Street Tree Master Plan

City of Signal Hill

SIGNAL HILL

STREET TREE MASTER PLAN

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Signal Hill From Hilltop Park. Photo: City of Signal Hill

EXECUTIVE SUMMARY

Section 1: Background

1.1 Introduction

Signal Hill's street tree canopy provides many benefits for the city, including shade and beauty. This Street Tree Master Plan updates the 2010 plan, and provides a path to grow the street tree canopy with economic, ecological, and environmental justice factors in mind. The Community Forest includes all vegetation within an urban community, and street trees are a vital part of that forest. The information contained in this document aims to help Signal Hill take a holistic approach to improving its street tree canopy, within the context of the Community Forest.

The document can be used to help set policy and budget goals, and provides a practical way for the city to choose a particular tree for a particular site ("the right tree in the right place") as well as an updated palette emphasizing water-wise, native, and Climate Ready species. It includes design guidelines for future development in addition to planting and maintenance guidelines.

1.2 Planning Context

Signal Hill is located in a populous part of Southern California dominated by industry, such as oil production and trade through the nearby Ports of Los Angeles and Long Beach. The area was originally settled by the Tongva people and then later become farmland, a result of its position between two major rivers, the Los Angeles and the San Gabriel, which brought vital water and nutrients for crops. While coastal sage scrub and wet meadow ecologies originally dominated the land, current urbanization makes trees even more valuable for their role in mitigating pollution and Urban Heat Islands, capturing and filtering stormwater, and providing animal habitat.

1.3 Existing Conditions

Pollution in the area is some of the worst in the state, and the city faces some inequality in terms of shade. Past tree planting created a mismatch between species and location, causing conflicts between trees, power lines, and underground utlities. All of these factors should be considerations in the placement of new street trees. Signal Hill's position on the border of two major watersheds means that its street trees can play a crucial role in helping to capture and filter stormwater, and could even be used to phytoremediate oil contamination.

1.4 Current Street Tree Conditions

Signal Hill has a 74% stocking rate of its street tree sites, meaning that over 1,000 sites are available be planted. 15% of the city's street trees are Chinese Elms, which are therefore not included in the updated palette in order to create a well-balanced urban forest. Less than 1% of Signal Hill's street trees are native, so any new trees planted should include a number of native species. Staff suggestions for which trees to avoid and which flourish in the city should also be taken into account, and are included in this section.

Section 2: Design & Management Plan

2.1 Guiding Goals & Objectives

1. Fill the vacant tree sites.
   a. Increase the city's tree canopy by 1% in so doing.
   b. Continue to replace trees in a timely manner as needed.
   c. Tree-planting initiatives can help Signal Hill achieve this goal.
2. Ensure the long-term health and prosperity of the city's street tree canopy by planting the right tree in the right place.
   a. Improve shade equity in the city by focusing on planting in areas of greater need.

b. Use species well-adapted to local environmental conditions and design objectives.
c. Provide native animal habitat and well-adapted trees by planting native species.
d. Achieve a diverse and resilient forest by following the 10-20-30 rule of community forestry.

3. Establish a high standard of maintenance and a sustainable care regimen for the city's street trees.
4. Promote public awareness of and involvement in community forestry care and benefits.

e. Promote the community forestry program's progress & achievements.
f. Encourage collaboration between city departments, local community organizations, and public schools.
g. Encourage monetary and other contributions to the community forestry program.
h. Participate in programs that support and promote the benefits of the community forest.

2.2 Planting Design Guidelines

Any new construction or renovation projects should include new street tree sites with irrigation installed, and modular suspended pavement systems are recommended. Additional detailed design recommendations for new development are included in this section, as well as Universal Planting Design Guidelines:

Enhancing Character & Aesthetics

1. Respect and emphasize the city's geographic setting.
2. Complement existing trees and other vegetation.
3. Use trees to create a variety of spatial experiences.

Increasing Forest Resiliency

1. Use native species where appropriate.
2. Plant to attract and support wildlife.
3. Select trees and plantings adapted to the environmental conditions of the site.
4. Satisfy any functional reasons for the planting.
5. Integrate low impact development best management practices for stormwater within public right-of-way plantings, where practical.
6. Diversify types and species where possible.

Supporting Maintenance & Safety

1. Plant to provide the intended performance and aesthetic with the lowest water usage.
2. Ensure planting designs conform to current local and state regulations.
3. Consider the non-optimum conditions of street tree plantings when designing tree spacing.
4. Design tree spacing based on mature plant sizes.
5. Place trees away from conflicting uses.
6. Locate trees to minimize conflict with overhead utilities.
7. Locate trees to minimize conflict with underground utilities.
8. Provide planting spaces that accommodate healthy tree growth.

2.3 Design for the Future

Goals such as phytoremediation using street trees and the completion of a Community Forest Master Plan should be considered in the future, as well as the integration of composting and mulching programs. Issues of climate justice should be addressed whenever possible.

2.4 Species Selection Criteria

This section provides a course of action for the city to take when maintaining and selecting street trees, including diagrams for the procedures already in place for maintaining existing trees, a method for

selecting a new tree for a vacant site, and a comprehensive selection method (pp. 60-63). Factors such as tree size, branch strength, root invasiveness, and proximity to utilities should be taken into account. Larger and native species should be given priority. The section also denotes specific locations where palm trees can be planted, as well as trees that are in the street tree database but are actually on private property.

2.5 Street Tree Palette Selection
2.6 Street Tree Palette
Many factors were considered when choosing trees for the palette, including lists from other cities, species from the Climate Ready Trees study, and nursery availability. A list of resources is provided here in addition to the palette list (pp. 67-69) and the palette itself (pp. 70-81).

3.0 Planting & Maintenance
3.1 Planting the Tree
Provides detailed instructions for street tree planting, including standard planting details for the city of Signal Hill (pp. 95-97).

3.2 Maintaining the Tree
Provides practical information on street tree maintenance, especially irrigation, as well as common problems and solutions.

4.0 Findings & Updates
4.1 Introductory findings
This section briefly analyzes past street tree policy.

4.2 Street Tree Policy Recommendations
This section delineates recommended changes to past street tree policy, including the stipulation that street trees cannot be trimmed or removed to protect a view, updated tree spacing and larger tree well sizes. The plan also recommends ways to encourage the growth of the street tree canopy and to protect existing trees.

4.3 Tree Planting Program
One of the most important things Signal Hill can do to reestablish a strong street tree canopy is to initiate a tree planting program, starting with filling empty sites and continuing to replace trees as they are removed. Choosing the appropriate tree for the site using this guide should aid in that endeavor. The city can work together with various non-profits, such as Tree People, and government organizations, like CAL FIRE, to help them achieve this goal. If the city plants 250 trees per year over five years, the street tree stocking level should reach 100%.

4.4 Tree Maintenance Program
This plan recommends that the city consider pruning by species instead of geographic zone, create a pest-monitoring protocol, and follow local regulations for pruning. Hiring an independent tree consultant can help with these tasks. Additionally, a "Street Tree Report Card" could be created to help track the health of Signal Hill's street tree canopy. Finally, creating a Community Forest Master Plan is the next logical step to ensure a robust urban forest for the city of Signal Hill.

4.5 Tree Ordinance Upate
Modifications to the Signal Hill's Street Tree Ordinance are listed here.

4.6 Updated 2023 Street Tree Policy
Signal Hill's updated 2023 Street Tree Policy is included here.

5.0 Community Participation & Education

5.1 Community Outreach

The city of Signal Hill included a community outreach program as part of the Street Tree Master Plan update process. The purpose of the outreach program was to notify the public of the project and provide education on the issues involved, as well as to solicit input from community members. It included public notifications, pop-up events, a community open house and a workshop, as well as an online survey. The city hosted a website about the plan with information on events and an interactive map.

5.2 Survey Slides with Results

Includes the slides used for the online survey via mentimeter.com, with the results from the survey.

5.3 Analysis & Integration

Key Findings

- Survey respondents recognize the value of street trees in their community
- Residents would like to see more trees in their city
- Planting more native and climate-adapted trees is important
- Water use and aesthetics are key criteria for tree selection
- Respondents do not value views over trees

The city should prioritize planting drought-tolerant native trees when possible, especially Island Oak and Western Redbud. Given appropriate space, survey-takers preferred larger, spreading trees to provide greater shade and relieve pollution; smaller trees were preferred to avoid conflicts with utilities. Working together with HOAs was also suggested.

5.4 Creation of a Community Forest Master Plan

The entire community benefits from an extensive, healthy, well-designed forest, beyond the limits of the street tree population. If possible, it is recommended that Signal Hill create such a comprehensive plan, involving trees not only in streets but parks, businesses, and residences. Citizens and businesses can become involved in selecting, planting and maintaining trees, by funding projects or providing land. Institutions such as schools, libraries, and hospitals can help promote involvement, as well as non-profit organizations. The city should also continue to publicize the new Street Tree Master Plan and any subsequent plans to promote community involvement.

Appendix

The appendix includes the complete outreach survey results in spreadsheet form, as well as information on modular suspended pavement systems and a street tree inventory checklist.

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1.0 BACKGROUND

1.1 Introduction

1.1a Trees in Signal Hill

What defines the city of Signal Hill? Whether it's the hill that gives it its name, the citizens who make their home there, or the community parks where those citizens gather together, trees play a role in improving their wellbeing. Trees prevent erosion and provide habitat for animals living on the hill. They beautify homes of residents, and can even lift their mood. They provide shade for people recreating in parks, and children enjoy climbing and playing around them.

The city takes pride in its street trees, of which there are over 3,000. But climate change, economic factors, and other influences have taken a toll on the street tree canopy of Signal Hill: there are actually more than 1,000 vacant street tree wells waiting to be replanted. As a result, this plan will update the 2010 Street Tree Master Plan, amend the existing Street Tree Policy and Tree Planting Standard Ordinances, and provide a map for the city to improve the size and health of the city's street canopy in the coming years.

Street trees in Signal Hill. Photo: City of Signal Hill

1.1b The Community Forest

The term “community forest” generally describes all vegetation – trees, shrubs, grasses, and flowers, growing within an urban or suburban environment, on both public and private property. While this Plan focuses on the City-maintained portion of the community forest, a healthy community forest in its entirety provides the maximum benefits to the local community and ecology.

Urban trees are impacted by various stress factors. The built environment covers and compacts soil, vehicles collide with branches, and polluted air damages foliage with particulates, toxins, and acid rain. The acute impacts of climate change—extreme heat, drought, intensified wildfire—further challenge the longevity of urban nature. Under these stressors, street trees have an average life expectancy of 19 to 28 years, while a tree might live four or five times longer under ideal conditions. As most species of trees take forty years to mature, city street trees are often adolescent and rarely reach a size where their full benefits can be enjoyed.

Although hundreds of urban street trees are removed annually due to death, declining structure, or storm damage, public-private partnerships can counteract these effects.

Figure 1.1.1: The Community Forest

Municipalities, local non-profit organizations, community groups, residents, and businesses are working together to promote, protect, and replenish our urban forests with tangible results. The basic means of overcoming the stress that besets city trees and restoring the vigor of the community forest is to correctly plant the right tree in the right place and provide it with proper care. Coupled with community education and participation, these are the essential recommendations of the Signal Hill Street Tree Master Plan.

The potential benefits of urban street trees include: slowing of climate change, water quality protection, better air quality, lower air temperature, wildlife habitat, increased property value, and improved quality of life. Capitalizing on the benefits of a healthy tree canopy will allow for a greener, more resilient city. The holistic perspective of community forestry—treating the community forest as an integrated piece of infrastructure that transcends property lines and political jurisdictions—makes the Signal Hill Street Tree Master Plan an essential framework for sustainable development in the City of Signal Hill.

1.1c Benefits of Trees

Physical & Environmental

Trees provide shade and reduce heat.
Trees are integral to fighting the effects of urban heat islands. In urban areas, shaded surfaces may be 20-45 degrees cooler and evapotranspiration can reduce peak summer temperatures by 2-9 degrees.

Trees moderate wind.
When trees are planted strategically, they not only reduce wind exposure but can reduce heating bills in the winter by 2 to 8 percent.

Trees improve air quality and reduce pollution.
By producing oxygen and filtering airborne particulates, trees help reduce air pollution. A tree's production of oxygen replenishes the atmosphere and dilutes pollutants. Airborne particulate pollution is trapped on the surface of leaves, which act as significant "scrubbers" or filters. In the United States alone, trees remove some 784,000 tons of pollution annually.

Trees provide habitat for animals.
Supporting a variety of insects, birds, and mammals with food and shelter, trees are a city's prime medium for attracting wildlife.

Trees improve water quality.
Leaves slow the impact of drops to reduce erosion and surface runoff, while roots help filter stormwater to improve groundwater quality and quantity.

Economic

Trees increase property values.
The beauty of a well-planted property and its surrounding street and neighborhood can raise residential property value by as much as 20 percent.

Trees help drive economic development.
Recent studies have revealed that people will travel farther, pay more for goods and services, and visit commercial districts more frequently—by an average of 12 percent—when trees and landscaping are present. Thus trees can help attract new businesses and tourism.

Trees provide energy savings.
The cooling, sheltering effect of trees helps lower energy use and bills.

Trees slow climate change.
By absorbing carbon dioxide through the processes of photosynthesis, carbon is "sequestered" in the biomass of the tree as long as the tree lives. A single large, healthy tree can remove greater than 300 pounds of carbon dioxide from the atmosphere every year. The reduction in energy use resulting from trees also decreases carbon production. Trees' positive impact on water quality & retention alleviates the effects of droughts. All of these factors help stem the economic impacts of climate change.

Human

Trees have a positive impact on people's physical & mental health.
Studies have shown that patients with views of trees out their windows heal faster and with less complications. Children with ADHD show fewer symptoms when they have access to nature. Exposure to trees and nature aids concentration by reducing mental fatigue. (Source: Tree People)

Trees enhance children's play.
They are natural playthings, full of life, and as capable of stimulating a child's imagination and sense of wonder as the most expensive toy.

Trees bestow beauty, character, and identity on a place. To come home to a green and shaded community establishes a powerful sense of place. The experience of traveling through the community is immeasurably more pleasurable along tree-lined streets. Distinctive plantings on major streets also help with orientation, making the city more "imageable" and therefore easier to navigate. Trees enrich the aesthetic experience of the city, adding pleasing shapes, colors, fragrance, texture, scale, and seasonal change.

Trees instill civic pride.
Citizens can feel proud of a city filled with beautiful trees. Tree planting programs allow citizens to participate and work together to create a more attractive city, fostering a sense of community.

1.1d How To Use This Document

This document is meant to provide a path for the City of Signal Hill to restore, grow, and maintain its street tree population. The document includes important background and contextual information, budget advice, resources to pursue grants and funding, planting and maintenance guidelines, a tree palette and selection guide, and methods to involve the public.

While street trees comprise only a small part of the tree canopy, they have a huge impact on heat and can greatly reduce the urban heat island effect. Filling the nearly one thousand vacant street tree sites in a methodical and efficient manner will not only help keep the city cool in the face of climate change, but help grow the city's tree canopy. This document provides an updated tree palette that considers the future of the climate as well as practical input from city employees. Based on feedback, native trees now make up 42% of the recommended palette, whereas the 2010 Street Tree Master Plan did not include any native species.

All trees on the palette have lower water needs, and they can be chosen based on the actual conditions of their particular site, instead of on a street-by-street basis (as with the 2010 plan). Factors considered include planting area and tree size, power line friendliness, root invasiveness, wind tolerance, and aesthetics. Chapter 2 provides planting design guidelines, species selection criteria, and the updated tree palette. Chapter 3 includes procedures for planting, pruning, and maintaining trees. Chapter 4 outlines how to maintain and develop the street tree inventory as a whole, including budgeting and phasing, as well as analysis of existing policy. Chapter 5 includes community feedback as well as ways to continue to include the community. There are different ways of pursuing the goal of an increased street tree canopy for the City of Signal Hill. This document can be used by the department of public works to rebuild the street tree population in the most efficient and economic way possible, as well as a manual for selecting, planting, and maintaining the right tree in the right place.

Street trees in Beverly Hills, which has 35% canopy coverage (#canopygoals). Photo: City Plants

1.2 Planning Context

1.2a A Brief History of Signal Hill

Signal Hill's first human population, the Puvungna settlement of Tongva/Gabrielino Indians, used the hilltop to signal their neighbors on Catalina Island. Spanish settlers called it "Loma Sental," which became Signal Hill in English. Under Spanish colonization, Signal Hill fell under the jurisdiction of Rancho Los Alamitos and Rancho Los Cerritos. Throughout the 19th century, the land was used for ranching and agriculture, including sheep grazing by the Bixby family.

At the turn of the century, the hill was home to mansions taking advantage of the panorama offered. The surrounding land supported many farms, including a large Japanese community. However, the discovery of oil and the enactment of the Alien Land Laws soon replaced the farms and mansions with oil fields. Royal Dutch Shell Oil Company hit a gusher on June 3, 1921, at Alamitos Well #1, and Signal Hill soon became a significant exporter of petroleum. The land, meanwhile, became so crowded with oil derricks that Signal Hill earned the moniker "Porcupine Hill."

A map of the Spanish Ranchos. Source: David Rumsey Map Collection

A view of Long Beach from Signal Hill, 1898. Source: Los Angeles Public Library

1958 Fire. Source: Los Angeles Public Library

Though Signal Hill is completely enveloped by the city of Long Beach, it voted for incorporation in 1924 to avoid its neighbor's oil tax. The first mayor, Jessie Nelson, was also one of the first female mayors in California. With the success of oil, however, came environmental repercussions. The town no longer supported farmland, and the oil was prone to explosions and spills with lasting ecological damage. An explosion in 1958 killed two and injured eight. The fire burned for two days and took the combined efforts of the Signal Hill, Long Beach and LA County fire departments to put out.

During the recession of the 1970s, the city established the Signal Hill Development Agency to focus on economic growth and diversification from oil, as well as environmental cleanup. Signal Hill also voted to finally get its own zip code in July 2002 (until then it shared one with Long Beach).

Today, Signal Hill boasts all kinds of businesses, including those in the auto, healthcare and tech industries, in addition to oil. The city itself maintains a diverse population, beautiful parks, and is heading toward a greener future.

An oil gusher, c. 1925. Source: Huntington Library

Signal Hill Oil Field. Source: Los Angeles Public Library

“Porcupine Hill,” 1922. Source: Huntington Library

1.2b Pre-Columbian Ecology

Signal Hill's most likely original ecology, before it became farm and ranch land, was coastal sage scrub and wet meadows. Situated between the channelized beds of the Los Angeles and San Gabriel rivers, Signal Hill is split by the two watersheds. Before these two rivers were channelized, their paths varied greatly from season to season, forming braided streams within wide channels. As the rivers approached the Pacific Ocean, they would have formed wetlands, supporting rich biodiversity. This land, with its access to water and abundance of wildlife, enabled the Tongva/Gabrielino tribe to flourish here. Water from the rivers, originating from the mountains to the north, would have been rich in sediment and thus able to support the farmland that later occupied the location.

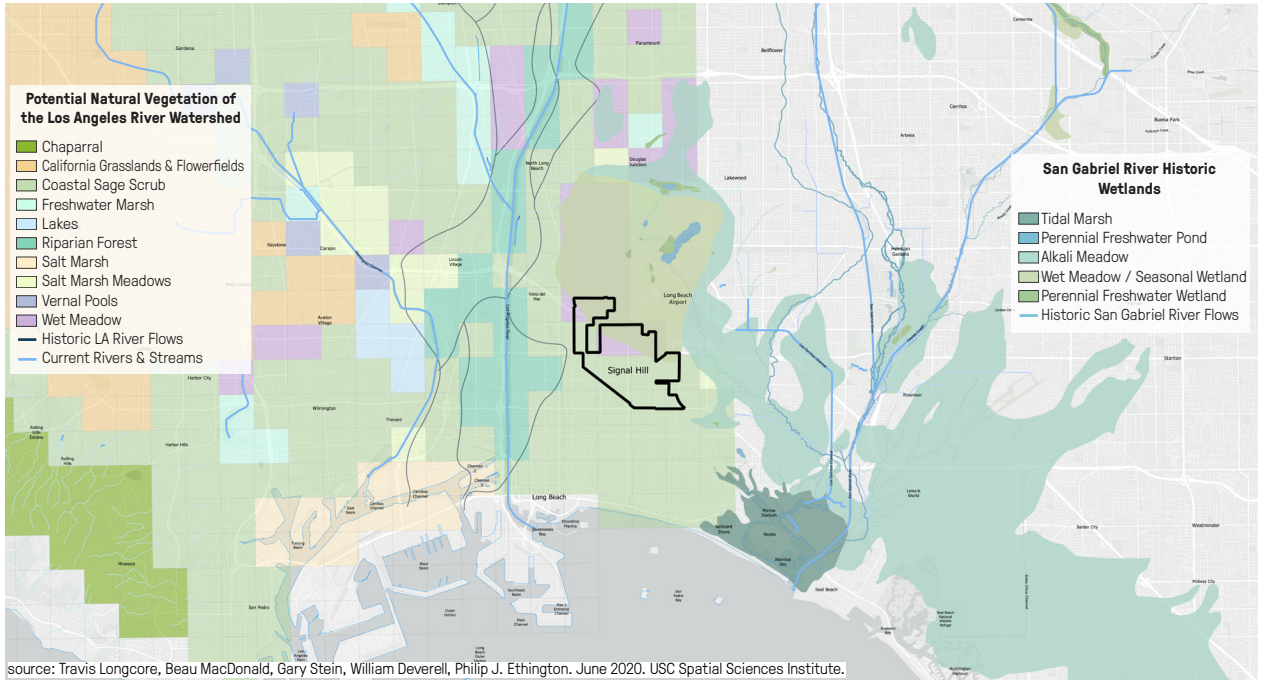


Figure 1.2.1: Historic Ecology of Signal Hill.

The two rivers framing Signal Hill would have looked very different before channelization. Photo: USGS

1.2c Natural Vegetation of Signal Hill

The vegetation in the wet meadow areas at the base of the hill would most likely have included grasses and wetland species like sedges and rushes as well as wildflowers. It would have supported minimal tree coverage, but shrubs like willow and mulefat. Riparian trees like cottonwoods, alders and sycamore might have grown at the edges, however. The hillside conditions of Signal Hill would have been home to a coastal sage scrub plant community. Plants that would have thrived there include sagebrush, buckwheat, and coyote brush. Coastal sage scrub would not have supported a large tree canopy like a forest, but a number of small trees / large shrubs like coast live oak, toyon, and lemonade berry would have provided shade. Plants such as sticky monkeyflower, lupines, sage, and encelia would have created pops of color.

1.2d Native Ecologies: Coastal Sage Scrub

The Coastal Sage Scrub plant community grows all along California's coasts. Mild temperatures and moisture from the ocean air allow for softer leaves than the chaparral found further inland and flowering plants year-round. Dry weather and heat cause many plants to go dormant in the later summer and fall, even while others are blooming. Near canyons and depressions that retain moisture, larger shrubs and riparian trees can also be found.

Coastal Sage Scrub. Photo: US Fish & Wildlife Service

Baccharis pilularis, coyote brush

Lupinus succulentus, arroyo lupine

Diplacus aurantiacus, sticky monkey flower

Rhus integrifolia, lemonade berry

Salvia leucophylla, purple sage

Ribes speciosum, fuchsia-flowering gooseberry

Encelia californica, bush sunflower

Eriogonum fasciculatum, California buckwheat

1.2e Native Ecologies: Wet Meadow

This ecosystem is characterized by grass, sedges, rushes, and forbs which can all tolerate seasonal inundation. They are often a buffer between wetlands and other ecosystem types, like coastal sage scrub. Because they are dependent on water, they are usually located near rivers (as with Signal Hill) or lakes.

Juncus bufonius, toad rush

Bromus carinatus, California brome grass

Carex praegracilis, clustered field sedge

Lythrum californicum, common loosestrife

Schoenoplectus californicus, California bulrush

Salix exigua, sandbar willow

Grassland alongside hills and a riparian corridor. Photo: California Native Grasslands Association

1.2f Native Ecologies: Trees & Animals

Both wet meadow and coastal sage scrub plant communities would include some tree species, especially given riparian conditions. Additionally, they would support a wide variety of animal life, including pollinators, birds, reptiles, amphibians, and mammals, creating great biodiversity.

Papilio rutulus, western tiger swallowtail


Megachile perihirta, western leafcutter bee

Calypte anna, Anna's hummingbird


Platanus racemosa, western sycamore

Sceloporus occidentalis, western fence lizard

Polioptila californica californica, coastal California gnatcatcher

Lynx rufus, bobcat

Rana draytonii, California red-legged frog

Populus fremontii, Fremont cottonwood

Alnus rhombifolia, white alder


Quercus agrifolia, coast live oak

Juglans californica, California walnut


Sambucus nigra ssp. caerulea, blue elderberry

1.2g Signal Hill's Position in the Region

Signal Hill lies between two major freeways (the 605 and the 710) and the rivers they follow (the Los Angeles and the San Gabriel). It is surrounded by the city of Long Beach, and is situated at the southern end of Los Angeles County, near the border of Orange County.

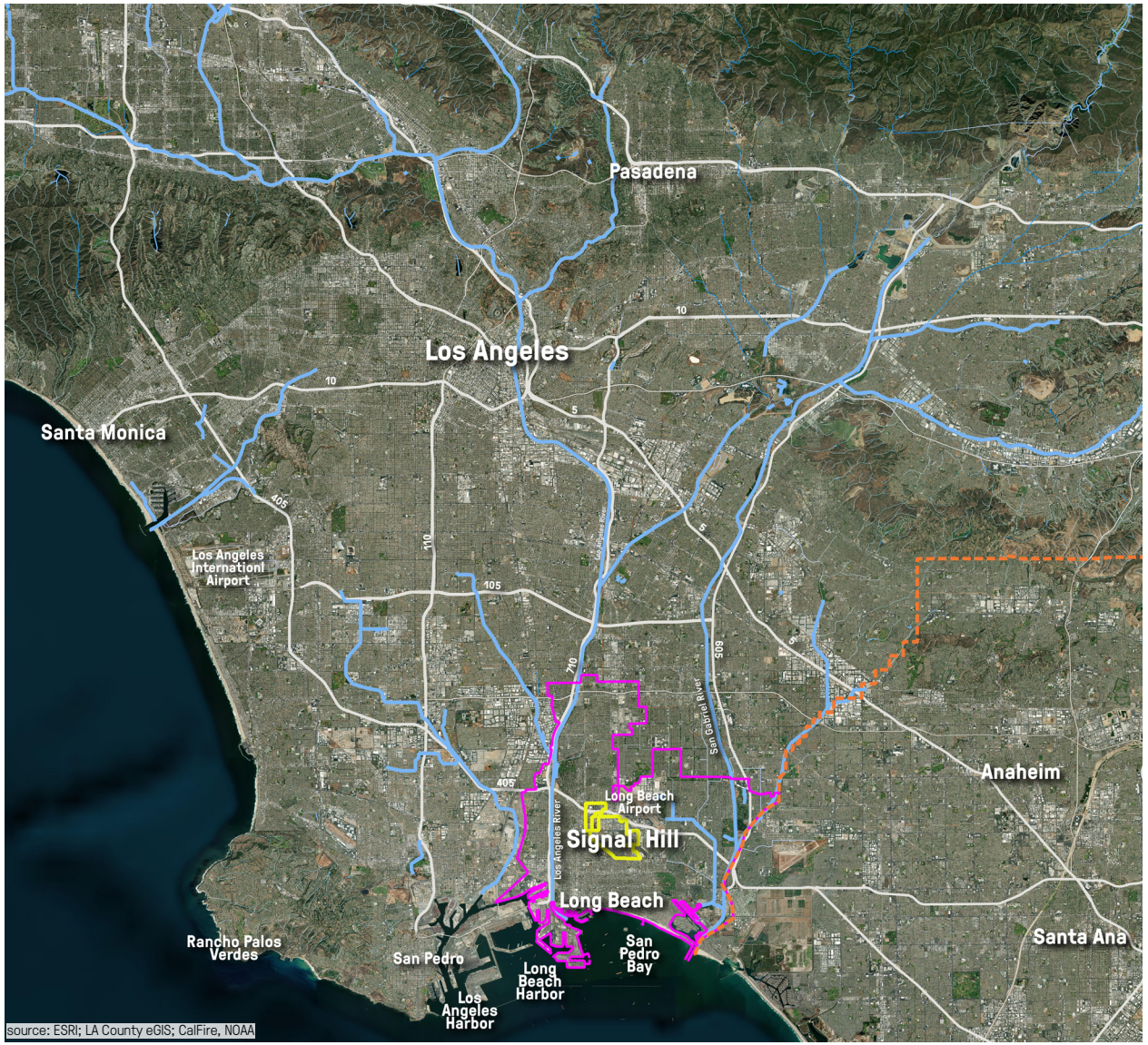


Figure 1.2.2: Signal Hill's Position in the Region, 1:480,000

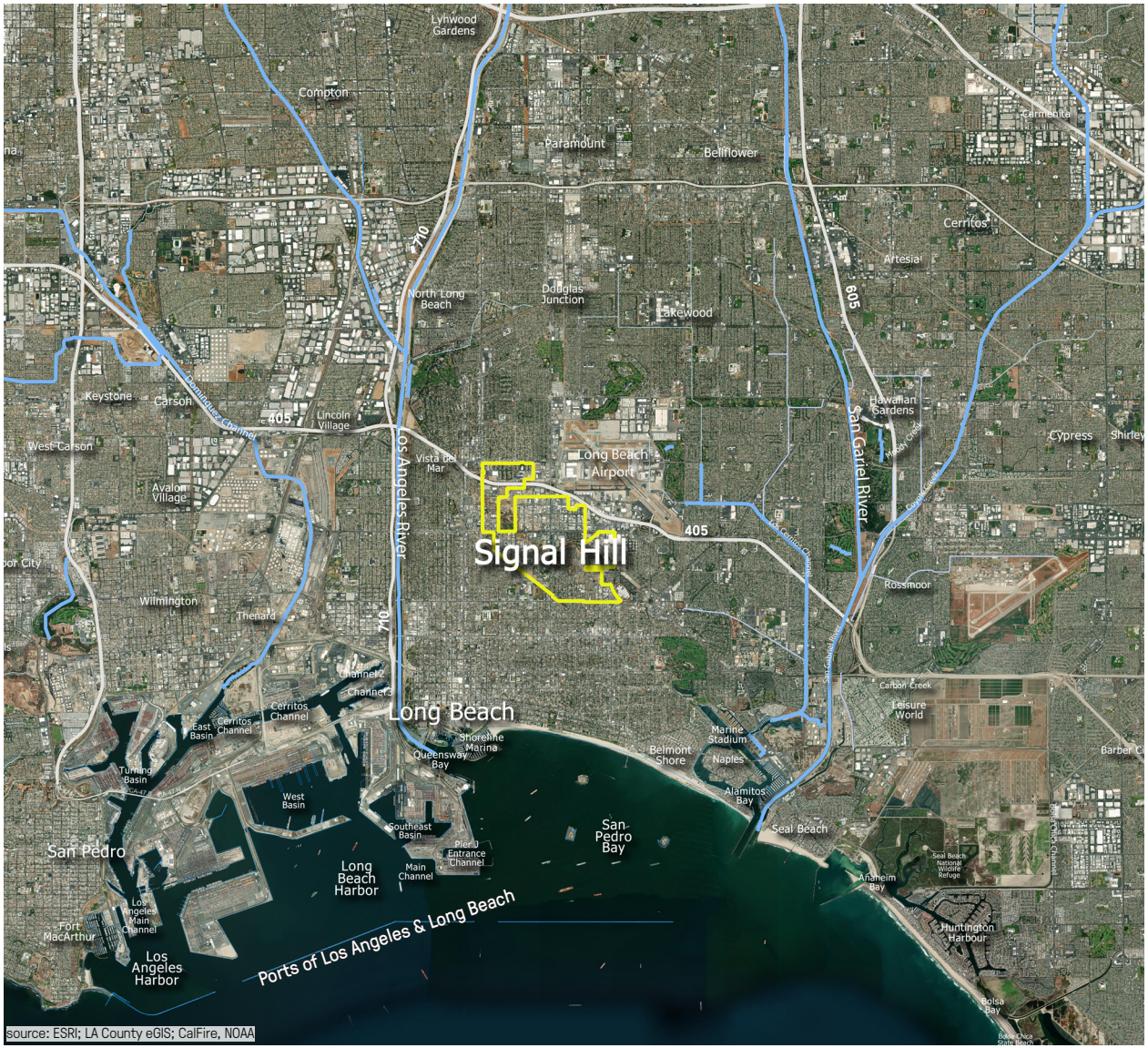


Figure 1.2.3: Signal Hill's Position in the Region, 1:192,000

Signal Hill's location close to the Pacific Ocean and major infrastructure like the Ports of Los Angeles and Long Beach and Long Beach Airport provides Signal Hill with many economic opportunities, but also has environmental repercussions.

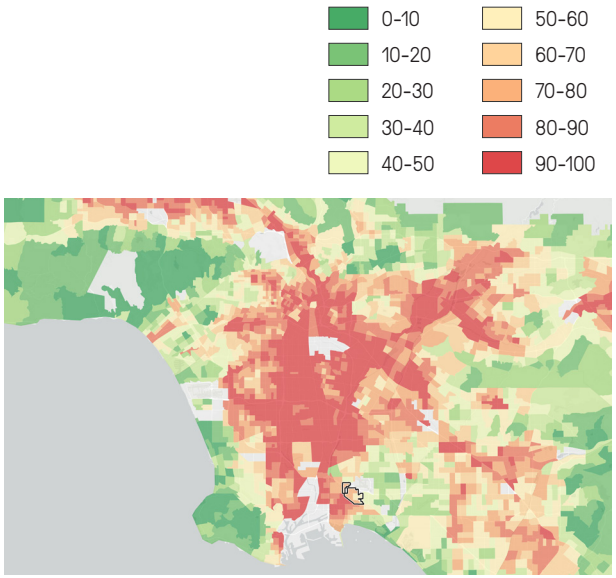
CalEnviroScreen uses government data to map the effects of pollution on California communities, charting the data by census tract. It uses environmental, health, and socioeconomic factors to compare different areas. A higher score indicates a worse pollution burden.[1] CalFire and other state agencies take this score into account when awarding grants. The following pages show CalEnviroScreen's 2021 findings for Signal Hill and the surrounding area.

1 https://oehha.ca.gov/calenviroscreen/about-calenviroscreen

1.2h Environmental Health

CalEnviroScreen Overall Score (Percentage)

The overall score takes into account both environmental and socioeconomic factors to compare communities, which are then are ranked based on these elements. For example, a score of 12% indicates a community fares worse than only 12% of the state and is not considered disadvantaged, while a score of 87% indicates a community fares worse than 87% of the state and is highly impacted by pollution. The northwest section (Zone 1) of Signal Hill scores 71% percent, the middle sections in orange score 79%, and the yellow section scores 56%, with a city average of 69%.



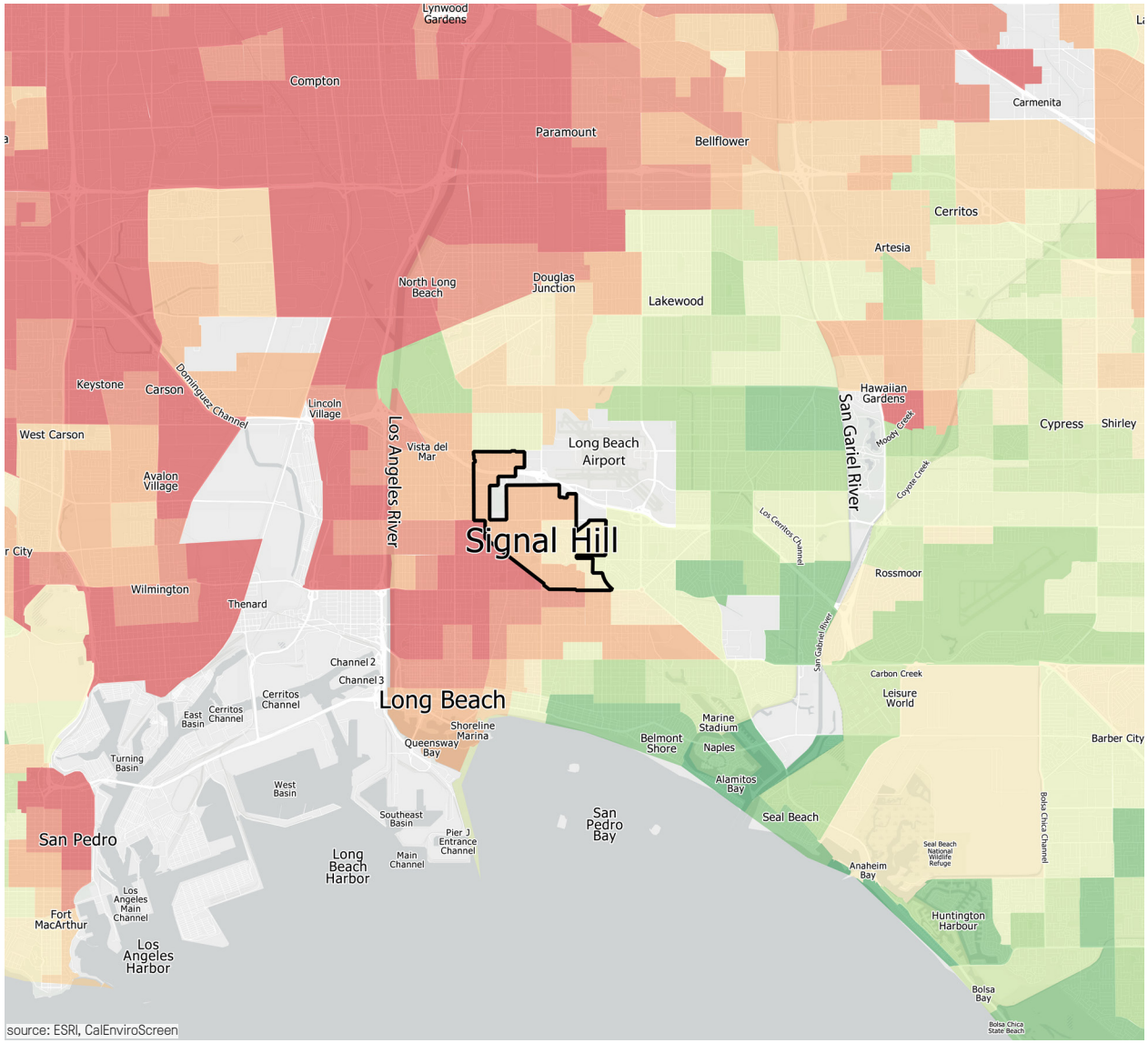


Figure 1.2.4: CalEnviroScreen Overall Score

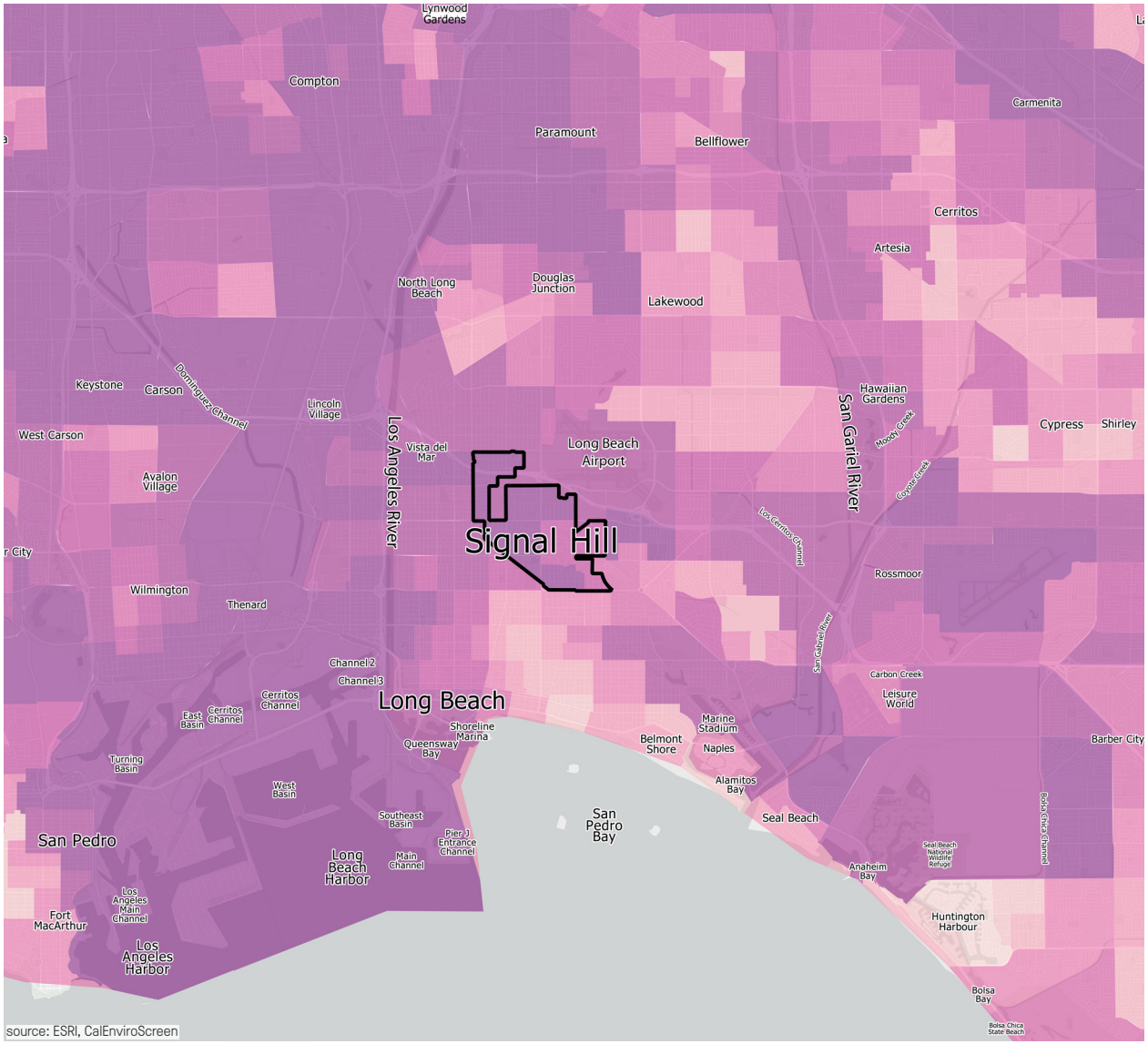
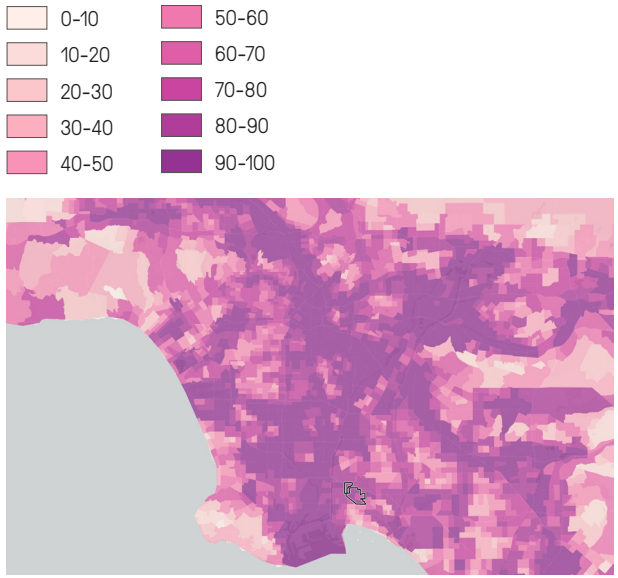


Figure 1.2.5: CalEnviroScreen Pollution Burden

CalEnviroScreen Pollution Burden

This map depicts the potential exposures to pollutants and the adverse environmental conditions caused by pollution. It takes into account factors like particulate matter, drinking water contaminants, toxic releases from facilities, cleanup sites, groundwater threats, and other environmental hazards. The northwest section (Zone 1) of Signal Hill scores 96% percent, the middle sections in purple score 91%, and the pink section scores 76%, with a city average of 88%. These scores indicate that the city has a very high pollution burden, higher than most of state. Trees can help relieve many of these issues, by working to clean the air and groundwater.



1.3 Existing Conditions

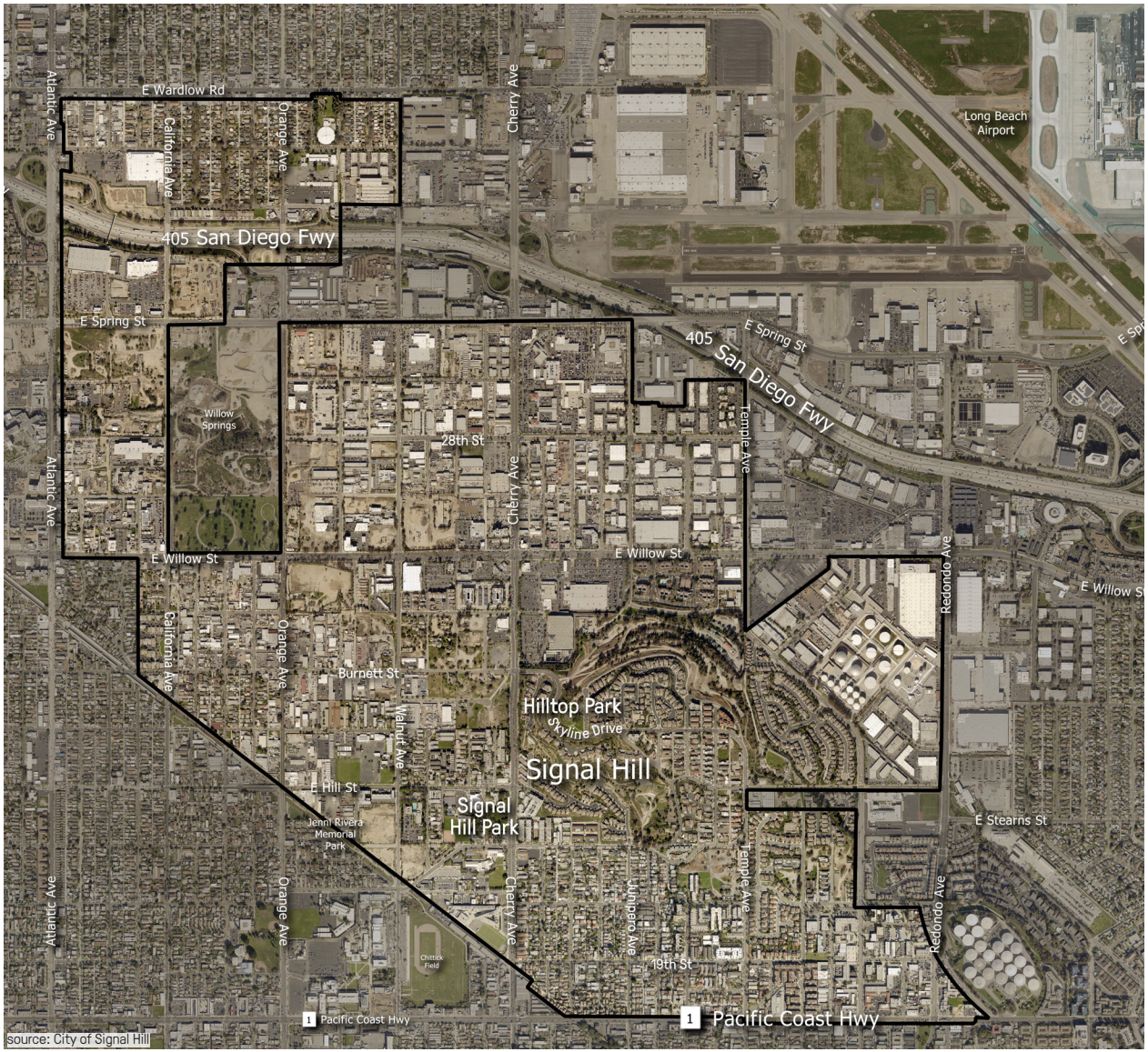


Figure 1.3.1: The City of Signal Hill, 1:28,800

1.3a The City of Signal Hill

Environmental and social conditions impact the growth of trees and other vegetation, as well as the planting and infrastructural strategies that can provide the greatest benefits. Understanding the context of the community forest helps in developing the most appropriate solutions for its sustainable management. Signal Hill occupies 2.25 square miles within the city of Long Beach and the Long Beach Oil Field. The city straddles the 405 freeway and sits just southwest of Long Beach Airport. The 2020 census population estimate is 11,848. Its eponymous hill gives the city a unique character and great views of the surrounding ocean and mountains.

