent characteristic growth pattern and habit (form) of a tree, shrub, or vine in its current location.

node–slightly enlarged growth point on a stem where buds, shoots, and leaves arise.

palm–monocotyledonous plant of the Arecaceae family, generally with one or more unbranched trunks, with fronds emanating from a meristem at the top of the trunk.

palm frond skirt–one or more year's accumulation of dead and drooping fronds at the bottom of the canopy and along the trunk of a palm.

parent branch or stem–a tree trunk or branch from which other branches or shoots grow.

peeling–(1) removing dead petiole bases by cutting into live tissue (synonymous with shaving, skinning, or sanding). Not an acceptable practice. (2) the tearing downward of bark or sapwood from the trunk or parent branch when the branch or stem was not precut.

petiole–stalk or support axis of a leaf.

permanent branches–branches that form the architectural framework of a tree. In structural pruning of trees, branches that will be left in place.

photosynthesis–process in green plants by which light energy is used to form sugar from water and carbon dioxide.

phytotoxic–term to describe a compound that is poisonous to plants.

pleaching–pruning system that trains one or more plants to achieve a desired shape or form through a combination of pruning and interweaving or tying small branches to one another, or to a preformed frame.

pollarding–a semiformal pruning system that maintains crown size by initial heading of branches on young trees or young portions of older trees, followed by removal of sprouts to their point of origin at appropriate intervals without disturbing the resulting pollard head.

pruning–the selective removal of plant parts to achieve defined objectives.

reaction zone–natural boundary formed chemically within a tree to separate damaged wood from existing healthy wood. Important in the process of compartmentalization.

reduce–reduce the length of a stem or branch using a reduction cut.

reduction cut–a pruning cut that removes the larger of two or more branches or stems, or one or more codominant stem(s), to a live lateral branch, typically at least one-third the diameter of the stem or branch being removed. Reduction cuts are referred to as *branch reduction, reduction*, or *reduce* (previously called *cutting to a lateral*).

rejuvenation–removal of overmature, dead, or dying stems of a shrub, near the ground, to stimulate new stem development.

restoring–the process of pruning to improve the structure, form, and appearance of trees that have been improperly trimmed, vandalized, or damaged.

retrenchment–crown reduction process involving one or more pruning events to manage loss of support or crown decline.

sanitation pruning–the removal of branches that are infested with insects or disease pathogens.

scaffold branch–a branch that is among the largest diameter on the tree and will remain on the tree to maturity.

shearing–cutting leaves, shoots, and branches to a desired plane, shape, or form, using tools designed for that purpose, as with topiary and pleaching pruning systems.

shoot–new stem or branch growth on a plant.

specifications–detailed plans, requirements, prescriptions, and statements of particular procedures used to define, measure, and guide work.

stem–woody structure bearing foliage and buds that gives rise to other stems (branches).

starch–chain of sugar molecules linked together that serves as a form of energy storage in plants.

structural pruning–pruning to influence the orientation, spacing, growth rate, strength of attachment, and ultimate size of branches and stems.

stub–portion of a branch or stem remaining after a heading cut, branch breakage, or branch death.

subordination–the removal of the end of a branch or stem to slow its growth relative to its parent, or to a favored branch or stem.

sucker–shoot arising from the roots. Contrast with *watersprout*.

throwline–thin, lightweight cord attached to a throwbag or throwing ball used to set climbing or rigging lines in trees.

topiary–a formal pruning system that uses a combination of pruning, supporting, and training branches to orient a plant into a desired shape.

topping–the reduction of tree size by heading large, live branches and leaders without regard to long-term tree health or structural integrity.

tree–a woody perennial plant with a single or multiple trunks, which typically develop a mature size of over several inches in diameter and 10 feet (3m) or more in height.

trunk–the main stem or stems of a tree.

union (crotch)–the junction of stem and branch or between stems.

watersprout (sprout)–upright, epicormic shoots arising from the trunk or branches of a plant above the root graft or soil line. Incorrectly called a *sucker*.

wound–an opening that is created when the bark of a live branch or stem is cut, penetrated, damaged, or removed.

wound dressing–compound applied to tree wounds or pruning cuts.

ZTV–the German industry-developed, national standards of practice for tree care.

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City of Carlsbad

APPENDIX H
Carlsbad Integrated Pest Management Plan

INTEGRATED PEST MANAGEMENT PLAN

NOV. 30, 2017

Parks & Recreation Department

Public Works Department

Section I - Purpose

The purpose of this Integrated Pest Management (IPM) plan is to direct health conscious and environmentally sensitive pest management strategies on city owned or controlled properties and public rights of way, in accordance with applicable federal, state and local regulations.