California experiences yearly seasonal drought from mid-spring to mid-fall, as a continental high pressure system keeps moist oceanic weather systems well off-shore. When cooler winter temperatures dissipate the high pressure, a stream of winter storms flows down from Alaska and Asia, leaving an average annual precipitation in Signal Hill of 12 inches. During years in which the high pressure system lingers, winter storms can be reduced drastically, leading to periods of sustained drought, such as is occurring now. These conditions have understandably put a strain on the community forest.

Signal Hill's Mediterranean climate typically requires plants that are adapted not only to relatively low overall rainfall, but also to the stress of regular summer dryness and occasional long-term drought. In order to increase the resiliency of the community forest, ensure its long term benefits, and reduce maintenance costs, trees and plants that have low to very low water needs should be prioritized. However, even these species need periodic watering during the first two or three summers until their root systems are well-developed.

Strong winds sometimes accompany winter storms, while dry, powerful Santa-Ana winds come in from desert regions to the east and south. Understanding wind patterns in relation to a particular site will indicate whether a particularly wind-tolerant tree species should be selected.

Signal Hill is located within Sunset Climate Zone 22 and USDA Plant Hardiness Zone 10b. Sunset describes this zone as quite mild, and freezing weather is extremely rare, though temperatures can occasionally fall into the 25-28°F range. Because it freezes so rarely, deciduous woody plants do not thrive here, but subtropical plants can as long as they are protected from the occasional frost.

The conditions at a specific planting site can vary greatly depending on its immediate surroundings. These locational conditions are referred to as the microclimate, which is influenced by topography (aspect and slope), structures, pavement, and existing vegetation.

As a city with a long history of oil production, pollution is another important factor to consider for the health of Signal Hill's tree canopy. This consideration is a two-way street: trees may not thrive in an area with contaminated soil or water; however, certain species can actually help to clean said water and soil in a process known as phytoremediation. Plants draw up contaminants through their roots and either store them or break them down into less harmful components, regardless removing the contaminants from the soil and water. More information on phytoremediation can be found on page 66.

Finally, the city itself needs to ensure that critical infrastructure like water and sewer lines, hydrants, and power lines are protected. Trees can cause costly damage to this infrastructure if not planted and maintained with careful consideration. The city must also maintain the current tree canopy as it seeks to expand it.

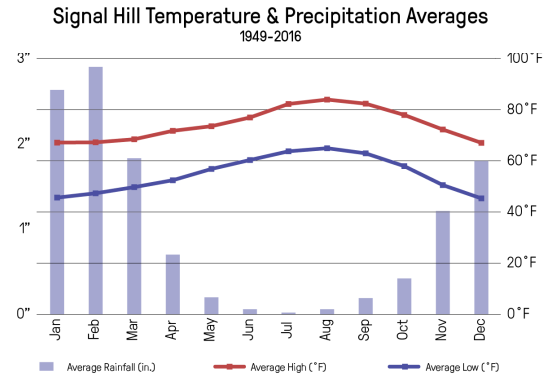


Figure 1.3.2: Signal Hill Average Temperature & Precipitation. Source: National Weather Service

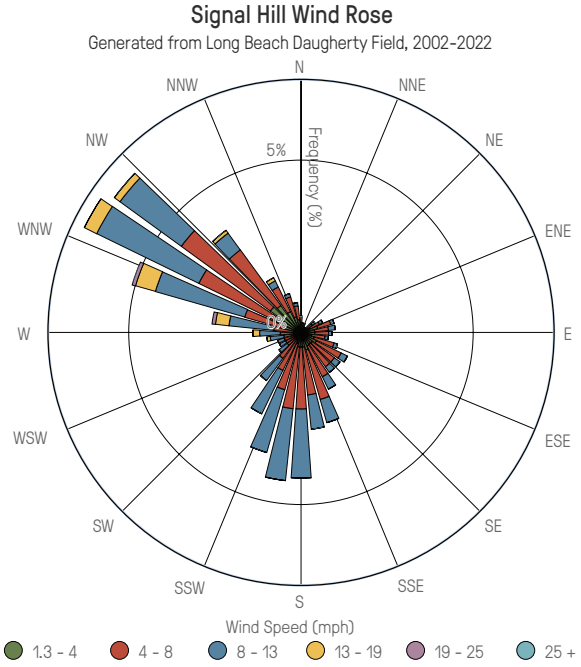


Figure 1.3.3: Signal Hill Wind Direction. Source: Midwestern Regional Climate Center

1.3b Topography & Groundwater

The shape of the land can affect air drainage, resulting in warmer zones on sloped ground and cool areas in basins or where air flow is stilled. Slopes may also create wind. The angle of the land in relation to the sun is important, with south- and west-facing slopes receiving the most direct sunlight and therefore being significantly hotter and dryer than the cool, moist microclimates of north- or east-facing slopes. Additionally, slope can impact the availability of water to vegetation. Quick run-off of water from steep slopes can contribute to excessively dry soil, while low spots collect run-off and may therefore be wetter than the surrounding soil. Topography also dictates where water flows, dividing Signal Hill into the Los Angeles River Watershed / West Coast Groundwater Basin and the San Gabriel River / Central Groundwater Basin. Trees can be instrumental in maintaining healthy watersheds.

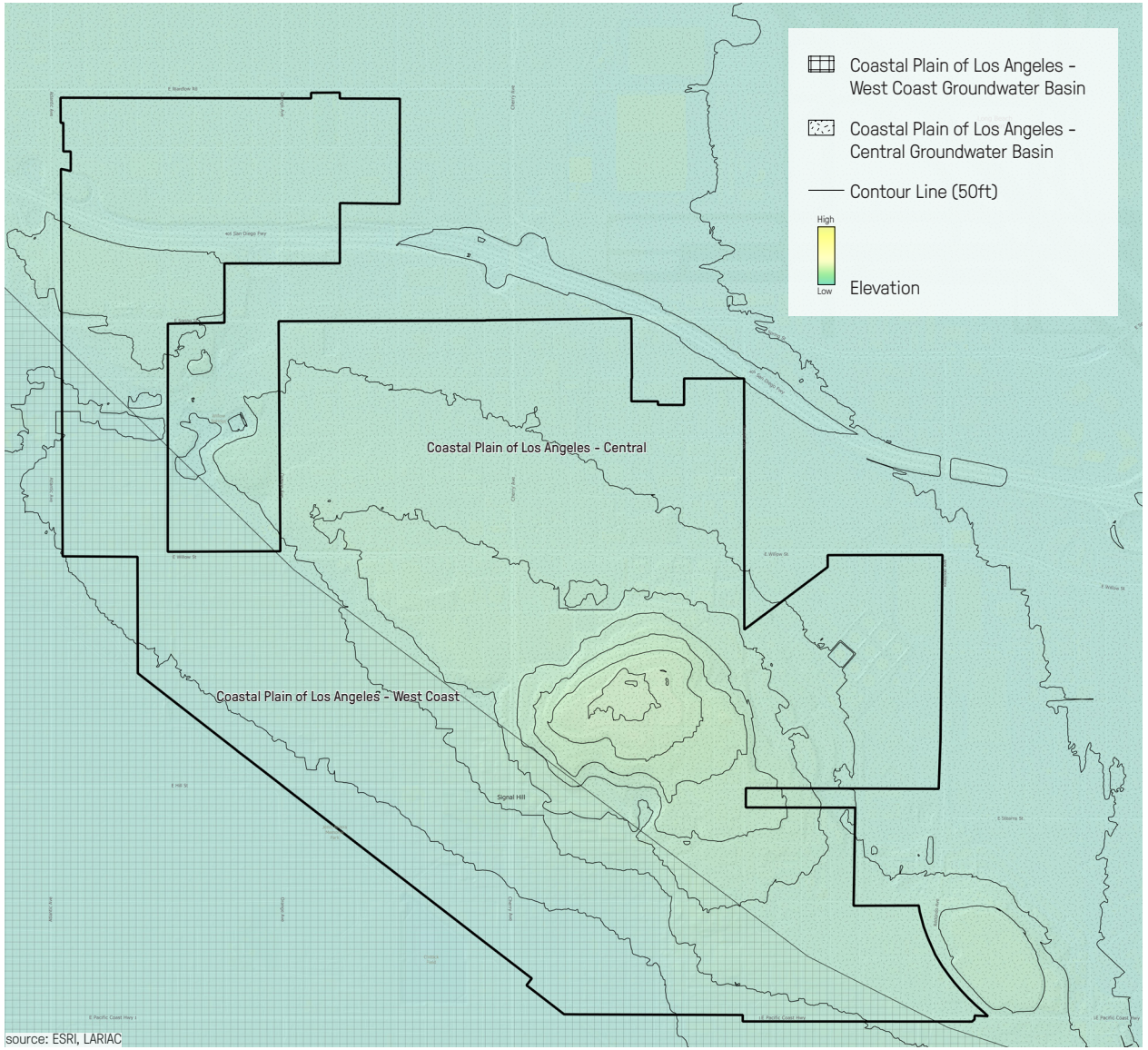


Figure 1.3.4: Topography & Groundwater

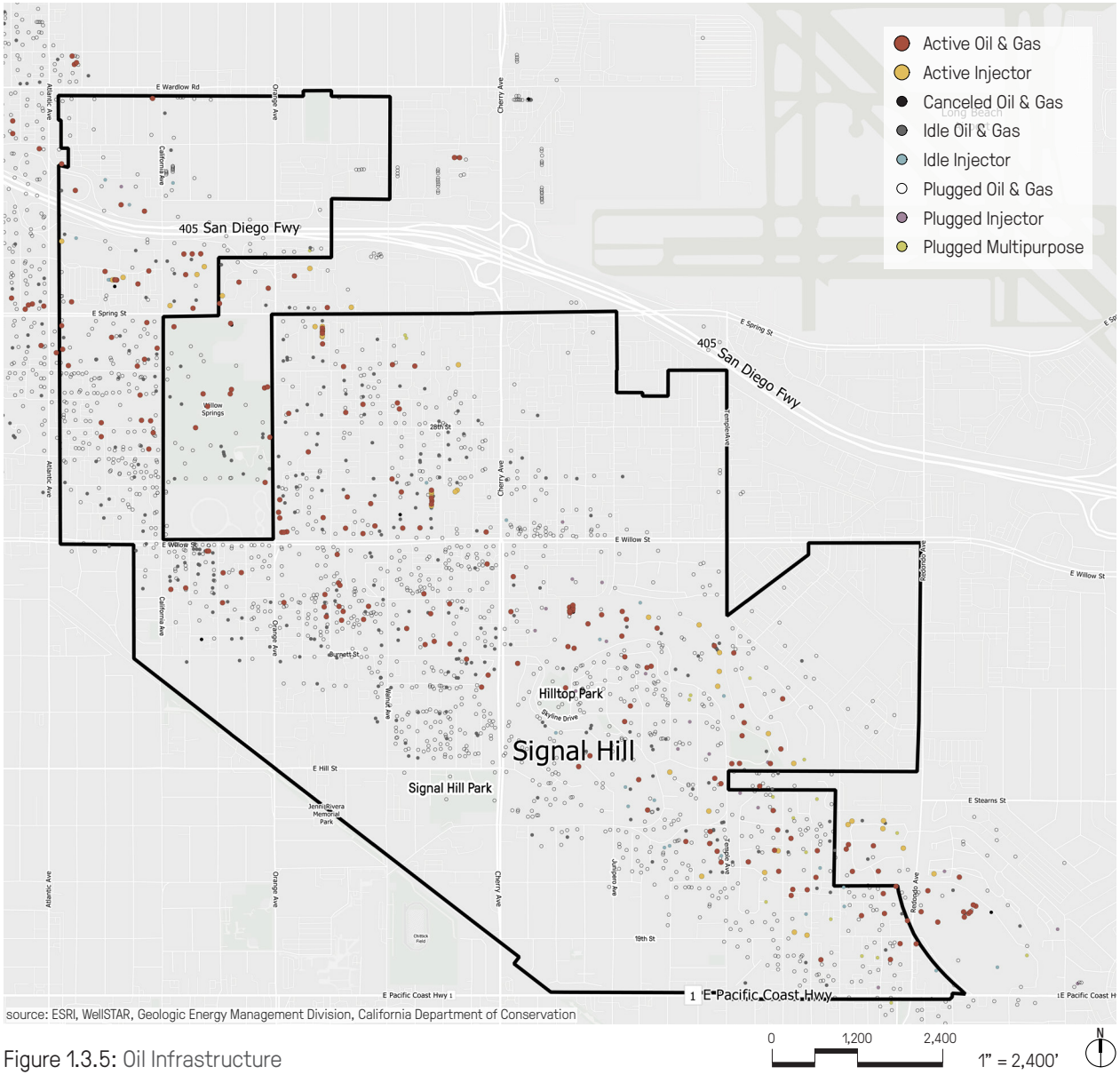


Figure 1.3.5: Oil Infrastructure

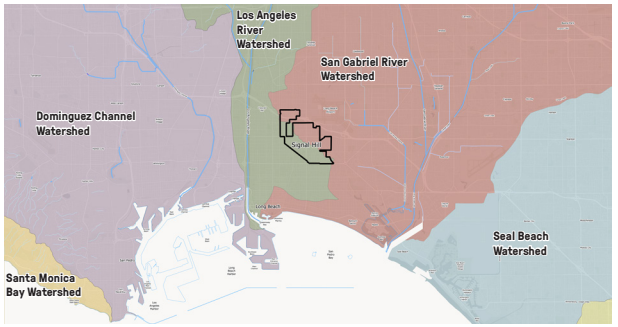
1.3c Oil Infrastructure

Signal Hill's long history of oil production has been an economic boon but an environmental burden. A large portion of the city hosts either active or plugged wells. These sites are usually cleared of vegetation, reducing the tree canopy. Wells that are not properly plugged and abandoned can remain a possible hazard, potentially leaking fluids and gases and interfering with future surface development.[1] Additionally, fracking at injector well sites uses large amounts of water to help release the oil. This water can pollute the groundwater basins and river watersheds and may require treatment before disposal or reuse.

Signal Hill's position among two watersheds and groundwater basins makes it particularly important to clean any water entering these vital resources, particularly in times of drought.

1 https://www.eia.gov/energyexplained/oil-and-petroleum-products/oil-and-the-environment.php

Figure 1.3.6: Watersheds of the Signal Hill Area



1.3d Urban Heat Index & Current Tree Canopy

Urban heat islands are urbanized areas that experience higher temperatures and pollution than their rural counterparts, creating negative health effects. The Index is calculated as a positive temperature differential over time between an urban census tract and nearby upwind rural reference points at a height of two meters above ground level, where people experience heat. Heat islands are created by a combination of heat-absorptive surfaces (such as dark pavement and roofing), heat-generating activities (such as engines and generators) and the absence of vegetation (which provides evaporative cooling).[1]

Stands of existing trees near a planting site can block wind or create shade. Large areas of vegetation reverse the effect of heat islands by absorbing sunlight and by releasing moisture into the air by transpiration from the leaves, cooling the surroundings like a huge air conditioner. Airborne moisture from ocean fog or other sources also tends to condense on the surfaces of leaves and needles, causing a wetter, cooler microclimate. As the map shows, Signal Hill's existing tree canopy helps mitigate the urban heat island effect.

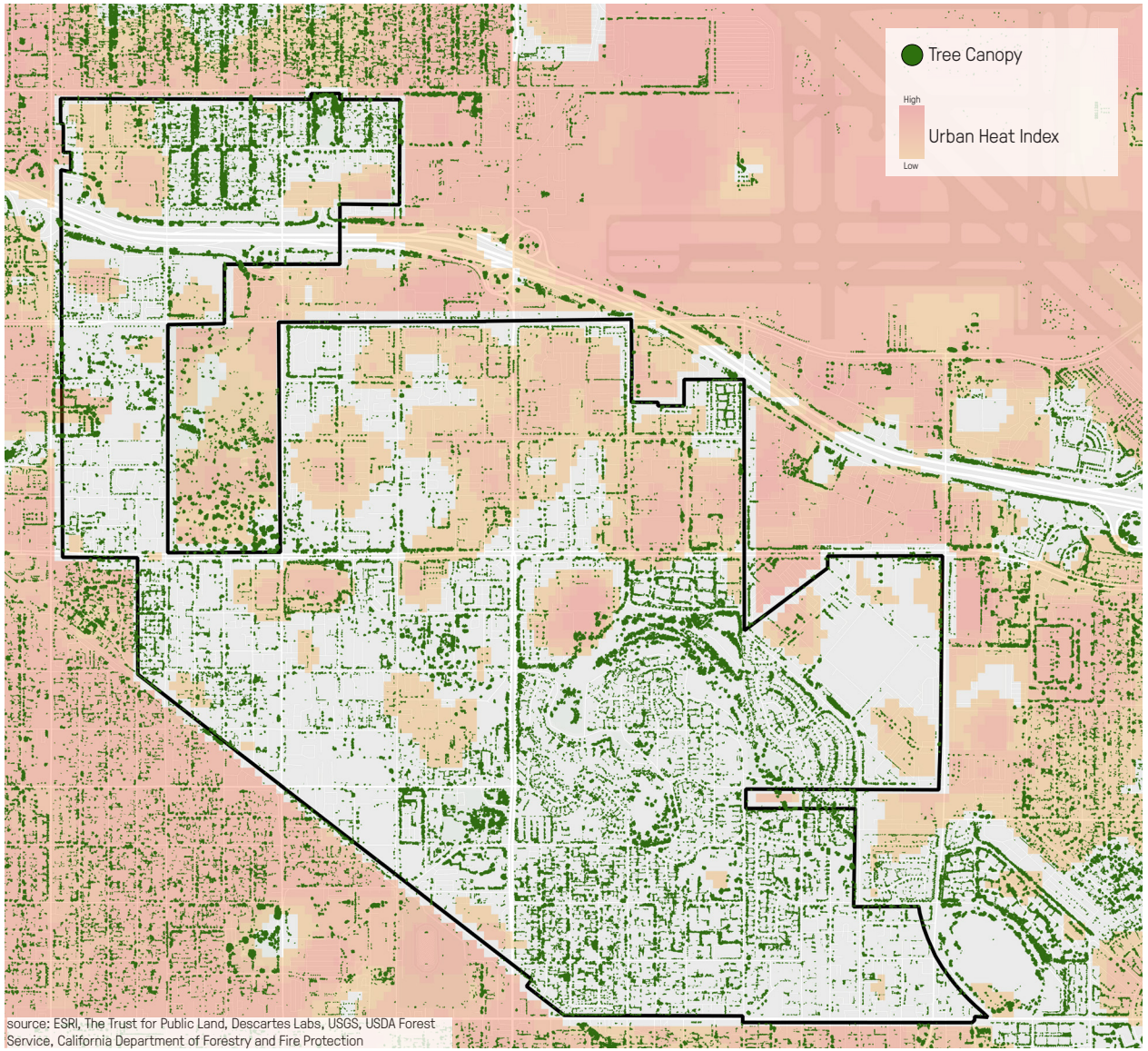


Figure 1.3.7: Urban Heat Index & Current Tree Canopy

1 https://calepa.ca.gov/climate/urban-heat-island-index-for-california/understanding-the-urban-heat-island-index/

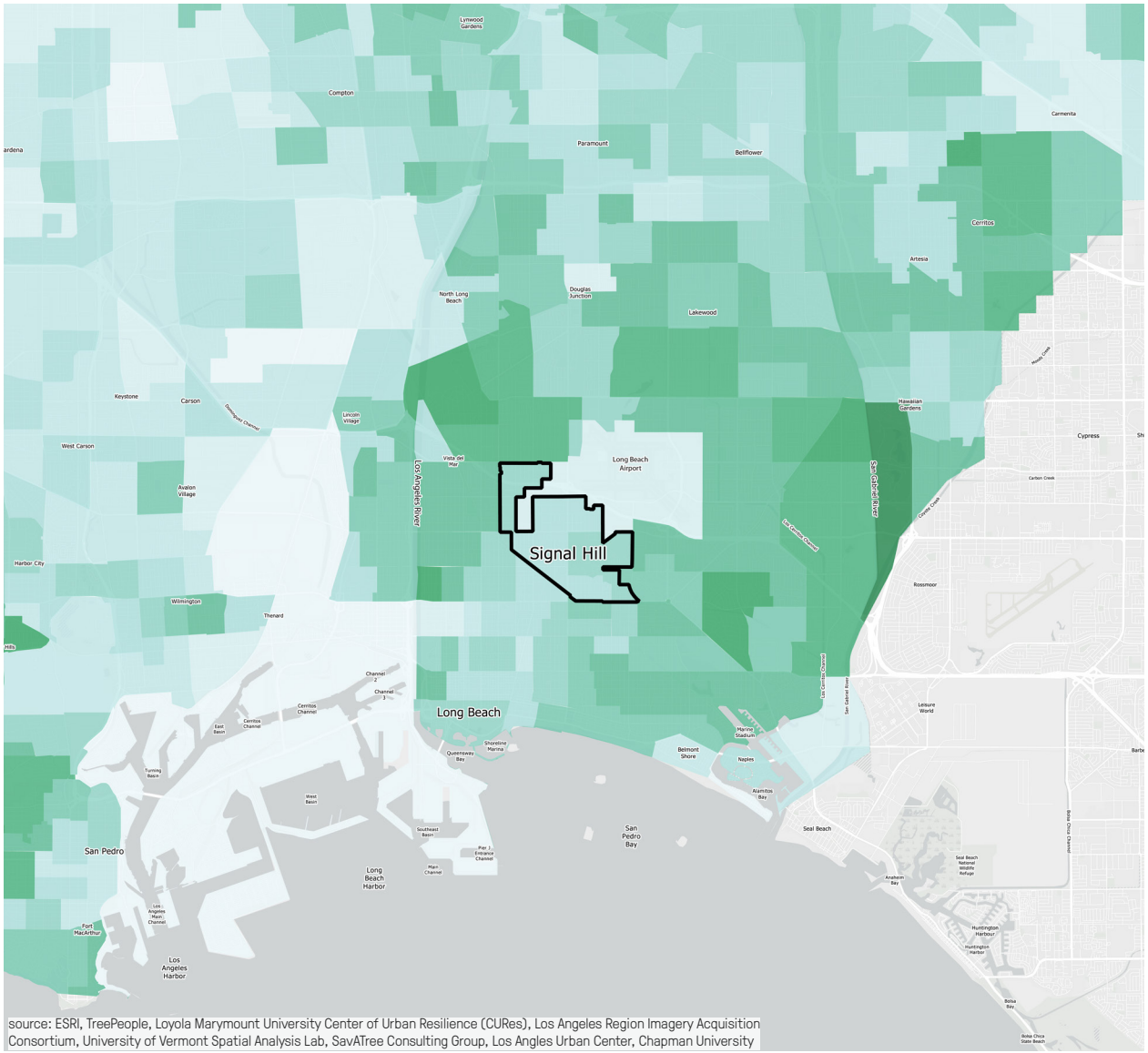


Figure 1.3.8: Tree Canopy Percentage by Census Tract

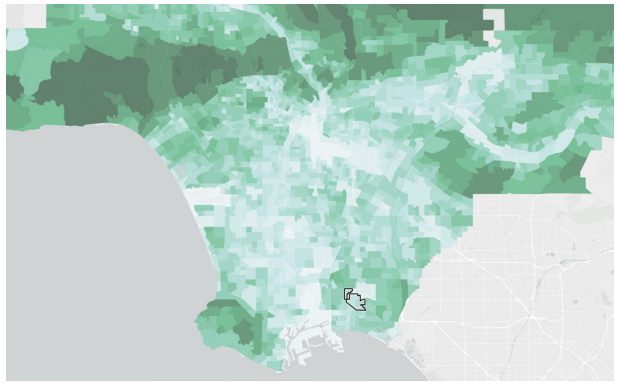
1.3e Tree Canopy Percentage by Census Tract

Currently, Signal Hill's tree canopy percentage (the proportion of land surface covered by tree tops) ranges from 10-16%.[2] The Street Tree Master Plan aims to help grow the tree canopy overall, as well as improve shade equity.

2 https://www.treepeople.org/los-angeles-county-tree-canopy-map-viewer/

Existing Tree Canopy Percentage by Census Tract

0-4	18-20
4-8	20-24
8-10	24-29
10-13	29-36
13-15	36-49
15-18	49-68



1.3f Tree Equity Score

The Tree Equity Score (TES) is calculated based on how much tree canopy and surface temperature align with income, employment, race, age and health factors in the U.S.[1] A canopy goal is calculated for a neighborhood, and then the actual canopy is subtracted from that, giving a canopy gap. A priority index takes into account income, employment, race, age, health, and Urban Heat Island severity. These numbers are combined to create the TES. A lower TES indicates a higher priority for planting trees in order to close the tree canopy gap.[2]

The map at left shows that Signal Hill should focus tree planting in the western and northern areas of the city (Zones 1 & 3) to improve shade equity. Zone 4 should be a lower priority. American Forests, the organization behind the Tree Equity Score, has created a Tree Equity Catalyst Fund to help cities achieve tree equity. In the future, perhaps Signal Hill could participate in this program as it adds more cities to its fund.

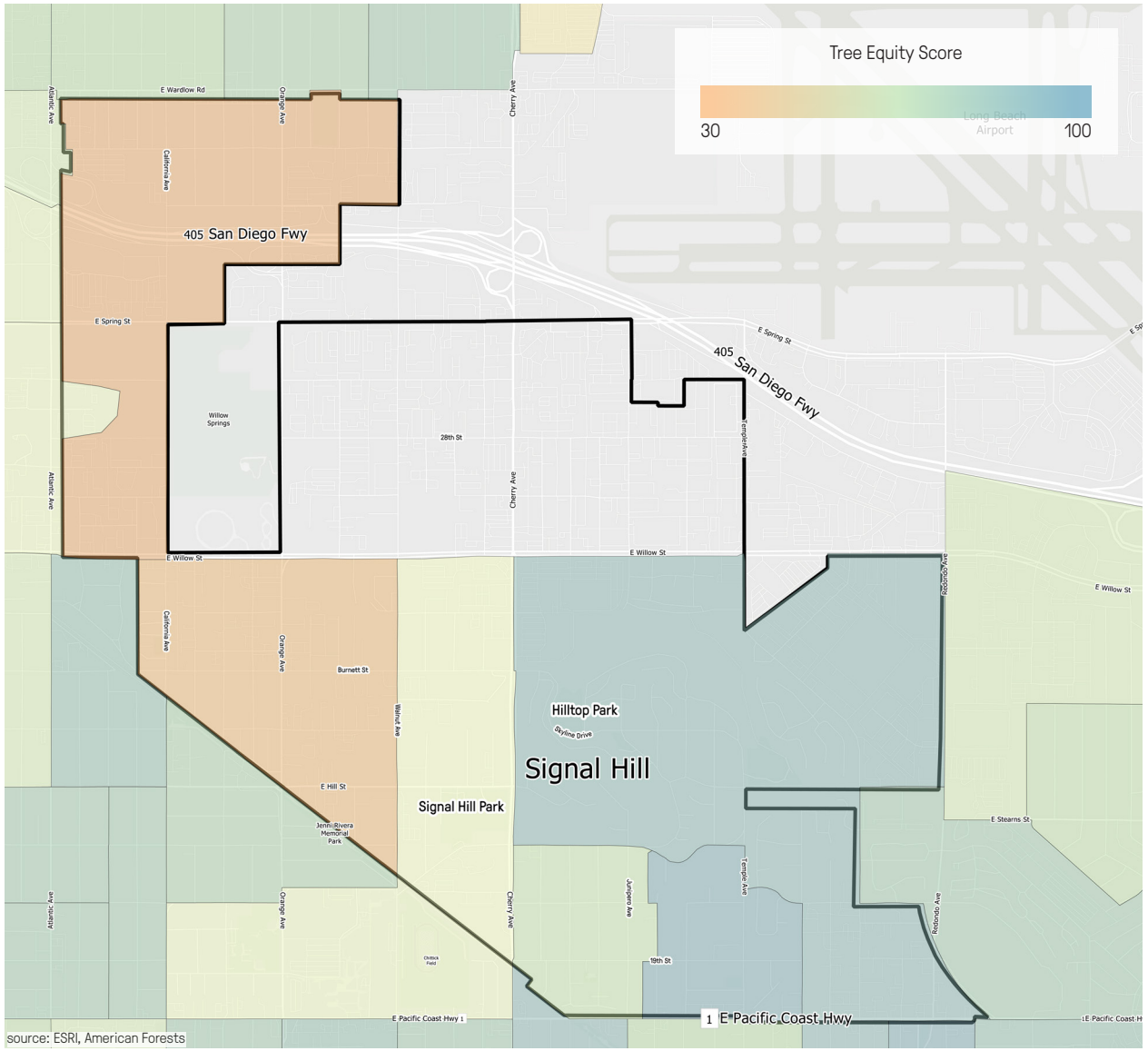
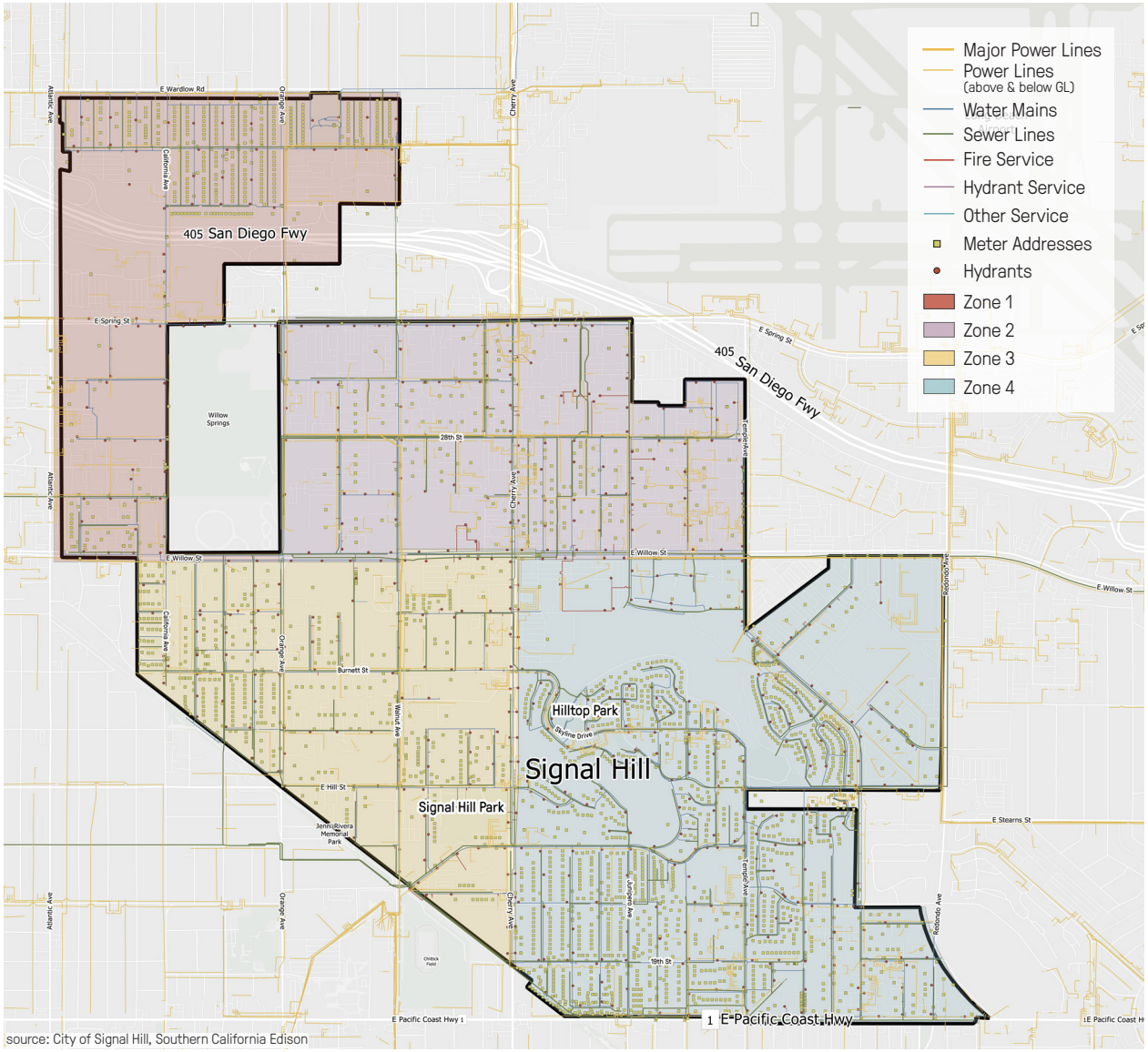


Figure 1.3.9: Tree Equity Score

1 https://www.treeequityscore.org/about/
2 https://www.treeequityscore.org/methodology/



source: City of Signal Hill, Southern California Edison

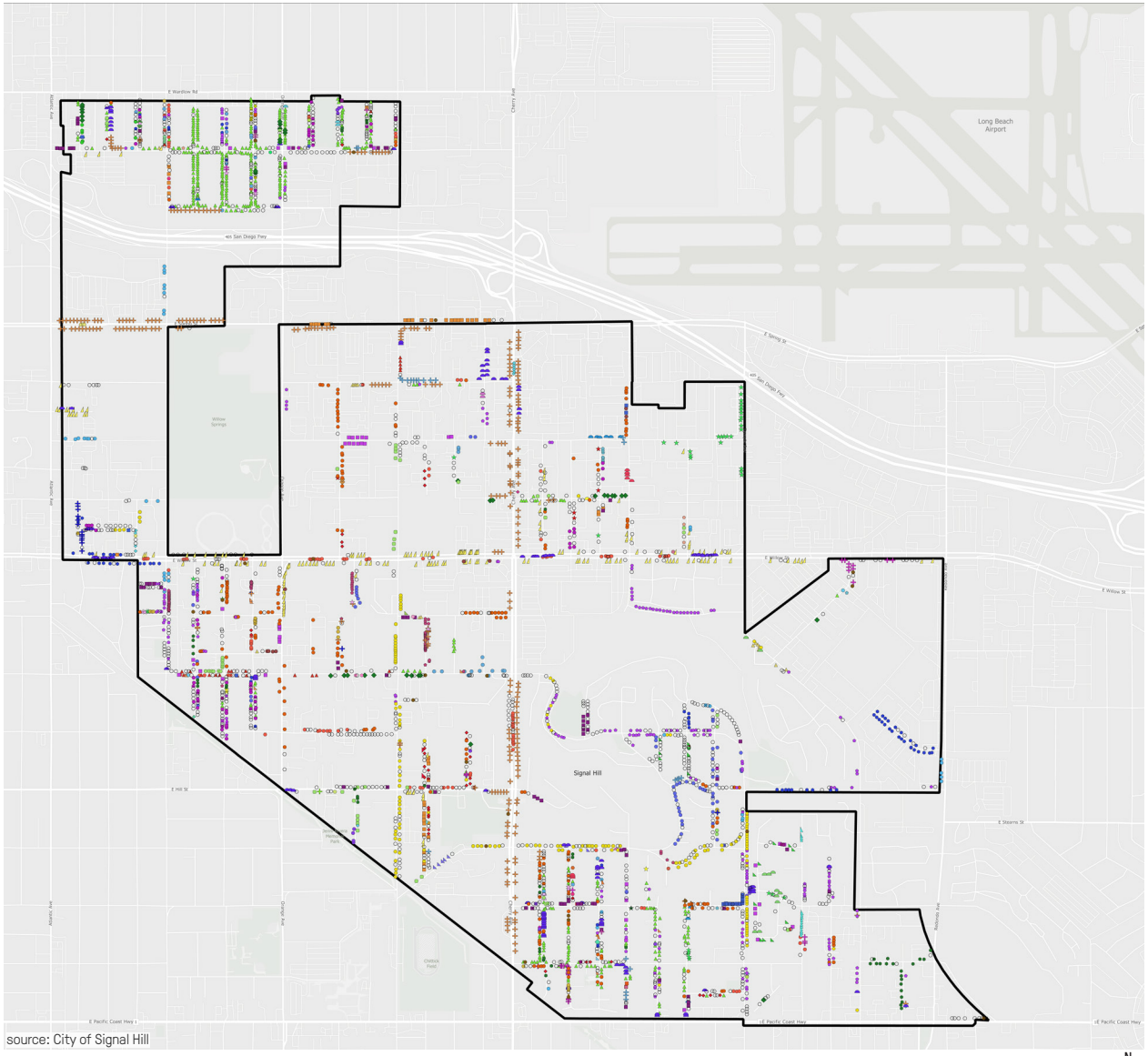
Figure 1.3.10: Public Works & Power Infrastructure

1.3g Public Works & Power Infrastructure

The City of Signal Hill Public Works department divides the city into 4 quadrants to determine their tree trimming and maintenance schedule. The department must maintain water lines as well as meter boxes and fire hydrants. Tree roots can damage subterranean lines in their quest for water, and are particularly likely to damage sewer laterals. Therefore careful consideration must be given when planting new trees in the vicinity of any of this ubiquitous infrastructure.

Each species must be appropriate for its location. Trees with water-seeking roots should not be placed near water or sewer lines, and tall trees should not be planted under power lines. Street trees should be planted at an appropriate distance to meter boxes and fire hydrants. Crucially, each of the nearly one thousand vacant tree wells, visible on the following map, should be filled with an appropriate tree.

Trees and oil derrick near Hilltop Park. Photo: G. Castriotta



0 1,200 2,400

1" = 2,400'

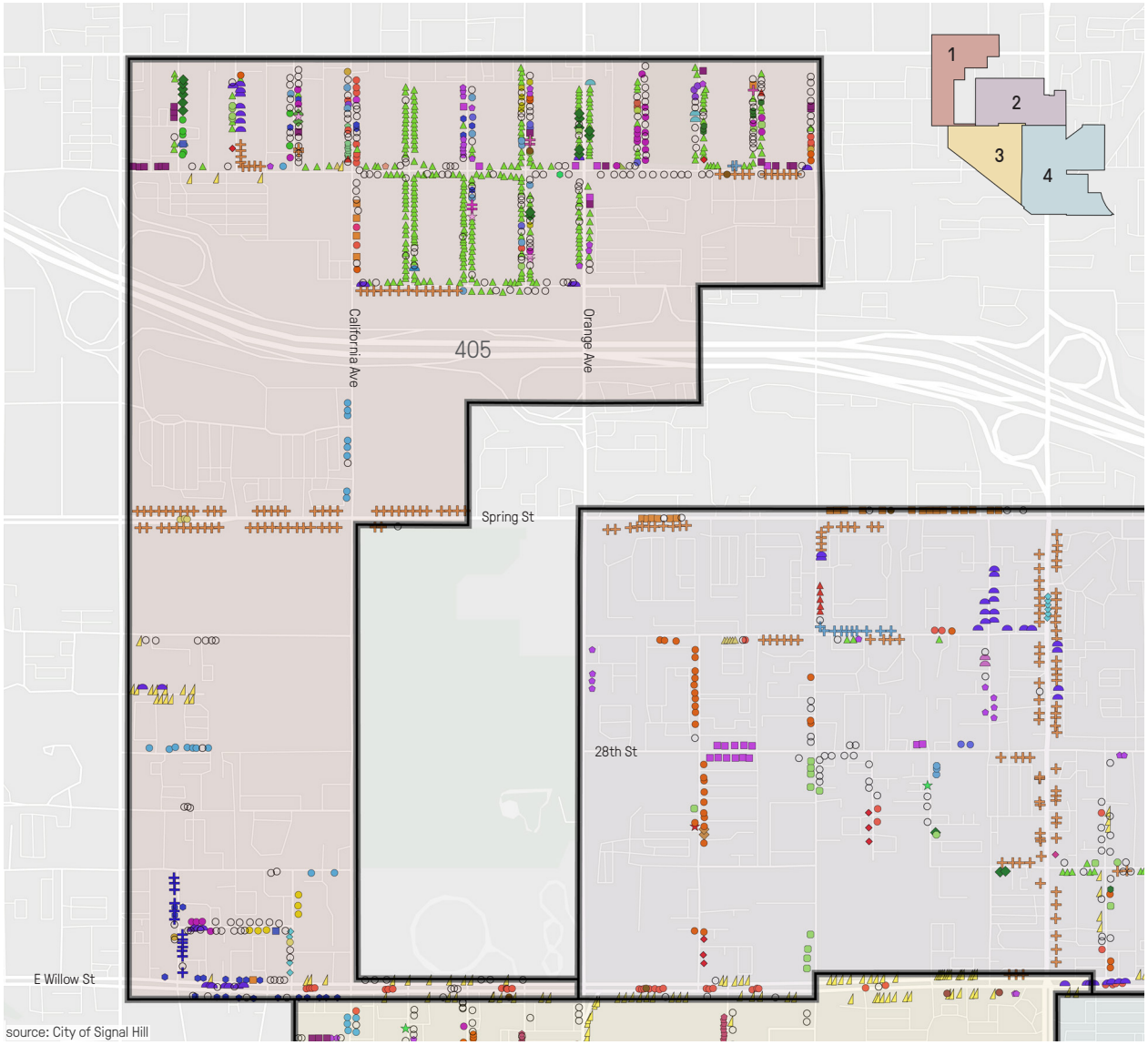
N

Figure 1.3.11: Current Street Tree Species Map

1.3h Current Street Tree Species Map

- African Sumac
- Aleppo Pine
- Alii Fig
- **American Sweetgum**
- Arizona Ash*
- Australian Flame Tree
- Australian Willlow
- Bottle Tree
- Brazilian Pepper
- Brisbane Box
- Bronze Loquat
- Brush Cheerry
- Cajeput Tree
- California Fan Palm*
- **California Pepper**
- California Sycamore*
- Camphor Tree
- Canary Island Date Palm
- Canary Island Pine
- Carob
- Carolina Red Cherry
- **Carrotwood**
- Cherimoya
- Chinaberry
- **Chinese Elm Tree**
- **Chinese Flame Tree**
- Chinese Pistache
- Crape Myrtle
- Date Palm
- Desert Gum
- Eastern Redbud
- Edible Loquat
- Evergreen Pear
- **Fern Pine**
- Flaxleaf Paperbark
- Frangipani
- Glossy Privet
- Gold Medallion Tree
- Goldenrain Tree
- Guava
- Hackberrry
- Holly Oak
- Honey Locust
- Indian Laurel Fig
- Italian Cypress
- Jacaranda
- Japanese Black Pine
- Java Plum
- King Palm
- Lavender Trumpet Tree
- Lemon
- **Lemon Bottlebrush**
- **Lemon-Scented Gum**
- London Plane
- Maidenhair Tree
- Malus (Apple) Species
- Mediterranean Fan Palm
- **Mexican Fan Palm**
- Modesto Ash*
- New Zealand Christmas Tree
- Norfolk Island Pine
- Olive
- Orange
- Ornamental Pear
- Palm
- Palo Verde
- Pecan
- Pink Crape Myrtle
- Pink Trumpet Tree
- Primrose Tree
- Purple Orchid Tree
- Purple-Leaf Plum
- **Queen Palm**
- Queensland Umbrella Tree
- Red Gum
- Red Ironbark
- Rusty-leaf Fig
- Sawtooth Zelkova
- Shamel Ash
- Siberian Elm
- Silk Tree
- Silver Dollar Gum
- Silver Mountain Gum
- Southern Magnolia
- Sugar Gum
- Sweet Bay
- Tipu
- Tupidanthus
- Weeping Bottlebrush
- Weeping Fig
- Western Redbud*
- Windmill Palm
- Yew Pine
- Stump
- Vacant Site

* Indicates native species
Bolded species are 10 most common



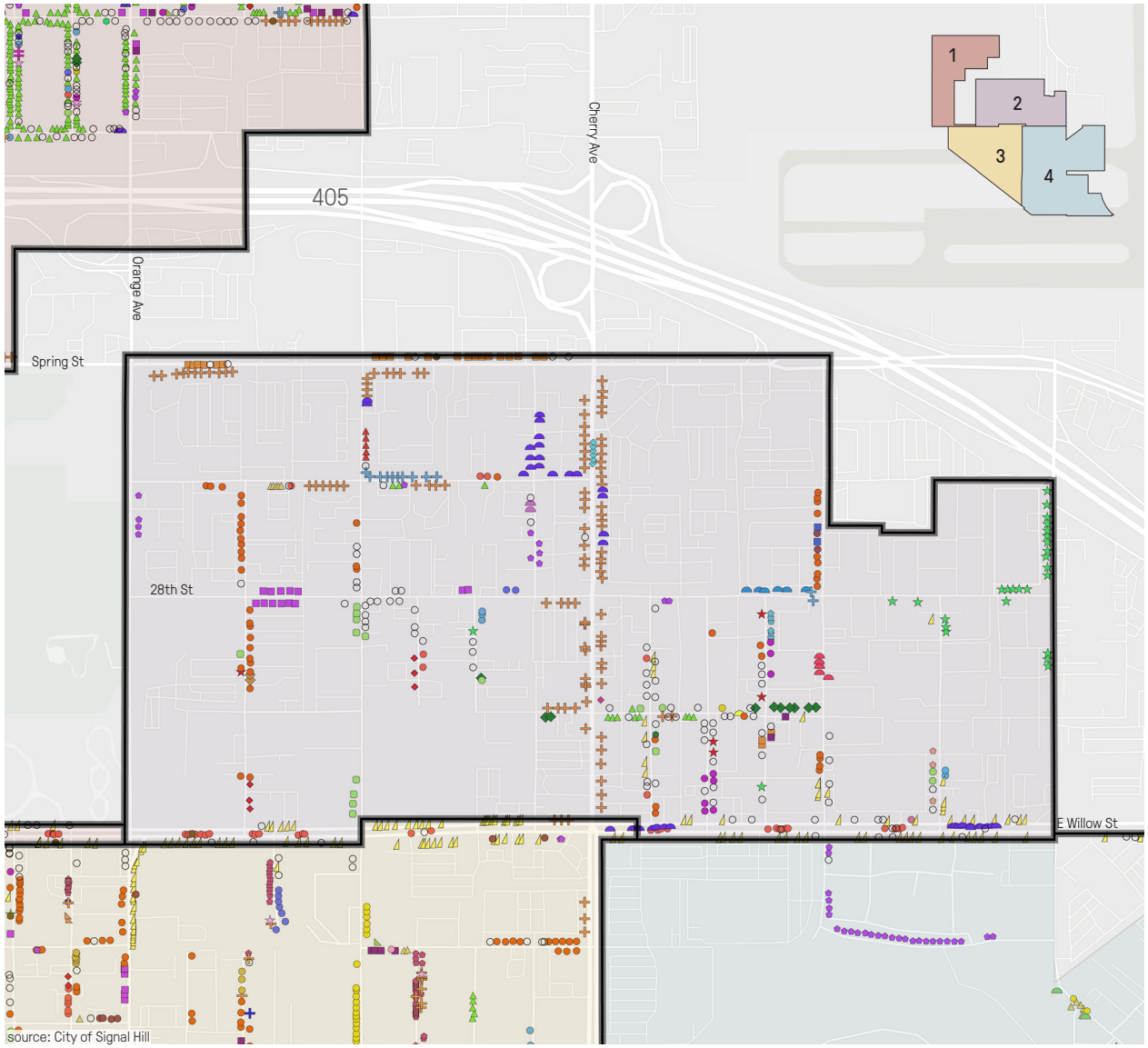
Zone 1

- African Sumac
- Aleppo Pine
- Alii Fig
- **American Sweetgum**
- Arizona Ash*
- Australian Flame Tree
- Australian Willlow
- Bottle Tree
- Brazilian Pepper
- Brisbane Box
- Bronze Loquat
- Brush Cheerry
- Cajeput Tree
- California Fan Palm*
- **California Pepper**
- California Sycamore*
- Camphor Tree
- Canary Island Date Palm
- Canary Island Pine
- Carob
- Carolina Red Cherry
- **Carrotwood**
- Cherimoya
- Chinaberry
- **Chinese Elm Tree**
- **Chinese Flame Tree**
- Chinese Pistache
- Crape Myrtle
- Date Palm
- Desert Gum
- Eastern Redbud
- Edible Loquat
- Evergreen Pear
- **Fern Pine**
- Flaxleaf Paperbark
- Frangipani
- Glossy Privet
- Gold Medallion Tree
- Goldenrain Tree
- Guava
- Hackberrry
- Holly Oak
- Honey Locust
- Indian Laurel Fig
- Italian Cypress
- Jacaranda
- Japanese Black Pine
- Java Plum
- King Palm
- Lavender Trumpet Tree
- Lemon
- **Lemon Bottlebrush**
- **Lemon-Scented Gum**
- London Plane
- Maidenhair Tree
- Malus (Apple) Species
- Mediterranean Fan Palm
- **Mexican Fan Palm**
- Modesto Ash*
- New Zealand Christmas Tree
- Norfolk Island Pine
- Olive
- Orange
- Ornamental Pear
- Palm
- Palo Verde
- Pecan
- Pink Crape Myrtle
- Pink Trumpet Tree
- Primrose Tree
- Purple Orchid Tree
- Purple-Leaf Plum
- **Queen Palm**
- Queensland Umbrella Tree
- Red Gum
- Red Ironbark
- Rusty-leaf Fig
- Sawtooth Zelkova
- Shamel Ash
- Siberian Elm
- Silk Tree
- Silver Dollar Gum
- Silver Mountain Gum
- Southern Magnolia
- Sugar Gum
- Sweet Bay
- Tipu
- Tupidanthus
- Weeping Bottlebrush
- Weeping Fig
- Western Redbud*
- Windmill Palm
- Yew Pine
- Stump
- Vacant Site

* Indicates native species
Bolded species are 10 most common

0 600 1,200
1" = 1,200'
N

Figure 1.3.12: Current Street Tree Species Map, Zone 1



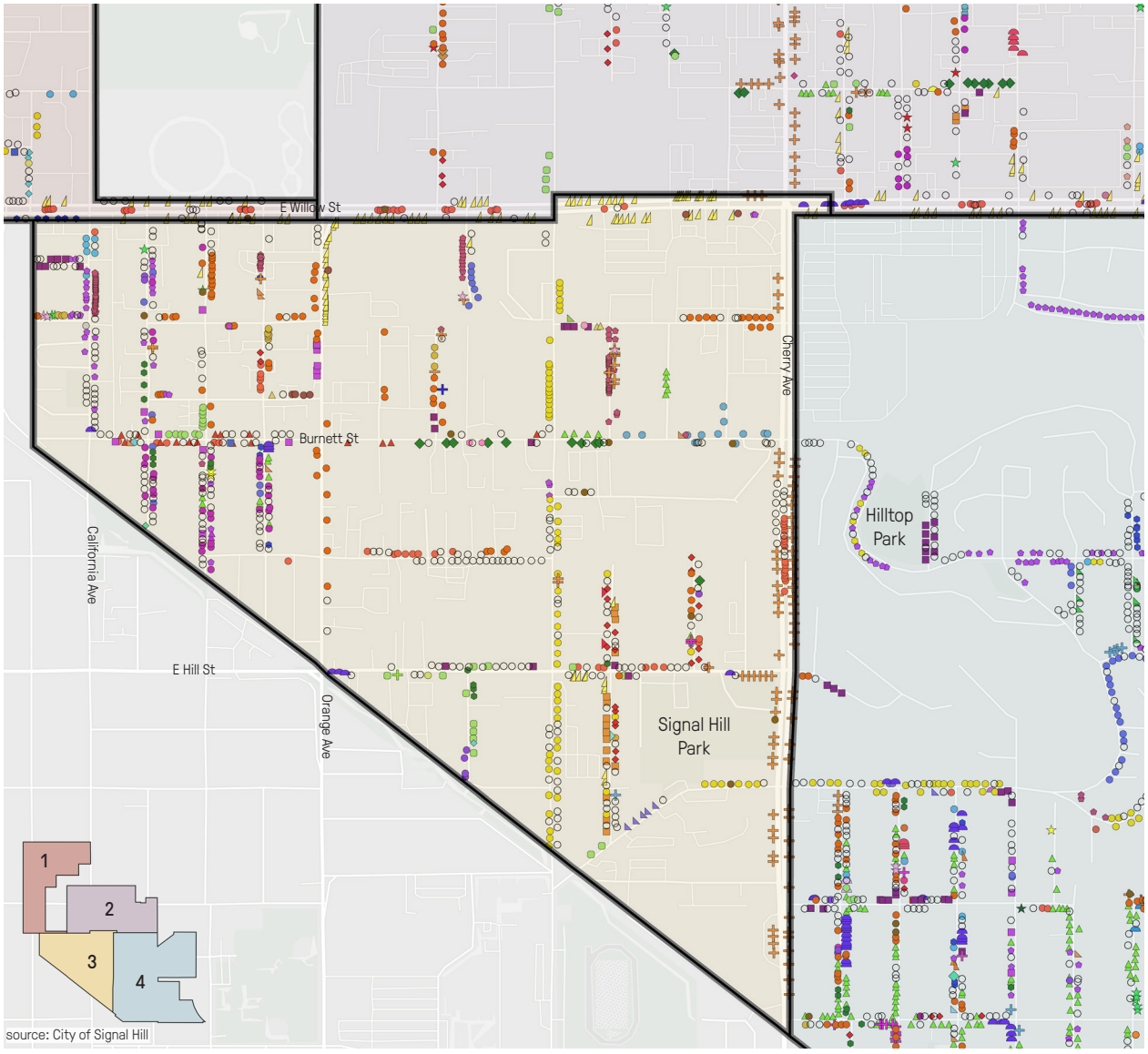
Zone 2

- African Sumac
- Aleppo Pine
- Alii Fig
- **American Sweetgum**
- Arizona Ash*
- Australian Flame Tree
- Australian Willlow
- Bottle Tree
- Brazilian Pepper
- Brisbane Box
- Bronze Loquat
- Brush Cheerry
- Cajeput Tree
- California Fan Palm*
- **California Pepper**
- California Sycamore*
- Camphor Tree
- Canary Island Date Palm
- Canary Island Pine
- Carob
- Carolina Red Cherry
- **Carrotwood**
- Cherimoya
- Chinaberry
- **Chinese Elm Tree**
- **Chinese Flame Tree**
- Chinese Pistache
- Crape Myrtle
- Date Palm
- Desert Gum
- Eastern Redbud
- Edible Loquat
- Evergreen Pear
- **Fern Pine**
- Flaxleaf Paperbark
- Frangipani
- Glossy Privet
- Gold Medallion Tree
- Goldenrain Tree
- Guava
- Hackberrry
- Holly Oak
- Honey Locust
- Indian Laurel Fig
- Italian Cypress
- Jacaranda
- Japanese Black Pine
- Java Plum
- King Palm
- Lavender Trumpet Tree
- Lemon
- **Lemon Bottlebrush**
- **Lemon-Scented Gum**
- London Plane
- Maidenhair Tree
- Malus (Apple) Species
- Mediterranean Fan Palm
- **Mexican Fan Palm**
- Modesto Ash*
- New Zealand Christmas Tree
- Norfolk Island Pine
- Olive
- Orange
- Ornamental Pear
- Palm
- Palo Verde
- Pecan
- Pink Crape Myrtle
- Pink Trumpet Tree
- Primrose Tree
- Purple Orchid Tree
- Purple-Leaf Plum
- **Queen Palm**
- Queensland Umbrella Tree
- Red Gum
- Red Ironbark
- Rusty-leaf Fig
- Sawtooth Zelkova
- Shamel Ash
- Siberian Elm
- Silk Tree
- Silver Dollar Gum
- Silver Mountain Gum
- Southern Magnolia
- Sugar Gum
- Sweet Bay
- Tipu
- Tupidanthus
- Weeping Bottlebrush
- Weeping Fig
- Western Redbud*
- Windmill Palm
- Yew Pine
- Stump
- Vacant Site

* Indicates native species
Bolded species are 10 most common

0 600 1,200
1" = 1,200'
N

Figure 1.3.13: Current Street Tree Species Map, Zone 2

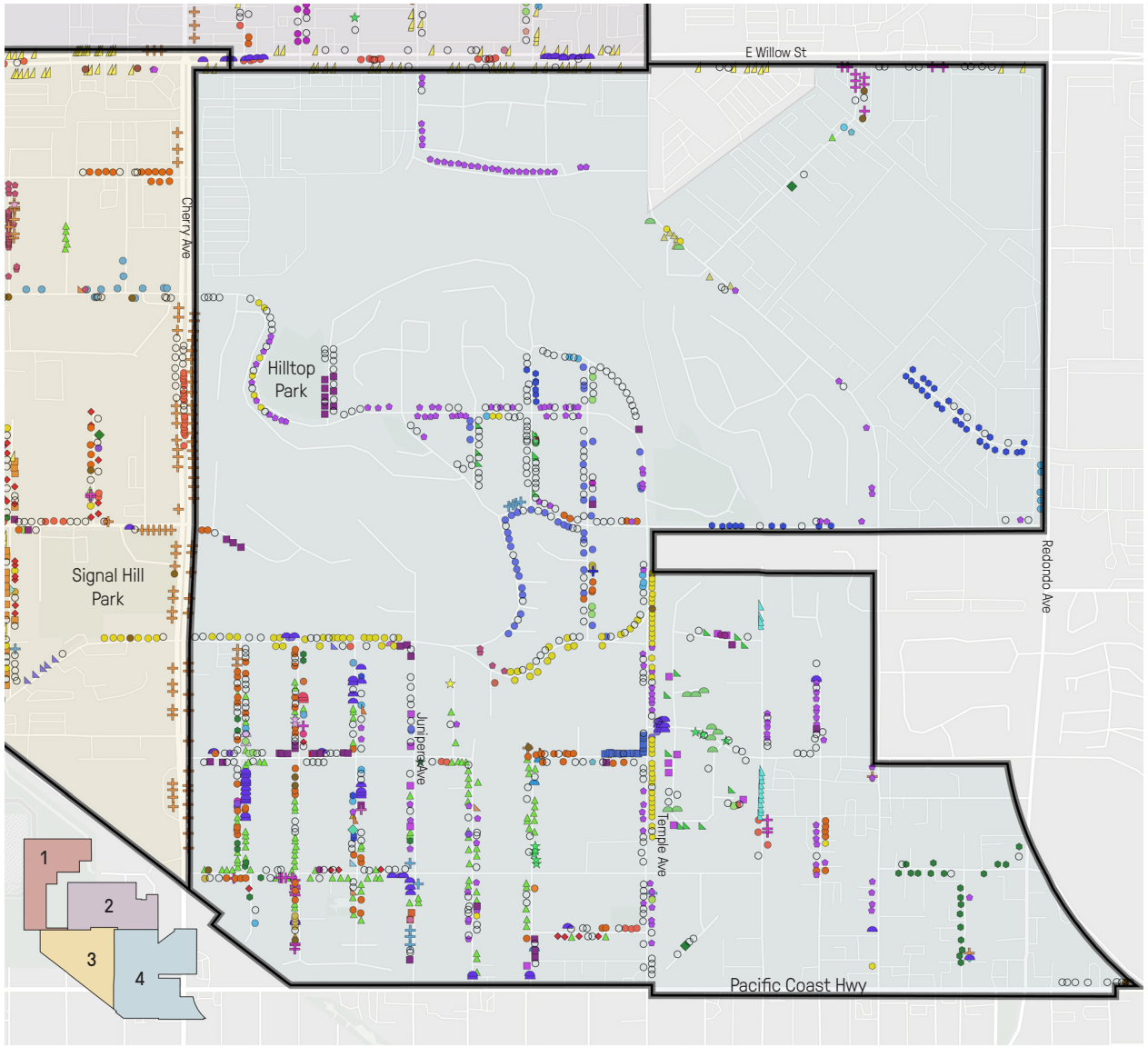


Zone 3

- African Sumac
- Aleppo Pine
- Alii Fig
- **American Sweetgum**
- Arizona Ash*
- Australian Flame Tree
- Australian Willlow
- Bottle Tree
- Brazilian Pepper
- Brisbane Box
- Bronze Loquat
- Brush Cheerry
- Cajeput Tree
- California Fan Palm*
- **California Pepper**
- California Sycamore*
- Camphor Tree
- Canary Island Date Palm
- Canary Island Pine
- Carob
- Carolina Red Cherry
- **Carrotwood**
- Cherimoya
- Chinaberry
- **Chinese Elm Tree**
- **Chinese Flame Tree**
- Chinese Pistache
- Crape Myrtle
- Date Palm
- Desert Gum
- Eastern Redbud
- Edible Loquat
- Evergreen Pear
- **Fern Pine**
- Flaxleaf Paperbark
- Frangipani
- Glossy Privet
- Gold Medallion Tree
- Goldenrain Tree
- Guava
- Hackberrry
- Holly Oak
- Honey Locust
- Indian Laurel Fig
- Italian Cypress
- Jacaranda
- Japanese Black Pine
- Java Plum
- King Palm
- Lavender Trumpet Tree
- Lemon
- **Lemon Bottlebrush**
- **Lemon-Scented Gum**
- London Plane
- Maidenhair Tree
- Malus (Apple) Species
- Mediterranean Fan Palm
- **Mexican Fan Palm**
- Modesto Ash*
- New Zealand Christmas Tree
- Norfolk Island Pine
- Olive
- Orange
- Ornamental Pear
- Palm
- Palo Verde
- Pecan
- Pink Crape Myrtle
- Pink Trumpet Tree
- Primrose Tree
- Purple Orchid Tree
- Purple-Leaf Plum
- **Queen Palm**
- Queensland Umbrella Tree
- Red Gum
- Red Ironbark
- Rusty-leaf Fig
- Sawtooth Zelkova
- Shamel Ash
- Siberian Elm
- Silk Tree
- Silver Dollar Gum
- Silver Mountain Gum
- Southern Magnolia
- Sugar Gum
- Sweet Bay
- Tipu
- Tupidanthus
- Weeping Bottlebrush
- Weeping Fig
- Western Redbud*
- Windmill Palm
- Yew Pine
- Stump

* Indicates native species

Figure 1.3.14: Current Street Tree Species Map, Zone 3



Zone 4

- African Sumac
- Aleppo Pine
- Alii Fig
- **American Sweetgum**
- Arizona Ash*
- Australian Flame Tree
- Australian Willlow
- Bottle Tree
- Brazilian Pepper
- Brisbane Box
- Bronze Loquat
- Brush Cherry
- Cajeput Tree
- California Fan Palm*
- **California Pepper**
- California Sycamore*
- Camphor Tree
- Canary Island Date Palm
- Canary Island Pine
- Carob
- Carolina Red Cherry
- **Carrotwood**
- Cherimoya
- Chinaberry
- **Chinese Elm Tree**
- **Chinese Flame Tree**
- Chinese Pistache
- Crape Myrtle
- Date Palm
- Desert Gum
- Eastern Redbud
- Edible Loquat
- Evergreen Pear
- **Fern Pine**
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- Glossy Privet
- Gold Medallion Tree
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- Guava
- Hackberrry
- Holly Oak
- Honey Locust
- Indian Laurel Fig
- Italian Cypress
- Jacaranda
- Japanese Black Pine
- Java Plum
- King Palm
- Lavender Trumpet Tree
- Lemon
- **Lemon Bottlebrush**
- **Lemon-Scented Gum**
- London Plane
- Maidenhair Tree
- Malus (Apple) Species
- Mediterranean Fan Palm
- **Mexican Fan Palm**
- Modesto Ash*
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- Norfolk Island Pine
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- Orange
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- Palm
- Palo Verde
- Pecan
- Pink Crape Myrtle
- Pink Trumpet Tree
- Primrose Tree
- Purple Orchid Tree
- Purple-Leaf Plum
- **Queen Palm**
- Queensland Umbrella Tree
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- Red Ironbark
- Rusty-leaf Fig
- Sawtooth Zelkova
- Shamel Ash
- Siberian Elm
- Silk Tree
- Silver Dollar Gum
- Silver Mountain Gum
- Southern Magnolia
- Sugar Gum
- Sweet Bay
- Tipu
- Tupidanthus
- Weeping Bottlebrush
- Weeping Fig
- Western Redbud*
- Windmill Palm
- Yew Pine
- Stump
- Vacant Site

* Indicates native species
Bolded species are 10 most common

Figure 1.3.15: Current Street Tree Species Map, Zone 4

1.4 Current Street Tree Conditions

1.4a Snapshot of Signal Hill Street Trees

The City of Signal Hill manages its tree data in Arbor Access, a proprietary database of West Coast Arborists (WCA), the company which maintains the city's street trees. The exported data, from July 2022, contains 2,859 live trees, 20 dead trees, 28 stumps, and 971 vacant sites where trees can potentially be planted. The data also includes records of 1,075 trees removed in the years 1998 to 2022.

Table 1 Street Tree Numbers & Value	
Live Trees	2,859
Replacement Value	$15.7 million

Table 2 Species Diversity	
Number of Species	88
Prevalence of Top Ten Species	63%
Species Exceeding 10%	1

Table 3 Vacant Sites	
Vacant Sites	1,019
Stocking Level	74%

1.4b Tree Taxonomy

Tree Families

The inventory of 2,859 live trees is composed of 29 families of trees. The five most represented families are Sapindaceae at 16 percent, Arecaceae at 16 percent, Ulmaceae at 15 percent, Myrtaceae at 15 percent, and Anacardiaceae at eight percent.

Table 4 Top 5 Tree Families	
Sapindaceae	6%
Arecaceae	16%
Ulmaceae	15%
Myrtaceae	15%
Anacardiaceae	8%

A commonly used guideline for managing urban tree populations is that no family should represent more than 30 percent of the tree population. The street tree population in Signal Hill currently complies with this guideline.

Tree Genera

The inventory of 2,859 live trees is composed of 61 genera of trees. The five most represented genera are Ulmus at 15 percent, Washingtonia at 10 percent, Koelreuteria at nine percent, Cupaniopsis at seven percent, and Corymbia at seven percent. A commonly used guideline for managing urban tree populations is that no genus should represent more than 20 percent of the tree population. The street tree population in Signal Hill currently complies with this guideline.

Table 5 Top 5 Tree Genera	
Ulmus	15%
Washingtonia	10%
Koelreuteria	9%
Cupaniopsis	7%
Corymbia	7%

Tree Species

The inventory of 2,859 live trees is composed of 88 species of trees. The five most represented species are Chinese elm (Ulmus parvifolia) at 15 percent, Mexican fan palm (Washingtonia robusta) at 10 percent, Chinese flame tree (Koelreuteria bipinnata) at seven percent, carrotwood (Cupaniopsis

Table 6 Top 5 Tree Species		
Ulmus parvifolia	Chinese Elm	15%
Washingtonia Robusta	Mexican Fan Palm	10%
Koelreuteria bipinnata	Chinese Flame Tree	7%
Cupaniopsis anacardioides	Carrotwood	7%
Corymbia citriodora	Lemon-Scented Gum	7%

anacardioides) at seven percent, and lemon-scented gum (Corymbia citriodora) at seven percent. A commonly used guideline for managing urban tree populations is that no species should represent more than 10 percent of the tree population. The street tree population in Signal Hill currently does not comply with this guideline as Chinese elm trees represent 15 percent of the population. One strategy to bring the Chinese elm species to 10 percent or less of the population is to temporarily or permanently remove this species from the planting palette so that future street tree plantings increase the populations of other species.

Washingtonia Robusta, Mexican Fan Palm


Koelreuteria bipinnata, Chinese Flame Tree


Ulmus parvifolia, Chinese Elm


Cupaniopsis anacardioides, Carrotwood

Corymbia citriodora, Lemon-Scented Gum

1.4c Native Tree Species

Of the 2,859 live trees in the inventory, 18 of the trees are a native California species. The native quantities and species in the inventory are eight Arizona ash (*Fraxinus velutina*), six western redbud (*Cercis occidentalis*), two western sycamore (*Platanus racemosa*), one California fan palm (*Washingtonia filifera*), and one Palo verde (*Parkinsonia florida*). **These 18 native trees represent less than one percent of the street tree inventory.**

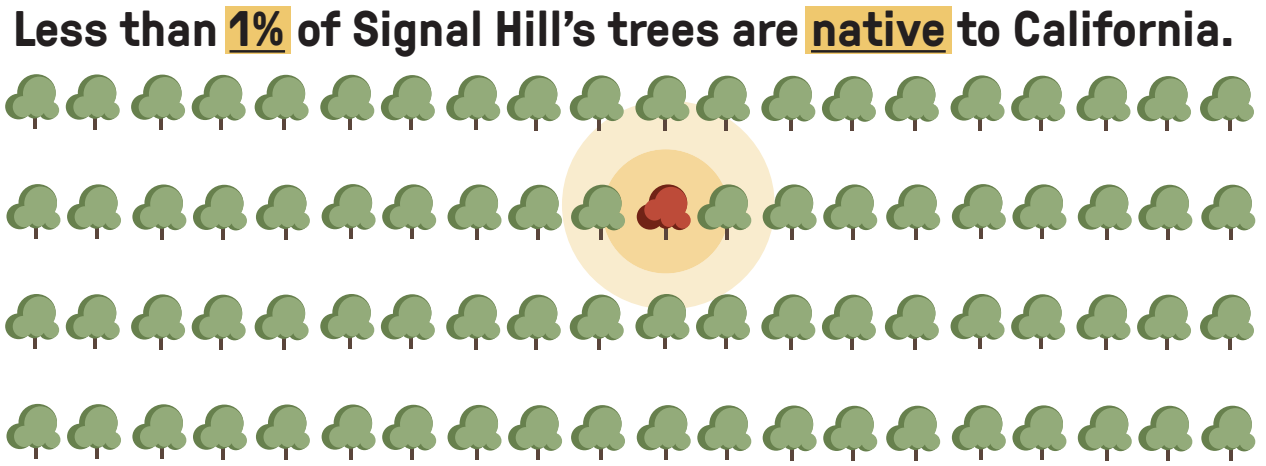


Figure 1.4.1: Native Tree Population. Out of the 100 trees in the diagram above, only one would be native (indicated in red and spotlighted) in Signal Hill's current street tree population.

Arizona Ash
Fraxinus velutina

Western Redbud
Cercis Occidentalis

Western Sycamore
Platanus racemosa

California Fan Palm
Washingtonia filifera

Palo Verde
Parkinsonia florida

1.4d Tree Size Classifications

Trunk Diameter

A common method of measuring tree size is Diameter at Standard Height (DSH), which is the measurement of trunk diameter at 54 inches above grade. The Arbor Access database records DSH data in terms of DSH size classes in increments of 6 inches. The three most represented DSH classes together comprise 97 percent of the inventory and include 7-12 inches at 39 percent, 13-18 inches at 36 percent, and 19-24 inches at 22 percent.

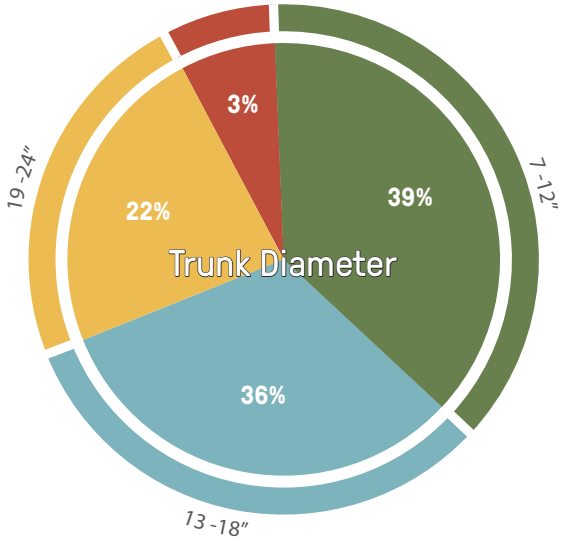


Figure 1.4.2: Trunk Diameter Distribution Chart

A resilient tree population is one with trees distributed across many size classes.

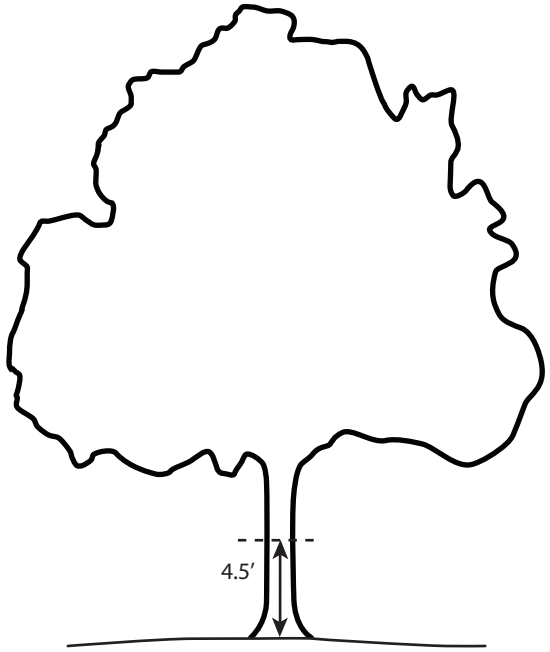


Figure 1.4.3: Diameter at Standard Height. The circumference of the tree's trunk is measured at 4.5' above the ground.

General strategies for improving the size class distribution of the Signal Hill street tree population are to maintain existing trees so they continue to grow and increase the populations of the larger diameter size classes as well as to plant new trees consistently over time to add to the smaller diameter size classes.

Tree Height

Tree height is another common method of quantifying the size of trees in a population. Arbor Access database records tree height data in terms of height classes in increments of 15 feet. The three most represented height classes together comprise 96 percent of the inventory and include 15-30 feet at 60 percent, 30-45 feet at 26 percent, and 45-60 feet at 10 percent.

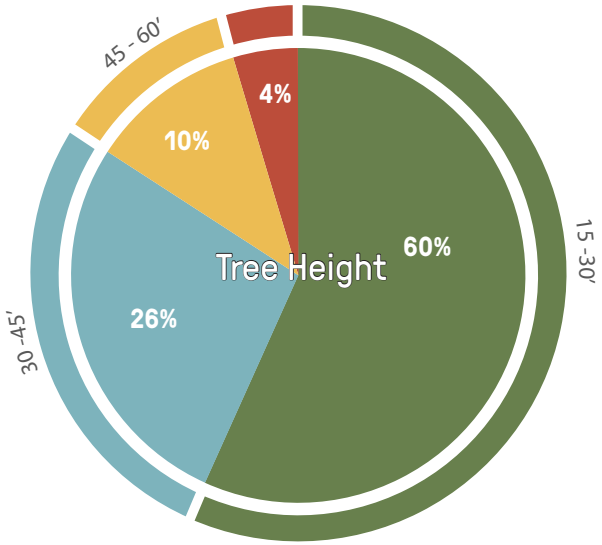


Figure 1.4.4: Tree Height Distribution Chart

General strategies for improving the size class distribution of the Signal Hill street tree population are the same as mentioned

in the trunk diameter section, which includes maintaining existing trees so they continue to grow and increase the populations of the larger diameter size classes as well as planting new trees consistently over time to add to the smaller diameter size classes.

1.4e West Coast Arborists (WCA) Recommendations & Categorizations

The tree database contains a field titled "Recommended". For trees lacking significant structural defects and lacking significant health conditions, WCA seems to use "Grid/ Routine Trim" as a default recommendation, and this recommendation is listed for 96 percent of the live inventory. The recommendation "Trim-Poorly Structured" is listed for two percent of the live tree inventory. Recommendations involving tree removal are listed for two percent of the live tree inventory. Finally, the recommendation "Small Tree Maintenance" is listed for less than one percent of the live tree inventory.

Tree Condition

The database contains data on the assessed condition of each live tree. The condition classes are good, fair, poor, N/A. The recorded conditions of the inventoried live trees show a condition of good for 80 percent, fair for 14 percent, poor for five percent, N/A for less than one percent, and three trees do not have a recorded condition. The general goal is to maintain as much of the inventory as possible in the condition class of good.

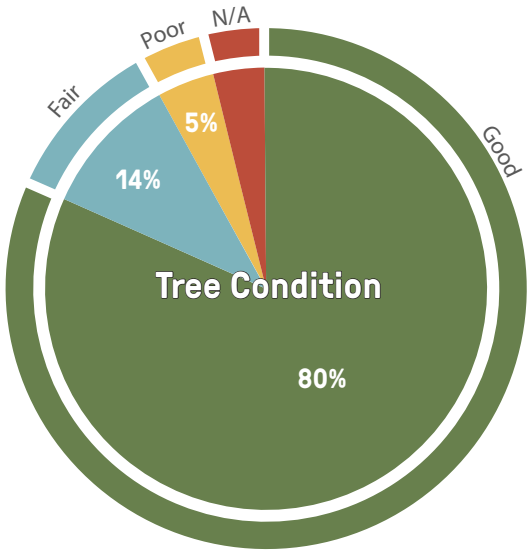


Figure 1.4.5: Tree Condition Chart

Trees in the poor category are candidates for a cost benefit assessment looking at if the condition of the tree can be improved, and if so, what are the costs and benefits. For poor condition trees whose condition cannot be improved, or whose condition can only be improved at a relatively high cost, tree removal and replacement may be warranted. Of the 155 trees in poor condition, 99 have the recommendation of Grid/ Routine Trim, 15 have the recommendation Trim-Poorly Structured, and 41 have a recommendation involving removal. These 155 trees are candidates for assessment of retention/ removal-replacement.

Site Type

Arbor Access has a data field labeled "Parkway Type" that describes the type of site in which a tree is growing. Of the 2,859 live trees, 52 percent are Parkway, 23 percent are Tree Well, 10 percent are Other, ten percent are Monolithic, five percent are Median, and three trees do not have a recorded parkway type.

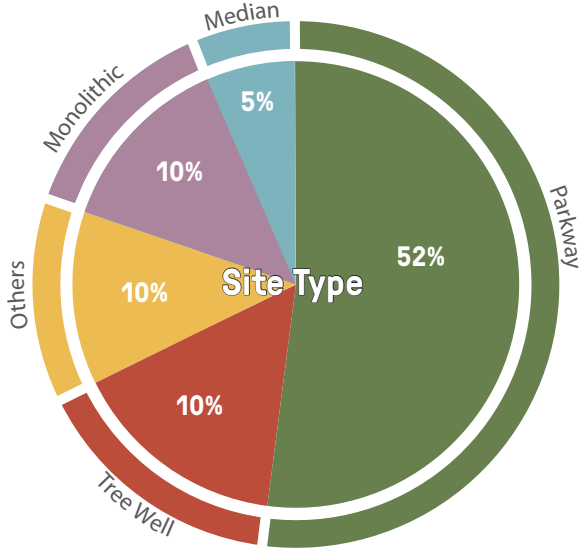


Figure 1.4.6: Site Type Chart

Dead Trees

The street tree inventory data from Arbor Access contains 15 trees with a recommended category of "Plant," another three trees with a status of "Dead," and two trees with a recommended category of "Removal-Dead Tree." These 20 dead trees are not included in the live tree data in the previous sections. These trees should be removed as soon as possible.

Vacant Sites

The inventory in Arbor Access includes 971 tree sites listed as a "Vacant Site", meaning neither a tree nor stump exists at that site; however, a tree could be planted at that site. A vacant site is often a site that previously had a tree, but the tree and stump have been removed. The street tree inventory contains 971 vacant sites. The additional tree locations of 20 dead trees and 28 stumps can quickly be converted into vacant sites, for a total of 1,019 planting sites without a live tree. Given these numbers, the current street tree stocking level is 74 percent. Of the 971 vacant sites, the site quantities and types are 727 Parkway, 164 Tree Well, 32 Monolithic, 30 Median, 15 Other, and three records had a blank site type. The map of vacant sites will function as a helpful tool in creating a planting plan and planting strategies.

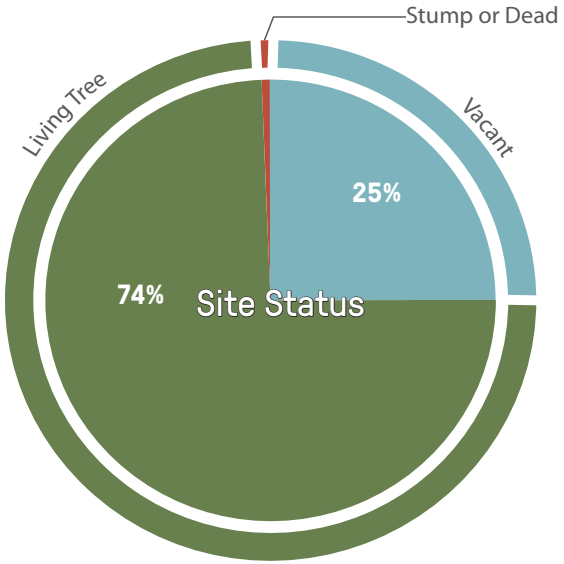


Figure 1.4.7: Site Status Chart

Trees Removed

Arbor Access data shows that in a period of 24 years (from August 1998 to August 2022) 1,224 trees were removed. On average, Signal Hill removed 51 trees per year during this 24-year period. The most trees removed in a calendar year was 92 trees in 2003, and the fewest trees removed in a calendar year was 15 in 2012. Looking at tree genera with a quantity of 50 or more in the inventory, the genera with the highest relative percentages of removals were Ficus at 62 percent, Eucalyptus at 61 percent, Pyrus at 36 percent, Liquidambar at 34 percent, Melaleuca at 33 percent, Magnolia at 32 percent, and Bauhinia at 31 percent (**Table 7**).

Table 7 Percent of Trees Removed by Genera

Ficus	62%
Eucalyptus	61%
Pyrus	36%
Liquidambar	34%
Melaleuca	33%
Magnolia	32%
Bauhinia	31%

Table 8 Top Species Removed

Ulmus parvifolia	Chinese Elm	81
Corymbia citriodora	Lemon-Scented Gum	65
Ficus benjamina	Weeping Fig	60
Koelreuteria bipinnata	Chinese Flame Tree	56
Washingtonia Robusta	Mexican Fan Palm	56
Ficus microcarpa 'nitida'	Indian Laurel Fig	55
Liquidambar styraciflua	Sweet Gum	53
Cupaniopsis anacardioides	Carrotwood	51

The species with the highest absolute quantities removed (**Table 8**, previous page) were 81 Chinese elm (Ulmus parvifolia), 65 lemon-scented gum (Corymbia citriodora), 60 weeping fig (Ficus benjamina), 56 Chinese flame tree (Koelreuteria bipinnata), 56 Mexican fan palm (Washingtonia robusta), 55 Indian laurel fig (Ficus microcarpa 'hitida'), 53 sweet gum (Liquidambar styraciflua), and 51 carrotwood (Cupaniopsis anacardioides).

For the 1,224 tree removals, the DSH at the time of tree removal ranged from zero to 58 inches. Of these 1,224 trees, 62 percent of the records did not have a recorded DSH class. The DSH classes with the highest percentages of removals were 7-12 inches at 16 percent and 13-18 inches at 12 percent. The tree height at time of tree removal ranged from zero to 75 feet. Of these 1,224 trees, 61 percent of the records did not have a recorded DSH class. The height classes with the highest percentages of removals were 15-30 feet at 19 percent and 1-15 feet at 8 percent.

Ficus benjamina, Weeping Fig

Ficus microcarpa 'hitida,' Indian Laurel Fig

1.4f Benefits of Signal Hill's Street Trees

The i-Tree Eco application was used to determine the benefits provided by the street trees in Signal Hill. The replacement value for the current street tree inventory is $15.7million. Currently, the inventory stores 1,674 tons of carbon, which is a benefit of $285,000, shown in Table 14.

Table 9 Benefits of Street Trees

Street Tree Replacement Value	$15,700,000
Carbon Sequestration	1,674 tons
Economic Value	**$285,000**

City-Wide Tree Canopy

The i-Tree Canopy application was used to determine the city-wide tree canopy for Signal Hill based on 100 random sampling locations. This canopy assessment includes all land cover in Signal Hill, both public and private. The tree/shrub cover class was found to be 20.59 percent with a standard error of ± 4.00. Benefits showing the amount of carbon captured each year by the city's street trees based off i-Tree calculations are shown in **Table 10**. This tree/shrub canopy cover value of 20.59 percent is slightly higher than two GIS-based sources, from the USDA[1] and Tree People.[2] . Those GIS datasets used analysis of LiDAR and imagery to determine a canopy

1 https://www.fs.usda.gov/detailfull/r5/communityforests/?cid=fseprd647442&width=full
2 https://www.treepeople.org/los-angeles-county-tree-canopy-map-viewer/

coverage percent. Those sources put Signal Hill's canopy cover between 10 and 16%. If we estimate it to be around 14% and thus 75% of the 21% value from iTree, the updated benefits can be calculated as shown in **Table 11**. Additional tree canopy benefits are shown in **Tables 12 & 13**, showing the overall stored carbon value to be between 1.31 and 1.75 million dollars, with an estimated carbon storage benefit of between $66,300 and $88,400 and annual air pollution benefits between $100,000 and $131,300.

Current Street Tree Management

The Streets/Parks/Facilities division of the Public Works Department manages the street trees in the City's right-of-ways. Staff from this division proactively manage street trees through a contract with WCA to prune every street tree biannually (every other year). This service is referred to as "grid pruning." Issues with data from WCA is outline in a separate report.

City staff also manage street trees reactively, for example when citizens report fallen branches to the City through the i-WorQ system. In such instances, if the debris load is relatively small, City staff will perform the branch clean-up using internal staff equipment. If the debris load is larger, staff will utilize WCA as an on-call contractor for clean-up.

Table 10 Tree Canopy Annual Benefits (iTree)

Benefit	Annual Amount	Annual Value
Pollution Removal	1.865 tons	$18,500.
Carbon Sequestration	80.07 tons	$13,700.
Avoided Stormwater Runoff	46,380 cubic feet	$3,100/ year

Table 11 Tree Canopy Annual Benefits (GIS)

Benefit	Annual Amount	Annual Value
Pollution Removal	1.4 tons	$13,900.
Carbon Sequestration	60 tons	$10,300.
Avoided Stormwater Runoff	34,850 cubic feet	$2,325/ year

Table 12 Canopy Statistics via iTree

Canopy Cover	21%
Overall Stored Carbon Value	$1.75 million
Annual Carbon Storage Benefits	$88,400
Annual Air Pollution Benefits	$131,300

Table 13 Canopy Statistics via GIS Data

Canopy Cover	14%
Overall Stored Carbon Value	$1.31 million
Annual Carbon Storage Benefits	$66,300
Annual Air Pollution Benefits	$100,000

Table 14 Signal Hill Current Street Tree Budget

Tree Trimming Contract Services	$176,105
City Maintenance Staff Time	$60,000
Additional Arborist Services	$18,000
Total	**$254,000**

In cases where city staff are unsure of the best course of action for a potentially high-risk tree, WCA is asked to function as a consultant and provide a recommended course of action. Management actions such as tree planting and pest management have not been undertaken over the last decade or longer. The total number of staff in the Streets/ Parks/ Facilities division has dropped by approximately 50 percent over the last decade.

As of 2022, the City currently invests approximately $254,000 annually on tree-related expenses. Of this annual investment total, the tree trimming contract services are $176,105, the City maintenance staff time is $60,000, and additional arborist services are $18,000. Budget data is shown in **Table 14**.

1.4g City Staff Perspectives

Regarding existing trees, city staff reported the genera/species in **Table 15** as performing well. Generally, city staff hope to see the new street tree planting palette focus on trees that have a small to medium mature stature, are drought-tolerant, and grow relatively slowly. They also would like to see regionally-native trees planted when possible and appropriate. Staff specifically requested the species listed in **Table 16** to be included in the planting palette. All staff-recommended species other than sweetshade (due to qualities such as weak branch strength and medium water use) were incorporated into the new palette.

Staff reported the trees in **Table 17** to be problematic, for reasons including utility conflict, sidewalk heaving, and limb drop. These species were not included on the new palette.

Table 15 Species Performing Well

Common Name	Botanical Name
Australian willow	Geijera parviflora
Goldenrain tree	Koelreuteria paniculata
Crape myrtle	Lagerstroemia indica

Geijera parviflora, Australian Willow

Lagerstroemia indica, Crape Myrtle

Koelreuteria paniculata, Goldenrain Tree

Trees the Staff Would Like To See on the Palette

Table 16 Species to Consider for New Planting Palette	
Common Name	**Botanical Name**
Sweetshade	Hymenosporum flavum
Desert willow	Chilopsis linearis
Palo blanco	Acacia willardiana
Tecate cypress	Hesperocyparis forbesii

Hymenosporum flavum, Sweetshade

Chilopsis linearis, Desert Willow

Acacia willardiana, Palo Blanco

Hesperocyparis forbesii, Tecate Cypress

Problem street trees . . .

Table 17 Most Problematic Species		
Common Name	**Botanical Name**	**Conditions of Concern**
Gum trees	Corymbia & Eucalyptus	Limb drop in wind events
Figs	Ficus spp.	Sidewalk heaving
Sweetgum	Liquidambar styraciflua	Sidewalk heaving, water line conflicts
Magnolia	Magnolia spp.	Limb drop in wind events, sidewalk heaving
Chinese elm	Ulmus parvifolia	Limb drop, sidewalk heaving, power line conflicts, water line conflicts

Corymbia citriodora, Lemon-Scented Gum

Magnolia grandiflora, Southern Magnolia

Liquidambar styraciflua, American Sweetgum

Magnolia grandiflora, Southern Magnolia

Ulmus parvifolia,Chinese Elm

. . . and the problems they cause

Dropped limbs

Waterline conflicts

Sidewalk heaving

Powerline conflicts

2.0 DESIGN & MANAGEMENT PLAN

2.1 Guiding Goals & Objectives

This chapter will set some basic goals for the City of Signal Hill in improving and maintaining its street tree population. **Guiding Goals and Objectives** contains important information to help frame these goals, as well as specific ways of achieving them. **Planting Design and Guidelines** will include information for the city to consider to improve street tree infrastructure, and useful information to consult when designing a new planting. **Design for the Future** discusses possible future urban forestry endeavors for Signal Hill. **Species Selection Criteria** provides a method for selecting a tree for a site. The **Street Tree Palette** includes a basic list and a detailed palette with photographs, as well information on how the palette was created.

1. Fill the vacant tree sites.
By far the most important goal of this plan is fill the existing 1,019 sites in need of live trees. If the city is able to accomplish this goal, the total street tree canopy will increase by roughly 1%. It is also important for the city to continue to fill sites as trees die or need removal if the total canopy is to grow. There are several organizations dedicated to helping communities plant trees. Below are some options Signal Hill should pursue to help them reach their tree planting goals.

1a. Increase the city's tree canopy by 1% in so doing.
Simply by filling the vacant tree sites, Signal Hill can actually increase the city's tree canopy by 1%. The tree canopy encompasses all trees in the city, including those in parks and on private property. The table below demonstrates the approximate size and number of trees needed to accomplish this goal.

Table 18 Number of Trees Needed to Increase Total Tree Canopy by 1%

Example 1: Small/Medium Trees	Quantity
Half small-growing trees	600
Half medium-growing trees	600
Total	1200
Example 2: Mixed Sizes	**Quantity**
One-third small-growing trees	269
One-third medium-growing trees	269
One-third large-growing trees	269
Total	807
Example 3: Large Trees	**Quantity**
All large-growing trees	488
Total	488

Given the limitations of most vacant tree sites, Example 3 may not be realistic for the city to achieve, but it demonstrates how effective larger trees are in providing canopy and associated shade/heat-reduction benefits. Example 1 is possible but does not provide

Goals

1. Fill the vacant tree sites.
   a. Increase the city's tree canopy by 1% in so doing.
   b. Continue to replace trees in a timely manner as needed.
   c. Tree-planting initiatives can help Signal Hill achieve this goal.

2. Ensure the long-term health and prosperity of the city's street tree canopy by planting the right tree in the right place.
   i. Improve shade equity in the city by focusing on planting in areas of greater need.
   j. Use species well-adapted to local environmental conditions and design objectives.
   k. Provide native animal habitat and well-adapted trees by planting native species.
   l. Achieve a diverse and resilient forest by following the 10-20-30 rule of community forestry.

3. Establish a high standard of maintenance and a sustainable care regimen for the city's street trees.

4. Promote public awareness of and involvement in community forestry care and benefits.
   a. Promote the community forestry program's progress & achievements.
   b. Encourage collaboration between city departments, local community organizations, and public schools.
   c. Encourage monetary and other contributions to the community forestry program.
   d. Participate in programs that support and promote the benefits of the community forest.

as many benefits without any larger trees. Therefore, a version of Example 2 might prove the best method of expanding Signal Hill's tree canopy by filling vacant street tree sites.

1b. Continue to replace trees in a timely manner as needed.
While filling the currently empty sites is the first priority, the city must continue to monitor its street tree population and quickly fill any new vacancies if it is to continue to grow its tree canopy. The following resources can aid in this endeavor. Additionally, when filling any tree sites, the city should analyze whether the site can accommodate a healthy tree, if the site can be modified to do so, or if another, more appropriate site should be created in its place.

1c. Tree-planting initiatives can help Signal Hill achieve this goal.
There are many resources available to help communities seeking to improve their tree canopies. The two mentioned below can provide immediate assistance in planting trees as well as other resources. Additional programs can help sustain the canopy down the road and ensure the community is aware of the importance of its street trees. Those programs will be discussed in a later section.

CAL FIRE Urban and Community Forestry Program Grants
CalFire offers urban forestry grants in three different sub-categories: Education and Workforce Development, Urban Forest Expansion and Improvement, and Urban Forest Management Activities. For Signal Hill's immediate priority of planting street trees, the second category offers the best source of aid. However, the public works department could also benefit from the first category, which could help train staff to care for trees. Should the city wish to update its tree database or analyze its tree canopy, the third category would be helpful. While 2023 grant application information is not available yet, more information can be found on CAL FIRE's website, www.fire.ca.gov. More details can be found on p. 125.

Tree People
This organization works within the Los Angeles area to organize tree planting initiatives and volunteering. It offers training and focuses on environmental justice. Tree People could prove an excellent resource for overcoming shade inequity within the city of Signal Hill. Their website, www.treepeople.org, provides a wealth of information and resources regarding trees, soil, water, and plants.

This plan strongly recommends reaching out to both **CAL FIRE** and **Tree People** for funding and other resources in replenishing the street tree canopy, as well as future urban forestry goals.

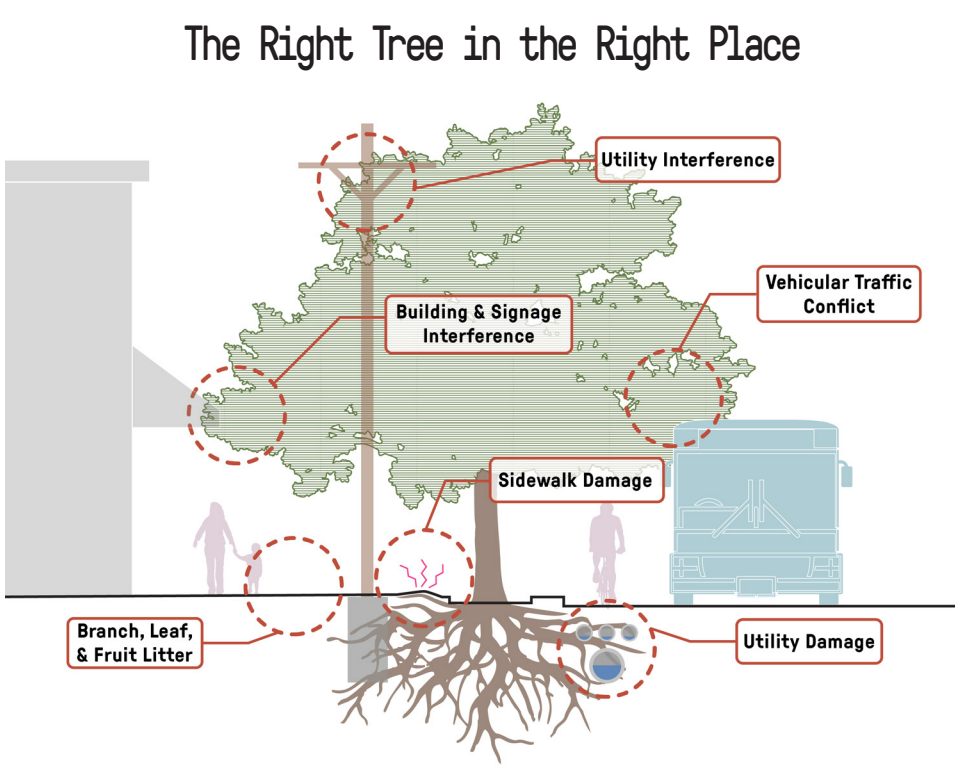
2. Ensure the long-term health and prosperity of the city's street tree canopy by planting the right tree in the right place.
Signal Hill does not merely need to fill the vacant sites; it must fill those sites with the trees that are best suited to them, which will ensure that the tree lives a long and healthy life, without premature removal. There are many factors to consider when planting a tree in a site.