Section II - Policy

The city will focus on the prevention and suppression of pest issues with the least impact on human health, the environment, and non-target organisms. In particular, the use of chemical pesticides on city owned or operated properties and public rights of way will be significantly reduced, according to these guiding principles:

A. Emphasize the initial use of organic pesticides.
B. Limit the use of chemical pesticides where the general public congregates.
C. Use EPA level pesticides in a targeted manner, and only if deemed necessary by supervisory staff - to protect public safety; to prevent a threat to sensitive species or native habitats; to assist in meeting regulatory compliance requirements; or to prevent economic loss - when pests cannot be managed by other tactics.

Section III - Goals

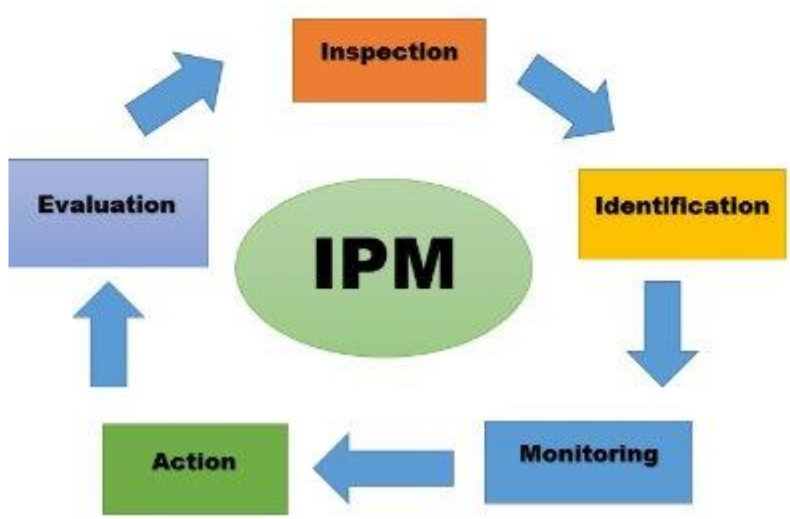
The goals of the IPM plan are:

A. Protect human health and the surrounding environment by implementing a range of preventative strategies, and using the least-toxic pesticides available for pest control and eradication.
B. Monitor presence of pests on a routine basis to ensure the most effective (combination of) pest control tactics are being used. Reference Section VI. E. 6.
C. Minimize the quantity of products used for pest management.
D. Use species-specific products for pest management and carefully target application areas.
E. Chemical pesticides shall only applied to: protect public safety; to prevent a threat to sensitive species or native habitats; to assist in meeting regulatory compliance requirements; or to prevent economic loss - when pests cannot be managed by other tactics.
F. Provide public notification signs at perimeter of outdoor areas or at entrances of buildings, where chemical pesticides are to be applied.

Section IV – Response

One of the characteristics of an IPM approach that make it effective is that the basic decision making process is the same for any pest problem in any location. The strategies and tactics may change, but the steps taken to decide if and when treatment is needed, and which methods to use, are the same each time. The IPM plan is built around the following components:

A. Routinely monitoring the pest populations and other relevant factors
B. Accurately identifying the pest
C. Determining injury and action levels that trigger treatments
D. Timing treatments to the best advantage
E. Spot treating the pest (to minimize human and other non-target organism exposure to pesticides)
F. Selecting least disruptive tactics
G. Evaluating the effectiveness of treatments to determine future actions



Section V - General Preventative Practices

General preventative practices are simple landscaping procedures that eliminate sources of food, water and shelter that attract pests to the building or grounds. The city shall use the following methods as the foremost means for controlling pests and preventing outbreaks:

A. Install mulch and other landscaping best practices to promote soil and plant health.
B. Use weed-free soil amendments.
C. Plan and maintain landscape features to eliminate safe havens for pests and rodents.
D. Clean up plant debris, especially from fruit-bearing trees.
E. Remove invasive plants that are known to harbor or provide food for pests.

Section VI - Pest Control Tactics

Integrated Pest Management uses a variety of pest control tactics in a compatible manner that minimize adverse effects to human health and the environment. A combination of several control tactics is usually more effective in minimizing pest damage than any single control method. The type of control(s) selected will likely vary on a case-by-case basis due to differing site conditions.

The primary pest control tactics to choose from include:

- Cultural
- Mechanical
- Environmental/Physical
- Biological
- Pesticide

A. Cultural Controls

Cultural controls are modifications of normal plant care activities that reduce or prevent pests. Cultural control methods include adjusting the frequency and amount of irrigation, fertilization, and mowing height. For example, spider mite infestations are worse on water-stressed plants; over-fertilization may cause succulent growth which then encourages aphids; too low of a mowing height may thin turf and allow weeds to become established.