First, a tree's eventual full size must be considered. Many trees in Signal Hill have been

lopped off to avoid growing into power lines, for example. In the future, care must be taken to plant only power line-friendly (i.e. small-growing) trees under utility lines. The palette in the following section specifies which trees are small-growing and thus recommended for this purpose. However, an area with plenty of canopy space and a need for shade would benefit from a medium or large tree if possible. Trees require a planting area of particular dimensions based on their size and growing habits; these parameters are listed in the palette. Finally, size should also be considered if a view is to be protected, to ensure that a tree won't eventually grow to block the desired vista.

The water needs of a tree are also a crucial consideration. Given the lack of irrigation available to many of Signal Hill's street trees, as well as the current drought conditions, no species with high water needs were included in the palette. Some trees do have moderate water needs, and they must be planted where they will have access to water in order to thrive. Many are drought-tolerant but will still need water to establish.

Additionally, some trees have roots that aggressively seek out water and can damage sewer and water lines and even crack sidewalks



Considerations

- Height
- Width
- Shape
- Foliage density
- Growth Rate
- Longevity
- Pollen
- Dropped fruit or flowers
- Toxicity
- Root damage
- Water needs
- Soil type
- Light preference
- Proximity to buildings, cars, or pipes
- View

Figure 2.1.1: The Right Tree in the Right Place

or paving. No trees with high root damage potential were placed on the palette, but some have moderate potential. These trees can and should still be used as long as they are not too close to water and sewer lines, or if there is a barrier to protect the lines from the roots.

Other considerations include form (is there room for a full, round tree or would a narrower tree fit the space better?), foliage (evergreen or deciduous, densely foliated for shade or allowing more light through?), blossoms and fruit (will the tree have litter to clean up?), and aesthetics. Different tree forms have different visual functions; some trees have spectacular blossoms or beautiful fall foliage; people d to respond strongly to such qualities.

Beyond the physical requirements of trees, other important elements affect the placement

Survival Rates (%) for Climate Ready Trees in the Southern California Coastal and Inland Climate Zones									
	Park Sites			Reference Sites			All Sites		
	Coast	Inland	All	Coast	Inland	All	Coast	Inland	All
Acacia aneura [a] (Mulga)	100	88	94	100	100	100	100	92	96
Cedrela fissilis [b] (Brazilian Cedarwood)	63			100			75		75
Celtis reticulata [a] (Netleaf Hackberry)	100	100		100	100		100	100	100
Chilopsis linearis 'Bubba' [c] (Desert Willow)		88			100			92	92
Corymbia papuana [a] (Ghost Gum)	63	100		75	100		67	100	83
Dalbergia sissoo [a] (Rosewood)	75	100		100	100		83	100	92
Hesperocyparis forbesii [a] (Tecate Cypress)	38	75	56	50	75	63	42	75	78
Mariosousa willardiana [a] (Palo Blanco)	63	100	81	75	100	88	67	100	83
Parkinsonia x 'Desert Museum' [c] (Palo Verde)		100	100		100	100		100	100
Pistacia 'Red Push' [a] (Red Push Pistache)	75	100	88	100	100	100	83	100	92
Prososis glandulosa x Maverick [a] (Mesquite)	100	100	100	100	100	100	100	100	100
Prunus ilicifola spp. *Lyonii* [b] (Catalina Cherry)	88		88	100		100	92		92
Quercus fusiformis [a] (Escarpment Live Oak)	88	38	63	100	100	100	92	58	75
Quercus tomentella [a] (Island Oak)	88	88	88	100	100	100	92	92	92
Average	78	90	84	92	98	95	83	92	88
a. Both Coastal And Inland Sites	b. Coastal Sites Only			c. Inland Sites Only					

Figure 2.1.2: Survival Rates for Climate Ready Trees. Source: McPherson et. al., "Climate-ready tree study: update for Southern California communities" in Western Arborist, 2020. https://www.srs.fs.usda.gov/pubs/60414

of trees within the city and the selection of appropriate species.

2a. Improve shade equity in the city by focusing on planting in areas of greater need. For Signal Hill, one of the most important factors for tree placement is environmental justice. Some parts of the city, such as Zone 4, fare consistently better then others in terms of shade, heat islands, pollution, and socio-economic issues. Tree planting efforts should be focused on areas with greater socio-economic and environmental difficulties. GIS data, such as shown in the earlier pages through CalEnviroScreen, Tree People, USFS, and Tree Equity Score, as well as from the Healthy Places Index and the Trust for Public Land, can all be used to help determine the areas of greatest need within the city.

2b. Use species well-adapted to local environmental conditions and design objectives. Great care has been taken in selecting trees for the palette that are well-adapted to Signal Hill's environment and to the changing climate. Not only are there no trees with high water use on the palette, several of the species come from a list of Climate Ready Trees developed by scientists at UC Davis. The Climate Ready Tree study evaluates "the ability of promising but underused species to tolerate stressors of future climates."[1] Species were evaluated for habitat suitability, physiology, and biological interactions in their respective climate zones.[2] Factors include the ability to withstand heat and drought, pest resistance, and adaptability. Once trees were rated, the best scoring ones were planted in test sites, both parks and control sites, and their conditions were monitored. The study began in 2016 and is ongoing. Southern California was divided into Coastal and Inland; given Signal Hill's proximity to the ocean, trees from the Coastal list were selected for the city's street tree palette. Not all trees on this list thrived, as indicated by the above table. Some of the more drought-tolerant species, like Tecate Cypress, might have been overwatered in coastal parks or intolerant of salt spray. They may work still well for Signal Hill and are certainly worth trying.

1 https://climatereadytrees.ucdavis.edu/
2 http://climatereadytrees.ucdavis.edu/why-climate-ready-trees/

2c. Provide native animal habitat and well-adapted trees by planting native species. Trees and plants native to Southern California are more likely to be adapted to conditions here. Several of the trees on the Climate Ready Tree list are native, but there are plenty more to choose from. Native plants have evolved over time to thrive in local conditions with various adaptations. Some plants have developed deeper or wider root systems to seek out water where other plants cannot reach. Some go summer dormant, conserving resources when water is scarce and springing back to life in winter or spring, after California's seasonal rains. As a result, they have gained a reputation for being ugly or "wild"-looking, but native plants in a garden can be cared for and trimmed to look well-groomed all year.

Many natives have adapted to the particular soils found here, and even the insects and microbes. These adaptations make them more likely to survive local pests and diseases, unless the pest is invasive. Some form symbiotic relationships with the fungi found in soil, also better enabling them to survive drought conditions. Because of these adaptations, native plants often require less management, such as fertilizer or soil amendments, than non-natives. Some native plants actually don't tolerate summer irrigation,

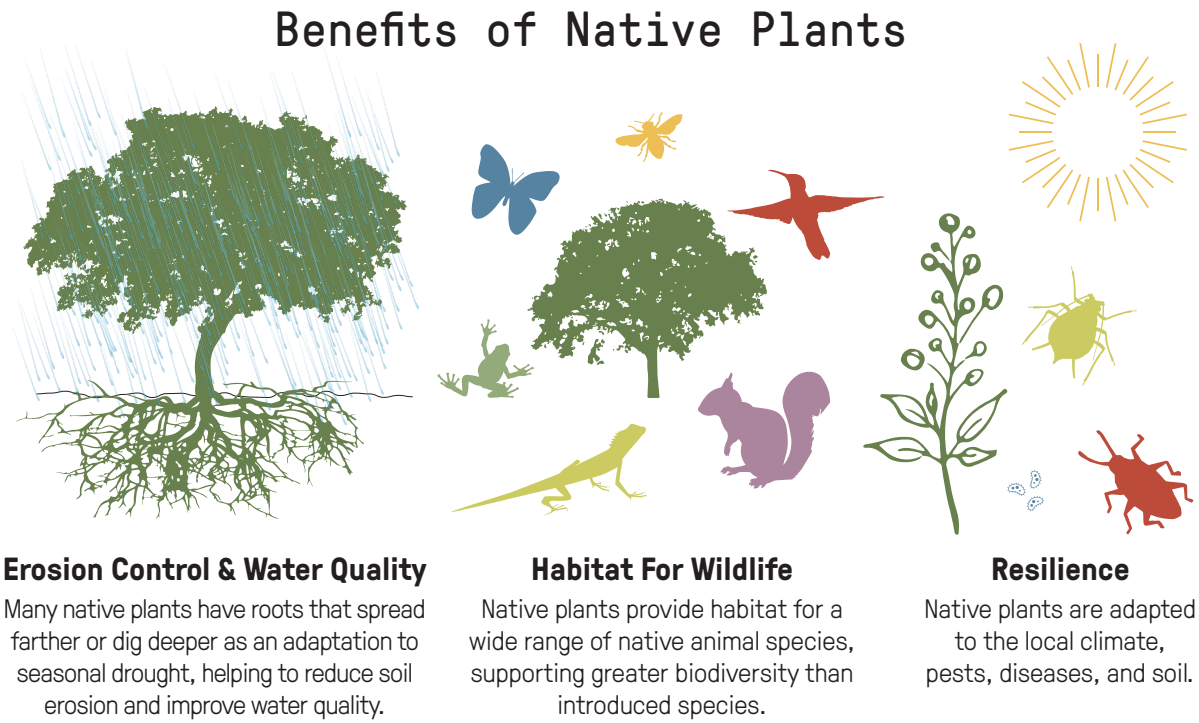


Figure 2.1.3: Benefits of Native Plants

as they are genetically prepared for dry summers.

Native plants and trees can also be quite beautiful. Some, like the Western Redbud or Ceanothus, both included in the palette, produce gorgeous, brilliantly colored flowers in spring. These flowers attract pollinators like bees, butterflies, and hummingbirds. Santa Cruz Ironwood has beautifully shaped leaves, cream flowers in spring, and provides great shade. The Catalina Cherry is a "triple threat": a California native plant found on the Climate Ready Tree list with very low water needs. It also produces cream flowers in spring, and small cherries in summer, helping to support native wildlife. All of these reasons make it important to prioritize planting more native trees in Signal Hill, and many are included in the palette.

2d. Achieve a diverse and resilient forest by following the 10-20-30 rule of community forestry.

A healthy urban forest needs species diversity. A good rule of thumb is that a forest should contain no more than 10% of any one species, 20% of any one genus, and 30% of any one family. Too many trees of a single family, genus, or species leaves the population vulnerable to pests and diseases. As mentioned in the previous chapter, Chinese elms comprise 15% of the current street tree population, and Mexican fan palms comprise 10%. For this and other reasons, these species are not included in the new palette.

Signal Hill's street trees do comply with the genus and family allotment. Nevertheless, the updated palette includes many trees that were never on previous palettes are not present in the street tree population. The new palette is also considerably more diverse than the 2010 palette. As a result, the street tree population should further diversify as new trees are planted, for the benefit of the entire canopy.

Figure 2.1.4: The 10-20-30 Rule of Urban Forestry

3. Establish a high standard of maintenance and a sustainable care regimen for the city's street trees.

Planting new trees will prove a costly endeavor if proper care is not provided to those trees to ensure their successful establishment and long-term health. And of course, the existing tree canopy needs attention, as well. The city must therefore plan carefully to invest in the health of its street trees by developing a realistic and sustainable maintenance regime and adhering to it. Chapters 3 and 4 provide more detailed recommendations regarding street tree care and maintenance.

4. Promote public awareness of and community forest benefits and involvement in tree care.

The public can play a large role in maintaining the Community Forest, including street trees. Tree planting volunteer events can both reduce the cost of planting new trees and create a sense of ownership and investment from the community. There are many ways to foster public investment, detailed in the following pages. Most importantly, the public should be made aware of the importance of the street tree canopy and all the benefits it provides them.

The Benefits of Trees

Trees provide habitat for animals, increasing biodiversity.
Supporting a variety of insects, birds, and mammals with food and shelter, trees are a city's prime medium for attracting wildlife.

Trees improve air quality and reduce pollution.
By producing oxygen and filtering airborne particulates, trees help reduce air pollution.

Trees provide shade and reduce heat.
Trees are integral to fighting the effects of urban heat islands. In urban areas, shaded surfaces may be 20-45 degrees cooler and evapotranspiration can reduce peak summer temperatures by 2-9 degrees.

Trees help drive economic development.
Recent studies have revealed that people will travel farther, pay more for goods and services, and visit commercial districts more frequently when trees and landscaping are present.

Trees have a positive impact on people's physical & mental health.
Spending time around trees and looking at trees reduces stress, lowers blood pressure and improves mood.

Trees improve water quality.
Leaves slow the impact of drops to reduce erosion and surface runoff, while roots help filter stormwater to improve groundwater quality and quantity.

Trees moderate wind.
When trees are planted strategically, they not only reduce wind exposure but can reduce heating bills in the winter by 2 to 8 percent.

Trees provide energy savings.
The cooling, sheltering effect of trees helps lower energy use and bills.

Trees increase property values.
The beauty of a well-planted property and its surrounding street and neighborhood can raise residential property value by as much as 20 percent.

Trees help create a sense of place.
To come home to a green and shaded community transforms a location into a beautiful place.

Figure 2.1.5: The Benefits of Trees

4a. Promote the community forestry program's progress & achievements.
For Signal Hill, promoting the new Street Tree Master Plan is critical to achieving the plan's goals. Citizens need to be engaged and supportive to help acquire funding and move the project forward.

4b. Encourage collaboration between city departments, local community organizations, and public schools.
Communication between different civic organizations can help promote planting initiatives, updates to policy, and the value of street trees. Schools can be instrumental in developing such programs, and community groups can boost a project. These organizations can also help support tree improvements economically. City departments must work together to promote the Street Tree Master Plan if it is to be successful and appreciated by residents.

4c. Encourage monetary and other contributions to the community forestry program.
Encouraging citizens to invest in the health and beauty of their city through tree planting will greatly increase the city's ability to fund tree planting initiatives and maintain the city's street trees. Residents can feel proud of their involvement. This type of engagement is only possible if the city works hard to promote the new Street Tree Master Plan.

4d. Participate in programs that support and promote the benefits of the community forest.
One way for the city to involve the public is to participate in national initiatives that share similar goals. These initiatives offer resources and support that can assist the city with its community forestry efforts. Formal participation in such programs communicates to the public the goals, values, and approaches that are shared by the initiative and the city community forestry program. Participation also promotes broader understanding of community forestry issues and benefits. In addition to aid from CAL FIRE and Tree People, the city can apply for programs such as Tree City USA through the Arbor Day Foundation, and Bee City USA. National initiatives such as these can really help to garner the attention and support of the public.

Tree City USA
"Tree City USA" is an Arbor Day Foundation program that works to establish, promote, and celebrate urban tree canopies. In partnership with the USDA Forest Service, Urban and Community Forestry, and the National Association of State Foresters, the status of Tree City USA is awarded to cities who meet the foundation's standards of urban forestry management.

In order to achieve Tree City USA status, a community must meet four standards of sound urban forestry management:
- A tree board or department
- A tree ordinance
- A community forestry program with an annual budget of at least $2 per capita
- Celebrate Arbor Day

The Tree City USA program provides the city's community forestry program direction, technical assistance, public attention, and national recognition; and would place Signal Hill within a network of over 3,400 recognized communities.

Bee City USA
Bee City USA is a program, launched in 2012, that invites cities to make commitments for providing sustainable habitats for pollinators. According to the program's website, "85% of flowering plants and trees rely on pollinators for the survival of their species. ...Entire species [of native bees and other pollinators] are disappearing at alarming rates as they battle most of the same enemies as honey bees – loss of habitat essential for food and shelter,

inappropriate pesticide use, diseases, and parasites."

The Bee City USA program is intended to raise awareness of these issues and encourage communities to take actions that will support populations of pollinators. Some of the guidelines for pollinator-friendly habitat include:

- Provide diverse and abundant pollinator food sources (nectar and pollen from blooming plants) that bloom in succession.
- Provide water for drinking, nest-building and cooling, diluting stored honey, and butterfly "puddling".
- Avoid the use of pesticides, or carry out the use of pesticide to impart the least ill effects on pollinators.
- Comprise plantings of mostly, if not all, native species of grasses, perennials, shrubs, and trees. (Many native pollinators prefer or depend on the native plants with which they have co-evolved for millions of years.)
- Source plants from nurseries that do not treat seeds with neonicotinoid pesticides, which permeate the entire plant and can remain active for years. (Some plants may be labeled "bee-friendly" even though they were grown from seeds treated with 'neonics".)
- Provide for safe and humane removal of bees when required.
- Provide undisturbed spaces (leaf piles, unmowed fields, fallen trees) for nesting and overwintering for native pollinators.

Collectively, the city and private land owners can follow these guidelines to plant and manage landscapes in a manner that will support sustainable habitats for pollinators.

Ultimately, if the Signal Hill wishes to fill its vacant tree sites and properly maintain a healthy street tree canopy in the long term, all city departments must work together with residents. Trees are vitally important to a clean, beautiful, and comfortable Signal Hill; as long as this fact is understood by the public, support should be easily attained.

TREE CITY USA®

Making The World Safer For Pollinators
Bee City USA™
One City At A Time
beecityusa.org

2.2 Planting Design Guidelines

This section provides design guidance to be consulted during development of planting designs within public rights-of-way. It begins with an overview of the different planting processes depending on the type of project. Most importantly, Signal Hill needs to begin filling its vacant street sites. As the city begins this task, these guidelines can be used to determine how different street tree plantings can affect the aesthetic of a location based on whether the site is located on a **major street** or in a **residential neighborhood**. These guidelines may vary from current policy, but are recommended for any future development of the city. Certain areas may have specific design requirements; check with the Planning Commission to confirm.

New Developments
After consulting regulatory documents and city staff, the developer's landscape architect submits plans for City review. The City reviews the plans for conformance with current regulations, works with the developer to adjust the plans, and may present to the Planning Commission or City Council as part of the permit approval process. New developments should be required to plant new street trees using the included guidelines, and should also be required to install irrigation for those new street trees.

Major Streets Plantings
Same process as above for major streets within new developments. For existing streets, the City initiates the plans, either developing them in-house or hiring a consulting landscape architect. The plans are presented to the public for comment and approved by City Council as a capital improvement budget item. **Any new construction or renovation projects should include new street tree sites with irrigation installed.**

Residential Neighborhood Plantings.
The Public Works Director or designee selects species and placement in conformance with Master Plan criteria and with prior notification of fronting property owners. Residents can choose from the appropriate species for the site provided by the director.

2.2b Principles of Community Forest Design

Landscape design is the process of altering the environment to meet human needs. The changes can be very subtle or quite dramatic. When sensitively carried out, the environment is enhanced, not harmed by such changes. A careful design considers the needs of species other than humans, and reveals hidden natural wonders. Good landscape design finds the balance between human needs and the rest of the natural world. In addition to working well with the natural and developed environments, trees and plants should be chosen and sited to make the highest contribution to the character of the neighborhood or commercial area in which it is planted.

In the case of the community forest, the human needs can vary greatly, as can the environmental conditions. What are the conditions of the site that will affect the plantings there? Will cars or trucks be driving under its limbs? Is the tree being planted to reduce the effects of wind, or in an area prone to high winds that can cause limb loss in some species? Or maybe the site's sunny, open location allows for a larger tree that will provide the city exponentially more shade than a smaller species. These are just some of the issues to consider when trying to choose a tree

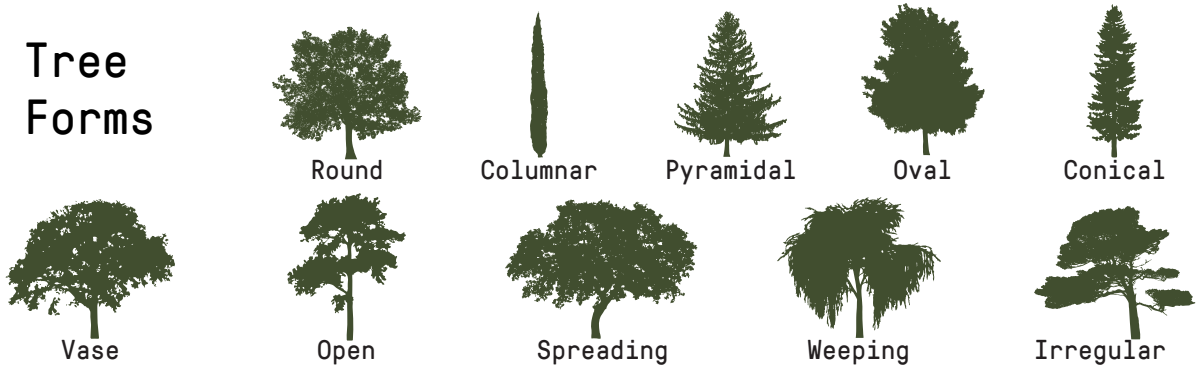
that will meet the needs of the people who use the site.

Trees can also be used to solve a variety of problems. Shade trees on the south and west sides of a building can significantly reduce cooling costs, or even provide heat relief for someone waiting for the bus. Trees can catch the particulates emitted by cars and reduce pollution of air in adjacent backyards and along sidewalks. Trees can help control erosion and aid in stormwater control on slopes. After all these needs and potential uses have been considered, the aesthetic character of the tree must be evaluated. Aesthetics is not an entirely subjective matter. Trees have a number of visual characteristics - such as scale, form, color and texture - that help determine appropriate species selection.

2.2c Universal Planting Design Guidelines

The following guidelines have been formulated to direct the design of the community forest as a whole. They have been organized into the following three categories: Enhancing Character & Aesthetics, Increasing Forest Resiliency, and Supporting Maintenance & Safety. Guidelines specific to the major streets and neighborhoods appear in the next sections. It should be noted that the design guidelines can be applied to the renovation of existing areas as well as new construction. Where existing landscaping has been found to conflict with the use of an area or create high maintenance conditions, these guidelines can aid in planning the renovation of those areas, thereby creating a more effective relationship between use and design as well as a corresponding reduction in maintenance problems.

Figure 2.2.1: Tree Forms



Enhancing Character & Aesthetics

1. **Respect and Emphasize the City's Geographic Setting.**
- Frame views from the public right-of-way to Signal Hill, as well as views of neighboring mountains, ocean, and ports.
- Consider accent species in the foreground of such views.
- Screen objectionable views, including large parking lots or oil derricks, with appropriate plantings.

2. **Complement existing trees and other vegetation.**
- New tree forms, colors, and textures should be compatible.
- Horticultural requirements should be consistent for healthy growth.
- Use special care when modifying conditions near existing natives.

3. **Use trees to create a variety of spatial experiences.**
- Where appropriate, use trees to enclose space with allees, bosques, or groves.
- To emphasize openness, use a single large specimen tree as a focal point within a large open space.

Universal Planting Design Guidelines

Enhancing Character & Aesthetics

1. Respect and emphasize the city's geographic setting.
2. Complement existing trees and other vegetation.
3. Use trees to create a variety of spatial experiences.

Increasing Forest Resiliency

1. Use native species where appropriate.
2. Plant to attract and support wildlife.
3. Select trees and plantings adapted to the environmental conditions of the site.
4. Satisfy any functional reasons for the planting.
5. Integrate low impact development best management practices for stormwater within public right-of-way plantings, where practical.
6. Diversify types and species where possible.

Supporting Maintenance & Safety

1. Plant to provide the intended performance and aesthetic with the lowest water usage.
2. Ensure planting designs conform to current local and state regulations.
3. Consider the non-optimum conditions of street tree plantings when designing tree spacing.
4. Design tree spacing based on mature plant sizes.
5. Place trees away from conflicting uses.
6. Locate trees to minimize conflict with overhead utilities.
7. Locate trees to minimize conflict with underground utilities.
8. Provide planting spaces that accommodate healthy tree growth.

Increasing Forest Resiliency

1. Use native species where appropriate.

2. Plant to attract and support wildlife.
- Select species that offer food, housing, and water, especially for indigenous fauna. Experts on local wildlife species can recommend appropriate species to meet these needs.
- Develop plantings that bloom in succession, providing pollinator food sources throughout the seasons.
- Plant wildlife-attracting species in sizable numbers and with some continuity throughout the community to mimic natural habitat; isolated patches are less effective.
- Incorporate native species of grasses, perennials, shrubs, and trees to the greatest extent practical.

3. Select trees and plantings adapted to the environmental conditions of the site. Refer to the Species Selection Criteria in the following section for more information.

4. Satisfy any functional reasons for the planting.
- Water conservation and quality
- Energy conservation
- Wind reduction
- Air pollution abatement
- Noise reduction
- Shading pavement to reduce heat island effect
- Screening objectionable views

5. Integrate low impact development best management practices for stormwater within public right-of-way plantings, where practical. Potential applications include tree wells, medians, parkway strips, and meandering sidewalks.

6. Diversify types and species where possible to avoid monotonous landscapes and overplanting of popular species.
- At least two species should be utilized on each block to ensure diversity.
- Intermix accent species in the dominant tree grid, as understory species, or to highlight key buildings or intersections.

Supporting Maintenance & Safety

1. Plant to provide the intended performance and aesthetic with the lowest water usage.
- Species with low to very low water use ratings are preferred.
- Group species by similar water needs in hydrozones.
- Minimize the number of hydrozones/irrigation valves per planting area.
- Trees and understory plantings should have compatible water needs.

Figure 2.2.2: Tree Planting Regulations. Recommended spacing requirements for new street trees.

2. Ensure planting designs conform to current local and state regulations.
- Do not obstruct sightlines at intersections or traffic signage.
- Comply with water allowance and irrigation requirements.
- Refer to **Chapter 4, Findings & Updates**, for local policies. Contact the City Planning to determine if other regulations apply to your project.

3. Consider the non-optimum conditions of street tree plantings when designing tree spacing. The following rule of thumb applies to street trees which are to be planted in an even-spacing pattern:
   Broad trees: 30 to 40 feet apart
   Average trees: 20 to 30 feet apart
   Narrow trees: 15 to 20 feet apart
- Design tree spacing based on mature plant sizes.

4. Place trees away from conflicting uses:
- *Intersections.* Minimum 15 feet from curb return at intersections for sidewalk and median trees to keep traffic sightlines clear.
- *Traffic and monument signs.* Placed far enough away to allow easy visibility, given the speed of traffic on the street.
- *Parking.* For parallel parking, place trees between stall markings to avoid damage from opening car doors.

- *Driveways.* No closer than 10 feet from any driveway.
- *Pedestrian and wheelchair clearances.* A minimum of 4 feet of clear sidewalk should be provided to allow comfortable passage.
- *Street lights.* Minimum 20 feet from light standards to prevent light obstruction.
- *Utility poles.* At least 10 feet so as not to obstruct access to the poles.
- *Fire hydrants.* At least 10 feet away to keep accessible.
- *Meter and valve boxes.* Far enough to keep clear of tree wells. At least 5 feet away.
- *Other street furniture* - benches, trash cans, etc. Space in a pleasing, logical and functional composition. Often aligned with trees in a sidewalk amenity zone along the curb. At least 5 feet away.

5. Locate trees to minimize conflict with overhead utilities.

- Where possible, utilities should be located underground; or, if overhead, aligned to accommodate street tree planting.
- Where overhead utilities exist, plant small trees (refer to Planting Palette) that will not reach the height of the wires.

6. Locate trees to minimize conflict with underground utilities.

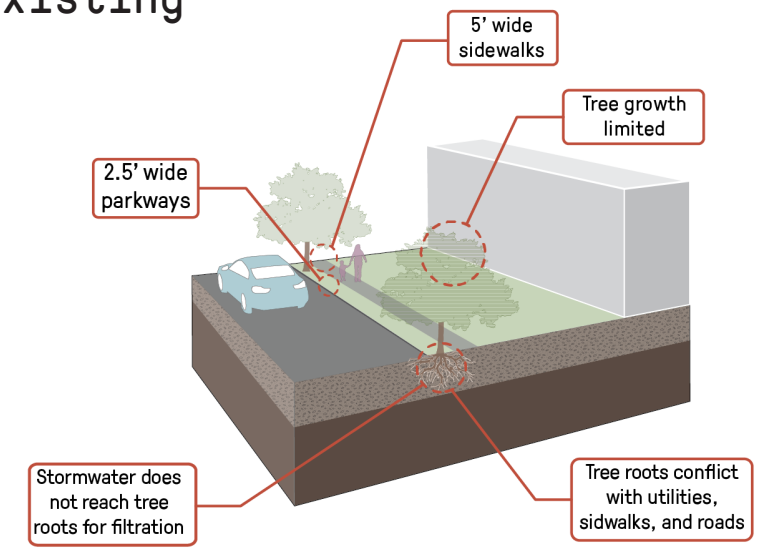
- Plant trees as far away as possible from utilities, to avoid damage by roots, and to avoid trenching through the root zone when lines are serviced.
- Contact utility companies to locate lines before determining planting location.

7. Provide planting spaces that accommodate healthy tree growth.

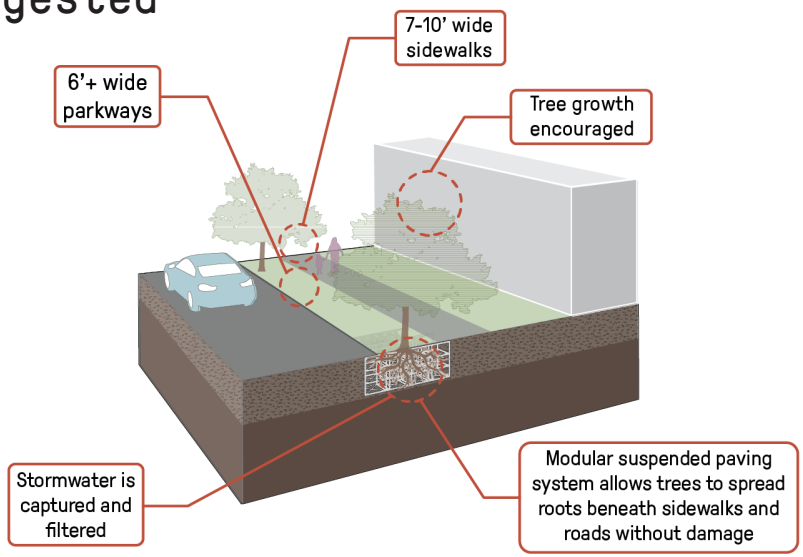
- Refer to the planting palette to match planting design to the available planting space size.
- Where possible, enlarge the existing planting areas.
- Under new paving where available space confines planting areas, provide structural soils or cells to increase rooting space.
- To maximize growth and health of trees, provide a minimum of 1,000 cubic feet of loam soil per tree, or aim for the preferred 1.5 to 2 cubic feet of loam soil per square foot of mature tree canopy area.
- *Tree Wells.* At a minimum, should be 4 x 6 x 3 ft. deep, with 6 x 6 or larger recommended. Tree wells with an opening of less than 8.3-square-feet (2.5 x 2.5) will support only small trees to maturity or medium-sized species for 10 to 15 years. Tree wells with an opening of 48-square-feet (6 x 8), on the other hand, will support large trees to maturity. Narrow parkways can be utilized by allowing the lateral spread of tree roots (e.g. 2.5 x 8 ft instead of 2.5 by 4 ft dimension for the tree well). Use of root barriers on two sides will help prevent root damage and allow for a wider variety of species.
- *Parkway Strips.* The design of new streets or retrofitting of existing streets with a 6-ft.-wide parkway is essential for healthy tree growth. A 2.5-feet-wide planting strip will not support a medium or large sized tree without pavement damage; the minimum recommended width is 4 feet. The benefit of planter strips over tree wells is increased tree vigor, due to the larger surface area of exposed soil.
- Where possible, provide for 7-8' sidewalks, allowing for 3-4' wide planting cutouts.
- Where possible, install modular suspended pavement systems (see "Modular Suspended Pavement Systems" in Appendix for details).

Figure 2.2.3: Existing vs. Suggested Street Tree Planting Design (following page). New development in Signal Hill should implement the planting design strategies from this document.

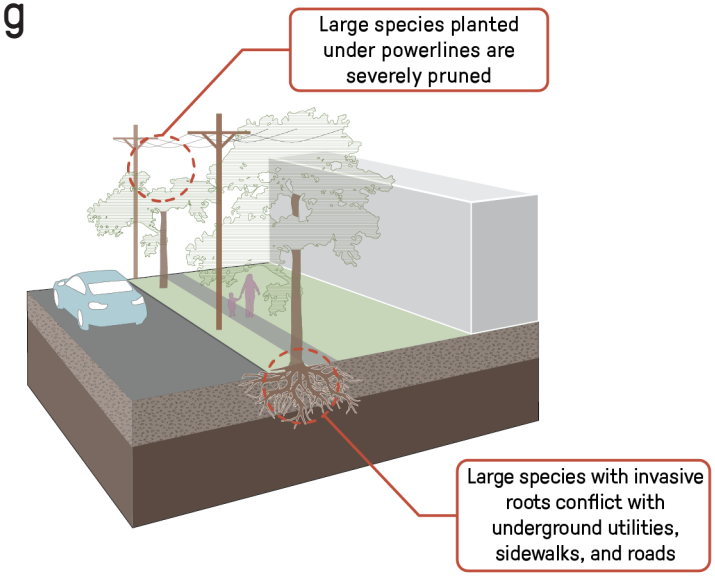
Existing



Suggested



Existing



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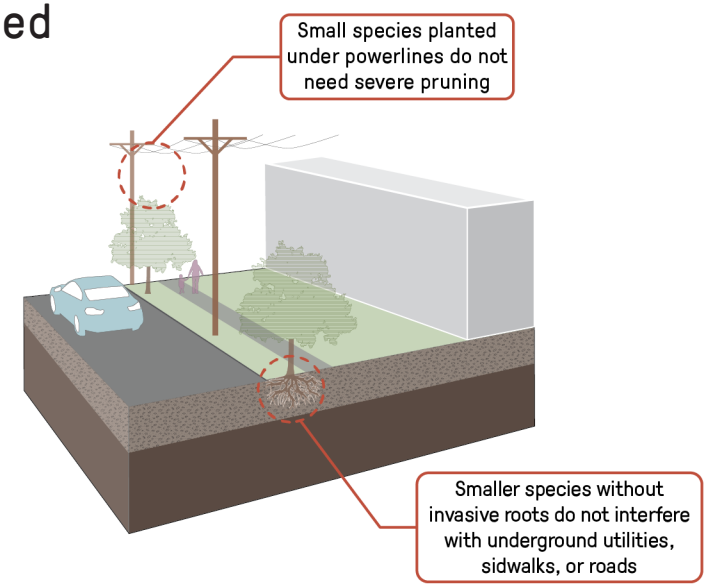


2.3 Design for the Future

In the immediate future, Signal Hill's top priority should be filling its vacant street tree sites. Beyond that, the city should attempt to maintain its current street trees to the highest possible level, and to make sure the public is aware of the importance of the street tree canopy. But as these goals are accomplished, Signal Hill should also be looking to the future.

Phytoremediation

One possible future objective could be to use street trees to phytoremediate areas of the public right of way that have contamination from former oil drilling or other pollution. Phytoremediation, "the treatment of pollutants or waste (as in contaminated soil or groundwater) by the use of green plants that remove, degrade, or stabilize the undesirable substances (such as toxic metals),"[1] is more commonly used to treat sites, called brownfields, that have been contaminated from former industrial use. However, given the widespread history of oil production in the city (see p. 23) and the current oil derricks well-integrated into public spaces in Signal Hill, street trees could potentially be used for this purpose. The city would need to identify which street trees are situated on old oil sites, or it could decide to create new street tree sites on current oil sites once those sites are decommissioned. Current GIS data suggests that there are plenty of possible locations for street tree phytoremediation, and this data can be used to help the city create a list of possible sites. In fact, some eucalyptus trees could already be performing this role, removing toxins from the soil along Willow Street, for example.

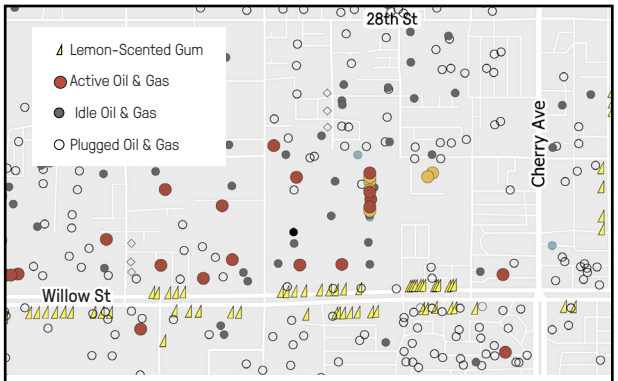


Figure 2.3.1: Possible Existing Phytoremediation in Signal Hill Street Trees. Lemon-scented gum (*Eucalyptus citriodora*) intermixed with oil sites on Willow St near Cherry Ave.

Once phytoremediation sites are established, the city must take care to track all locations carefully. Phytoremediation can work in different ways depending on which species are used to remediate which chemicals. Sometimes plants break down the chemicals, in which case phytoremediating species can be treated like any other plant. But others take up the chemicals into their roots, branches, or leaves; thus their byproducts, such as leaf litter or trimmed/downed branches, could be toxic. If this type of phytoremediation is implemented, all waste from phytoremediation trees must go to the landfill and not to any composting or mulching center. Currently, street tree waste from the city already goes to the landfill, but if this system were to change, phytoremediation sites would need to be carefully tracked and tree litter treated separately to ensure that all contaminated waste would go to the landfill.

The most commonly used trees for oil field phytoremediation are poplars and willows.[2] These species are not a good fit for Signal Hill's street tree palette as they are high water use and also have invasive roots that can damage underground utilities. Eucalyptus species can also be used, and have lower water needs, but present other problems like invasiveness, flammability, and limb drop. However, because research on this process is relatively new and ongoing, there are some other species that could be possible and might be a better fit for Signal Hill. *Acacia sieberiana* proved effective in Sudan,[3] and *var. woodii* grows well in South Africa,[4] a similar climate to Southern California. Local research on native plant species has also been conducted. A future street tree plan might include these species for phytoremediation as long as proper care is taken in disposal. Since research on this topic is ongoing, additional species may be possible.

1 https://www.merriam-webster.com/dictionary/phytoremediation
2 https://clu-in.org/download/studentpapers/A_Van_Epps-Final.pdf
3 https://doi.org/10.1080/15226514.2022.2083575
4 https://treesa.org/acacia-sieberiana/

Acacia (vachellia) sieberiana var. woodii, or Paperbark Thorn, in South Africa. Photo: G. Ebedes

Further Goals

As Signal Hill gradually refills the vacant tree sites, strengthens its tree canopy, and moves toward shade equity within the city, it should try to incorporate the entire canopy into its goals. Tying together the Parks plan as well as property owners' yards into a **Community Forest Plan** would allow the city to achieve its canopy goals with far greater efficiency, and benefit the entire city.

One way to better involve the community in tree planting goals would be to provide free trees to residents, instead of charging them. Los Angeles' City Plants program provides free trees for residents' yards, and plants street trees free of charge upon request. The process requires application and approval, as well as a commitment from residents to care for the trees during establishment, 3-5, years, ensuring the city's investment. San Francisco, on the other hand, ensures the health of its street trees by placing watering responsibility solely with the city. Both methods are worth considering.

Together with its canopy goals, the city could consider adding additional green initiatives such as a mulching program, where a portion of mulch from city tree trimmings is reserved for city use as well as for the public. The Los Angeles Department of Sanitation provides such a program. If Signal Hill's mulching needs increase due to tree planting initiatives, such a program could save money.

Finally, the city should continue to address issues of climate justice, especially relating to tree canopy coverage.[5] Information included in this document can be used to pursue grants to help counteract this problem, and the city should act now to counter shade disparity within its borders. Regardless of future actions, the city can follow this plan, especially the next section, to start on the road to a greener, more equitable city.

5 https://pdxscholar.library.pdx.edu/toward-resilient-futures/5/

2.4 Species Selection Criteria

The following pages provide a course of action for the city to take when maintaining and selecting street trees. The first diagram (**Figure 2.4.1**) outlines the procedures already in place for maintaining existing trees. The second diagram (**Figure 2.4.2**) provides a method for selecting a new tree for a vacant site. The third diagram (**Figure 2.4.3**) provides a more comprehensive selection method.

Figure 2.4.2 is intended to provide an overview of the selection process and trees available in each size category, using common names. It gives a snapshot of which trees have stronger branches for windy locations, and whether trees have low or moderate root damage potential. A more versatile tree that could be planted in, for example, a windy location with nearby water lines, should obviously be prioritized for those limited locations. In the interest of creating a more diverse urban forest, trees that can only be planted without restrictions should be prioritized in sites without limitations on canopy size, root invasion, or wind; otherwise, the more versatile trees will come to occupy too large a percentage of the canopy. To this end, the chart lists all possible trees that can be planted at each site; it bolds the species that are more limited in use. For the same reason, larger trees should be planted when space is available, otherwise the street tree canopy will be comprised entirely of small trees with more limited shading and pollution reduction potential.

Figure 2.4.3 gives a complete view of all the trees available, using Latin names and showing whether they are flowering, evergreen, or deciduous. This chart is intended to aid in selecting a particular tree for a particular site. Once the available species are determined from **Figure 2.4.2**, the detailed selector that follows in **Figure 2.4.3** allows the user to decide which type of tree would be the best choice. Basic information on each tree follows in the palette list on pp. 67-69, and detailed information, including photographs, can be found in the palette on pp. 70-81. The trees are listed alphabetically by Latin name in the palettes.

While this Master Plan does not recommend planting a single species of tree per block, should the city wish to provide an area with a certain character, two species may be assigned. For example, near the city entrance sign on Cherry Ave, the current palm trees could be gradually be replaced by just Incense Cedars and Santa Cruz Ironwoods. The trees are low-water native species which are tall and narrow, similar to palms, but with greater shade and carbon absorption capacity.

Figure 2.4.1: Maintenance Protocol for Existing Trees

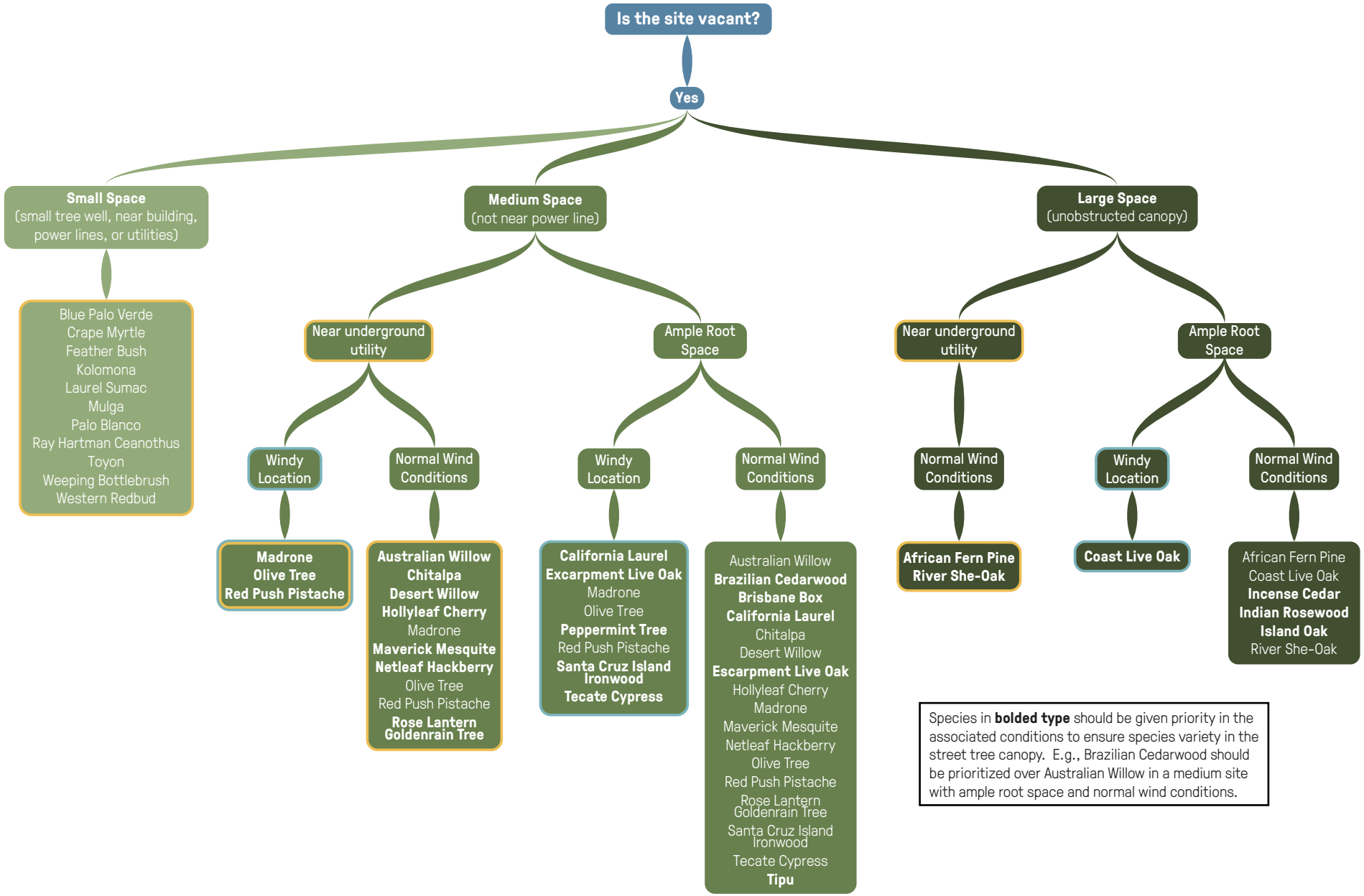
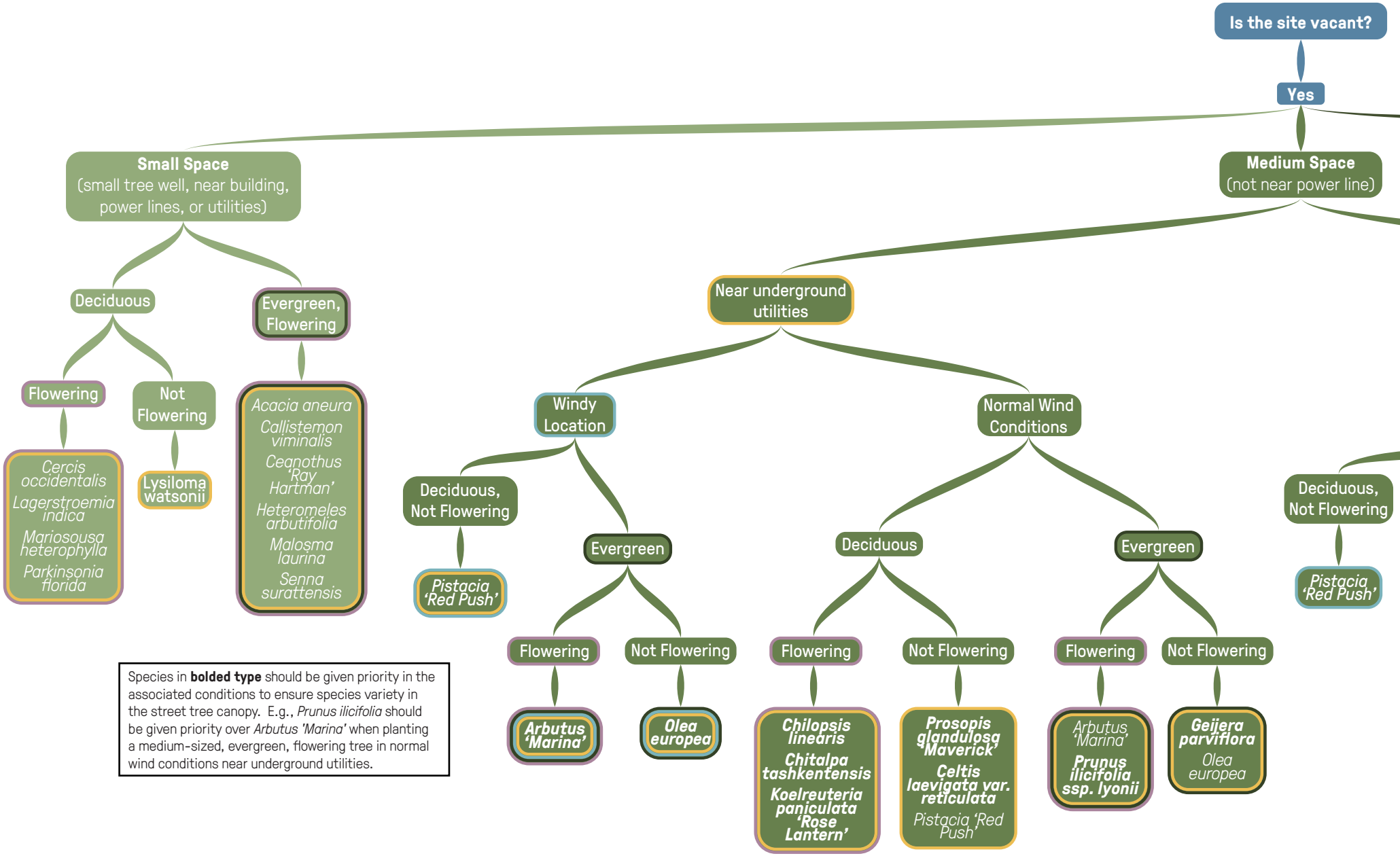
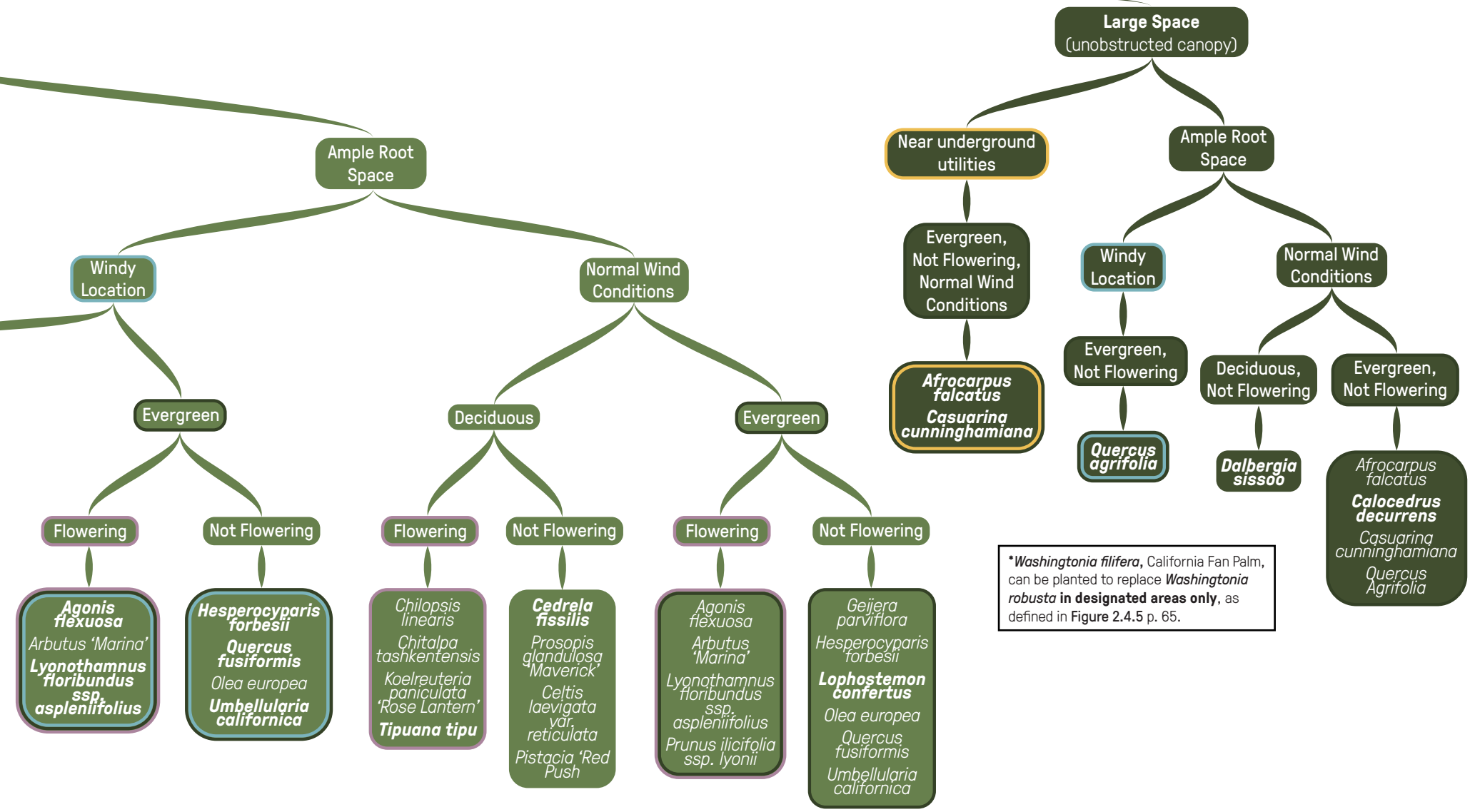


Figure 2.4.2: Method of Selecting New Trees for Vacant Sites.