B. Mechanical Controls

Mechanical control tactics involve the use of manual labor and machinery to reduce or eliminate pest problems, such as handpicking, physical barriers, or machinery. Other examples include hoeing and applying mulch to control weeds, using trap boards for snails and slugs, and use of traps for gophers.

C. Environmental/Physical Controls

The use of environmental/physical controls such as altering temperature, light, and humidity, can be effective in controlling pests. Although in outdoor situations these tactics are difficult to use for most pests, they can be effective in controlling birds and mammals if their habitat can be modified such that they do not choose to live or roost in the area. Other examples include removing garbage in a timely manner, and using netting or wire to prevent birds from roosting.

D. Biological Controls

Biological control practices use living organisms to reduce pest populations. These organisms are often also referred to as beneficials, natural enemies or biocontrols. They act to keep pest populations low enough to prevent significant economic damage. Biocontrols include pathogens, parasites, predators, competitive species, and antagonistic organisms. Biocontrols can occur naturally or they can be purchased and released.

The most common organisms used for biological control in landscapes are predators, parasites, pathogens and herbivores.

- Predators are organisms that eat their prey (e.g. Ladybugs)
- Parasites spend part or all of their life cycle associated with their host. Common parasites lay their eggs in or on their host and then the eggs hatch, the larvae feed on the host, killing it (e.g. tiny stingless wasps for aphids and whiteflies)
- Pathogens are microscopic organisms, such as bacteria, viruses, and fungi that cause diseases in pest insects, mites, nematodes, or weeds (e.g. Bacillus thuringiensis or BT)
- Herbivores are insects or animals that feed on plants. These are effective for weed control. Biocontrols for weeds eat seeds, leaves, or tunnel into plant stems (e.g., goats and some seed and stem borers)

In order to conserve naturally occurring biocontrols, broad-spectrum pesticides should not be used since the use of these types of pesticides may result in secondary pest outbreaks due to the mortality of natural enemies that may be keeping other pests under control

E. Pesticide Controls

As defined in California Food and Agriculture Code Section 12753, "Pesticide" includes any of the following: (a) any spray adjuvant; (b) any substance, or mixture of substances which is intended to be used for defoliating plants, regulating plant growth or for preventing, destroying, repelling or mitigating any pest…which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or nonagricultural environment whatsoever. The term pesticides includes organic products and chemical products. Insecticides, herbicides, fungicides and rodenticides are all pesticides.

Pesticides may be used when other methods fail to provide adequate control of pests and before pest populations cause unacceptable damage. When pesticides are to be used, considerations will be made for how to apply them most effectively.

Pesticides that are broad-spectrum and persistent shall be avoided, since they can cause more environmental damage and increase the likelihood of pesticide resistance. The overuse of pesticides can cause beneficial organisms to be killed and pest resistance to develop. In addition, considerations should be given to the proximity to water bodies, irrigation schedules, weather, etc., that may result in the pesticide being moved off-site, into the environment.

1. Criteria for Selecting Treatment Strategies

Once the IPM decision making process is in place and monitoring indicates that pest treatment is needed, the choice of specific strategies can be made. Strategies will be chosen that are:

a) Least hazardous to human health
b) Least disruptive of natural controls in landscape situations
c) Least toxic to non-target organisms other than natural controls
d) Most likely to be permanent and prevent recurrence of the pest problem
e) Easiest to carry out safely and effectively
f) Most cost effective in the long term
g) Appropriate to the site and maintenance system

2. Selection of Appropriate Pesticides

The following criteria will be used when selecting a pesticide:

a) Safety
b) Species specificity
c) Effectiveness
d) Endurance
e) Speed
f) Repellency
g) Cost

When selecting pesticides, supervisory staff will rely on advisement from State of California certified pest control applicators, to ensure that the most appropriate pesticide is selected.

3. Prioritized Use of Pesticides

Pesticides are to be utilized in a prioritized approach on city properties as follows:

a) Organic pesticides to be used first, when pesticides are deemed necessary.
b) Pesticides registered with the California Department of Pesticide Regulations Registrations Branch to be used as a protocol.
c) U.S. Environmental Protection Agency (EPA) Toxicity Category III “Caution” label pesticides to be used in a targeted manner by a certified pest control applicator, and only if deemed necessary by supervisory staff - to protect public safety; to prevent threats to sensitive species or native habitats; to assist in meeting regulatory compliance requirements; or to prevent economic loss - when pests cannot be managed by other tactics.
d) U.S. EPA Toxicity Category II “Warning” label pesticides to be used in a targeted manner by a certified pest control applicator, and only if deemed necessary by supervisory staff - to protect public safety; to prevent threats to sensitive species or native habitats; to assist in meeting regulatory compliance requirements; or to prevent economic loss - when pests cannot be managed by other tactics.
e) U.S. EPA Toxicity Category I “Danger” label pesticides, to be used in a targeted manner by a certified pest control applicator, and only if deemed necessary by supervisory staff - to protect public safety; to prevent threats to sensitive species or native habitats; to assist in meeting regulatory compliance requirements; or to prevent economic loss - when pests cannot be managed by other tactics.