Species in **bolded type** should be given priority in the associated conditions to ensure species variety in the street tree canopy. E.g., *Prunus ilicifolia* should be given priority over *Arbutus 'Marina'* when planting a medium-sized, evergreen, flowering tree in normal wind conditions near underground utilities.

Figure 2.4.3: Comprehensive Method of Selecting New Trees for Vacant Sites



Washingtonia filifera, California Fan Palm, can be planted to replace ***Washingtonia robusta*** **in designated areas only**, as defined in **Figure 2.4.5** p. 65.

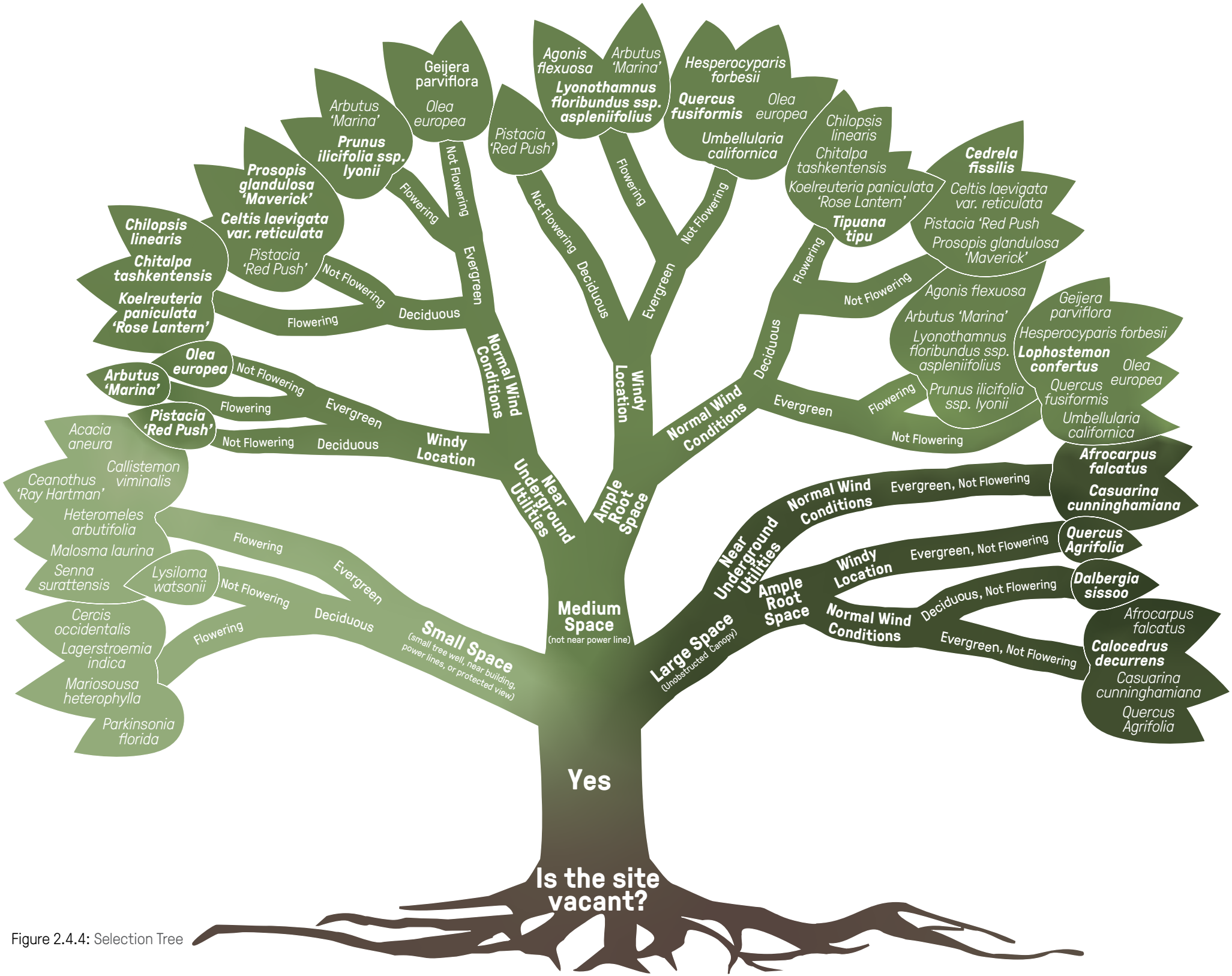
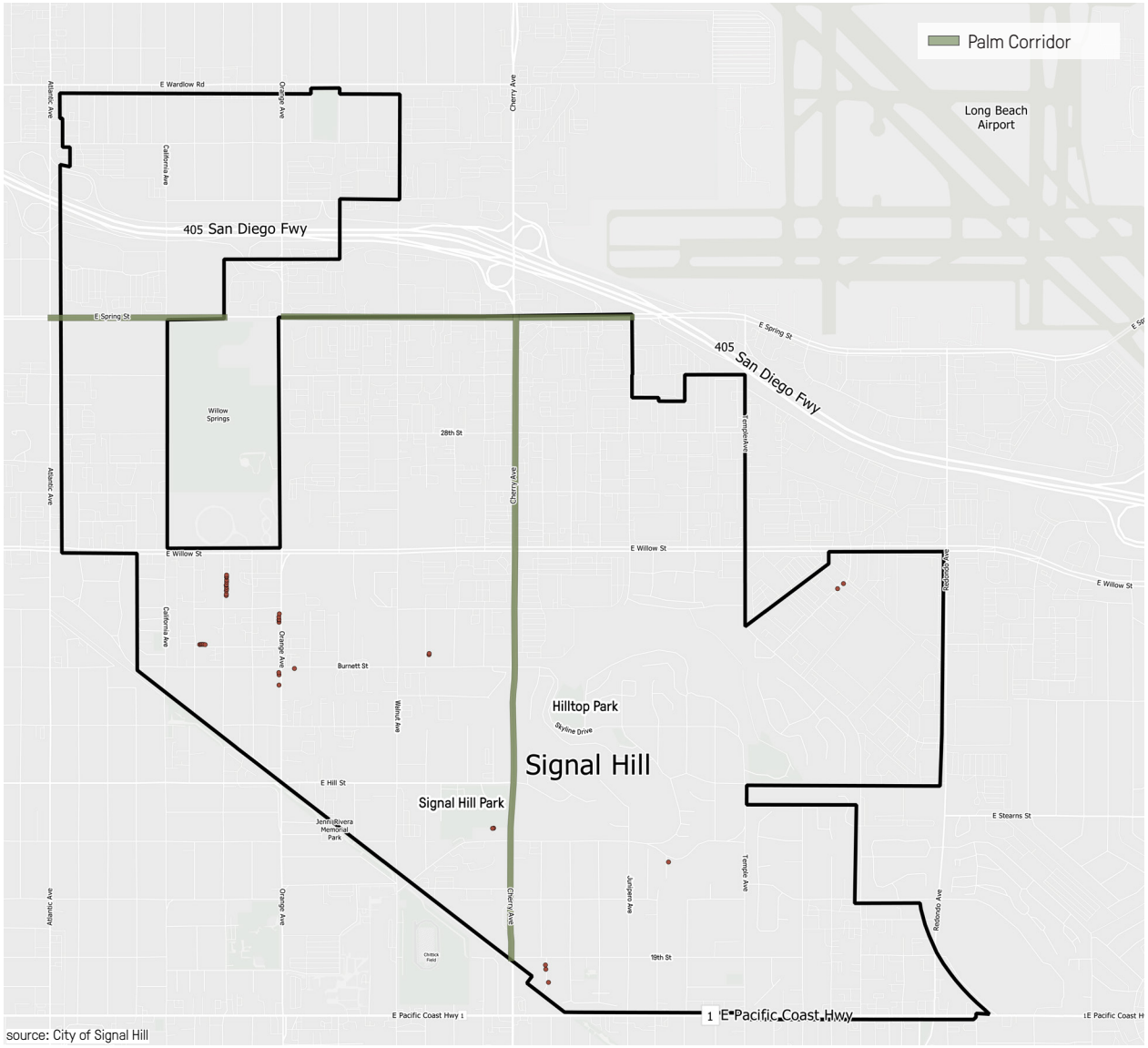


Figure 2.4.4: Selection Tree



source: City of Signal Hill

Figure 2.4.5: Palm Corridors & Private Trees

2.4a Palm Corridors

As noted on Figure 2.4.3 , the detailed tree selection chart, palm trees are only to be planted in designated Palm Corridors along East Spring Street and Cherry Ave. The precise locations are outlined in green on the map to the left.

2.5 Street Tree Palette Selection & Resources

Palette Selection

When selecting trees for this palette, many factors were taken into account. Staff suggestions as to which trees were thriving and which caused problems, detailed on pp. 38-41, gave a starting point for specific trees to include or exclude. Only trees with low-to-medium water use and low-to-moderate root damage potential were considered. All Southern California Coastal Climate Ready Trees were included minus the eucalyptus species. Native species appropriate for street tree use and with likely nursery availability were also a high priority. The palette includes many smaller species so there will be plenty of options for limited spaces, especially under power lines. Street tree lists from other California cities, such as Los Angeles, Long Beach, and Mountain View, were also consulted. The list is specifically curated for the City of Signal Hill, its climate, and its needs.

Resources

In addition to previously mentioned resources such as Tree People, the Arbor Day Foundation, and Climate Ready Trees, the following organizations can provide valuable information about trees, native plants, and plant care. This page is not endorsement of associated businesses, however.

[CalPoly SelecTree]
A comprehensive urban forestry website from the Urban Forest Ecosystems Institute (UFEI) at CalPoly San Luis Obispo. Each entry in the palette contains a link to its SelecTree site for more information.

[CalScape]
An online database of native California plants by the California Native Plant Society.

[Calflora]
An online database of California native plants with search information from scientific partners.

[San Marcos Growers]
A nursery located in Santa Barbara with plentiful information on their website and a large selection of native plants.

[Las Pilitas Nursery]
A California native plant nursery located in San Luis Obispo County with information on and native plants lists for each California ecosystem type.

[Tree of Life Nursery]
A California native plant nursery with a large selection of native plants and useful information on their website, located in San Juan Capistrano, CA.

[Theodore Payne Foundation]
Organization dedicated to California Native Plants with a nursery located in Sun Valley, CA.

[Mountain States Wholesale Nursery]
A wholesale nursery located in Arizona specializing in water-efficient plants with an informational website.

[Monrovia Nursery]
Large nursery with multiple locations, including Azusa, CA.

2.6 Street Tree Palette

Attributes	Scientific Name	Common Name	Max Height x Width	Planting Width	Size	Water Needs	Deciduous / Evergreen	Branch Strength	Root Damage Potential	Powerline Friendly	Prominent Flowers
	Acacia aneura	Mulga	20 ft x 15 - 20 ft	2-5'	S	Very Low	Evergreen	Medium	Low	Yes	Yes
	Afrocarpus falcatus	African Fern Pine	40 - 60 ft x 20 - 40 ft	10'+	L	Medium	Evergreen	Medium	Low	No	No
	Agonis flexuosa	Peppermint Tree	25 - 40 ft x 15 - 25 ft	5-10'	M	Low	Evergreen	Strong	Moderate	No	Yes
	Arbutus 'Marina'	Marina Madrone	40 - 50 ft x 25 - 40 ft	2-5'	M	Low	Evergreen	Strong	Low	No	Yes
	Callistemon viminalis	Weeping Bottlebrush	20 ft x 15 - 20 ft	2-5'	S	Low	Evergreen	Medium	Low	Yes	Yes
	Calocedrus decurrens	Incense Cedar	12 - 200 ft x 30 - 50 ft	10'+	L	Very Low	Evergreen	Medium	Moderate	No	No
	Casuarina cunninghamiana	River She-Oak	40- 60 ft x 15 - 25 ft	10'+	L	Low	Evergreen	Medium	Low	No	No
	Ceanothus 'Ray Hartman'	Ray Hartman Ceanothus	12 - 20 ft x 15 - 20 ft	2-5'	S	Low	Evergreen	Medium	Low	Yes	Yes
	Cedrela fissilis	Brazilian Cedarwood	40 - 60 ft x 40 - 50 ft	10'+	M	Medium	Deciduous	Medium Weak	Moderate	No	No
	Celtis laevigata var. reticulata	Netleaf Hackberry	20 - 30 ft x 25 - 30 ft	5-10'	M	Low	Deciduous	Medium	Low	No	No
	Cercis occidentalis	Western Redbud	10 - 20 ft x 10 - 15 ft	2-5'	S	Low	Winter Deciduous	Medium	Low	Yes	Yes
	Chilopsis linearis	Desert Willow	12 - 30 ft x 10 - 15 ft	2-5'	M	Very Low	Deciduous	Medium	Low	No	Yes

Climate Ready Tree Native California Tree Very Low Water Use Tree

Attributes	Scientific Name	Common Name	Max Height x Width	Planting Width	Size	Water Needs	Deciduous / Evergreen	Branch Strength	Root Damage Potential	Powerline Friendly	Prominent Flowers
	Chitalpa tashkentensis	Chitalpa	15 - 30 ft x 15 - 25 ft	5-10'	M	Low	Deciduous	Medium Weak	Low	No	Yes
	Dalbergia sissoo	Indian Rosewood	40 - 60 ft x 30 - 40 ft	10'+	L	Very Low	Deciduous	Medium Weak	Moderate	No	No
	Geijera parviflora	Australian Willow	20 - 30 ft x 15 - 20 ft	5-10'	M	Medium	Evergreen	Medium	Low	No	No
	Hesperocyparis forbesii	Tecate Cypress	25 - 30 ft x 20 - 25 ft	5-10'	M	Very Low	Evergreen	Strong	Moderate	Yes	No
	Heteromeles arbutifolia	Toyon	6 - 30 ft x 10 - 15 ft	5-10'	S	Very Low	Evergreen	Medium	Low	Yes	Yes
	Koelreuteria paniculata "Rose Lantern"	Rose Lantern Goldenrain Tree	35 ft x 25 - 40 ft	5-10'	M	Low	Deciduous	Medium	Low	No	Yes
	Lagerstroemia indica	Crape Myrtle	25 ft x 25 ft	2-5'	S	Low	Deciduous	Medium	Low	Yes	Yes
	Lophostemon confertus	Brisbane Box	50 ft x 10 - 30 ft	5-10'	M	Medium	Evergreen	Medium	Moderate	No	No
	Lyonothamnus floribundus ssp. aspleniifolius	Santa Cruz Island Ironwood	25 - 50 ft x 12 - 24 ft	5-10'	M	Very Low	Evergreen	Strong	Moderate	No	Yes
	Lysiloma watsonii	Feather Bush	15 ft x 12 - 15 ft	2-5'	S	Low	Partly Deciduous	Medium Weak	Low	Yes	No
	Malosma laurina	Laurel Sumac	10 - 20 ft x 10 - 20 ft	2-5'	S	Very Low	Evergreen	Weak	Low	Yes	Yes
	Mariosousa heterophylla	Palo Blanco	20 ft x 12 - 15 ft	2-5'	S	Very Low	Partly Deciduous	Weak	Low	Yes	Yes

Climate Ready Tree Native California Tree Very Low Water Use Tree

Attributes	Scientific Name	Common Name	Max Height x Width	Planting Width	Size	Water Needs	Deciduous / Evergreen	Branch Strength	Root Damage Potential	Powerline Friendly	Prominent Flowers
	Olea europea	Olive Tree	30 ft x 25-30 ft	5-10'	M	Low	Evergreen	Strong	Low	No	No
	Parkinsonia florida	Blue Palo Verde	25 ft x 15 - 20 ft	5-10'	S	Very Low	Deciduous	Medium	Low	Yes	Yes
	Pistacia 'Red Push'	Red Push Pistache	40 ft x 20 - 40 ft	5-10'	M	Medium	Deciduous	Strong	Low	No	No
	Prosopis glandulosa 'Maverick'	Maverick Mesquite	35 ft x 25 - 35 ft	5-10'	M	Low	Deciduous	Medium	Low	No	Yes
	Prunus ilicifolia ssp. lyonii	Catalina Cherry	25 - 40 ft x 20 -30 ft	5-10'	M	Very Low	Evergreen	Medium	Low	No	Yes
	Quercus agrifolia	Coast Live Oak	25 - 80 ft x 15 - 35 ft	10'+	L	Low	Evergreen	Strong	Moderate	No	No
	Quercus fusiformis	Escarpment Live Oak	50 ft x 20 - 40 ft	10'+	M	Medium	Evergreen	Strong	Moderate	No	No
	Quercus tomentella	Island Oak	30 - 70 ft x 35 ft	10'+	L	Low	Evergreen	Strong	Moderate	No	No
	Senna surattensis	Kolomona	25 ft x 20 - 25 ft	5-10'	S	Low	Evergreen	Medium	Low	Yes	Yes
	Tipuana tipu	Tipu	50 ft x 25 - 50 ft	10'+	M	Medium	Partly Deciduous	Weak	Moderate	No	Yes
	Umbellularia californica	California Laurel	6 - 80 ft x 3 - 30 ft	10'+	M	Low	Evergreen	Strong	Moderate	No	No
	Washingtonia filifera	California Fan Palm	70 ft x 10 - 20 ft	5-10'	M	Low	Evergreen	Medium Strong	Moderate	No	No

Climate Ready Tree Native California Tree Very Low Water Use Tree

Acacia aneura
Mulga

Family: *Fabaceae*

Photos: CalPoly SelecTree

Native Range: Western Australian Mulga shrublands

Shape: Rounded

Foliage Type: Evergreen

Size: 20' x 15-20'

Planting Area: 2-5'

Water Use Rating: **Very Low**

Growth Rate: Moderate

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: Yes

Leaves: Bluish Green or Silver or Gray Green; Alternate, Simple; Linear

Bark: Dark Brown or Light Green, Fissured

Litter: Dry Fruit

Flowers/Fruit: Small, yellow, bottle brush-shaped flower clusters in spring; brown seed pods in summer-fall.

Notes: **Climate Ready Tree**

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/14

Afrocarpus falcatus
African Fern Pine

Family: *Podocarpaceae*

Photos: F & K. Starr; CalPoly SelecTree

Native Range: Eastern South Africa, Swaziland, Mozambique, and Zimbabwe

Shape: Rounded

Foliage Type: Evergreen

Size: 40-60' x 20-40'

Planting Area: 10'+

Water Use Rating: Medium

Growth Rate: Moderately Fast

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: No

Leaves: Deep Green; Alternate, Simple; Linear

Bark: Light Gray, Furrowed, Smooth

Litter: Dry Fruit

Flowers/Fruit: Inconspicuous flowers; small yellow fruit resembling olives in fall.

Notes: Medium water use

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1113

Agonis flexuosa
Peppermint Tree

Family: *Myrtaceae*

Photos: CalPoly SelecTree

Native Range: Western Australia

Shape: Rounded or Vase, Weeping

Foliage Type: Evergreen

Size: 25-40' x 15-25'

Planting Area: 5-10'

Water Use Rating: Low

Growth Rate: Moderately Fast

Branch Strength: Medium

Root Damage Potential: Moderate

Powerline Friendly: No

Leaves: Green; Alternate, Simple; Spear-shaped

Bark: Red Brown, Exfoliating, Furrowed

Litter: Dry Fruit

Flowers/Fruit: White, fragrant flowers in spring; small, brown, cone-like fruit

Notes:

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/143

Arbutus 'Marina'
Marina Madrone

Family: *Ericaceae*

Photos: CalPoly SelecTree

Native Range: Hybrid of Mediterranean & British Isles species

Shape: Rounded or Vase

Foliage Type: Evergreen

Size: 40-50' x 25-40'

Planting Area: 2-5'

Water Use Rating: Medium

Growth Rate: Moderate

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: No

Leaves: Green; Alternate, Simple; Elliptic

Bark: Red Brown, Exfoliating, Smooth

Litter: Wet Fruit

Flowers/Fruit: Clusters of small, pink, bell-shaped flowers; edible red fruit resembling strawberries

Notes: Medium water use; fruit can be messy; standard version best for street trees; *Arbutus unedo* acceptable substitution

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/174

Callistemon viminalis
Weeping Bottlebrush

Family: *Myrtaceae*

Photos: E. Gilman; CalPoly SelecTree

Native Range: Eastern Australia

Shape: Rounded, Weeping

Foliage Type: Evergreen

Size: 20' x 15-20'

Planting Area: 2-5'

Water Use Rating: Low

Growth Rate: Moderately Fast

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: Yes

Leaves: Green; Alternate, Simple; Spear-shaped

Bark: Dark Gray, Exfoliating, Striated

Litter: Dry Fruit

Flowers/Fruit: Bright red, large, bottle brush-shaped flowers blooming in spring/summer

Notes: High biogenic emissions

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/241

Calocedrus decurrens
Incense Cedar

Family: *Cupressaceae*

Photos: S. Patel; CalPoly SelecTree

Native Range: California, Western North America

Shape: Conical

Foliage Type: Evergreen

Size: 12-200' x 30-50'

Planting Area: 10'+

Water Use Rating: **Very Low**

Growth Rate: Slow

Branch Strength: Medium

Root Damage Potential: Moderate

Powerline Friendly: No

Leaves: Deep Green; Opposite, Simple; Scale-like

Bark: Red Brown, Fibrous, Furrowed

Litter: Dry Fruit

Flowers/Fruit: Small cones in fall/summer.

Notes: **California native**, found mostly in mountainous areas; large

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/243

Casuarina cunninghamiana
River She-Oak

Family: *Fabaceae*

Photos: CalPoly SelecTree

Native Range: Australia
Shape: Rounded
Foliage Type: Evergreen
Size: 40-60' x 15-25'
Planting Area: 10'+
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: No

Leaves: Bluish Green or Silver or Gray Green ; Whorled, Simple; Linear

Bark: Dark Gray to Brown, Fissured

Litter: Dry Fruit

Flowers/Fruit: Small brown cones in spring.

Notes: Large. Not an oak. Also called Horsetail Tree, Australian Pine.

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/275

Ceanothus 'Ray Hartman'
Ray Hartman Ceanothus

Family: *Rhamnaceae*

Photos: CalPoly SelecTree; Las Pilitas Nursery

Native Range: California
Shape: Rounded
Foliage Type: Evergreen
Size: 12-20' x 15-20'
Planting Area: 2-5'
Water Use Rating: Low
Growth Rate: Moderately Fast
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: Yes

Leaves: Deep Green; Alternate, Simple; Oval

Bark: Brown, Smooth

Litter:

Flowers/Fruit: Clusters of small, blue-purple flowers in spring; small, berry-like capsules in winter or summer

Notes: **California native**; single-trunk standard variety trained with higher first branches best for street tree use

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/282

Cedrela fissilis
Brazilian Cedarwood

Family: *Meliaceae*

Photos: L. Correa; CalPoly SelecTree;

Native Range: Brazil, Paraguay
Shape: Rounded
Foliage Type: Deciduous
Size: 40-60' x 40-50'
Planting Area: 10'+
Water Use Rating: Medium
Growth Rate: Moderately Fast
Branch Strength: Medium Weak
Root Damage Potential: Moderate
Powerline Friendly: No

Leaves: Green, new growth has red tinge; fall color; Alternate, Pinnately Compound; Spear-shaped

Bark: Dark Brown, Dark Gray, Light Gray or Light Green, Smooth

Litter: Dry Fruit

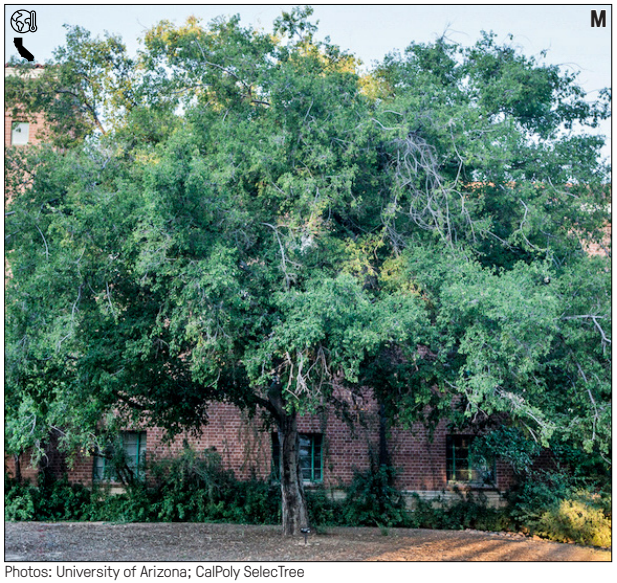
Flowers/Fruit: Clusters of small white bells in spring followed by pear-shaped brown cones that split into star shape

Notes: **Climate Ready Tree**

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/285

Celtis laevigata var. reticulata
Netleaf Hackberry

Family: *Cannabaceae*



Photos: University of Arizona; CalPoly SelecTree

Native Range: California; riparian areas of the Southwest US

Shape: Rounded

Foliage Type: Deciduous

Size: 20-30' x 25-30'

Planting Area: 5-10'

Water Use Rating: Low

Growth Rate: Moderate

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: No

Leaves: Green, yellow fall color; Alternate, Simple; Ovate

Bark: Mottled, Light Gray or Red Brown, Smooth

Litter: Dry Fruit

Flowers/Fruit: Inconspicuous fruit in spring; small, red-orange drupe in fall

Notes: California native, Climate Ready Tree; has excellent survival readings in CRT study; needs pruning to maintain shape

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/301

Cercis occidentalis
Western Redbud

Family: *Fabaceae*

Photos: G. Castriotta; CalPoly SelecTree

Native Range: California foothills, Arizona, Utah

Shape: Rounded

Foliage Type: Deciduous

Size: 10-20' x 10-15'

Planting Area: 2-5'

Water Use Rating: Medium

Growth Rate: Moderately Fast

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: Yes

Leaves: Bright Green to Blue-Green; Alternate, Simple; Oval

Bark: Gray to Brown

Litter: Dry Fruit

Flowers/Fruit: Small magenta blossoms along branches, brown seed pods

Notes: California native; medium water use; standard version trained with single stem and higher branches best for street trees

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/321

Chilopsis linearis
Desert Willow

Family: *Bignoniaceae*

Photos: L. Lukes, L. Kling, P. Breen

Native Range: California, Texas, Mexico

Shape: Rounded

Foliage Type: Deciduous

Height: 12-30' x 10-15'

Planting Area:2-5'

Water Use Rating: Very Low

Growth Rate: Moderately Fast

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: No

Leaves: Green; Alternate, Simple; Linear

Bark: Light Green to Light Gray, Exfoliating

Litter: Dry Fruit, Flowers

Flowers/Fruit: Pink, trumpet-shaped flowers in spring; long, thin seed pods in fall

Notes: California native; standard version trained with single stem and higher branches best for street trees; 'Bubba' cultivar acceptable substitute and **CRT Inland but not Coastal**

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/345

Chitalpa tashkentensis
Chitalpa

Family: *Bignoniaceae*

Photos: CalPoly SelecTree

Native Range: hybrid between desert willow & catalpa (Southern US)
Shape: Rounded or Vase
Foliage Type: Deciduous
Size: 15-25' x 15-25'
Planting Area: 5-10'
Water Use Rating: Low
Growth Rate: Fast
Branch Strength: Medium Weak
Root Damage Potential: Low
Powerline Friendly: No
Leaves: Green; Opposite, Simple; Linear
Bark: Light Green to Light Gray, Scaly
Litter: Flowers
Flowers/Fruit: Lavender, trumpet-shaped flowers in spring
Notes: "Pink Dawn" or "Morning Cloud" both acceptable cultivars

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1488

Dalbergia sissoo
Indian Rosewood

Family: *Fabaceae*

Photos: CalPoly SelecTree

Native Range: Indian Subcontinent
Shape: Rounded or Vase
Foliage Type: Deciduous
Size: 40-60' x 30-40'
Planting Area: 10'+
Water Use Rating: **Very Low**
Growth Rate: Moderate
Branch Strength: Medium Weak
Root Damage Potential: Moderate
Powerline Friendly: No
Leaves: Green; Alternate, Pinnately Compound; Oval
Bark: Dark Brown or Light Green, Furrowed, Rough
Litter: Dry Fruit, Flowers
Flowers/Fruit: Small white or yellow flowers in spring; seed pods in fall
Notes: **Climate Ready Tree**; wide-spreading roots help control erosion

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/483

Geijera parviflora
Australian Willow

Family: *Rutaceae*

Photos: PlantMaster; CalPoly SelecTree

Native Range: Australia
Shape: Rounded
Foliage Type: Evergreen
Size: 20-30' x 15-20'
Planting Area: 5-10'
Water Use Rating: Medium
Growth Rate: Moderately Fast
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: No
Leaves: Green; Alternate, Simple; Spear-shaped
Bark: Dark Brown or Light Green, Rough
Litter: Dry Fruit
Flowers/Fruit: Small white flowers in spring; small green capsules in fall
Notes: Medium water use

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/654

Hesperocyparis forbesii
Tecate Cypress

Family: *Cupressaceae*

Photos: Theodore Payne Foundation; CalPoly SelecTree

Native Range: California
Shape: Columnar or Rounded
Foliage Type: Evergreen
Size: 20-30' x 15-25'
Planting Area: 5-10'
Water Use Rating: **Very Low**
Growth Rate: Fast
Branch Strength: Strong
Root Damage Potential: Moderate
Powerline Friendly: Yes
Leaves: Green; Whorled, Simple; Scale-like
Bark: Dark Brown or Red Brown, Exfoliating, Scaly, Smooth
Litter: Dry Fruit
Flowers/Fruit: Small cones
Notes: **California native**, **Climate Ready Tree**; 'Greenlee's Blue Rocket' cultivar a taller and narrower alternative. Did not perform well in coastal sites in CRT study—**DO NOT OVERWATER**.

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/472

Heteromeles arbutifolia
Toyon

Family: Rosaceae

Photos: Channel Islands Research; CalPoly SelecTree

Native Range: California
Shape: Rounded or Vase
Foliage Type: Evergreen
Size: 6-30' x 10-15'
Planting Area: 5-10'
Water Use Rating: **Very Low**
Growth Rate: Moderate
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: Yes
Leaves: Dark Green; Alternate, Simple; Oblong
Bark: Dark Brown, Dark Gray or Light Gray, Smooth
Litter: Wet fruit
Flowers/Fruit: Clusters of small white flowers in summer; clusters of small, bright red berries in fall-winter
Notes: **California native**; naturally mounding shrub form but can be pruned

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/697

Koelreuteria paniculata 'Rose Lantern'
Rose Lantern Goldenrain Tree

Family: Sapindaceae

Photos: Harvard Arboretum; CalPoly SelecTree

Native Range: China
Shape: Rounded
Foliage Type: Deciduous
Size: 35' x 25-40'
Planting Area: 5-10'
Water Use Rating: Low
Growth Rate: Moderately Fast
Branch Strength: Medium Weak
Root Damage Potential: Low
Powerline Friendly: No
Leaves: Green; Alternate, Pinnately Compound; Oval
Bark: Dark Brown or Light Green, Fissured
Litter: Dry Fruit
Flowers/Fruit: Clusters of small yellow flowers in spring; pink seed capsules (lanterns) in fall
Notes: Goldenrain tree and *K. elegans* are acceptable substitutes; *K. bipinnata* also acceptable but susceptible to shot-hole borer; have higher water rating than "Rose Lantern"

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/780

Lagerstroemia indica
Crape Myrtle

Family: *Lythraceae*

Photos: R. Rasthan; ASU; CalPoly SelecTree;

Native Range: China
Shape: Rounded or Vase
Foliage Type: Deciduous
Height: 25' x 25'
Planting Area: 2-5'
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: Yes

Leaves: Green, edges can be tinged red or bronze; fall color; Alternate, Simple; Oval

Bark: Light Green, Pink or Red Brown, Exfoliating, Smooth

Litter: Dry fruit

Flowers/Fruit: Clusters of showy flowers; several colors available including white, pink, and lavender

Notes: Multi- or single-stemmed; Several cultivars acceptable, including 'Catawba,' 'Cherokee,''Potomac,' and 'Powhatan'

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/790

Lophostemon confertus
Brisbane Box

Family: *Myrtaceae*

Photos: JMK; CalPoly SelecTree

Native Range: Australia
Shape: Rounded
Foliage Type: Evergreen
Size: 50' x 10-30'
Planting Area: 5-10'
Water Use Rating: Medium
Growth Rate: Moderately Fast
Branch Strength: Medium
Root Damage Potential: Moderate
Powerline Friendly: No

Leaves: Green; Alternate/Whorled, Simple; Ovate

Bark: Striking, Light Green, Red Brown or Multicolored, Exfoliating, Smooth

Litter: Dry Fruit, Flowers

Flowers/Fruit: Clusters of small, star-shaped flowers in spring, small brown or red capsules in summer

Notes: Medium water use

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1425

Lyonothamnus floribundus ***ssp. aspleniifolius***
Santa Cruz Island Ironwood

Family: *Rosaceae*

Photos: G. Castriotta; CalPoly SelecTree

Native Range: California
Shape: Conical or Rounded
Foliage Type: Evergreen
Size: 25-50' x 12-24'
Planting Area: 5-10'
Water Use Rating: **Very Low**
Growth Rate: Moderate
Branch Strength: Strong
Root Damage Potential: Moderate
Powerline Friendly: No

Leaves: Dark Green; Opposite, Pinnately Compound; Oblong

Bark: Striking, Light Gray or Red Brown, Exfoliating, Smooth, Striated

Litter: Dry Fruit, Flowers

Flowers/Fruit: Clusters of small white flowers in summer; small brown capsules in fall

Notes: **California native**, Catalina Ironwood also acceptable

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/832

Lysiloma watsonii
Feather Bush

Family: *Fabaceae*

Photos: M. Dimmit; ASU; CalPoly SelecTree

Native Range: Arizona
Shape: Rounded or Vase
Foliage Type: Deciduous
Size: 15' x 12-15'
Planting Area: 2-5'
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Medium Weak
Root Damage Potential: Low
Powerline Friendly: Yes
Leaves: Green; Alternate, Bipinnately Compound; Oblong
Bark: Dark Gray or Light Gray, Rough, Scaly
Litter: Dry fruit
Flowers/Fruit: Small white puff balls in spring; large brown seed pods in fall
Notes: **Climate Ready Tree**

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/834

Malosma laurina
Laurel Sumac

Family: *Anacardaceae*

Photos: P. Vellieux, G. Castriotta; SMMNRA

Native Range: California
Shape: Rounded, Shrub
Foliage Type: Evergreen
Size: 10-20' x 10-20'
Planting Area: 2-5'
Water Use Rating: **Very Low**
Growth Rate: Fast
Branch Strength: Low
Root Damage Potential: Low
Powerline Friendly: Yes
Leaves: Green with red tinge; Alternate, Simple; Lance-shaped
Bark: Gray to Reddish, Smooth
Litter: Dry Fruit, Flowers
Flowers/Fruit: Clusters of small white flowers in spring; small white drupe in fall
Notes: **California native**; shrub, not tree, but very hardy and drought-tolerant, provides deep shade; can be pruned to shape

CalScape: https://calscape.org/loc-California/Malosma-laurina-(Laurel-Sumac)?srchcr=sc634889672331d

Mariosousa heterophylla
Palo Blanco

Family: Fabaceae

Photos: CalPoly SelecTree

Native Range: Mexico, Sonoran Desert
Shape: Weeping
Foliage Type: Partly deciduous
Size: 20' x 2-15'
Planting Area: 2-5'
Water Use Rating: **Very Low**
Growth Rate: Moderate
Branch Strength: Weak
Root Damage Potential: Low
Powerline Friendly: Yes
Leaves: Bluish Green or Silver or Gray Green; Alternate, Simple; Linear
Bark: Cream or White, Exfoliating, Smooth
Litter: Dry fruit
Flowers/Fruit: Cylindrical clusters of fringed flowers in summer followed by large brown seed pods
Notes: **Climate Ready Tree**; Also called "Acacia willardiana" or "Mariosousa willardiana;" weak branch strength

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1578

Olea europaea
Olive Tree

Family: *Oleaceae*

Photos: CalPoly SelecTree

Native Range: Mediterranean

Shape: Rounded or Vase

Foliage Type: Evergreen

Size: 30' x 25-30'

Planting Area: 5-10'

Water Use Rating: Low

Growth Rate: Medium

Branch Strength: Strong

Root Damage Potential: Moderate

Powerline Friendly: No

Leaves: Bluish Green or Silver or Gray Green; Opposite, Simple; Ovate

Bark: Light Gray, Scaly

Litter: Wet Fruit, Dry Fruit

Flowers/Fruit: Inconspicuous flowers in spring; edible fruit in fall

Notes: Low-fruit or fruitless cultivars include "Majestic Beauty" and "Swan Hill;" "Mission" bears fruit but is hardy, developed by Spanish missionaries in California

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/970

Parkinsonia florida
Blue Palo Verde

Family: *Fabaceae*

Photos: D. Seibert; L. Makings, L. Landrum

Native Range: Southern California, Arizona, Mexico

Shape: Rounded

Foliage Type: Deciduous

Size: 25' x 15-20'

Planting Area: 5-10'

Water Use Rating: **Very Low**

Growth Rate: Moderately fast

Branch Strength: Medium

Root Damage Potential: Low

Powerline Friendly: Yes

Leaves: Bluish Green or Silver or Gray Green; Alternate, Pinnately Compound; Oval

Bark: Green or Red Brown, Exfoliating, Smooth

Litter: Dry fruit

Flowers/Fruit: Yellow flowers in spring followed by brown seed pods

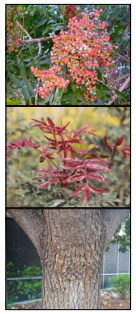
Notes: California native; thorny; 'Desert Museum' available as thornless cultivar and **CRT inland**; drought deciduous

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/309

Pistacia 'Red Push'
Red Push Pistache

Family: *Anacardiaceae*

Photos: G. McPherson, Tucson Clean & Beautiful, Treeland Nurseries



Native Range: Hybrid developed in Arizona of species from China and Persia

Shape: Rounded or Vase

Foliage Type: Deciduous

Size: 40' x 20 - 40'

Planting Area: 5-10'

Water Use Rating: Medium

Growth Rate: Moderately slow

Branch Strength: Strong

Root Damage Potential: Low

Powerline Friendly: No

Leaves: Green, deep red when emerging in spring, fall color; Alternate, Pinnately Compound; Spear-shaped

Bark: Dark Brown, Light Gray or Light Green, Furrowed, Scaly

Litter: Leaves

Flowers/Fruit: Inconspicuous fruit in spring followed by small clumps of red berries

Notes: Climate Ready Tree; winter deciduous; *P. chinensis* acceptable substitute.

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1604

Prosopis glandulosa 'Maverick'
Maverick Mesquite

Family: *Fabaceae*

Photos: CalPoly SelecTree

Native Range: Cultivar from Southwestern U.S.
Shape: Rounded
Foliage Type: Deciduous
Size: 35 x 25-35'
Planting Area: 5-10'
Water Use Rating: Medium
Growth Rate: Moderately Fast
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: No
Leaves: Green; Alternate, Bipinnately Compound; Linear
Bark: Grey, Smooth
Litter: Dry Fruit, Leaves
Flowers/Fruit: Yellow catkins in spring; large brown seed pods in fall
Notes: **Climate Ready Tree**; winter deciduous

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1605

Prunus ilicifolia ssp. lyonii
Catalina Cherry

Family: *Rosaceae*

Photos: M. Bush, Z. Akulova; CalPoly SelecTree

Native Range: California Channel Islands
Shape: Rounded
Foliage Type: Evergreen
Height: 30-50' x 1 0-20'
Planting Area: 5-10'
Water Use Rating: **Very Low**
Growth Rate: Moderate
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: No
Leaves: Dark Green; Alternate, Simple; Spear-shaped, serrated edges
Bark: Dark Brown, Fissured
Litter: Wet Fruit
Flowers/Fruit: Bottle brush-shaped white flower clusters in spring; red cherries in summer
Notes: **California native, Climate Ready Tree;** Hollyleaf Cherry is acceptable substitute

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1164

Quercus agrifolia
Coast Live Oak

Family: *Fagaceae*

Photos: T. Russell; CalPoly SelecTree

Native Range: Central & Southern California
Shape: Rounded
Foliage Type: Evergreen
Size: 25-80' x 15-35'
Planting Area: 10'+
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Strong
Root Damage Potential: Moderate
Powerline Friendly: No
Leaves: Dark Green; Alternate, Simple; Oval
Bark: Dark Gray, Furrowed, Smooth
Litter: Dry Fruit
Flowers/Fruit: Inconspicuous flowers in spring; acorns in fall
Notes: **California native**; Native CA oaks have protected legal status and may require permits for trimming or removing

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1227

Quercus fusiformis
Escarpment Live Oak

Family: *Fagaceae*

Photos: ASU; CalPoly SelecTree

Native Range: South-Central United States, Mexico
Shape: Rounded
Foliage Type: Evergreen
Size: 50' x 20-40'
Planting Area: 10'+
Water Use Rating: Medium
Growth Rate: Slow
Branch Strength: Strong
Root Damage Potential: Moderate
Powerline Friendly: No
Leaves: Dark Green; Alternate, Simple; Oval
Bark: Black or Dark Brown, Blocky, Furrowed, Scaly
Litter: Dry Fruit
Flowers/Fruit: Inconspicuous flowers in spring; acorns in fall
Notes: **Climate Ready Tree**; medium water use

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1608

Quercus tomentella
Island Oak

Family: *Fagaceae*

Photos: D. Gress; CalPoly SelecTree

Native Range: California Channel Islands
Shape: Rounded
Foliage Type: Evergreen
Size: 30-70' x 35'
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Data Not Available
Root Damage Potential: Data Not Available
Powerline Friendly: No
Leaves: Dark Green; Alternate, Simple; Ovate
Bark: Dark Gray / Brown, Blocky, Smooth
Litter: Dry Fruit
Flowers/Fruit: Inconspicuous flowers in spring; acorns in fall
Notes: **California native, Climate Ready Tree**; Native CA oaks have protected legal status and may require permits for trimming or removing; suitable for monolithic sites

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1484

Senna surattensis
Kolomona

Family: *Fabaceae*

Photos: CalPoly SelecTree

Native Range: Australia and Southeast Asia
Shape: Rounded
Foliage Type: Evergreen
Size: 25' x 20-25'
Planting Area: 5-10'
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Medium
Root Damage Potential: Low
Powerline Friendly: Yes
Leaves: Green; Alternate, Pinnately Compound; Oblong
Bark: Gray, Smooth
Litter: Dry Fruit, Leaves, Flowers
Flowers/Fruit: Clusters of bright yellow flowers, followed by long brown seed pods
Notes: Synonym for *Cassia surattensis*

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/269

Tipuana tipu
Tipu

Family: *Fagaceae*

Photos: D. Gress; CalPoly SelecTree

Native Range: Bolivia and Southern Brazil
Shape: Rounded
Foliage Type: Deciduous
Height: 50' x 25-50'
Planting Area: 10'+
Water Use Rating: Medium
Growth Rate: Moderate
Branch Strength: Medium Weak
Root Damage Potential: Moderate
Powerline Friendly: No
Leaves: Light Green; Alternate, Pinnately Compound; Oblong
Bark: Dark Brown or Light Green, Fissured
Litter: Dry Fruit, Flowers
Flowers/Fruit: Bright yellow flowers in summer; samara in fall
Notes: Medium water use, weak branch strength

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1419

Umbellularia californica
California Laurel

Family: *Lauraceae*

Photos: G. Smith; CalPoly SelecTree

Native Range: California
Shape: Rounded
Foliage Type: Evergreen
Size: 6-80' x 3-30'
Planting Area: 10'+
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Strong
Root Damage Potential: Moderate
Powerline Friendly: No
Leaves: Green; Alternate, Simple; Spear-shaped
Bark: Dark Brown, Fissured
Litter: Dry Fruit
Flowers/Fruit: Small, fragrant yellow flowers in spring; cherry-size, green to purple drupe in summer
Notes: **California native**; medium water use

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1446

Washingtonia filifera
California Fan Palm

Family: *Arecaceae*

Photos: University of Arizona; CalPoly SelecTree

Native Range: Southeastern California and Northern Mexico
Shape: Palm
Foliage Type: Evergreen
Size: 70' x 10-20'
Planting Area: 5-10'
Water Use Rating: Low
Growth Rate: Moderate
Branch Strength: Medium Strong
Root Damage Potential: Moderately Fast
Powerline Friendly: No
Leaves: Dark Green; Alternate, Palmately Compound
Bark: Red Brown, Furrowed, Smooth
Litter: Dry Fruit, Large Leaves
Flowers/Fruit: Clusters of small white flowers in spring; clusters of small dark drupe in fall
Notes: **California native**; "skirts" need trimming; **only for planting in designated spots as indicated on flow chart**; replacement for *Washingtonia robusta*

CalPoly SelecTree: https://selectree.calpoly.edu/tree-detail/1470

2.7 Management Guidelines

This section outlines the major strategies for managing the community forest, many of which have been adapted from classical forestry for use in the urban environment. While the recommendations are for the entire community forest, they can and should be applied to Signal Hill's street trees. These guidelines are intended to assist city staff in monitoring and managing the rates of planting and removal and the overall composition of the forest. Policy makers, business people, developers and residents will find these strategies of interest since they set the context for day-to-day decisions affecting the forest.