4. Certification and Permitting

Restricted use pesticides shall only be applied by, or under the direct supervision of, an individual with a State of California, Department of Pesticide Regulations, Qualified Applicators Certificate.

Pesticides listed as "restricted" in the State of California shall be applied only under a restricted materials permit, issued by the San Diego County Department of Agriculture, Weights and Measures. The permit must be renewed annually for continued application.

5. Employee Training

Staff and contractors must know the information on the chemical label and the MSDS before using or handling the chemical. In addition, they will be trained annually and when a new pesticide is to be used.

The certified pest control applicators must know:

- The immediate and long-term health hazards posed by chemicals to be used, the common symptoms of chemical poisoning, and the ways poisoning could occur; and
- The safe work practices to be followed, including the appropriate protective clothing, equipment, mixing, transportation, storage, disposal and spill cleanup procedures applicable to the chemical used
- In addition to the training and annual continuing education required for certification, staff will be encouraged to participate in pesticide application programs that are above and beyond minimum compliance requirements.

6. Record Keeping

Monitoring the effectiveness of the IPM plan over time requires diligent tracking of several items: pest populations and locations; management strategies employed; quantities and types of chemicals or other products used; and the outcome of pest management activities. The certified pest control applicator is responsible for maintaining, and submitting to the city as requested, records that include the following:

a) Target pest
b) Prevention and other non-chemical methods of control used
c) Type and quantity of pesticide used
d) Location of the pesticide application
e) Date of pesticide application
f) Name of the pesticide applicator
g) Application equipment used
h) Summary of results

7. Materials for Use – Least Toxic Pesticides

Pesticides are considered a secondary resort under the tenets of IPM. This control strategy is to be used on city owned or controlled properties and rights of way after general preventative practices and non-chemical options – including organic pesticides - have been fully explored. Least-toxic pesticides meet the following criteria:

a) Products contain no known, likely, or probable carcinogens - as listed by the CA Office of Environmental Health Hazard Assessment.
b) Products contain no reproductive toxicants (CA Prop 65).
c) Products contain no items listed by the CA Department of Toxic Substance Control as known, probable, or suspected endocrine disrupters
d) Active ingredients have soil half-life of thirty days or less.
e) Products are labeled as not toxic to fish, birds, bees, wildlife, or domestic animals.

The term “least toxic” refers to pesticides that have low or no acute or chronic toxicity to humans, affect a narrow range of species and are formulated to be applied in a manner that limits or eliminates exposure of humans and other non-target organisms. Examples of least toxic pesticides include products formulated as baits, pastes or gels that do not volatilize in the air and that utilize very small amounts of the active ingredient pesticide, and microbial pesticides formulated from fungi, bacteria or viruses that are toxic only to specific pest species but harmless to humans.

Least toxic pesticides include:

- Boric acid and disodium octobrate tetrahydrate
- Silica gels
- Diatomaceous earth
- Nonvolatile insect and rodent baits in tamper resistant containers
- Microbe based pesticides
- Pesticides made with essential oils (not including synthetic pyrethroids) without toxic synergists
- Materials for which the inert ingredients are nontoxic and disclosed.

The term least toxic pesticides does not include a pesticide that is:

a) Determined by the U.S. EPA to be a possible, probable or known carcinogen, mutagen, teratogen, reproductive toxin, developmental neurotoxin, endocrine disrupter or immune system toxin.
b) A pesticide in the U.S. EPA’s Toxicity Category I or II.
c) Any application of the pesticide using a broadcast spray, dust, tenting, or fogging application.

8. Notification Signs

Chemical pesticide application notification signs shall meet the following criteria:

a) Posted at perimeter of outdoor areas or at building entrances, where chemical pesticides are to be applied.
b) Posted at least 24 hours prior to application of chemical pesticides and shall remain for at least 72 hours after the application.
c) Include “Notice – Pesticide Treated Area,” and product’s/manufacturer’s name, scheduled date of application, and pest to be controlled - e.g., weeds, insects, rodents.

9. Revisions

Staff will review this IPM plan annually at minimum, and update it as needed.