From the perspective of the long-term health and appearance of the community forest, maintaining a diversity of tree species and ages is vital. A diverse forest, like a diverse natural ecosystem or a diversified economy, is likely to be more stable than a simple one. Should a pest, disease, climatic occurrence or other problem cause the removal of an entire species, diversity provides insurance against the kind of wholesale denuding of the forest cover that took place in many eastern communities with the invasion of Dutch elm disease.

Monitor overall species and age diversity. The city staff must keep track of the percentages of each species in the city and assess where imbalances may be developing. This monitoring will be a primary use of the city's tree inventory, with assessments made periodically.

Encourage planting a variety of species and cultivars. When a species begins to be over-planted, the City should discourage its use and recommend alternative species. A variety of cultivars of a single species might also be appropriate, if each is known to possess tolerances to certain conditions not found in the others. Although environmental stresses that are predictable will be selected against, a range of adaptability in the tree stock ensures against unanticipated problems. In general, the city as a whole should contain no more than 10% of any species, no more than 20% of any genus, and no more than 30% of any family.

Test new species and cultivars for wider application. The City should actively seek to expand its palette of acceptable trees by test-planting species not widely planted here and monitoring their performance. Since availability is often a limiting factor to the use of new species, the City could contract with nurseries both to provide experimental stock and to supply usable quantities once a species is proven. The city might also contract to have nurseries provide oaks and other native species grown from local genetic stock rather than those developed elsewhere in California.

Monitor pests and diseases within Signal Hill and neighboring communities. To prepare for problems which may entail large-scale removal and replacement of trees, the City should actively monitor all major pest and disease populations, both locally and regionally, that could adversely affect its forest. Preparations should then include special preventative health care of targeted tree species to help them withstand the disease, pest or other threat.

Foster age diversity by immediately replacing trees as they are removed. Replacement at removal will create a staggered-age new generation providing more or less continuous tree cover.

Anticipate removals and plan for plantings accordingly. To properly monitor age diversity, a useful life expectancy must be established for each species. This describes approximately how long the tree can be expected to remain in a healthy and vigorous condition, before serious decline sets in. At that point, the

expense of maintaining the tree in a pleasing and non-hazardous condition may exceed the benefits it provides. Its removal should then be considered, although the final decision should be subject to the removal evaluation process per the latest city policies.

Keep the inventory current. In order to gain the full benefits of the inventory, it is essential that each servicing of a tree be recorded in the inventory, together with an updating of the information about the tree to reflect any change in its status or condition. An accurate inventory will serve as the nerve center of a forestry effort which maximizes both program efficiency and forest benefits.

Inform the residents of the horticultural needs of trees fronting their property, especially for drought-tolerant species in parking strips in front of houses.

Removing Trees

Tree removal is perhaps the most sensitive decision to be made regarding the community forest. The depth of people's attachment to trees and the benefits associated with them become clear when one is slated for removal. However, when seen in the context of the lifecycle of the forest, and when complemented by vigorous efforts to preserve and replant trees, removals are an essential part of the overall care of the forest. Establishing clear criteria and a well-defined process for determining removals will help ensure that this aspect of forest management is accepted by the community.

In general, trees in a city should be allowed to grow to the maximum age possible. Unlike traditional forestry management, where value is measured by monetary return when harvested, the value of city trees comes from their ability to grow old and large, providing shade and beauty. As a part of routine maintenance, all trees will be monitored for hazardous conditions.

The relationship between timely removals and the long-term health of the forest cannot be overemphasized. Educating the community about the benefits of a managed forest is essential to avoid problems later on. Meeting with environmental groups to explain city management policies, as well as informing the public about tree removal criteria, will help the tree removal process proceed more smoothly.

Management Guidelines

- Monitor overall species and age diversity.
- Encourage planting a variety of species and cultivars.
- Test new species and cultivars for wider application.
- Monitor pests and diseases within Signal Hill and neighboring communities.
- Foster age diversity by immediately replacing trees as they are removed.
- Anticipate removals and plan for plantings accordingly.
- Keep the inventory current.
- Inform the residents of the horticultural needs of trees fronting their property.

3.0 PLANTING & MAINTENANCE

3.1 Planting the Tree

This chapter describes the actual installation of a tree, an event which is the culmination of the careful process of site and species selection. Proper planting techniques can greatly affect the lifelong health of the tree. The location for planting a tree has been determined. Underground utilities have been identified and the planting area sited so that the tree will not be in conflict with them. An appropriate species has been selected which meets the design guidelines, matches the environmental conditions, and fits the size of the planting area. The tree has been acquired and is ready for planting.

The time of year when the tree is planted has a major impact on the long-term success of a tree. Installation of trees during the months of November and December will facilitate movement of new roots in the surrounding soil before the hot weather arrives, and thereby accelerate the establishment of the tree in its new soil environment. It will also save on maintenance costs since much of the watering during the first four to five months will be taken care of by the winter rains. This timing has such a significant effect on the proportion of success in establishment of new trees that sincere efforts should be made to avoid planting street trees at any other time of the year than late fall.

By contrast, the worst time to install street trees is mid-spring through summer, when the maximum demand for moisture is taking place. At this time, it is most difficult to resupply moisture to the root mass as fast as it is being used by the foliage canopy of the tree. Transplant success ratios for trees installed during these months are significantly less than for those installed in early winter.

When spring or early summer planting is necessary, the following steps must be taken:

- Soak the rootball in wetting agent before removal from the container.
- Fill the planting hole with water and let settle before planting.
- Check rootball moisture at least once per week.

3.1a Guidelines for Tree Planting

1. Contact utility companies to locate underground utilities and call DigAlert, 811.
2. Obtain the necessary permit.
3. Notify nearby property owners if they have not been previously notified.
4. Gather tools and materials needed (see the checklist which follows).
5. Set up safety barricades.
6. Prepare the planting area.
7. Cut the pavement, if needed.
8. Dig the planting area.
9. Check for soil and drainage problems.
10. Add special materials such as root control barriers or drainage materials.
11. When possible, include modular suspended pavement support system (see "Modular Suspended Pavement Systems" in Appendix for details).
12. Fill the area with backfill and water to allow settlement overnight.
13. Check for drainage problems the next day. If water has not drained, choosing a different planting location is highly recommended.
14. Dig planting holes and plant and water the tree.
15. Install non-wire stakes and tree ties.
16. Add mulch over the planting area.
17. Place paving materials, tree guards and tree grates if required.
18. Clean up.

Record the tree planting in the city inventory database.

Standard tree planting details for Signal Hill are included on pages 95-97. Recommended changes to these guidelines are included in **Section 2: Design & Management Plan**.

3.1b Checklist for Planting

☑ Checklist for Planting

<u>The Basics</u>
- ☐ Trees
- ☐ Source of water
- ☐ People-power

<u>Power Tools</u>
- ☐ Concrete saw cutter
- ☐ Backhoe
- ☐ Auger
- ☐ Dump truck

<u>Hand tools</u>
- ☐ Mattock
- ☐ Planting bar
- ☐ Shovel
- ☐ Stake pounder
- ☐ Broom
- ☐ Can snips
- ☐ Gloves

<u>Materials</u>
- ☐ Mulch
- ☐ Backfill
- ☐ Gravel
- ☐ Modular suspended pavement support system
- ☐ Water retaining polymer
- ☐ Water wetting agent
- ☐ Fertilizer
- ☐ PVC perforated drainpipe, 36” min. lengths
- ☐ Tree stakes

3.1c Preparing the Planting Area

The lifespan of a street tree planted in typical urban conditions (i.e., a 36” square planting hole surrounded by extensive paving, with frequent pedestrian traffic) can be as brief as ten years. Providing the largest available amount of uncompacted soil section for growth is the most important factor in helping a tree grow to maturity.

Make the planting area as wide as possible Most tree roots grow horizontally in the first 12” of soil below finish grade. Larger planting areas (6ft. by 6ft.) are recommended on major streets and wherever possible. Parkways and tree wells that do not meet these standards must be widened by cutting the concrete. Soil is purposely compacted in urban areas to facilitate construction of pavement and buildings. In construction work a stable surface which will not settle is desired. Soil is usually compacted to 95% of the possible maximum. When trees grow in compacted soil their access to oxygen is limited, and both percolation and drainage of water are slowed. A tree’s roots cannot absorb needed nutrients without sufficient aeration and good moisture levels. In addition, compacted soils discourage deep rooting.

Often trees grown near pavement in compacted soil will put their roots under the hardscape as they seek water and air. (Shallow irrigation can also be a factor in this, and some tree species are naturally shallow rooted and/or aggressive in their rooting habits.) Moisture tends to collect under pavement, and the gravel layer often present there is a source of air. The temperature under pavement is often less vulnerable to extreme changes than the temperature of soil exposed to air. Creating a large, uncompacted planting area and providing good drainage and aeration will all help mitigate the problem of compaction. Preparing the planting area allows soil compaction to be lowered from the usual 95% to a maximum of 85%. Using a backhoe or power auger greatly

eases the task of digging the planting hole. If the hole is dug with an augur, the walls must be roughened with a planting bar to allow roots to penetrate the soil after the tree is planted. Trees require about 1.5 to 2 cubic feet of loam soil per square foot of canopy area, defined as the area within the mature diameter of the trees canopy spread. An industry rough rule of thumb is that 1,000 cubic feet of loam soil is the minimum required, but this is still not sufficient to support a large mature tree such as an Oak or Plane tree. (See **Figure 3.1.1** from page 205 of Up By Roots by James Urban) There are many optional approaches to adding loam soil under pavement, each is different in its

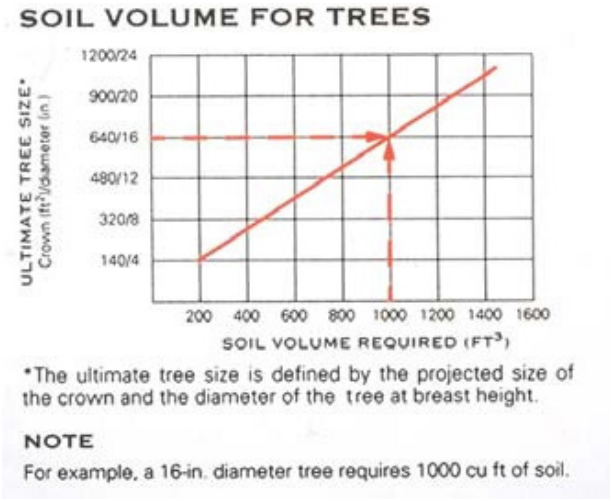


Figure 3.1.1: Tree Size to Soil Volume Ratio, James Urban

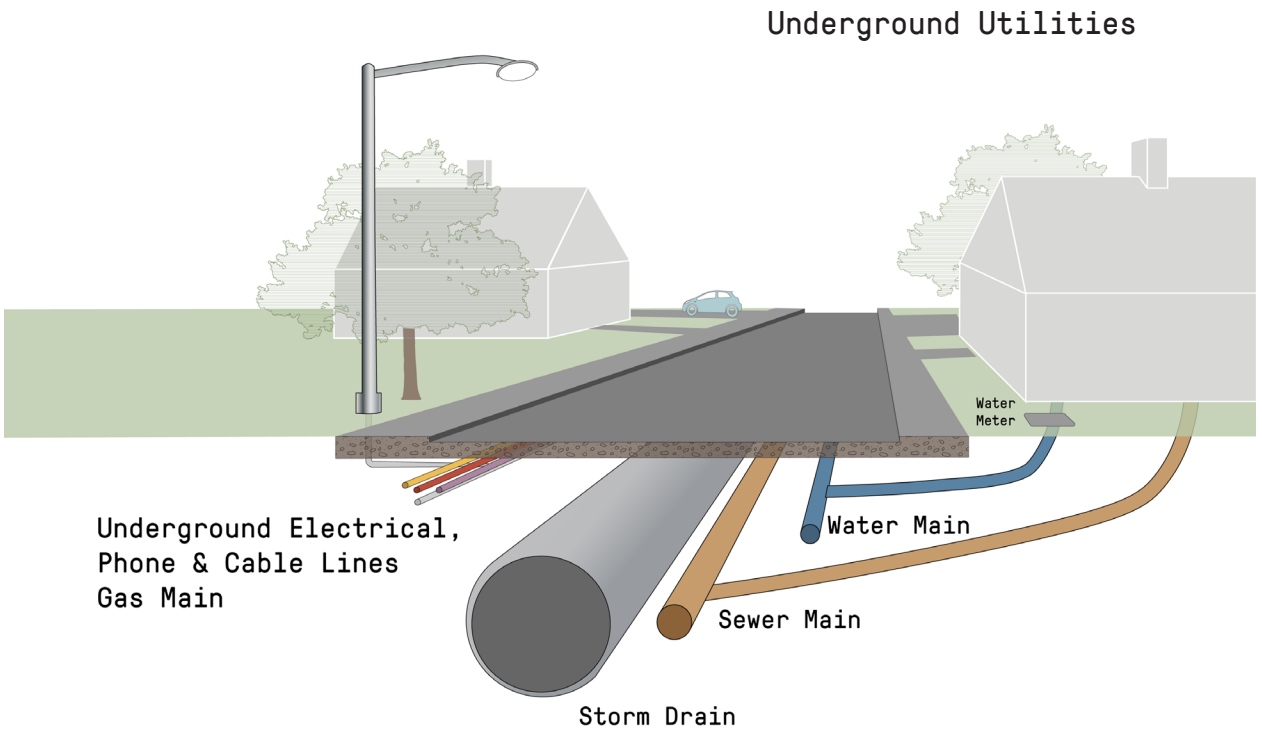


Figure 3.1.2: Underground Utilities. Be careful to check for underground utilities before planting a new tree.

effectiveness. Stone based structural soil only contains 20% loam soil and thus requires 5,000 cubic feet of material to get to the 1,000 cubic feet minimum. Sand based structural soils have limited testing and have not performed nearly as well as loam soil. The most efficient system is to increase the loam soil under pavement by using a modular suspended pavement system filled with unscreened loam soil.

Locate Underground Utilities

Every home and business in Signal Hill is served by public utilities: water, wastewater, gas, electric, telephone, and cable television. Wastewater laterals are particularly susceptible to damage and stoppages due to root intrusion by trees and even large shrubs, especially in times of drought. This results in both added and unnecessary costs to the city as well as the individual property owners.

City crews and/or property owners must contact the various utility companies prior to scheduling planting to determine the location of their respective utility laterals prior to digging. The location of a water service lateral is usually obvious because the water meter should be visible at the ground surface. This is not, however, true with the other utilities. It is not uncommon to dig or drill directly into a gas main or wastewater lateral. People may not be aware that they have hit a wastewater lateral and unknowingly plant their tree, resulting in possible flooding at a later date. There is also potential danger from cutting into a gas main (resulting in explosions or fire), or electrical conduit (causing shock or electrocution).

Planting in Tree Wells

Cutting existing pavement may be needed to create an adequate tree well. This work requires the use of heavy equipment and should only be done by city crews or an appointed contractor with a permit from the city. A diamond saw cutter, jackhammer, backhoe, loader and dump truck may all be required depending on the situation.

Check For Soil and Drainage Problems

While digging and preparing the planting area, it is recommended that you check for any adverse or unusual soil conditions such as alkalinity, poor drainage, rocks or debris, or compaction. These conditions must be remedied prior to planting.

Alkalinity may be found by looking at color. Gray or white soil usually indicates an alkaline condition. The use of alkaline-tolerant species is recommended.

Poor drainage can be identified by filling a planting hole with water and seeing how long it takes to drain. If water in the hole has not settled at least one inch in one hour, do not plant before special drainage preparations are tried. If the water has not drained overnight, a new planting location should be chosen. Also check the species selected to be sure it will grow in poorly drained soil. If not, contact the Public Works Director or designated personnel.

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

The soil on construction sites is often compacted - either unintentionally, due to the movement of heavy equipment and materials, or deliberately, to help the soil bear the weight of buildings and pavement. These compacted soils can create conditions similar to both bedrock and hardpan, especially when the existing soil has a high clay content. Trees should never be planted in soils which have a compaction rate higher than 85%.

If compaction is severe, a breaker bar may be needed to loosen the soil or drill through hardpan. (See the following section on improving drainage.)

Backfill

When preparing and planting trees in clay soils, do not add soil amendments unless special conditions require it, such as highly alkaline soil. Although organic materials can improve the structure and permeability of any soil, if you add a large quantity to a planting hole in clay soil you can, in effect create an underground “container” for a new tree’s roots. Upon reaching the perimeter of the planting hole and its soft, permeable, conditioned soil, roots will then run into dense native clay and have difficulty penetrating it. Excess water also collects in the amended planting hole, waterlogging the root zone and possibly killing the tree from lack of air in the soil.

In clay soils, the backfill mix should be native soil which has been loosened by excavation of the planting area. Water immediately after

placing the backfill in the planting area and tamp to settle the backfill and add soil as necessary to achieve finish grade before digging planting hole.

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

Laboratory analysis. For large plantings, soil samples from several spots on the site should be submitted to a professional soil laboratory. The resulting chemical and particle size analysis gives both the makeup of the soil and recommendations for corrective measures and appropriate plants.

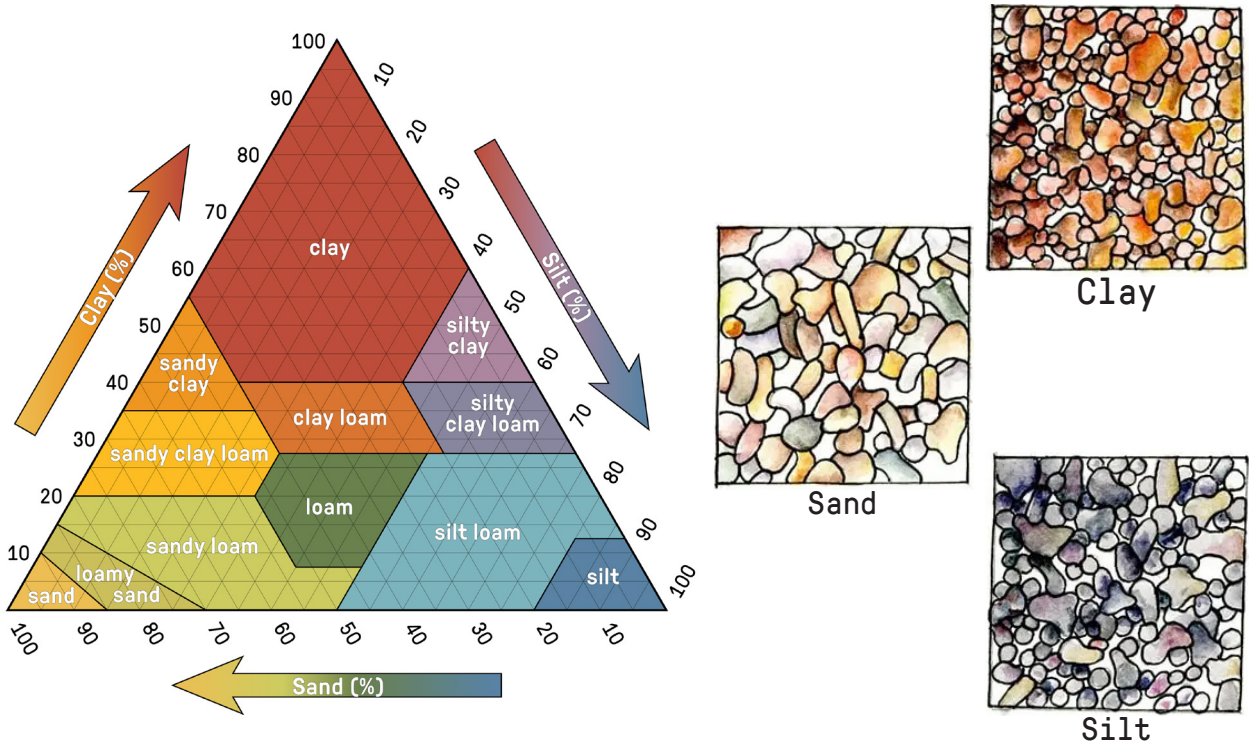


Figure 3.1.3: USDA Soil Types. Source: Wikimedia, Carrie Lapolla

Improving Drainage

Constantly wet soil prevents active root growth. Various methods for assuring acceptable drainage in the planting area should be used. In the very worst cases, where no percolation takes place, and the layer creating the problem is too thick to drill through, planter holes must be thought of as bathtubs. A drain line must run from the bottom of the "bathtub" to a common drain.

Where a hardpan layer is encountered, drill numerous 2" diameter holes through the hardpan. This can be accomplished using pneumatic tools such as an air spade/ air knife, or a mechanical auger. In clay soils which drain slowly but in which the topsoil is at least 6 ft. deep and continuous, irrigation should be thorough and infrequent. If water does not drain when tested while preparing the planting area, 6" diameter holes augured to a depth of 2 ft. minimum, and filled with gravel, may help keep water away from the roots. In deeper soils with an uninterrupted soil profile to a depth of 10 ft. or more, no drainage arrangements should be needed.

Root Control Barriers

The recommended minimum planting area is 4 ft. by 8ft. Root control devices should be used whenever the tree must be in a 48" square or smaller opening of a pavement area. They should also be used when a tree is planted in an area adjacent to pavement, within 5 ft. of the pavement. Any tree species, in most soils, will eventually damage surrounding pavement in openings less than 36" square without root control, and many will cause damage in areas of less than 48". While barriers help direct the tree's root growth downward, they should not be thought of as removing the need for proper species selection. An alternate method of root control is to use a bio barrier. This is a geotextile fabric (a synthetic textile which can be placed underground) impregnated with an herbicide.

Trees in Turf Areas

In turf areas, when appropriate, trees are to be installed with a 3 x 3 ft. wood header to keep turf away from the tree trunk. Lawn mowers and string-trimmers cause tremendous destruction of the cambium layer, and must be kept away from tree trunks.

3.1d Preparing Planting Holes and Placing the Tree

After the planting areas have been prepared, drainage and root barrier systems have been installed, and the back fill has been well settled, the planting holes are dug and the trees planted.

Container Grown Trees

Do not plant the tree until the buttress roots have been found. Tree nurseries often grow trees too deeply in the container soil mix. Trees whose buttress roots are not visible are at high risk of developing roots that girdle (strangle) the trunk. Take time to pull away any soil that is covering the buttress roots. The exposed and visible buttress roots should be planted at grade, or 1-2 inches above grade. Plant the tree when the root ball is moist. Dry root balls are tough to moisten once planted, and overly wet root balls may fall apart during planting.

1. Dig the planting hole at least twice as wide as the root ball, and only as deep as the root ball.
2. Remove the tree from the container, carefully supporting the root ball from below. Trees should never be handled by the trunks (except bare-root trees). Handle all trees by their containers or root balls.
3. Check the root ball for signs of being rootbound. Reject any badly rootbound trees, or trees with kinked roots. Otherwise, sever any circling or matted roots with a saw, sharp shears, or a knife.
4. Set the tree in the planting hole so that the buttress roots are at grade, or 1-2 inches above grade. (The tree will settle to grade when watered.)
5. Fill in about half the hole with backfill and soak the soil. When the water has drained away, fill in the rest of the planting hole.
6. Form a watering basin of the same diameter as the root ball, and fill up the basin three times, letting the water drain each time

Bare Root

1. Soak the tree's roots in water or keep them in a moist plastic bag while preparing planting hole.
2. Form a mound or cone of soil in the center of the planting hole.
3. Place the roots of the tree on this mound, carefully spreading them out at their natural angles. Roots should fit the planting hole without bending or cutting them.
4. Plant the tree with its buttress roots at grade, or 1-2 inches above grade.
5. With the tree positioned on the cone of soil, fill in about half of the hole with backfill soil

and soak the soil.

6. When the water has drained away, fill in the rest of the planting hole with more backfill and water it. If the tree settles too low in the process, you can raise it to the proper position while the soil is moist by grasping it firmly and gently, lifting it up with a side-to-side rocking motion until it is at the proper height.
7. Apply more soil and water until the tree remains at the correct level.
8. Form a watering basin which is the same diameter as the root system, and fill up the basin three times, letting the water drain each time.

Ball and Burlap

1. Soak the root ball thoroughly with a water one to two days before installation.
2. Do not plant the tree until the buttress roots have been found. Tree nurseries often grow trees too deeply in the field soil. Trees whose buttress roots are not visible are at high risk of developing roots that girdle (strangle) the trunk. Take time to pull away any soil that is covering the buttress roots.
3. The exposed and visible buttress roots should be planted at grade, or 1-2 inches above grade.
4. Dig a planting hole twice the diameter of the root ball and the same depth as from the bottom of the root ball to the buttress roots.
5. Place the tree in the planting hole. Verify that the buttress roots are at grade, or 1-2 inches above grade.
6. Remove as much of the burlap and metal cage as possible without the root ball falling apart. Bolt cutters are useful for removing the metal cage and a box cutter is useful for removing the burlap.
7. Fill the hole to half its height with backfill soil and water. When the water has drained away, fill in the rest of the planting hole with more backfill and water it.
8. Form a watering basin which is the same diameter as the root ball, and fill up the basin three times, letting the water settle in between soakings.

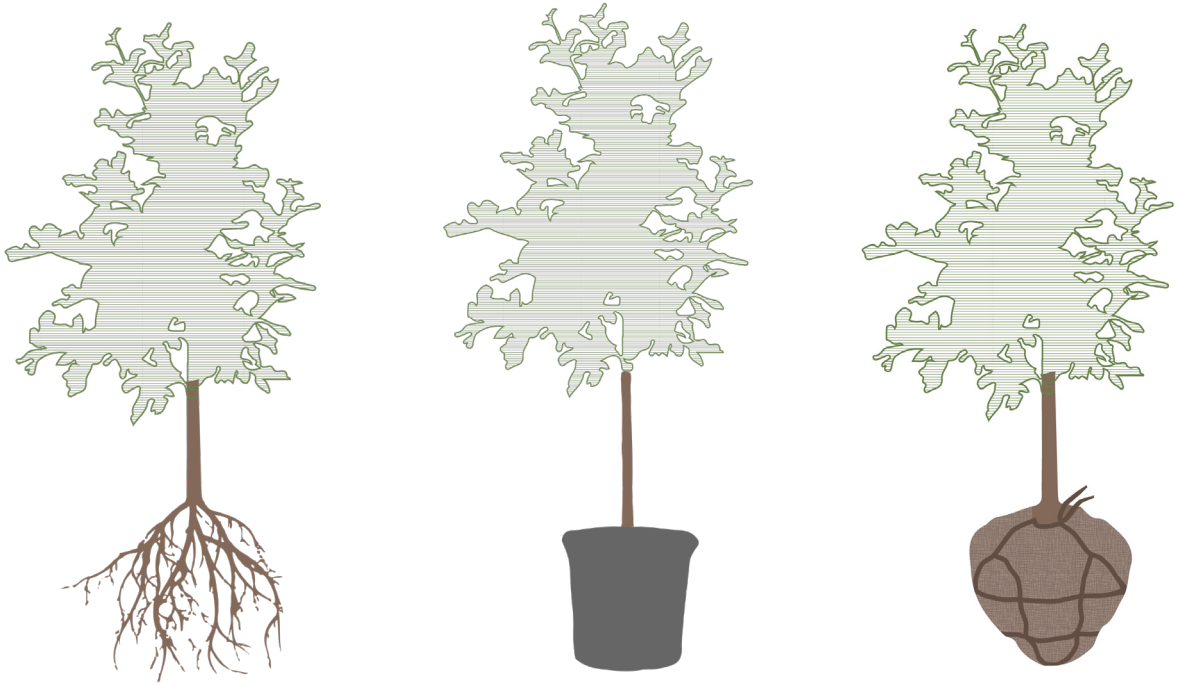


Figure 3.1.6: Trees from Nurseries. Trees may come in just their roots, in a container, or with their roots wrapped in burlap.

Slow-release irrigation bags, such as the Treegator pictured above, can be installed at planting. These bags prevent water waste from runoff and allow the tree to be watered weekly. Photo: treegator.com

3.1e Staking the Tree

The purpose of staking is to stabilize the root ball until the roots can anchor the tree, supporting the trunk in an upright position, and protecting the trunk from injury. Whenever possible, it is better to not stake a tree if it can stand without one. The tree will develop a strong trunk in a shorter period without staking. Conifers, upright growing trees, and trees planted bare root may not need staking. However, some nursery-grown trees will need staking for stability and protection from injury.

As support stakes for five-gallon to 24-inch box trees, install two 2" diameter (or 2" by 2") stakes per tree, tall enough for the particular tree. Install the stakes outside the root ball and a minimum 30" below grade to ensure stability. Supplemental stakes for anchoring the root ball or for protection should be 3 ft. long, with half the length of the stake below grade. Support stakes should be perpendicular to the prevailing wind direction. A 1" by 3" cross bar in may be added for stability. On windy sites where the wind comes from several directions, a three-stake system may be needed.

Ties should be flexible to allow for growth of the trunk. Wire ties should never be used. Install ties at one point only, at 6" above the natural bend point of the tree. To find the bend point, remove the nursery stake (the small stick attached to the trunk at the nursery) and pull the top of the crown to one side, holding the trunk with one hand. The point on the trunk where the canopy will snap back to an upright position by itself is the natural bend point. Pruning the tree at planting time, when indicated, will lighten the weight of the canopy and raise the natural bend point.

Cut the tops of the stakes so that they are only 2" to 3" taller than the point where the ties are placed. This prevents the top of the tree from rubbing against the stakes in strong winds.

The nursery stake should usually be removed at planting time. However, if the trunk is too weak to stand without the stake, it should be cut and reattached as an auxiliary stake. The auxiliary stake should be attached 2" above the root ball and no higher than 24" from the tip of the tree's central leader. An even better auxiliary support in this case would be a flexible spring steel rod (or other flexible support stake such as fiberglass or bamboo) extending from 2" above the root ball to 6" above the natural bend point of the tree. The rod should be 1/4" diameter for five-gallon containers and 3/8" diameter for fifteen-gallon containers. Tie the rod to the trunk with one-inch-wide plastic tape at 6" to 10" on center. Auxiliary stakes do not take the place of support stakes. Their sole purpose is to help strengthen and straighten the trunk while allowing movement.

Ties should contact the trunk with a broad surface to minimize rubbing or girdling, and they should have some elasticity. Wire should never be used. Elastic webbing, tire cording, or heavy polyethylene tape (for small trees) can be used. The tie should be loosely looped

around the trunk. Two ties, one from each stake, should be used.

Larger trees, 36" box or larger, may require a guying system for anchorage. The least hazardous method for pedestrians is an underground auger anchor, such as Duckbill earth anchors. Above grade guy wires should not be used.

For small trees which may need protection against weed competition and human and machine damage, trunk guards may be used. Trunk guards should be made of stiff materials that hang loosely around the trunk, which prevents trunk constriction and prevents moisture from being trapped against the trunk. Trunk protection tubes are often made of plastic.

3.1f After the Tree is in Place

A 4"-deep layer of shredded bark or bark chips should be spread over the entire planting area outside the watering basin at planting time wherever possible, to conserve soil moisture, inhibit weed growth, and prevent baking of the soil by the sun. Mulch will also improve soil fertility and soil structure as it degrades into the soil. For trees in tree wells or narrow planting strips, where mulch would tend to spill out on the pavement, it may be necessary to use a thinner layer. Shredded bark is preferable on slopes as it has less tendency to slip than bark chips. Mulch should never be in contact with the tree trunk and be kept clear of the buttress roots.

Placing Paving Materials

Paving materials laid flush with the soil in a tree well generally cause compaction and limit access for watering, but they are a better method than planting in smaller cutouts. They will also cause trunk damage and girdling if in constant contact with the trunk. In high-traffic areas, where the planting areas need to be diminished to allow for pedestrian movement, use a tree grate or other self-supporting system which does not compact the soil.

Where new paving is installed, it should slope away from the planting area so that excess runoff does not drain toward the tree in the winter. Water from paved surfaces also carries alkaline chemicals and motor oil residue into the soil.

When possible, install a modular suspended pavement support system per manufacturer's most recent recommendations prior to replacing or installing new pavement.

Placing mulch around a street tree. Photo: canopy.org

Installing Tree Guards and Grates

In high-traffic areas more protection is needed for young trees. In some cases, aesthetics may demand iron tree guards, but they must be removed as the tree matures or they will strangle the tree.

Perforated iron tree grates or precast concrete tree covers with perforations may be used if they are self-supporting above the soil. The perforations allow air and water to reach the soil. The grates must be expandable (by means of knock-out sections) to allow for trunk growth. Pea gravel is the recommended mulch material when tree grates are used.

Turf and Ground Covers

Turf and ground covers should not be installed within a tree's watering basin, as they will compete with the tree for nutrients; the tree may also suffer damage from mowers and string-trimmers. Frequently when trees are planted, ground cover is kept at least 3 or 4 ft. from the tree. However, sometimes the aesthetic benefit of ground cover, or the need to protect or enhance trees in high traffic areas, outweighs the problem of competition for nutrients. This is a design decision that needs to made for each situation.

Cleaning Up

The work area should be swept, debris removed, and tools returned. The new tree should be entered into the street tree database.

3.1g Why Trees Sometimes Die After Planting

- Lack of water.
- Overwatered, soggy soil.
- Insufficient preparation of the planting area, so that soil compaction is not corrected.
- Failure to correct alkalinity in the soil and to plant an alkaline-tolerant species.
- Loss of roots from overly severe root pruning (roots are often pruned to compensate for a root bound condition in containers) or from a root ball breaking apart when handled.
- Drying of roots from exposure to sunlight before planting, in bare root trees.
- Air pockets, stones, or hard clumps in the soil which prevent contact of the roots with the soil.
- Crowding of the roots into too small a planting hole.

Dead street trees can be avoided. Photo: S. Bloch

3.1h Signal Hill Standard Tree Planting Details

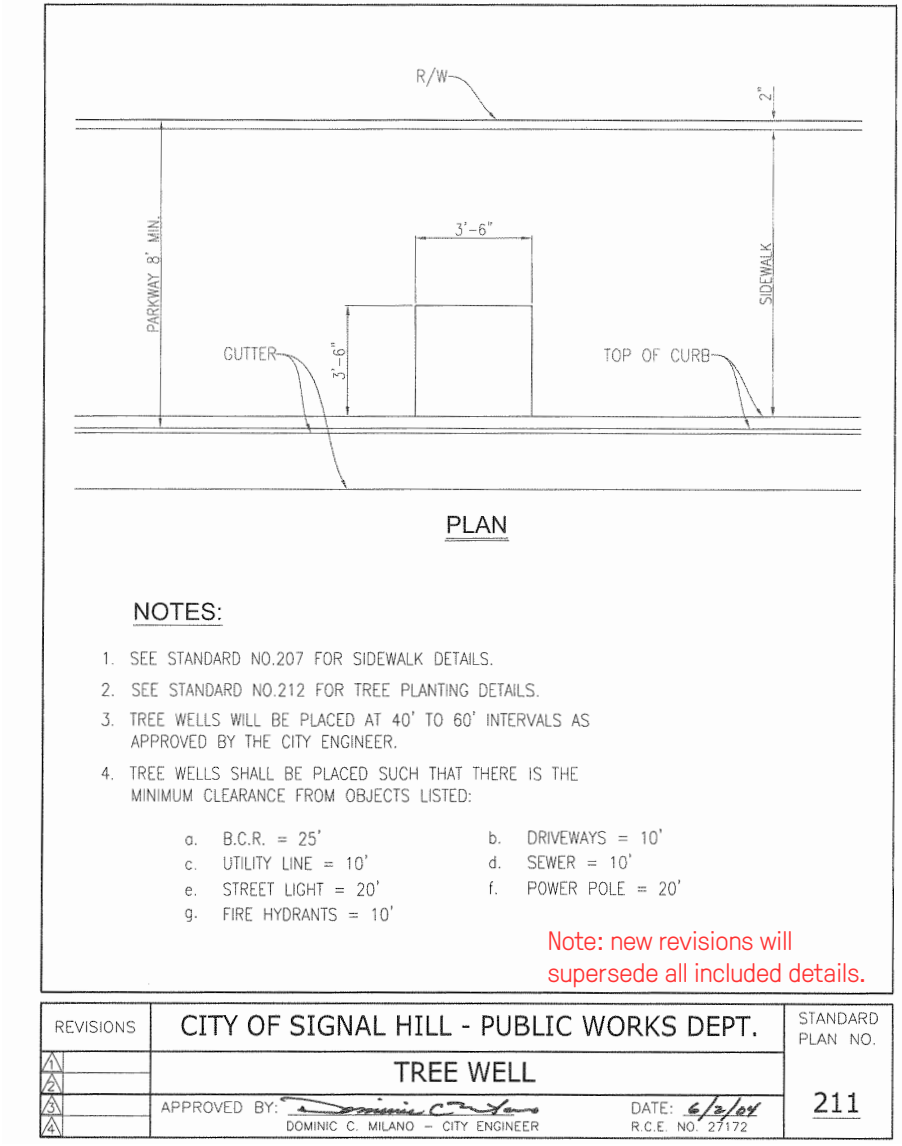


Figure 3.1.7: Signal Hill Public Works Tree Well Detail, Plan (211)

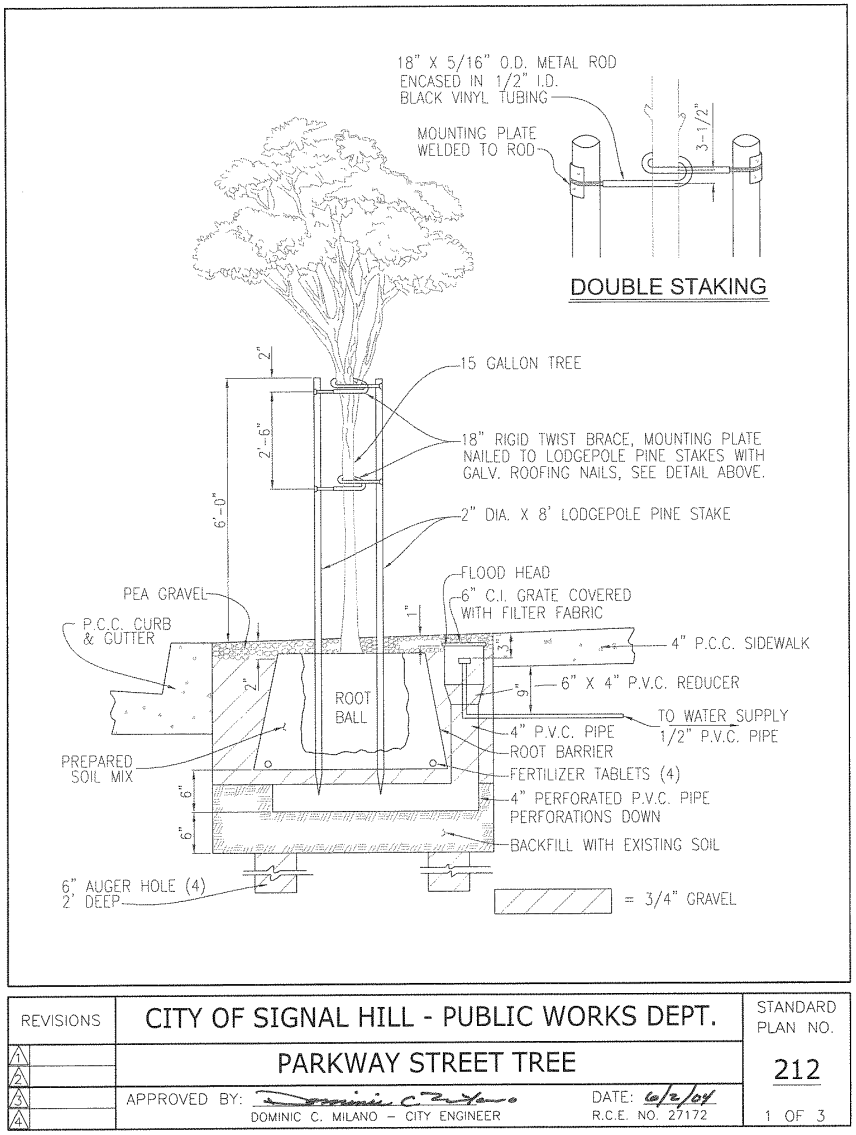
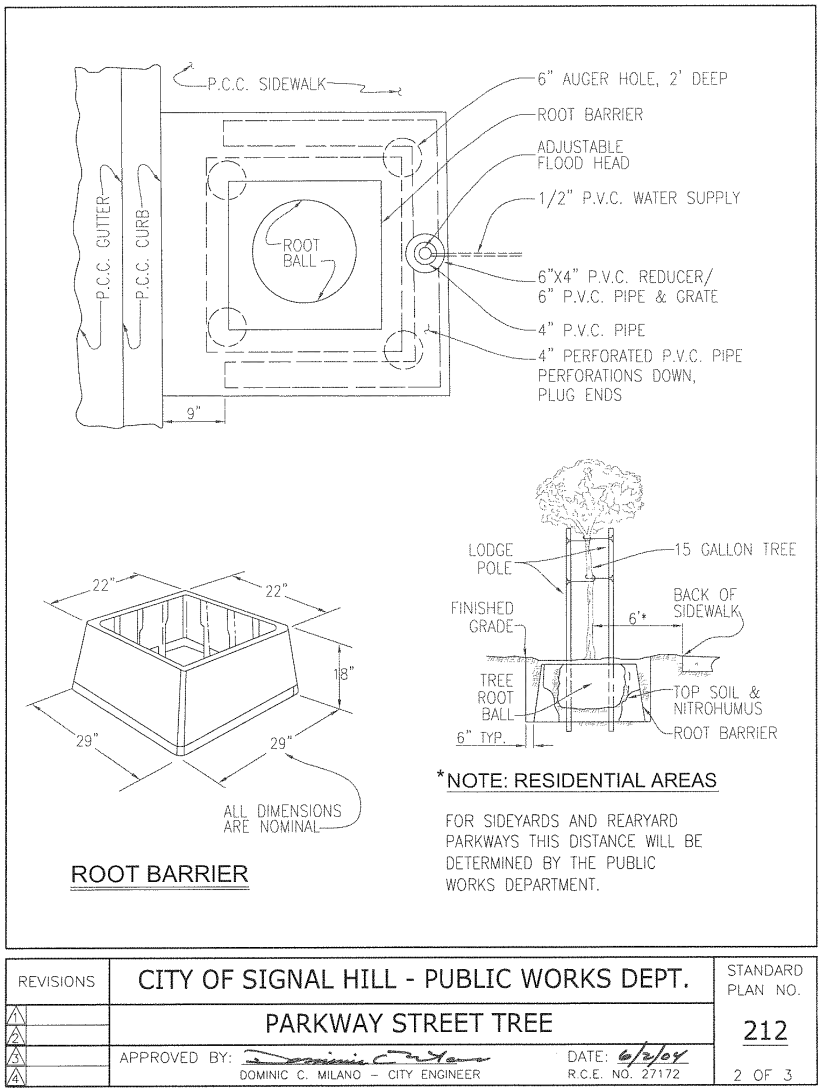


Figure 3.1.8: Signal Hill Public Works Parkway Street Tree Planting Detail, Section (212)



REVISIONS	CITY OF SIGNAL HILL - PUBLIC WORKS DEPT.	STANDARD PLAN NO.
1	PARKWAY STREET TREE	212
2		
3	APPROVED BY: DOMINIC C. MILANO – CITY ENGINEER DATE: 6/2/04 R.C.E. NO. 27172	2 OF 3
4		

Figure 3.1.9: Signal Hill Public Works Parkway Street Tree Planting Detail (212)

NOTES:

1. STREET TREES PLANTED IN PARKWAYS AND PUBLIC RIGHT-OF WAY SHALL FOLLOW THE REQUIREMENTS SPECIFIED IN THIS STANDARD.

2. STREET TREES SHALL BE PLANTED ALONG STREET FRONTAGES (SEE STANDARD PLAN NO. 211) AT LOCATIONS DIRECTED BY THE PUBLIC WORKS DEPARTMENT. THE TREES SHALL BE OF AN ESTABLISHED 15 GALLON STANDARD SIZE AND OF A SPECIES DESIGNATED BY THE PUBLIC WORKS DEPARTMENT.

3. PRIOR TO INSTALLATION , ALL TREES AND HOLES MUST BE INSPECTED AND APPROVED BY THE DEPARTMENT OF PUBLIC WORKS FOR COMPLIANCE WITH THIS STANDARD.

4. ALL TREE HOLES SHALL BE 6" LARGER IN DIAMETER AND 4" DEEPER THAN EXISTING BALL AFTER CONTAINER HAS BEEN REMOVED. AREA BETWEEN BALL, HOLE BOTTOM AND ROOT BARRIER SHALL BE FILLED WITH TOP SOIL AND NITROHUMUS AND WATERED TO PREVENT AIR ENTRAPMENT.

5. ALL TREE HOLES SHALL BE PROVIDED WITH A DEEP WATERING DEVICE MADE WITH SCHEDULE 40 P.V.C. PIPE AS SPECIFIED IN THIS STANDARD. THE ADJUSTABLE FLOW RANGE - FLOOD HEAD SHALL BE BRASS, (ENCLOSED WITH A FILTER-FABRIC SOCK AND SECURED BY A STAINLESS STEEL CLAMP) AND LOCATED A MAXIMUM OF 3" BELOW FINISHED SURFACE. THE WATER SUPPLY SHALL BE CONNECTED TO THE IRRIGATION SYSTEM FOR THE ADJACENT DEVELOPMENT. THE WATERING SCHEDULE SHALL BE COORDINATED WITH THE DEPARTMENT OF PUBLIC WORKS. DEPARTMENT OF PUBLIC WORKS MAY ELIMINATE DEEP WATERING DEVICE.

6. ALL TREES SHALL BE LOCATED, PLANTED AND STAKED AS SPECIFIED IN THIS STANDARD. THE DEPARTMENT OF PUBLIC WORKS SHALL BE NOTIFIED 24 HOURS PRIOR TO PLANTING ANY TREE.

7. ALL TREES SHALL HAVE CONTAINERS REMOVED FOR INSPECTION OF THE ROOT ZONE. ANY TREE FOUND TO ROOT BOUND SHALL BE REPLACED.

8. ANY TREE PLANTED WITHIN 6' OF A PUBLIC SIDEWALK SHALL BE SUBJECT TO THE REQUIREMENTS IN THIS STANDARD.

9. ALL TREES MUST BE PLANTED IN A DEEP ROOT BARRIER OR EQUIVALENT AS ILLUSTRATED IN THIS STANDARD. ROOT BARRIER SHALL BE FABRICATED FROM A HIGH DENSITY AND HIGH IMPACT PLASTIC SUCH AS POLYVINYL CHLORIDE. ABS OR POLYETHYLENE AND HAVE A MINIMUM THICKNESS OF 0.06 INCH. THE PLASTIC SHALL HAVE ½ INCH TO ¾ INCH HIGH RAISED VERTICAL RIBS ON THE INNER SURFACE SPACED NOT MORE THAN 6 INCHES TO 8 INCHES APART.

10. TREE STAKES SHALL BE TREATED WITH COOPER NANTHANATE.

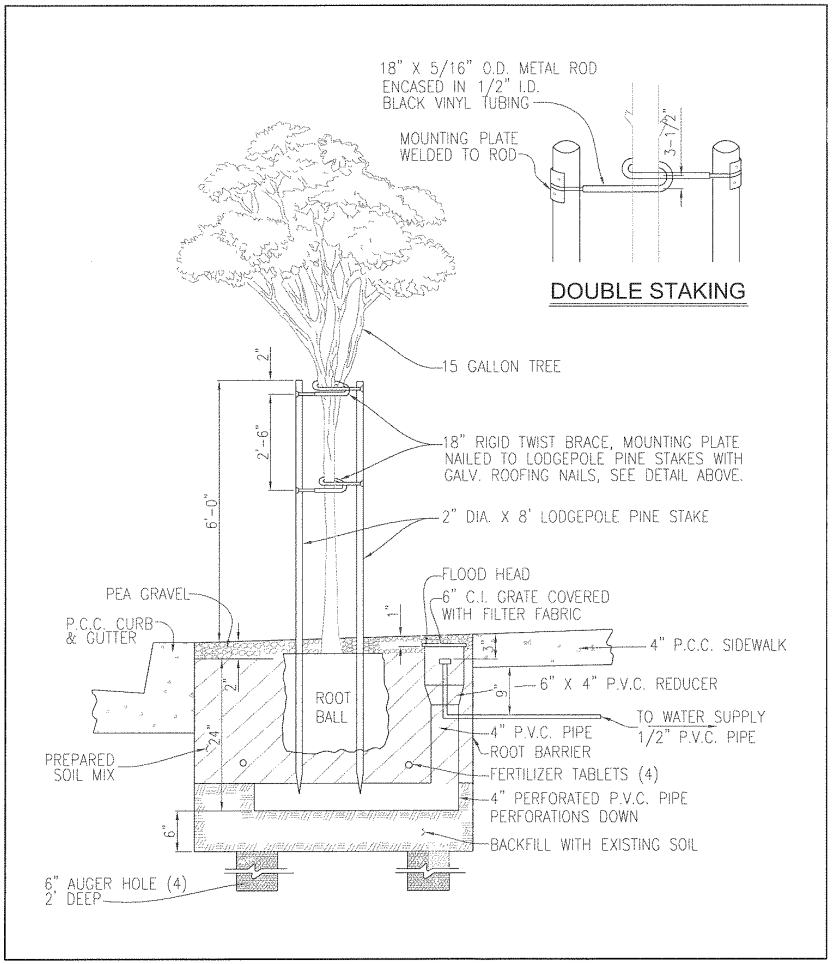
11. TREES SHALL BE CENTERED IN TREE WILL OR PARKWAY AS DIRECTED.

12. FERTILIZER TABLETS SHALL BE GRO-POWER 12-8-8.

13. DEPARTMENT OF PUBLIC WORKS MAY SUBSTITUTE OTHER MATERIALS FOR THE PEA GRAVEL. THE CAST IRON GRATE SHALL BE COVERED WITH A LOOSE FITTING FERRULE TO PREVENT OTHER MATERIALS FROM ENTERING DEEP WATERING DEVICE AND TO ALLOW WATER TO FLOW OUT OF THE DEVICE

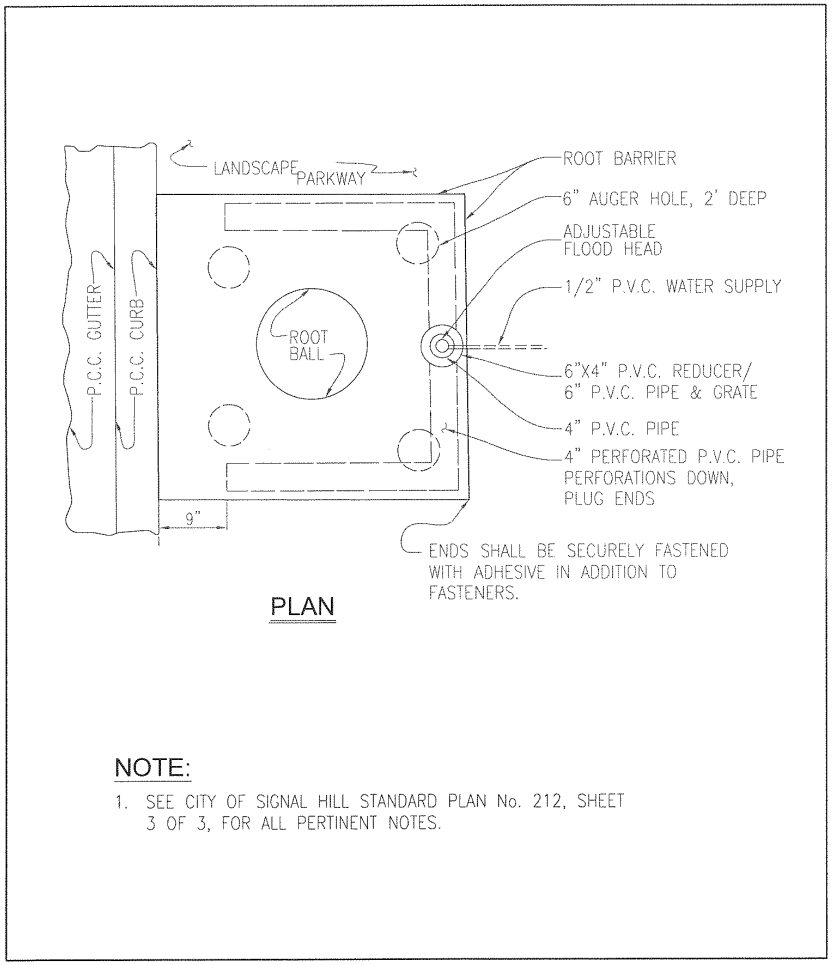
REVISIONS # DATE	CITY OF SIGNAL HILL - PUBLIC WORKS DEPT.	STANDARD PLAN NO.
1	PARKWAY STREET TREE	212
2		
3	APPROVED BY: DOMINIC C. MILANO – CITY ENGINEER DATE: 6/2/04 R.C.E. NO. 27172	SHEET 3 OF 3
4		

Figure 3.1.10: Signal Hill Public Works Parkway Street Tree Planting Detail, Notes (212)



REVISIONS	CITY OF SIGNAL HILL - PUBLIC WORKS DEPT.	STANDARD PLAN NO.
1	PARKWAY STREET TREE	212A
2		
3	APPROVED BY: DOMINIC C. MILANO – CITY ENGINEER DATE: 6/2/04 R.C.E. NO. 27172	1 OF 2
4		

Figure 3.1.11: Signal Hill Public Works Parkway Street Tree Planting Detail, Section (212A)



REVISIONS	CITY OF SIGNAL HILL - PUBLIC WORKS DEPT.	STANDARD PLAN NO.
1	PARKWAY STREET TREE	212A
2		
3	APPROVED BY: DOMINIC C. MILANO – CITY ENGINEER DATE: 6/2/04 R.C.E. NO. 27172	2 OF 2
4		

Figure 3.1.12: Signal Hill Public Works Parkway Street Tree Planting Detail, Plan (212A)

3.2 Maintaining the Tree

3.2a Pruning

Regular maintenance and pruning is to be carried out by the contracted arborist. Currently, the city trims by grid. It is recommended that the city adopt a species-based trimming schedule; however, due to budget constraints, staff recommends to prune/trim on a biannual basis with the exception of sudden growths or unforeseen circumstances. **Additionally, trees are not to be pruned to protect or enhance a view.**

3.2b Tree Removals

All trees eventually will need to be removed due to old age, disease, death, or problems with hardscape destruction. Removal of any tree of 15 feet in height or more is a procedure which, like tree pruning, should have the supervision of a qualified tree specialist. Tree climbers should have an ISA Climber's Certificate and on-the-job rope training. It is a dangerous operation requiring specialized knowledge and equipment, and care must be taken to avoid injury to workers or the public, or damage to property.

Limb and Branch Removal

Wood infected with wood boring insects such as shot hole borer, eucalyptus longhorn beetle, or pine bark beetle must be handled differently because of insect problems. Chip, bury, burn, or tarp all infected wood. Tarp with 6 mil thick clear plastic, and leave stored for at least 6 months. It is inappropriate to transport infected firewood outside of city limits and depending on type of pest and local regulations, may be illegal. Trees infected with the shot hole borer must also be handled differently. Wood should be chipped to help limit the spread of the beetle/fungus complex. Wood should be chipped to pieces smaller than 1". Unchipped logs should be stacked into small piles and treated by solarizing/tarping under clear plastic.

Stump Removal

Stumps should be ground out or pulled out even if they aren't in the way of replanting. They provide sites for insect infestations and fungus infections, particularly the fungus Armillaria mellea (honey mushroom fungus). Pine stumps are also attractive to the pine bark beetle, and the California turpentine beetle. Eucalyptus stumps can harbor eucalyptus longhorn beetle.

Tree stumps should be removed promptly to prevent the spread of pests. Photo: G. Castriotta

These infestations can spread to nearby live trees. Stumps should be removed to a depth of 24" for most trees.

3.2c Tree Watering

No absolute rule exists that will tell you precisely how often to water trees. Watering frequency will be influenced by the type of tree, weather conditions, soil type, root competition from other plants, and how well the tree is established.

A basic goal of this the Master Plan is to plant trees which are compatible with the natural water cycles Southern California. Most of the trees on the recommended list will survive on normal rainfall once they are established.

Proper tree irrigation creates a root zone that will be moist enough to encourage growth of new roots but not so wet that air is continually excluded from the soil pore space, which hampers growth. In addition, proper irrigation should encourage deep root penetration that can sustain a tree in dry periods. This also keeps the tree from developing shallow roots which can crack pavement. Infrequent, slowly applied, deep watering is the best way to accomplish these goals. Frequent light sprinklings or surface irrigation, such as turf watering, will discourage deep rooting. A

Table 19 Infiltration Rates	
Soil Texture	**Infiltration Rate (Inches/Hour)**
Sand	1-10
Sandy Loam	.5-3
Loam	.3-.8
Clay Loam	.1-.6
Clay	.01-0

Table 20 Soil Moisture	
Amount of Moisture	**Feel or Appearance of Soil**
Close to 0% field capacity. Little or no moisture available	Sandy loam: dry, loose; flows through fingers Clay foam: Somewhat crumbly; will hold together with pressure
50-75%. Enough available moisture.	Sandy loam: Tends to ball under pressure but will seldom hold together. Clay loam: Forms a ball; somewhat plastic; may stick slightly with pressure
75%. Plenty of available moisture.	Sandy loam: Forms weak ball; breaks easily. Clay loam: Forms a ball, very pliable

new 15-gallon tree will need to have the soil moistened to a depth of at least 12", and a mature tree to a depth of at least 24" with each irrigation.
Newly installed trees can easily have their root balls dry out, even when the surrounding soil is very wet. Care must be taken to make sure that water is getting to the root ball by making the watering basin of a newly installed tree the same size as the root ball.

The use of a mulch around the tree is recommended to slow the evaporation of water. A 4" layer of shredded bark or bark chips will help retain moisture and discourage weed growth. Most standards call for a 2" minimum layer, but recent studies show that a 4" layer is 5 times more effective in retaining moisture and discouraging weed growth. In tree wells and narrow planting strips where there might not be enough room for the full 4" depth, install as deep a layer as possible without spilling over.
Note: mulch should never be placed against the trunk of the tree or root flare.
Using a soil probe to determine the soil moisture content in the root zone is the most effective way to schedule watering. If the soil is wet enough to make a solid, firm ball, the tree should not be watered. It is also important to begin irrigating in the spring before the soil has dried out, in order to make use of the reservoir of water from the winter rains. It requires much less irrigating to replace the water lost through a week of evapotranspiration than it does to totally recharge the planting area reservoir.

Watering Frequency Guidelines

These guidelines assume average weather conditions and rainfall, and are for all trees during establishment regardless of species water preferences.

For the first 2 to 3 weeks after planting:
- New trees may require water every 2-4 days, especially in hot weather. In winter, container-grown evergreens need water at least once a month.

First year:
- Fall and spring: once weekly
- Summer: twice weekly

Second year:
- Fall and spring: twice monthly
- Summer: once weekly

Third year:
- Once a month during the dry season

Fourth year and after:
- Two waterlogs during the entire dry season, if needed.
- Drought tolerant trees often do not need

any further irrigation.

- In times of drought, a normal watering program may not be possible, even if the regular program has been a careful, conserving one. It will be most important in these times to give a deep watering at the beginning of the dry season. Established drought-tolerant trees should be able to survive the dry season with just one watering.

Methods of Irrigation

By hand with a hose: Care should be taken to water long enough to soak the root ball deeply. Flow through the hose should be gentle enough that it does not destroy the watering basin or compact the soil. A mulch helps prevent compaction.

With a water truck: One unit with a one or two person crew can efficiently irrigate many trees. This is the most cost- effective method, since most trees will need only infrequent irrigation once established. A watering truck typically provides water to sidewalk cutouts, and community trees where there is no existing irrigation (no meter). It is recommended that the city purchase a watering truck if the budget allows.

Automatic irrigation: While most of Signal Hill's street tree sites do not currently have irrigation, the city should add irrigation lines as a requirement for new development and include street tree irrigation line with new city construction projects and sidewalk improvements. Hard pipe bubblers connected to a weather based, smart irrigation controller. Hard pipe bubblers are municipal-friendly considering that they are easy to work on, can be inspected easily, deliver a sufficient amount of water in minimal time, and do not cause overspray.

It is necessary to change the location and number of emitters as the trees mature, so that water continues to get to the feeder roots around the driplines of the trees. As a tree grows, emitters should be placed so that, at a minimum, an area between the dripline and 3 ft. toward the trunk from the dripline is irrigated (if the tree continues to need irrigation).

Irrigation Repair

Any irrigation system needs to be monitored to make sure it is operating properly. The most obvious and important sign is plant material that looks unhealthy. Too much or too little water should be one of the first things considered when this occurs.

Street tree being watered. Photo: City of Vancouver

"Automatic" systems are not maintenance free, and need care in terms of programming to fit weather conditions, and monitoring to see that the system is working properly. This is particularly important since most systems are programmed to run in very early morning. This means that the system will go on when no one is there to see how it's functioning. Periodic "early bird" inspections are needed to check the functioning of the systems. In systems which cover a large area, it may be helpful to use a clock which can be controlled by a remote control device. Inspections, adjustments, and repairs can be made without having to travel back and forth from the clock to the area being worked on.

The irrigation systems should be monitored for problems with sprinkler heads, which are commonly of three kinds. Either the riser has been broken off and needs to be replaced, or the sprinkler is blocked by foliage which needs to be pruned away from the head, or the head has be come clogged and needs to be removed and cleaned out. Sometimes a head only needs to be adjusted to get better coverage, but it may be that the adjustment is needed because of partial clogging, so this should be checked. Frequent clogging may be a sign of a small break in the pipe. A broken pipe can cause large amounts of water to be wasted. Usually the problem will be obvious, with a telltale area of standing water and mud. When a sprinkler head needs to be replaced, if the identical head is not available it is important that the replacement has a similar precipitation rate and radius of throw. Manufacturer's catalogs will have this information. Another common problem is a stuck valve, which can prevent the water from shutting off at the end of a cycle. This can result in the waste a large amount of water in a short time if not reported, as well as overwatering of the plants. Most valve manufacturers sell replacement kits for the innards of the valve. Valves should always be installed with a union connection to the pipe, so they can be more easily removed and replaced.

When a valve doesn't open, or doesn't close, it can sometimes take some troubleshooting to determine if the problem is caused by a valve or controller. Most controller problems are not fixable in the field, since most modem controllers are solid-state computerized models. The clock will need to be replaced or fixed at the factory. Care must be taken if automatic controllers are used, that if power failures interrupt the programs, the clocks are reprogrammed. Most controllers have battery backups, but the batteries must be replaced every year.

When valves, controllers, heads, and other equipment need to be replaced, it is important that the quality of the replacement parts be at least equal to the original parts. If poor-quality parts have been used originally, the quality should be upgraded when the parts are replaced.

When irrigation repair is needed, often the repair crew will need to refer to the as-built drawings in order to locate various components of the system. It is important that accurate as-built plans are filed with the city when an irrigation system is constructed.

Watering During Drought

Signs of Drought Stress:

- Wilting of leaves and shoots
- Less deep green leaves
- Smaller than normal leaves
- Early leaf drop and thinning canopy
- Browning of leaf edges

Steps to Improve a Tree's Drought Tolerance:

- Remove turf (lawn/grass) from under the dripline as turf competes for soil moisture.
- Remove any impervious surfaces as they impair the movement or water, nutrients and air into the soil.
- Decompact the soil within the dripline using a garden fork, air tool or auger. This adds holes that create air circulation within the soil.
- Install four inches of organic mulch under the dripline, improving root growth and soil condition, reducing weeds and the need for water by conserving moisture.
- Do not remove or turn off turf irrigation that is also watering a tree. Slowly reduce the amount of irrigation or replace it with another watering method.
- Monitor and adjust to save water by measuring soil moisture. Provide soil moisture to 18-24" beneath as much of the dripline as possible. A soil probe used one to two hours after watering should be

able to penetrate into the soil to a depth of 12" fairly easily. The soil should feel slightly damp and be darker in color.
- Continue to monitor the tree's health, consider increasing the frequency and/or watering volume if it continues to show signs of drought stress.

3.2d Protection of Existing Trees

Before construction work is undertaken near existing trees, procedures for protection of the trees should be understood. Specific procedures for protection during and after construction should be agreed upon and approved by the Public Works Director or designee. It is important to realize that the result of damage to the root system of the tree may appear anywhere from five to fifteen years after the work has been done.

The following guidelines are basic tree protection practices. The city may require additional conditions as part of their plan review or permit process.

Compaction

Do not compact the soil any closer than 5 ft. out from the dripline of any tree during construction (the tree's "protected zone"). Fence off the tree at the outermost edge of the protected zone before any equipment is allowed on the site.

Trenching

Utilities and footings for buildings and walls should be designed and located to minimize disturbance to tree roots. If a footing must be laid near a tree, use only pier and grade beam footings with bridge foundations within the dripline. Do not use a continuous grade beam footing. Dig 30" deep pilot holes with a two-man power auger, using an 8" bit. If roots of 4" in diameter or greater are encountered, move the proposed location of the pier 12". If utility lines must travel through a dripline the trenches must be dug by hand. Tunnel under any roots encountered rather than cutting the roots. Trenching under oaks can only legally be done with hand tools.

Tree with damaged roots. Photo: B. Hagen

Root Damage

Avoid encroachments, cutting, and filling within the dripline whenever possible. If roots over 1" are broken, cut the root cleanly and immediately cover the cut with a plastic bag tied with a rubber band or tape. No oak roots over 1" may legally be cut.

Watering

If one-quarter or more of a tree's roots will be disturbed, a special watering schedule is necessary. The tree should be watered before construction begins. The tree will need 10 gallons of water for each 1" of tree caliper, applied to a minimum depth of 12" over the outer half of the dripline area. Continue watering once a month during the dry season.

Drainage and Erosion Control

If grading alters the drainage patterns, be sure that water is directed away from the trunks of the trees to prevent fungus infections.

Paving

Consider use of modular suspended pavement system where applicable.

Pests & Diseases

The following pages list common pests and diseases to look for.


M. Fratino

COMMON PESTS & DISEASES

TREE	PROBLEM
Acacia species	chlorosis in alkaline soils
Callistemon species, Bottlebrush	chlorosis in alkaline soils
Celtis occidentalis, Common hackberry	caterpillars
Cercis occidentalis, Western redbud	water molds, Rhizoctoria root rot, black stem fungus
Cinnamomum camphora, Camphor tree	honey mushroom fungus verticillium wilt
Cupaniopsis anacardioides, Carrotwood	aphids in the spring
Eriobotrya deflexa, Bronze loquat	firehlight, black scale
Erythrina caffra, Coral tree	caterpillars in summer
Eucalyptus species	lime-induced chlorosis in alkaline soil, Eucalyptus longhorn borer
Fraxinus velutina glabra, Modesto ash	ash anthracnose, ash curl aphid, honey mushroom fungus
Geijera parviflora, Australian willow	occasional black scale
Jacaranda mimositolia, Jacaranda	caterpillars in the spring
Lagerstroemia indica, Crape myrtle	mildew (new hybrids are resistant)
Ligustrum lucidum, Glossy privet	black scale
Liquidambar styraciflua, American sweetgum	brown softshell scale
Magnolia grandiflora, Southern magnolia	aphids in spring
Olea europaea, Olive	black scale, Pseudomonas syringa canker
Pinus canariensis, Canary Island pine	pine bark aphid, pine needle aphid
Pinus halapensis, Aleppo pine	pine bark aphid, pine needle aphid western pine rust gall, Sequoia pitch moth, severe spider mite

TREE	PROBLEM
Pinus thunbergiana, Japanese black pine	pine bark aphid, pine needle aphid
Pinus radiata, Monterey pine	pine bark beetle, California turpentine beetle, pine bark aphid, pine needle aphid, western pine rust galls, sequoia pitch moth, very severe spider mite
Prunus caroliniana, Carolina cherry laurel	chlorosis in alkaline soils
Prunus caroliniana, Purple plum	shot hole fungus, water mold fungi (in over-wet soils), plum leaf aphid (in variety 'Bijeriana')
Pyrus calleryana varieties, Ornamental pear	check for fireblight
Quercus agrifolia, Coast live oak	fruit tree leaf roller, oak leaf caterpillar, oak twigborer, oak tree hopper, honey mushroom fungus
Schinus molle, California pepper	pepper tree psyllid
Schinus terebinthifolius, Brazilian pepper	verticillium wilt
Tipuana tipu, Tipu tree	aphids
Tristania conferta, Brisbane box	chlorosis
Ulmus parvifolia, Chinese elm	elm anthracnose, elm leaf beetle

DIAGNOSIS

TIPS FOR DIAGNOSING TREE PROBLEMS CAUSED BY PESTS

By C. S. Koehler
Cooperative Extension, U.C. Berkeley

1. More then half of the problems brought to your attention will be attributable to factors other than insects and mites.
2. The cause of poor plant performance may not be evident on the plant sample given to you for diagnosis. The cause may lie farther down the plant.
3. The mere presence of insects or mites does not always mean that they are the real cause of poor plant performance. (Improper maintenance or poor plant selection also contribute.)
4. If the entire tree is dead, the chances are great that insects or mites were not the cause of death. Insects and mites seldom kill their host plants.
5. Most insects and mites show specificity in their choice of plants. Some are general feeders, but most are not. Knowing the name of the affected plant is therefore extremely helpful in determining the identity of the offending insect or mite, because lists of pests and other references are often organized by host plant.
6. The application of a pesticide is not the solution to every problem.
7. By the time many people notice a pest problem and seek your advice, it is often too late in the season to take corrective action.
8. Especially when reporting by telephone, people tend to magnify the actual size of an insect.
9. Insects and mites must feed in order to survive and reproduce. Evidence of their feeding will nearly always remain on the plant after the pest is gone. Most signs and symptoms of pest activity fit into one or more of the categories listed in this table.

Symptom or Sign	**Probable Pest Resopnse**
I. Chewed leaves, blossoms	Caterpillars, beetles, sawflies, snails, slugs. Also leafminers (chewing is inside leaf)
II. Stippled, bleached, yellowed, or bronzed leaves	Leafhoppers, aphids, psyllids, thrips, lace bugs, spider mites
III. Distortion (twisting, cupping, swelling of plant parts)	Thrips, aphids, blister (bud) mites, gallmakers
IV. Dieback of plant parts	Borers, scales, gallmakers
V. Presence of excrement, sooty mold flocculence, froth, cast skins, tents, pitch tubes, or other insect product	Aphids, soft scales, mealybugs, whitefly, adelgids, thrips, lace bugs, spittlebugs, certain caterpillars, etc.

4.0 FINDINGS & UPDATES

4.1 Introductory Findings

Signal Hill Street Tree Policy from 2010 to 2022 was guided by three documents: the Street Tree Policy, the 2010 Street Tree Master Plan Update, and the 2011 Tree Ordinance. The next section includes findings from analyzing these policies, followed by the updated 2023 Street Tree Policy. This 2023 Street Tree Master Plan and the 2023 Street Tree Policy included in this chapter will determine the city's street tree policy from 2023 until the next Master Plan update. Signal Hill's View Protection Policy, previously cited in connection with street tree pruning, is clearly intended to guide new development, specifically buildings, not street trees. In fact, trees are not mentioned at all in the document. Therefore, analysis of the View Policy is not included in the Street Tree Master Plan.

4.1a Street Tree Policy Analysis

Signal Hill's Street Tree Policy largely consists of information from the Street Tree Ordinance, though it does contain some original content as well. The "whereas" clauses of the 2011 Street Tree Ordinance are conveyed as goals in the Street Tree Policy, and include the following:

- Establish standards for the planting, removal, replacement and maintenance of all City Street trees.
- Create a sense of community, pride and recognition to individual neighborhoods.
- Minimize maintenance costs and develop a cost-effective tree planting program.

One piece of original content is the statement that "The Director of Public Works shall develop a street tree planting program for the existing vacant tree sites incorporating the species from the Street Tree Master Plan based on conditions exclusive to that site, planting standards, and surrounding environment." **At the time this statement was written in 2010, 320 vacant tree sites existed in Signal Hill. In the time between 2010 to 2022, the number of vacant sites increased from 320 to over 1,000.**

4.1b 2010 Street Tree Master Plan Update Analysis

Much of the 2010 Master Plan text overlaps with the Street Tree Policy and the Tree Ordinance. The rest of the 2010 STMP contains a tree palette.

The stated objectives of the 2010 Update to the Street Tree Master Plan are as follows:

1. Evaluate the overall condition of the City's existing street tree inventory including growth trends.
2. Inventory public right-of-way to identify vacant tree sites and develop a tree planting program based on planting standards and site conditions.
3. Identify diseased, damaged, or unsuitable trees and recommended replacement trees.
4. Develop a cost-effective/ viable street tree planting and replacement palette based on environmentally-friendly trees species suitable for unique conditions that may be found at any given site.

Looking at these 2010 objectives, it appears that Signal Hill completed objectives 1, 3, and 4. Objectives 1 and 3 were completed through the WCA inventory of existing street trees. Objective 4 was completed and included as Appendix B "Street Tree Planting Schedule", which identifies the existing primary street tree species on each block of the city, as well as recommended replacement species for each block. Objective 2 was partially completed through the WCA inventory of vacant sites. The part of objective 2 left incomplete is development of a tree planting program.

View Protection Policy

As mentioned previously, the View Protection Policy does not actually pertain to street trees, but since there is confusion among the public on this matter, the policy should be amended to include exceptions for trees.

4.2 Street Tree Policy Recommendations

Several city policies regarding warrant updating, with the following recommendations:

1. Add language to the City's View Protection Policy to clarify that the policy does not apply to city managed trees, and that the city does not prune or remove trees for reasons relating to view enhancement requested by residents. This language can then also be included in the City's Street Tree Policy.
2. Identify areas for prioritizing new tree plantings for 5-year time period.
3. Create a budget for street tree planting and maintenance, contingent on grant and other funding.
4. Establish an Adopt-a-Tree Program, contingent on staff availability to coordinate the program.

Other policy changes may also aid the city in improving its street tree numbers and health, including these recommendations:

1. Create initiatives to plant street trees in vacant sites proactively and without requiring property owners to pay for the installation.
   a. Require that adjacent property owners' consent to watering the tree throughout the life of the tree.
   b. Consider providing a watering bag with each installed tree.
   c. Provide the vacant tree well site list

Street trees in Signal Hill. Photo: G. Castriotta

to the public, along with a tree request/ watering agreement form available on the City's website, which could facilitate prioritization of tree planting locations in residential neighborhoods.

2. Establish criteria for prioritizing new tree plantings, such as:
   a. Vacant sites with available water source
   b. Submitted tree installation requests from adjacent property owners that consent to watering the tree
   c. Replacing hazardous trees and trees damaging public property
3. Plant trees in all areas of the city, and select appropriate species to achieve the city's goals. **Protect and preserve all desirable trees, wherever they are located.** Encourage new tree planting on public property and the cultivation of a flourishing urban forest with an emphasis on native and drought tolerant species.
4. Establish policy for street tree removal that requires in-kind replacement within specified timeframe.
5. Update the Street Tree Policy to reflect the spacing requirements included later in this chapter, and adopt the 2023 Street Tree Policy.
6. Identify heritage trees for preservation.
7. Establish guidelines for root removals to be evaluated by a certified arborist.

The following changes are recommended for the Planting Guidelines:

- The requirement that trees be planted at least 20 feet from bus stops should be amended. Trees should be planted closer to bus stops to provide shade for those waiting.
- Minimum spacing requirements of 30 feet between trees should be changed to allow for closer planting of smaller species.
- Minimum tree well size should raised to 6' long x 4' wide by 3' deep for all new street tree sites. Older sites should be enlarged as trees are replaced.

New development in Signal Hill should require new trees.

Development and Trees

Current City ordinances require the inclusion of trees on development site plans along with a notation of whether these trees will be retained or destroyed; however, the ordinance does not include any content regarding circumstances by which tree removal would be approved or denied, protection standards for retained trees, and replacement requirements for removed trees. This kind of content would be helpful to maintaining and expanding the existing stocking level of the street tree inventory, as well as the maintenance and expansion of tree canopy across the entire City. Additionally, creating specific design requirements, including the number of new street trees per square foot, as well as irrigation requirements and recommendation of modular paving systems, would greatly improve the aesthetics and environmental quality of new projects. More detailed information on design guidelines for new development is included in **Section 2: Design & Management Plan**.

4.3 Tree Planting Program

Above all else, a review of Signal Hill's 2011 Street Tree Ordinance, 2010 Street Tree Policy, 2010 Street Tree Master Plan, inventory data from Arbor Access, field observations, as well as interviews with city staff, indicate that creating and implementing a tree planting program to increase the stocking level above the current 74 percent is the most important goal for the updated Street Tree Master Plan. In the last 24 years (from June 1998 to June 2022) 1,224 street trees were removed, and few have been replaced. As this document emphasizes throughout, planting new street trees would provide great benefits to the city of Signal Hill. The following section outlines a path toward creating and implementing a street tree planting program.

Table 21 Budget to Plant 1000 Trees in 5 years

Fiscal Year	22/23	23/24	24/25	25/26	26/27	**27/28**
Tree Trimming Contract Service[1]	$176,105	$180,508	$185,020	$189,646	$194,387	**$199,247**
Part time City Maintenance Staff time or Contractor[2]		$43,000	$43,860	$44,737	$45,632	**$46,545**
Additional Arborist Services[3]	$18,000	$8,000	$8,000	$8,000	$8,000	**$8,000**
Additional Trees [4]		$150,000	$153,750	$157,594	$161,534	**$165,572**
Water Bags (Irrigation)[4]		$5,000	$5,638	$6,356	$7,167	**$8,080**
Contingency		$19,325	$19,813	$20,317	$20,836	**$21,372**
Total	$194,105.00	$405,833.01	$416,081.21	$426,649.71	$437,555.17	**$448,815.80**

Notes

[1] Regular tree maintenance contract

[2] Part time maintenance staff or contractor to water and care for new trees. Must have Arborist back ground.

[3] Additional arborist services cost will go down due to additional staff

[4] CCLB's average cost for plant placement including equipment and delivery.

[5] $20 water bag cost + 2.5 % material cost increase + 10% replacement cost

4.3a Tree Planting Goals

The proposed goals of Signal Hill's street tree planting program are:

1. Increase the street tree stocking level from its current level (74 percent in 2022) to 100 percent by 2033 by:
   a. Planting trees in all vacant street tree sites
   b. Planting a replacement tree whenever a street tree is removed, contingent on budget
   c. Removing sites from the vacant sites list that do not adequately accommodate new trees and replacing with a new, more appropriate site
2. Increase the resilience of the street tree population by:
   a. Increasing family, genus, and species diversity
   b. Bring the street tree population into compliance with the 30-20-10 rule by not planting Chinese elm (*Ulmus parvifolia)* trees.
   c. Planting more drought tolerant, climate-ready tree species
3. Decrease future maintenance costs, infrastructure conflicts, and public complaints by:
   a. Choosing appropriate species given site constraints
   b. Planting small or medium stature trees in areas with view complaints involving street trees

4.3b Methods

The Signal Hill street tree planting program will generally include:

- Planning/ coordinating
- Tree planting
- Establishment watering

The planning/ coordinating aspect of the program can best be accomplished by one of the following:

- A contracted consultant
- A city employee

The tree planting aspect of the program can be best accomplished by one of the following:

- A contracted consultant leading volunteers with support from city staff and equipment
- A local tree-planting non-profit leading volunteers using their equipment
- A tree service contractor using their equipment
- City employees using city equipment

The establishment watering aspect of the program can be best accomplished by one of the following:

- A local non-profit partner using their equipment
- A tree service contractor using their equipment
- City employees using city equipment

4.3c Funding

Of the methods listed above, most would require identification of additional resources. If city employees are to be utilized in planning, planting, or watering, existing staff capacity would need to be expanded. If city equipment is to be used in planting or watering, additional equipment would need to be acquired. If a consultant is used in planning or in planting with volunteers, funding would be needed. If a contractor is used for planting or watering, funding would be needed. The option of partnering with a local non-profit for planting or watering may or may not require additional funding. An approximate budget for reaching these planting goals without the help of a grant or partner organization is included in **Table 21** on the previous page.

Among the various ways to acquire resources for a street tree planting program, applying for grants is one common way. Possible grant sources include

- CAL FIRE: Urban and Community Forestry Grant Program
- California Natural Resources Agency: Urban Greening Grant Program
- Port of Long Beach: Community Grants Program
- Arbor Day Foundation: Grants
- Tree People: Community Tree-Planting Initiatives

In light of all the options described above for planning and implementing a tree planting program, perhaps the simplest one is to hire a consultant with expertise in urban forestry and grant writing to lead the City through the CAL FIRE Urban Forestry grant application. The application can include funding for hiring a consultant to assign the best species to each vacant site, select and reserve trees at nurseries, and arrange for tree deliveries. The funding can also cover the expenses for WCA to install the trees and perform establishment watering.

Applications for this grant program happen on an annual basis. CAL FIRE's estimated timeline for this cycle is that concept proposals will be accepted for a one-month window at the beginning of 2023. For concept proposals that are invited to submit a full application, the full application will be due in April 2023. Grant awards are expected to be announced in May or June of 2023, with grant-funded work beginning around July 2023. Awarded grants are active for three years (until March 2026). Grant awards range from $150,000 to $1.5 Million.

4.3d Phasing Plan

While it may be possible to plant trees in all 1,019 vacant sites in one year, it is not preferable. Planting trees consistently over time leads to a street tree population that is more resilient because it possesses trees of various ages. Phased planting can also spread the planting and maintenance costs evenly across years as opposed to causing acute spikes in expense.

One way to approach phased street tree planting in Signal Hill would be to spend six months to one year planning, and then begin planting 200 trees per year for five years. While this plan would fill in all vacant planting sites in five years, it does not address replanting of the average of 50 trees street trees that are likely to be removed over the course of the planting project. To address this, the planting plan could aim for 250 trees per year over five years, or the replacement of future removed trees could be accomplished through a different plan or method.

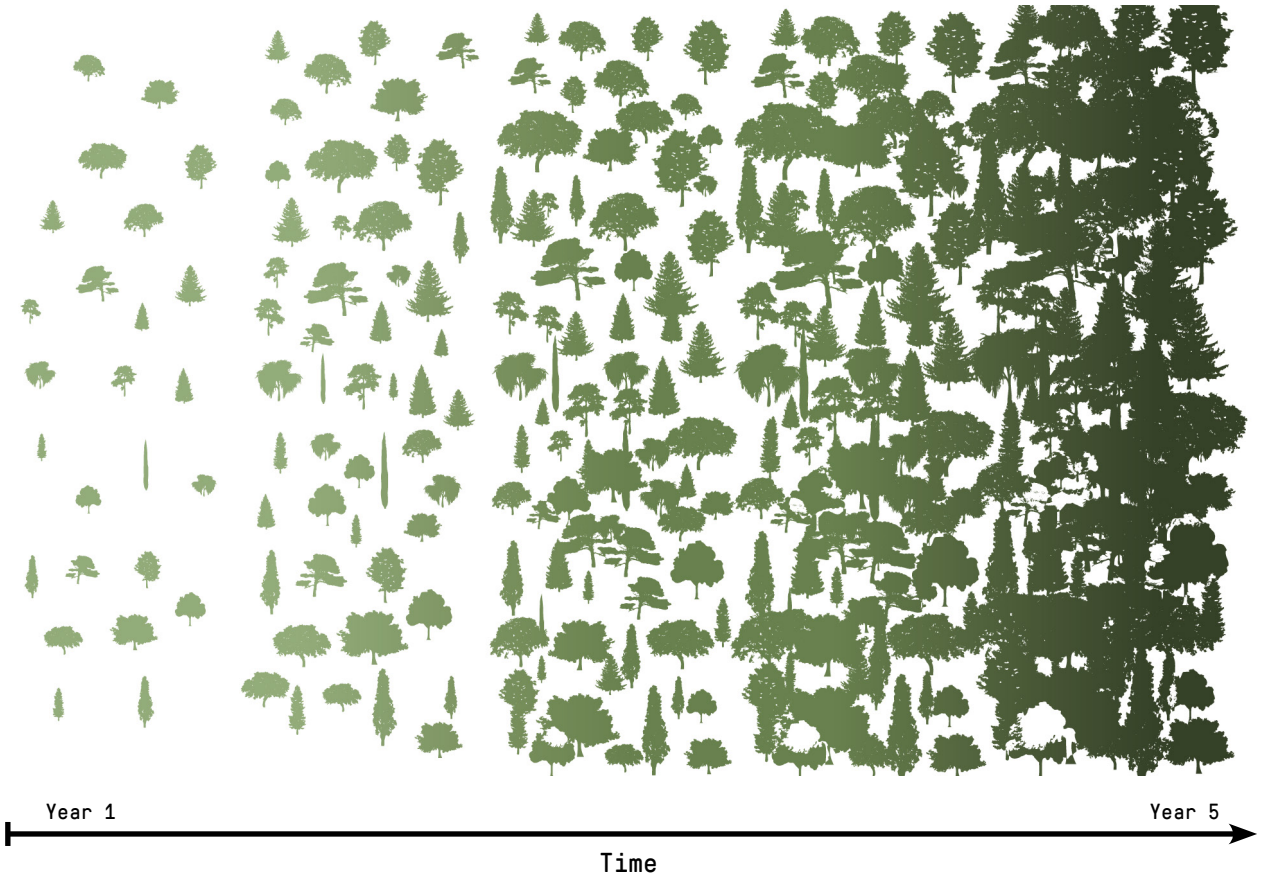


Figure 4.3.1: Phasing Plan. The street tree canopy will grow dramatically if the city plants 250 new trees annually over 5 years.

It will make sense to develop a prioritization system for the existing vacant sites. Logistically, it often makes sense prioritize clusters of vacant sites, as planting and watering will be more efficient for clustered sites. Depending on the funding for establishment watering, it may make sense to prioritize the planting of vacant sites where the adjacent resident has expressed a willingness to perform the establishment watering.

Planting trees in areas of greater need, i.e. where there is a current gap in the street tree canopy, also makes good sense, and can help to close the shade equity gap.

4.4 Tree Maintenance Program

4.4a Maintenance Goals

The proposed goals of Signal Hill's street tree maintenance program are as follows:

1. Ensure the highest quality pruning possible by stipulating that:
   a. All contract specifications should require that tree care operations adhere to the ANSI Z133 Safety Requirements, ANSI A300 Standards for Tree Care Operations, and the ISA Best Management Practices (BMPs)
   b. All contract specifications should require that tree care operations adhere to The Federal Migratory Bird Treaty Act (MBTA), the Federal Endangered Species Act, and the California Fish and Game Code, Section 3503.
   c. An independent tree consultant should review the work of contract pruning crews on a weekly or monthly basis during grid pruning cycle.
   d. The different pruning levels offered by the pruning contractor to specific species and specific contexts throughout the city should be implemented.
2. Create a pest monitoring protocol.
   a. Trees at risk of known pests should be monitored at least annually for pest presence.
3. Create a tree risk assessment protocol
   a. In cases where a city employee assesses a reported tree issue and a course of action is not clear, call in a consulting arborist to perform a Level 2 Tree Risk Assessment.
   b. Create a city policy on the level of risk the city is willing to tolerate for street trees.
   c. Many cities retain trees with a low or moderate risk rating. For trees with a high or extreme risk rating, mitigation actions are utilized to reduce risk to an acceptable rating. If the risk cannot be lowered to an acceptable level (low or moderate), then the tree is removed and replaced.

Street tree maintenance. Photo: City of Chino Hills

Tree Data

Through analysis of the Arbor Access data, and through field checks, it was found that the Arbor Access is missing data, has inaccurate data, and exhibits data inconsistencies. The nature of these data issues suggests that the issues have arisen though data management practices over time as opposed to having arisen during the original inventory of street trees. Help the contractor improve tree data completeness, accuracy, and consistency by:

1. Hiring an independent tree consultant to update the entire tree inventory every 10 years, starting in 2023.
2. Tasking WCA with correcting the missing and inconsistent data outlined in the WCA Data Report.
3. Ensuring that future tree care contracts require the contractor to update all tree data fields for each tree whenever pruning, removing, planting, or otherwise working with a street tree.

4.4b Track Progress

Tracking of progress makes sense on an annual cycle as well as on a decade cycle.

For the annual cycle, going over all the above goals for tree planting, tree maintenance, tree data, and tree ordinance/ policy makes sense. Additionally, a "Street Tree Report Card" can be published annually with the following information:

REPORT CARD
CITY MANAGED STREET TREES • 2024

Street Tree Numbers
Live Trees 3,183
Trees Planted 324

Species Diversity
Number of Species 98
Prevalence of Top Ten Species 42%
Species Exceeding 10% 0

Vacancy Rates
Vacant Sites 695
Stocking Level 82%

Figure 4.4.1: Street Tree Report Card

Continuing the practices of updating the Street Tree Master Plan every 10 years makes sense. When updating the STMP, the total progress on goals can be assessed, and revised goals can be created.

4.4c Community Forest Master Plan

Beyond the Street Tree Master Plan, a Community Forest Master Plan (CFMP) is warranted. A CFMP includes the STMP, and goes beyond to address tree statistics and goals for other city trees (trees in parks and at city facilities) as well as trees that are not city owner or managed, such as trees on industrial, commercial, state, federal, educational, cemetery, and residential property throughout Signal Hill. Creating a Community Forest Master Plan could also help the city to develop a larger budget for tree planting and maintenance. Such a plan can bring together stakeholders to generate ways to encourage tree canopy health and expansion throughout the entire City.

Current street tree canopy in Signal Hill. Photo: G. Castriotta

4.5 Tree Ordinance Update

12.05.040 New Street Tree Planting

C. New street tree placement. Features that may be unique to an individual street parkway will be taken into consideration by the Director of Public Works when placing a new street tree. These include width of parkway, width of sidewalk, existence of sidewalk, utility poles, street lights, bus stops, traffic signs, ADA accessibility, utility boxes, and fire hydrants. Therefore, the following planting guidelines must be followed by the Director of Public Works to optimize street tree planting opportunities.

1. Tree species must be listed in the Street Master Plan Street Tree Palette.
2. Street trees shall have the following approximate spacing range, based on mature plant sizes (refer to the Street Tree Palette of the Street Tree Master Plan when determining species size):
   Large trees: 30 to 40 feet apart
   Medium trees: 20 to 30 feet apart
   Small trees: 15 to 20 feet apart
3. Street trees shall be placed according to the above range regarding proximity to street lights and power poles. Trees should be placed away from the curb near bus stops to provide shade at the stop without interference to the bus. Trees should be planted 5-15' from the bus shelter, depending on species size.
4. Street trees shall be placed a minimum of 15 feet from the start of a street curb return.
5. Street trees shall be placed a minimum of 10 feet from a fire hydrant or driveway approach where possible.
6. Trees should be placed at least 5 feet from utility meters. Size and root invasiveness (refer to the Street Tree Palette of the Street Tree Master Plan when determining species size and root invasiveness) must be considered when planting near meters, drains, and underground utilities.
7. Street trees shall be centered in the parkway between the sidewalk and curb unless near a bus stop.
8. Street tree well sizes should be a minimum of 4 x 6 x 3 ft. deep, with 6 x 6 or larger recommended. Tree wells with an opening of less than 8.3-square-feet (2.5 x 2.5) will support only small trees to maturity or medium-sized species for 10 to 15 years. Tree wells with an opening of 48-square-feet (6 x 8) can support large trees to maturity. Narrow parkways can be utilized by allowing the lateral spread of tree roots (e.g. 2.5 x 8 ft instead of 2.5 by 4 ft dimension for the tree well). Refer to the Street Tree Palette of the Street Tree Master Plan when determining species size and appropriate planting area. Use of root barriers will help prevent root damage and allow for a wider variety of species.
9. As a best practice measure, street trees should be situated to provide 4 feet of sidewalk clearance to allow for passage of wheelchairs, with a minimum of 30" where preexisting conditions prevent greater clearance from being provided, thus meeting ADA requirements.
10. Locate trees to minimize conflict with overhead utilities. Where overhead utilities exist, plant only small trees (refer to the Street Tree Palette of the Street Tree Master Plan when determining species size) that will not reach the height of the wires.

4.6 Updated 2023 Street Tree Policy

Introduction

Street trees, an integral part of the urban forest, are an important part of the attraction and character of Signal Hill's streets and neighborhoods, and provide many benefits to the community. Trees increase the beauty of neighborhoods and shelter homes from the hot summer sun or cold winter winds,and, as a result, lower cooling and heating bills. Trees also reduce erosion, buffer noise, reduce air pollution, and increase property values. The city maintains 2,859 live street trees for the benefit of the community. In fact, there are 88 different species and, collectively, the street trees have an estimated replacement value of $15.7 million dollars. These trees sequester 1,674 tons of carbon, which is an economic value of $285,000. They help to capture and clean an estimated 35,000 cubic feet of stormwater runoff. **Signal Hill's 2023 Street Tree Policy covers street trees only; the policy is not intended to be applied to trees located in city parks or on private property including private streets and property owned and maintained by homeowners associations.**

Goals

- Fill vacant tree sites.
- Provide for the long-term health and prosperity of the city's street tree canopy by ensuring the right tree is planted in the right place.
- Establish a high standard of maintenance and a sustainable care regimen for the city's street trees.

Street Tree Master Plan

The Street Tree Master Plan serves to establish a cohesive tree planting program with an appropriate diversity of tree species, designed to maximize the health of the street tree canopy by providing a palette and planting guidelines. These guidelines ensure that each new street tree's characteristics are appropriate to its site. The guidelines should also help minimize conflicts with utilities and sidewalks, and maximize the long-term health of the new tree. The design considered factors such as drought-tolerance, species origin, size, branch strength, root damage potential, and aesthetics. The Street Tree Master Plan should be updated every five years and should include species name, mature height and width, recommended planting dimensions, water needs, branch strength, and utility friendliness.

Objectives

- Continue a comprehensive street tree maintenance program
- Inventory public right of way to identify vacant tree sites
- Provide a palette of environmentally-friendly tree species suitable for the current environment
- Include species selection criteria based on species characteristics and site conditions
- Develop a cost-effective, viable street tree planting and replacement program
- Update the Street Tree Master Plan every five years

Street Tree Inventory

The inventory should evaluate number, spacing, site condition, and tree health. A summary of the 2023 Street Tree Inventory indicates that 80% of the City street trees are in good condition, 14% are fair, and 5% are poor. The city should evaluate street tree inventory to eliminate trees species that did not meet expectations. As the city's urban forest matures, the originally-selected tree species may not necessarily be compatible with its current environment. The tree may have damaged adjacent hardscapes, outgrown its space or require excessive maintenance. New species should be identified that will thrive in the problem sites.

Street Tree Planting

The Director of Public works shall develop a street tree planting program for the existing vacant tree sites, incorporating the species from the Street Tree Master Plan based on conditions specific to that site, planting standards, and surrounding environment. The City will make every effort to replace the trees as the city budget allows and/or by obtaining grant funding. Under direction of the Public Works Director, the City Engineer shall develop a Standard Plan for planting street trees.

The Director of Public Works shall determine the location of new or replacement street trees. Signal Hill has many streets with different characteristics; hence, one size does not fit all. There are streets with no parkways, and others have parkways with varying widths. Similarly, sidewalks do not exist on some streets and vary in width on streets that have sidewalks. Other features that must be taken into consideration when placing trees are utility poles, street lights, bus stops, traffic signs, utility boxes, and fire hydrants. Heavy emphasis on ADA accessibility is another key factor in sizing and placing trees. Therefore, planting guidelines have been developed to optimize tree planting opportunities.

Guidelines for planting street trees:

1. Tree species must be listed in the Street Master Plan Street Tree Palette.
2. Street trees shall have the following approximate spacing range, based on mature plant sizes (refer to the Street Tree Palette of the Street Tree Master Plan when determining species size):
   Large trees: 30 to 40 feet apart
   Medium trees: 20 to 30 feet apart
   Small trees: 15 to 20 feet apart
3. Street trees shall be placed according to the above range regarding proximity to street lights and power poles. Trees should be placed away from the curb near bus stops to provide shade at the stop without interference to the bus. Trees should be planted 5-15' from the bus shelter, depending on species size.
4. Street trees shall be placed a minimum of 15 feet from the start of a street curb return.
5. Street trees shall be placed a minimum of 10 feet from a fire hydrant or driveway approach where possible.
6. Trees should be placed at least 5 feet from utility meters. Size and root invasiveness (refer to the Street Tree Palette of the Street Tree Master Plan when determining species size and root invasiveness) must be considered when planting near meters, drains, and underground utilities.
7. Street trees shall be centered in the parkway between the sidewalk and curb unless near a bus stop.
8. Street tree well sizes should be a minimum of 4 x 6 x 3 ft. deep, with 6 x 6 or larger recommended. Tree wells with an opening of less than 8.3-square-feet (2.5 x 2.5) will support only small trees to maturity or medium-sized species for 10 to 15 years. Tree wells with an opening of 48-square-feet (6 x 8) can support large trees to maturity. Narrow parkways can be utilized by allowing the lateral spread of tree roots (e.g. 2.5 x 8 ft instead of 2.5 by 4 ft dimension for the tree well). Refer to the Street Tree Palette of the Street Tree Master Plan when determining species size and appropriate planting area. Use of root barriers will help prevent root damage and allow for a wider variety of species.
9. As a best practice measure, street trees should be situated to provide 4 feet of sidewalk clearance to allow for passage of wheelchairs, with a minimum of 30" where preexisting conditions prevent greater clearance from being provided, thus meeting ADA requirements.
10. Locate trees to minimize conflict with overhead utilities. Where overhead utilities exist, plant only small trees (refer to the Street Tree Palette of the Street Tree Master Plan when determining species size) that will not reach the height of the wires.

Tree Maintenance

A healthy urban forest takes a community effort. **Adjacent home owners and business owners shall be responsible for the watering of street trees along the frontage of their properties.** Property or business owners and residents should report any damage or suspected diseased trees to the Public Works Department.

The City performs periodic trimming work for all the street trees. Signal Hill is divided into four maintenance areas. Street trees are trimmed by the city's landscape contractor on a regular schedule, two quadrants per year as the City budget allows. Trees are trimmed regularly to make sure the sidewalks and streets are clear of any safety hazards. The City may change to a species-based maintenance schedule should budget allow. Signal Hill strives to maintain city street trees in a healthy and nonhazardous condition through good arboricultural practices.

Supplemental trimming of city street trees will be considered and, if approved by the Director of Public Works, the requester shall pay the extra tree trimming cost. The City does not allow property owners, residents or gardeners to trim street trees or tree branches on city property or within the public right-of-way.

Street Tree Removal

The Department of Public Works will assess the overall condition of each street tree as part of the street tree trimming cycle. Should one of the following conditions be observed as part of this assessment, the City will remove and replace the street tree at no cost to the adjacent property owner:

- Dead/ Diseased/Severely Declining tree
- Poorly structured (potentially hazardous)
- Seedling or Volunteer growth (palms, pepper, etc)
- ADA Access/Utility/Sign Obstruction
- Severely damaging adjacent hardscape or utilities
- **Street trees are NOT to be removed to protect a view.**

Property owners are also responsible to report to the City any observed decline of the health of a street tree and/or other observations consistent with the criteria listed above regarding street trees adjacent to their properties. Upon receiving these reports the City will take the necessary actions including possible replacement of the street tree at no cost to the property owner. A property owner may request replacement or removal of a street tree adjacent to the property for reasons other than defined above. **The entire cost to perform this work, including incidental cost, if ultimately approved, shall be the responsibility of the property owner.**

The Director of Public Works may establish a procedure for an entire block approach, for the purpose of removing existing street trees that have outgrown their useful life and are considered high maintenance. The procedure would include replacement of the trees consistent with the Tree Policy and Street Tree Master Plan.

Enforcement

Under California Penal Code 594 (A) (1), it is unlawful for any person to damage or destroy any public or private tree.

5.0 COMMUNITY PARTICIPATION & EDUCATION

5.1 Community Outreach

The City of Signal Hill included a community outreach program as part of the Street Tree Master Plan update process. The purpose of the outreach program was to notify the public of the project and provide education on the issues involved, as well as to solicit input from community members. It included public notifications, pop-up events, a community open house and a workshop, as well as an online survey.

This section includes a description of the methods of notification and engagement that were used to meet the city's outreach goals, analysis of the outreach results, and a summary of how the information collected was integrated into the updated Street Tree Master Plan. Full results are included in the appendices.

5.1a Community Outreach Objectives

- Engage a wide range of Signal Hill residents
- Involve existing landowners, tenants, and other stakeholders
- Identify and translate community needs and values into plan recommendations
- Educate stakeholders on the physical, mental, ecological and economic benefits of a healthy tree canopy
- Build consensus to solve complex issues
- Report outcomes back to the community

Inspecting the street tree map. Photo: G. Castriotta

5.1b Community Outreach Methods

SWA helped the city's communications and GIS specialists to create an engaging, interactive website for the project. The website provided information on outreach events as well as an interactive map to explore the city's current street trees. The link to the online survey was posted on the website. The city also provided updates and information on outreach events through social media, via Facebook, Twitter, and Instagram. Additionally, flyers were handed out at events and posted at parks, libraries, and plant nurseries to advertise outreach events and the online survey.

Two outdoor pop-up events were used to inform the public about the plan and to advertise upcoming workshops as well as ways to become involved. The first, at a Concert in the Park on Wednesday, August, 10, 2022,

alerted concertgoers to the existence of the Street Tree Master Plan with posters, and encouraged them to visit the website for more information on the update process. The second, at the Mayor's Fall Cleanup Event in Raymond Arbor Park on the morning of Saturday, October 22, 2022, encouraged attendees to come to the workshop event the following week. A Community Open House at the Signal Hill Public Library on Thursday evening, September 15, 2022 educated participants on the current status of the update, how Signal Hill's street trees compared to nearby cities', and encouraged future participation in the Street Tree Master Plan update process. Participants in the workshop asked great questions and demonstrated their investment in the future of Signal Hill's urban forest.

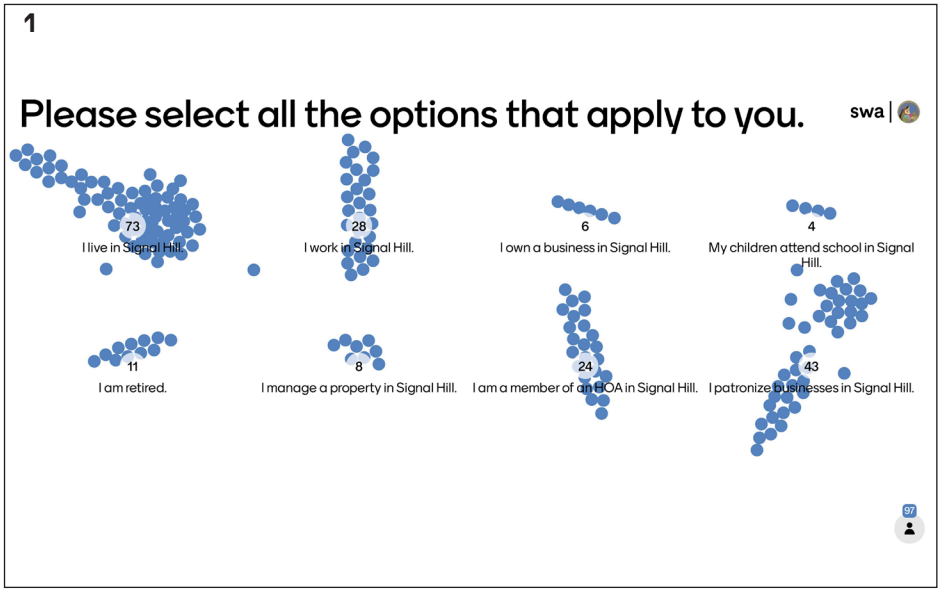
On Thursday, October 27, a hybrid Community Workshop both in-person at City Hall and online via Zoom presented some aspects of the Street Tree Master Plan update and included a Mentimeter survey with live-updated results. The survey was intended to engage the audience by educating them on the importance of Signal Hill's Street Trees, explaining the update process, and soliciting feedback. A modified version of that survey, included in the following pages, was posted online on Monday, October 31, 2022 and remained open through Wednesday, January 4, 2023. 84 people participated in the survey, with 57 completing it. Complete survey results are included in this document in Appendix 2. The final outreach event will be the presentation of the completed Street Tree Master Plan update to the public in 2023.

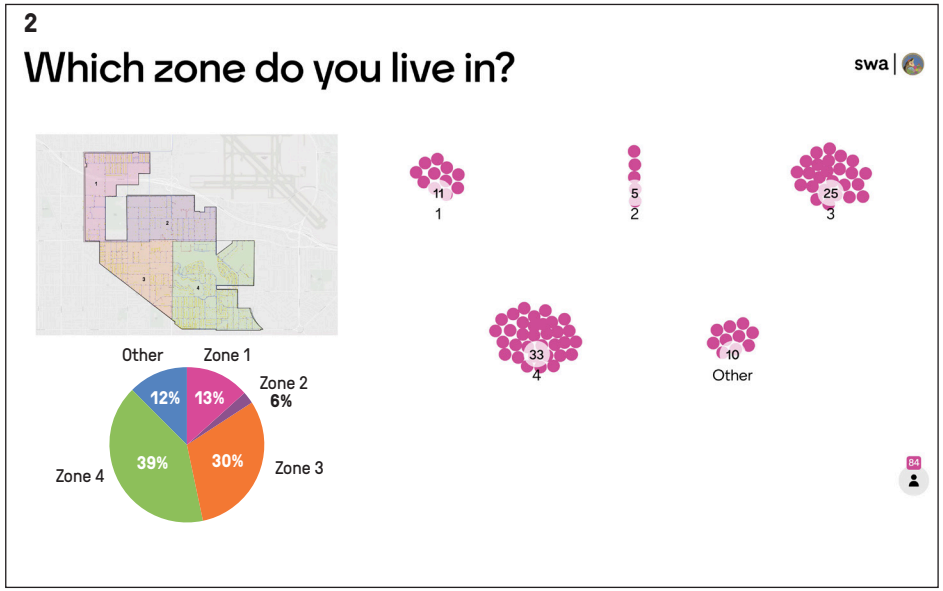
October Pop-up. Photo: P. Masek

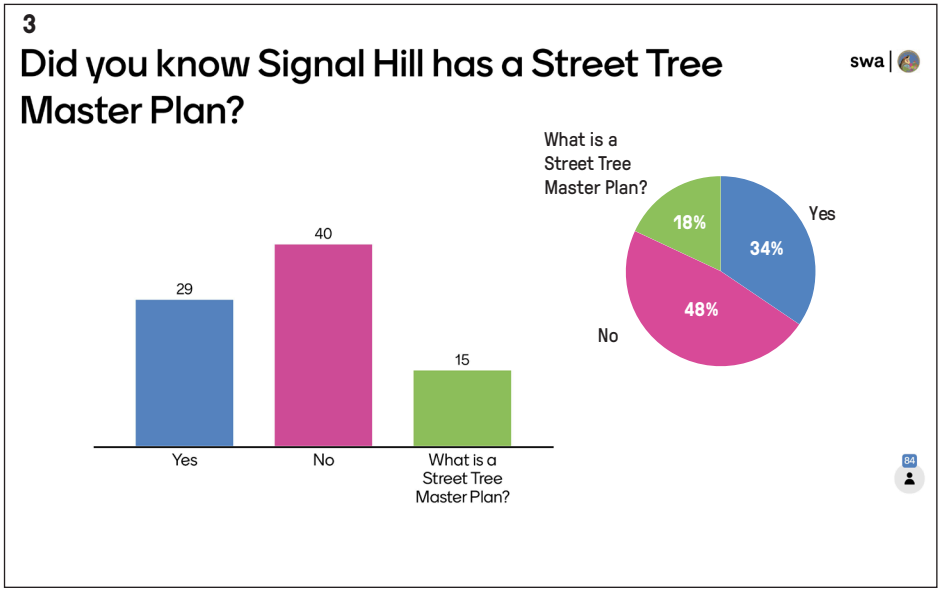
Key Findings

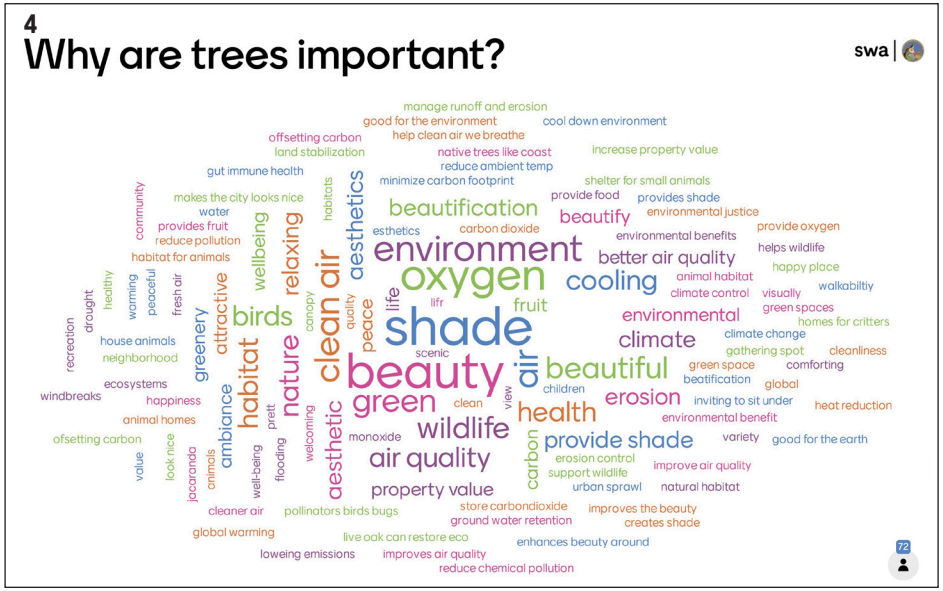
- Survey respondents recognize the value of street trees in their community
- Residents would like to see more trees in their city
- Planting more native and climate-adapted trees is important
- Water use and aesthetics are key criteria for tree selection
- **Respondents do not value views over trees**

5.2 Survey Slides with Results









5

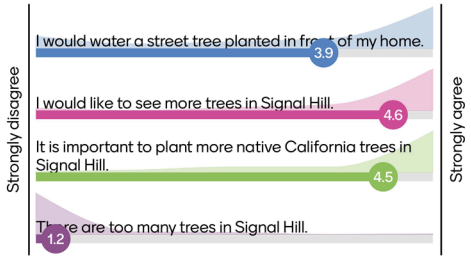
Street Tree Establishment

Street trees need to be watered for 1-3 years before they are considered established. A typical watering regimen might be: water tree every-other day for months 1-3, once a week for months 4-12, once a month for months 13-24. Skip a watering if soil is already saturated on a watering day. Property owners are responsible for watering street trees adjacent to their property, but not trimming or maintenance

11

6

Rate your opinion on the following statements:



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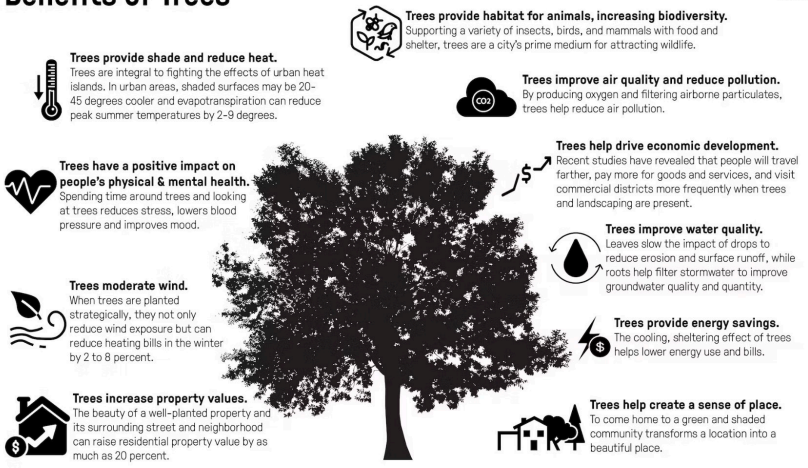
7

Benefits of Trees



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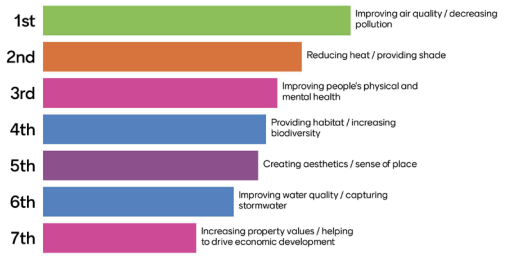
Rank the importance of the different ways trees help Signal Hill.



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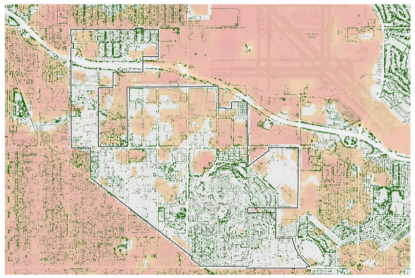
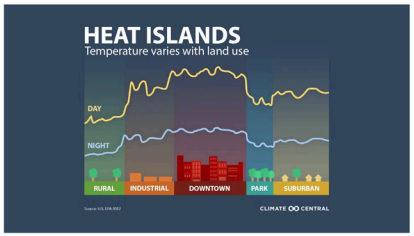


Urban Heat Islands (UHI):

urbanized areas that experience higher temperatures and pollution than their rural counterparts, creating negative health effects. It is calculated as the temperature difference over time between an urban area and a rural reference point at 2 meters above ground level.

10



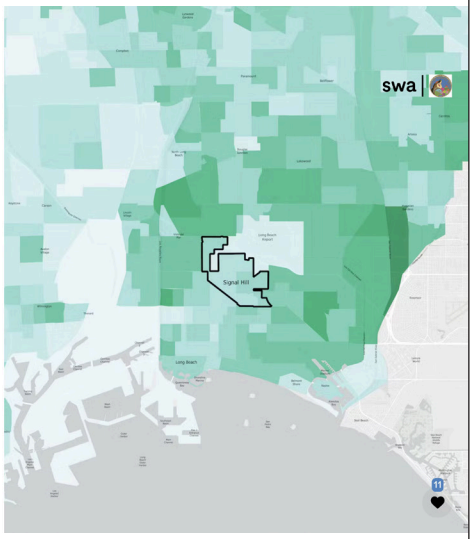
UHI is affected by:

- Heat-absorptive surfaces - e.g. dark pavement and roofing
- Heat-generating activities - e.g. engines and generators
- Absence of vegetation, which provides evaporative cooling

11

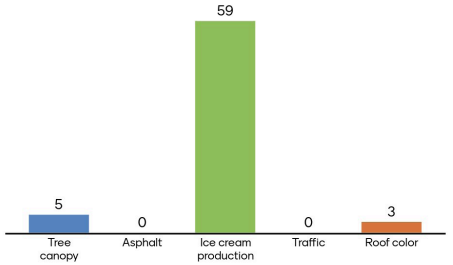
Trees help mitigate UHI effect by:

- Creating shade
- Absorbing sunlight
- Releasing cooling moisture into the air (transpiration)
- Collecting moisture from ocean air



12

Which of the following options do NOT have an effect on Urban Heat Islands?



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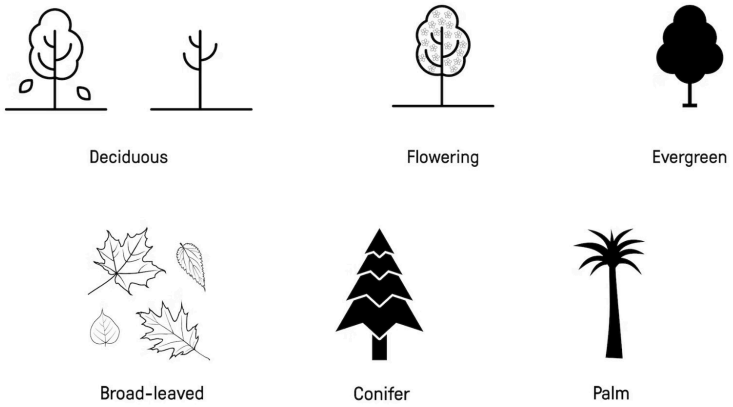
Tree Types

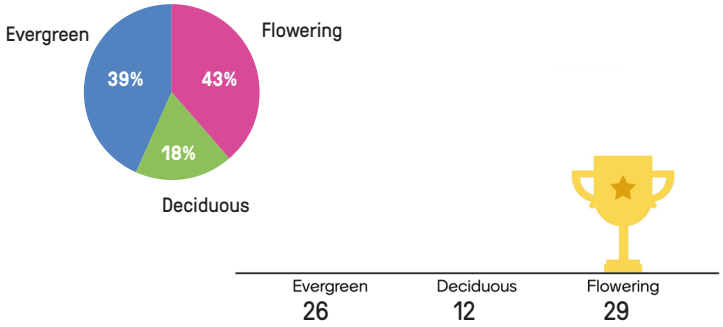
swa



14

What is your favorite tree type? Flowering wins!

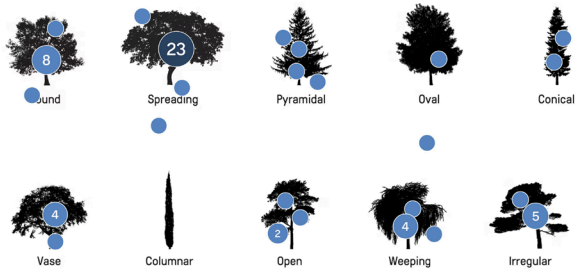
swa



15

Click your favorite tree form.

swa



16

The Right Tree In The Right Place

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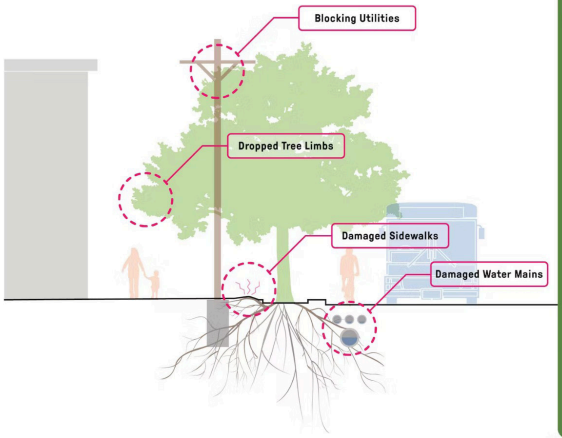


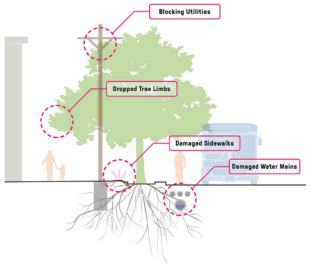
Considerations

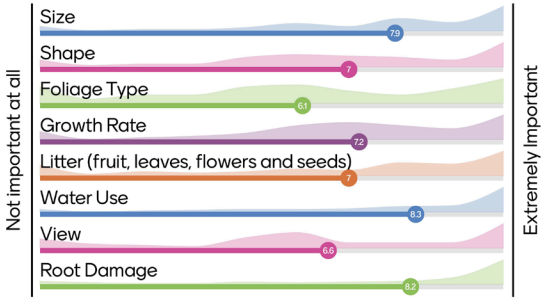
- Height
- Width
- Shape
- Foliage density
- Growth Rate
- Longevity
- Pollen
- Dropped fruit or flowers
- Toxicity
- Root damage
- Water needs
- Soil type
- Light preference
- Proximity to buildings, cars, or pipes
- View

17

Rate the importance of these street tree planting factors.

swa





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18

Which scenario would you choose?

swa

17

19

The Community Forest

swa

20

swa

Tree Canopy Increase

While street trees comprise only a small part of Signal Hill's total street tree canopy, filling the city's empty street tree sites (over 1,000) would definitely have a positive impact.

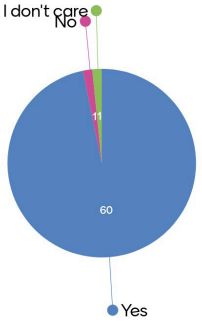
Scenario 1:	Tree Quantity
50% Small Trees	600
50% Medium Trees	600
Total	1200
Scenario 2:	
33% Small	269
33% Medium	269
33% Large	269
Total	807
Scenario 3:	
All Large Trees	488

13

21

Would you like to see Signal Hill increase its tree canopy by filling vacant street tree sites?

swa



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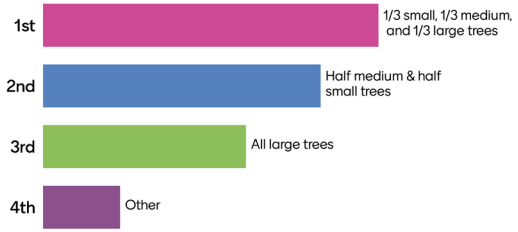
22

Rank the following methods of filling the street tree sites.

swa



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10-20-30 Rule of Urban Forestry

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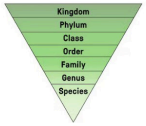

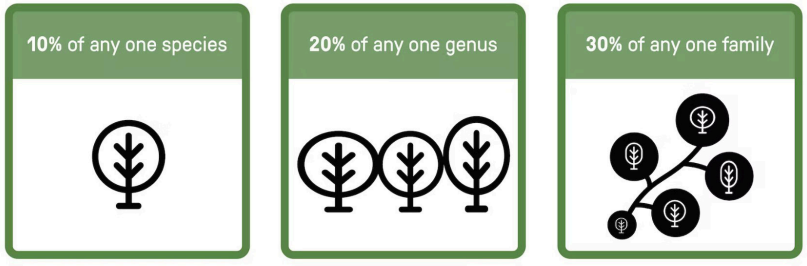

24

Top Street Trees in Signal Hill

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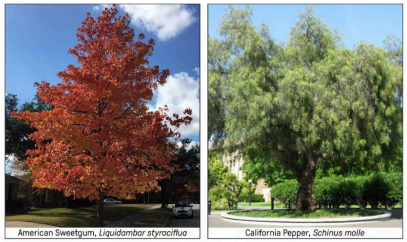
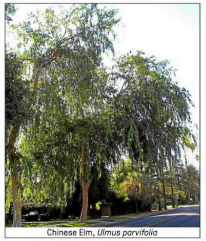
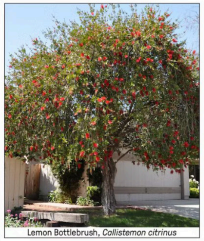

American Sweetgum, *Liquidambar styraciflua*

California Pepper, *Schinus molle*


Mexican Fan Palm, *Washingtonia robusta*

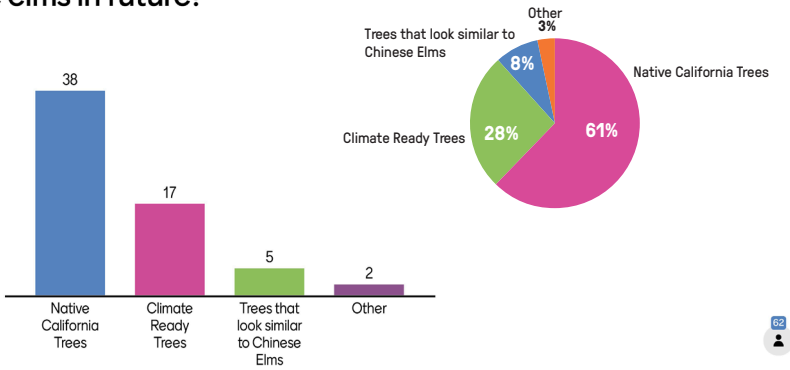

Chinese Elm, *Ulmus parvifolia*


Lemon Bottlebrush, *Callistemon citrinus*

25

Chinese Elms comprise 15% of the current street tree canopy. What kinds of trees would you like to see replace Chinese elms in future?

swa



62

26

What is your favorite kind of tree and why? Would you like to see it planted in Signal Hill?

swa

I love peppercorn trees because they smell great, are useful, and provide good shade. We need more shade in Signal Hill!

Cedar.

Elm.

Acacia.

Any trees and shrubs native to California that are drought resistant.

Sycamore.

Oak.

Crape myrtles are non-native but pretty and good for limited space.

Jacaranda - love the flowers and the color they provide when they bloom.

Native trees.

Eucalyptus. I love how they're very tall and majestic. The tree bark looks light and smooth.

I love our palm trees. They represent being in Southern California and being near the beach.

Desert willow. Drought tolerant native with colorful flowers.

Eucalyptus.

HOAs can partner with the city to plant trees.

Jacaranda.

Willow.

Tree-lined residential streets are beautiful. I would love to see more in my neighborhood.

Palo Blanco.

Maple tree. I love the shape of the leaves and the bright colors during autumn.

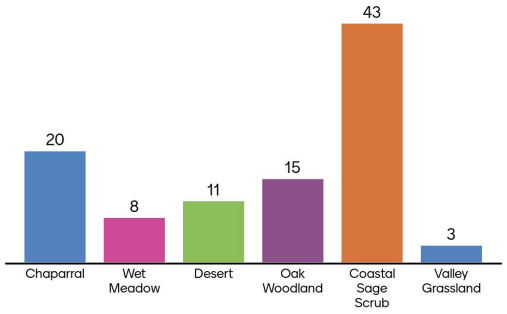
Gingko! Beautiful leaves, color in autumn, irregular graceful shape.

45

27

What is the native ecology of Signal Hill?

swa



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Erosion Control & Water Quality

Many native plants have roots that spread farther or dig deeper as an adaptation to seasonal drought, helping to reduce soil erosion and improve water quality.

Habitat for Wildlife

Native plants provide habitat for a wide range of native animal species, supporting biodiversity more than introduced species.

Resilience

Native plants are adapted to the local climate, pests, diseases, and soil.

Benefits of Native Plants

11

29

Click your favorite native tree type.

swa

Drought-Tolerant Native California Tree Species

52

30

Rate these statements about the importance of native trees.

swa

58

31

swa

WESTERN Arborist

Table 1. Survival rates (%) for park and reference sites in the Southern California Coastal and Inland climate zones.

	Park Sites			Reference Sites			All Sites		
Survival (2016-2018)									
	Coast	Inland	All	Coast	Inland	All	Coast	Inland	All
Acacia aneura[a] (Mulga)	100	88	94	100	100	100	100	92	96
Cedrela fissilis[a] (Brazilian Cedarwood)	63			100			75		75
Celtis reticulata[a] (Netleaf Hackberry)	100	100		100	100		100	100	100
Chilopsis linearis 'Bubba'[a] (Desert Willow)		88			100			92	92
Corymbia papuana[a] (Ghost Gum)	63	100		75	100		67	100	83
Dalbergia sissoo[a] (Rosewood)	75	100		100	100		83	100	92
Hesperocyparis forbesii[a] (Tecate Cypress)	38	75	56	50	75	63	42	75	78
Mariosousa willardiana[a] (Palo Blanco)	63	100	81	75	100	88	67	100	83
Parkinsonia x 'Desert Museum'[a] (Palo Verde)		100	100		100	100		100	100
Pistacia 'Red Push'[a] (Red Push Pistache)	75	100	88	100	100	100	83	100	92
Prosopis glandulosa x *Hawkii*[a] (Mesquite)	100	100	100	100	100	100	100	100	100
Prunus ilicifolia spp. *Lyonii*[a] (Catalina Cherry)	88		88	100		100	92		92
Quercus fusiformis[a] (Escarpment Live Oak)	88	38	63	100	100	100	92	58	75
Quercus tomentella[a] (Island Oak)	88	88	88	100	100	100	92	92	92
	78	90	84	92	98	95	83	92	88
a. In both Coastal and Inland sites									
b. Coastal sites only									
c. Inland sites only									

Climate Ready Trees Study

Scientists at UC Davis have created a long term study of several underutilized tree species they hope will thrive in our changing climate. These trees are resistant to pests, adaptable to their locations, and hardy.

11

32

3 Climate Ready Trees

swa

Mulga, *Acacia aneura*
Size: Small, 20ft high x 20ft wide
Evergreen
Water Use: Very Low
Origin: Australia
Root Damage: Low
Powerline Friendly: Yes
Yellow flowers in spring

Red Push Pistache, *Pistacia 'Red Push'*
Size: Medium, 40ft high x 20-40ft wide
Deciduous
Water Use: Medium
Origin: Hybridized species from China and Persia
Root Damage: Low
Powerline Friendly: No
Red leaves when first emerging and again in fall

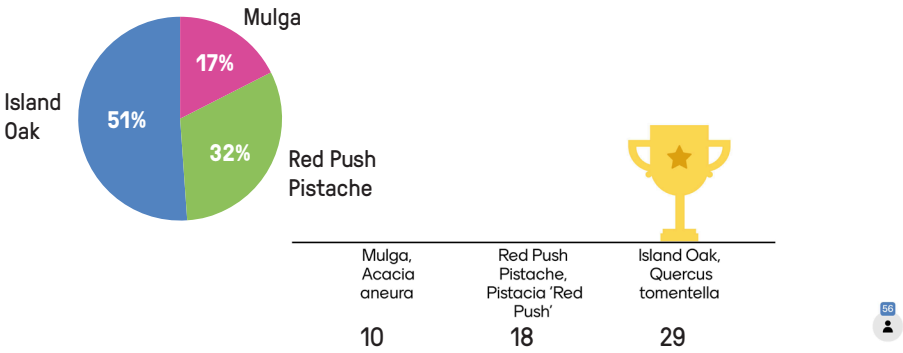
Island Oak, *Quercus tomentella*
Size: Large, 30-70ft high x 35 ft wide
Evergreen
Water Use: Low
Origin: California Channel Islands
Root Damage: Unknown
Powerline Friendly: No
Large native oak provides excellent shade canopy

33

Which Climate Ready Tree do you like best?

swa

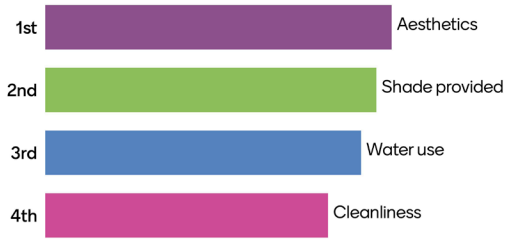
Island Oak, Quercus tomentella wins!



34

Rank these items in term of importance in selecting a tree in front of your home.

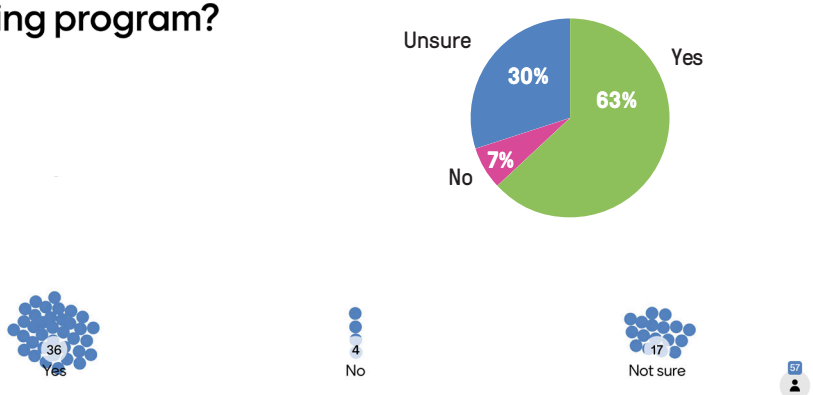
swa



35

Would you participate in a community tree-planting program?

swa



5.3 Analysis & Integration

Survey respondents mostly lived in the city, but some worked or patronized businesses in Signal Hill [**Slide 1**]. Only 4 had children who attend school in the city. A large number (24) were members of an HOA in the city, a factor which indicates that cooperating with local HOAs could help streamline the tree-planting process. While respondents came from all across the city, the largest number lived in Zone 4, a more affluent part of Signal Hill which already has the greatest canopy cover [**Slide 2**]. Because people took the survey on their own initiative, answers may skew to those already invested in Signal Hill's environmental wellbeing or those who have a problem with a tree in their neighborhood. Most people (48%) were not aware that the city has a Street Tree Master Plan, and 18% wondered what a Street Tree Master Plan was [**Slide 3**]. The city will need to continue to educate residents about the existence and nature of the Street Tree Master Plan, especially the 2023 update.

When asked why trees are important, people stressed shade, air quality and environmental benefits, and beauty [**Slide 4**]. Respondents strongly agreed with the statements "I would like to see more trees in Signal Hill" and "It is important to see more trees in Signal Hill." People generally agreed that they would water a tree planted in front of their home, but with less enthusiasm than for the previous statements [**Slide 6**], indicating that the city will have to carefully consider its irrigation methods when planting new street trees.

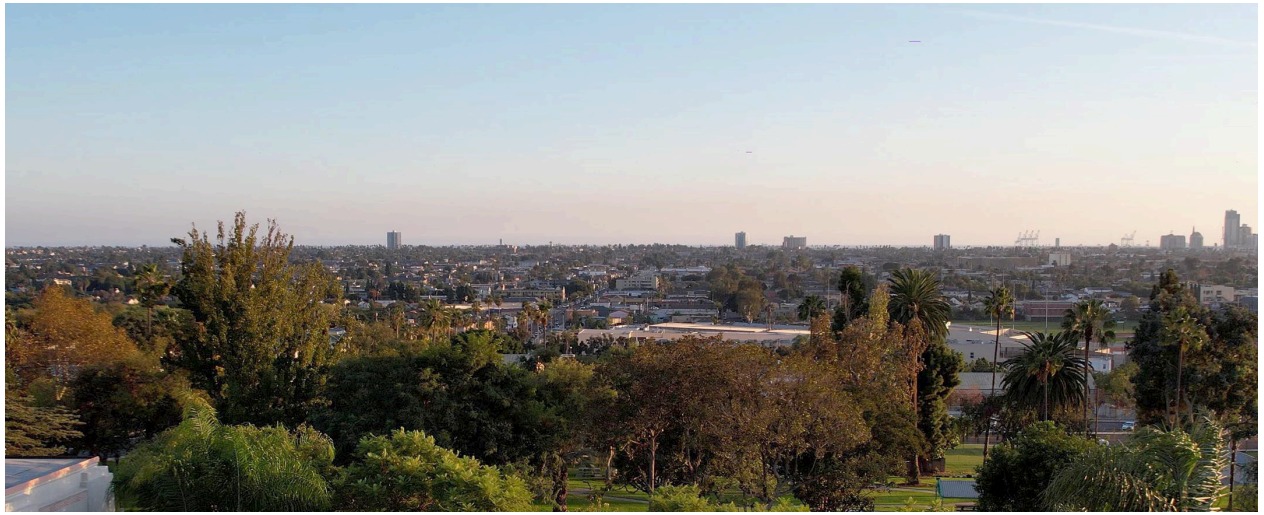
Respondents ranked "improving air quality / decreasing pollution" as the most important role of trees in Signal Hill, followed by "reducing heat / providing shade" and "improving people's physical and mental health." Providing habitat, aesthetics, and improving water quality followed, with increasing property values at the bottom [**Slide 8**]. Planting trees strategically to provide shade, especially planting larger species with greater shade production and pollution reduction benefits, should therefore be prioritized.

Asked their preference of evergreen, deciduous, or flowering trees, people preferred flowering closely followed by evergreen, in line with their values of shade and beauty [**Slide 14**]. Aesthetically, respondents strongly preferred spreading tree forms, reinforcing the need for more shade in Signal Hill [**Slide 15**]. Round and weeping forms were also popular. When ranking the importance of street tree planting factors, water use was the first priority (8.3), followed by root damage (8.2) and size (7.9) [**Slide 17**]. These answers are in line with the findings of this Street Tree Master Plan that the city should plant trees that will thrive in Southern California's drought-prone environment, as well as to plant trees carefully in the future to avoid current issues such as trees interfering with utilities. Notably, citizens ranked "view" as a lower-priority factor when planting trees, at 6.6 ranking only above foliage type (6.1) and below growth rate (7.2), shape (7), and litter (7) in addition to the previous factors. When asked whether they would prefer a large tree with an impacted view, a small tree with a partial view, or no tree with an open view, all respondents preferred a tree (large tree 9, small tree 8) to no tree (0) [**Slide 18**]. While this question was added to the survey later and therefore has fewer respondents (17), it clearly indicates a preference for trees over views, despite frequent complaints by a small number of citizens about trees blocking views. Finally, while granting aesthetics a lower consideration for street trees, respondents ranked it first as a factor in selecting a tree in front of their home, followed by shade provided, water use, and cleanliness [**Slide 34**]. While anecdotally, many residents expressed annoyance with tree litter, especially from jacaranda trees, in the survey they granted it less importance, and several expressed a desire for jacarandas to be further planted in the city [**Slide 26**].

Survey respondents also strongly support

increasing Signal Hill's tree canopy by filling vacant street tree sites, with 97% expressing approval [**Slide 21**]. Respondents preferred an even mix of trees sizes to only small and medium or all large trees [**Slide 22**]. When asked what kind of trees should replace overused species such as Chinese elm to restore balance to the urban forest, most respondents (61%) preferred native trees, followed by Climate Ready Trees (28%) [**Slide 25**]. The updated street tree palette contains many native species; planting these species should be prioritized. Respondents also had much to say about their favorite trees **[Slide 26**]; a word cloud version is included on Slide 26, while the full comments are included in Appendix 2.

Given pictures of 8 different species of native trees, respondents expressed a preference for the Western Redbud (15 votes), Incense Cedar (11 votes), and Blue Palo Verde (9 votes) [**Slide 29**]. These trees should be included in future plantings. Respondents found the benefits of native trees to all be very important, especially their suitability to the local environment [**Slide 30**]. Of the three Climate Ready Trees shown to survey takers, respondents expressed a strong preference for Island Oak (51%), a large, drought-resistant native California tree [**Slide 33**]. This tree should be used whenever possible given both its strong qualifications and popularity.



A view from City Hall. Photo: M. Fratino

The survey included slides intended to educate survey-takers on street tree establishment [**Slide 5**], Urban Heat Islands [**Slides 9-10**], tree canopy [**Slide 11**], benefits of native plants [**Slide 28]**, and Climate Ready Trees [**Slide 31**]. They are included in the slides on the previous pages. These elements should continue to be emphasized as Signal Hill implements and promotes its updated Street Tree Master Plan.

Many survey respondents (63%) indicated they would participate in a tree planting program [**Slide 35**]. The city should capitalize on this factor and encourage participation in such a program as much as possible. Respondents appreciate street trees, especially for shade, pollution reduction, and aesthetics. They value trees over views, and wish to see more native trees in their city. This updated Street Tree Master Plan should help guide the city in their endeavor to create a robust urban forest in compliance with the desires of the residents of Signal Hill.

5.4 Creation of a Community Forest Master Plan

The entire community benefits from an extensive, healthy, well-designed forest, beyond the limits of the street tree population. If possible, it is recommended that Signal Hill create such a comprehensive plan, involving trees not only in streets but parks, businesses, and residences. Even if the city simply continues to implement and regularly update the Street Tree Master Plan, an informed, involved populace is essential. Each individual tree requires proper care to thrive, while the forest as a whole needs long-term planning and support to assure its growth. Community involvement is therefore integral to the life of the forest.

5.4a Who to Involve in the Community

Residents of Signal Hill are perhaps most emotionally affected by decisions regarding the forest. Contact with residents can be on an individual basis, as in city-initiated newsletters delivered to all households, or through groups such as homeowners' associations or neighborhood-improvement organizations. The formation of such groups should be encouraged, in order to help disseminate information and enlist support for the forest. Organizations also create social bonds that help build community spirit.

Local business of all kinds, including large corporations with local offices, benefit from the community forest. A community full of trees makes the city a more attractive place to do business, helps attract and keep workers, and reduces energy costs. Trees planted on or near business sites have a positive impact on the image of the business as well as the city as a whole. Treelined commercial districts draw more customers than treeless ones. Corporate campuses with impressive groves to relax in with clients or during lunch are far more memorable than corporate landscapes of grass berms and shrubs. Industrial sites are often improved by the screening effects of trees. Shade trees in parking lots and near buildings can greatly reduce cooling costs. It should be noted that the enhanced public image resulting from the private sector's involvement in the community forest is also an effective marketing strategy.

The type of involvement depends on the type of business. Developers play a major role in the community forest's growth, of course, but so can other businesses if given the opportunity and inspiration. As with residents, interaction may be between the City and individual business people or groups of businesses. Such groups can be particularly influential in the expansion of the forest, especially when their intent is to make commercial districts more attractive and humane.

Institutions - schools, hospitals and libraries offer many opportunities for the community forest. Their grounds provide room to expand the forest, and their strong connections to the community create a natural interest in the forest. Schools and libraries are especially invaluable in their role as community teachers, but will need city support and advice to fully develop this function.

Organizations such as Scouting groups, community volunteer groups, civic organizations, and environmental groups can be encouraged to play an active role in the creation and maintenance of the forest. These groups will assist with community education as well as participating in the physical needs of the forest. Outreach programs aimed at these groups will ensure their ongoing interest and participation.

5.4b How to Involve the Community

This section describes some of the many ways to bring the community into the process of creating and maintaining the forest, starting with types of participation.

Selecting trees

Residents usually have a strong notion of how their neighborhood should look and what its character should be. In addition, having a hand in the design process will result in a more personal connection between residents and their neighborhood, engendering greater pride of place. Citizens should therefore be brought into this process as much as possible to review planting plans for their areas.

Planting trees.

While all work associated with the forest is important, perhaps the most satisfying job is planting trees. This is where people develop emotional attachments and a lifelong interest in the forest. The more individuals who personally plant a tree in the city, the greater the long term support for the forest. This axiom is especially applicable to the children of Signal Hill. Setting a goal of having each child plant a tree ensures that the ideals of the community forest will be carried into the next generation.

The beautiful walnut tree in Raymond Arbor Park is an important part of Signal Hill's Community Forest.

Signal Hill's parks have beautiful trees worthy of a Community Forest Plan. Photo: G. Castriotta

Maintaining trees.
Residents already play a hand in the maintenance of the neighborhood street trees - many people at least water the tree fronting their house, and some go beyond this to include fertilizing, minor pruning and the like. Providing residents with standards for care will result in healthier trees. In addition, residents as well as businesses should be alerted to signs of poor tree health or maintenance. Having all eyes focused on the forest will increase the ability of the forestry staff to engage in preventive maintenance, possibly saving trees in the early stages of ill-health and eliminating potential accidents.

Funding tree planting or maintenance.
Providing the mechanism for citizens, including businesses and institutions, to donate money earmarked for this work is an important avenue of participation, particularly for people with time or physical constraints.

Providing land for expansion of the forest.
Landowners with room to spare can be brought into the forestation process without sacrificing property rights. The benefits of trees to the community - and to the planet - provide convincing reasons to join the effort.

Advising the city on forestry decisions.
As particular issues arise, the city may consider forming ad hoc advisory committees to provide a connection between the city bureaucracy and citizens, as well as a way for both sides to exchange information and voice concerns. The city forestry staff cannot be expected to handle every decision about every tree in the forest without such help. Encouraging citizen input will give weight to the term "community forest."Tree Board University offers guidance in this area.

Educating others about the forest.
The community's teachers, biologists, naturalists, historians, artists, landscape architects, and horticulturists all have a great deal to offer toward this worthy endeavor.

Ways for Residents to Participate

Encourage neighborhood tree associations to ensure a close relationship between residents and their part of the forest. Activities could include planting parties and maintenance workshops, as well as celebratory events, all of which help build ties between neighbors. A participatory process should be used when city staff begin planning for tree plantings or removals in a neighborhood. This process might include community meetings, preference surveys, or design charrettes. It is advisable to seek the needs and preferences of residents in the case of neighborhood parks as well.

Residents interested in planting trees community-wide might form a nonprofit organization based on San Francisco's "Friends of the Urban Forest" or Los Angeles' "Tree People." However, while such groups can play an invaluable role in the community forest, they should not be expected to substitute for city support and forestry resources. If such a group is formed, and depending on the available resources, the City should offer assistance and legitimization by way of seed money, grant-writing assistance, technical advice, meeting space and staff assistance.

Getting the Participation of Business

Inform businesses of options for supporting the forest. A pamphlet describing the benefits of trees could be distributed to the business community. Inform retail businesses of the decision-making process regarding street trees. Involve those interested in the process as much as possible.

Businesses with large reserves of land in Signal Hill should be encouraged to join the growing ranks of companies nationwide that are converting portions of their holdings to wildlife habitat. Some ways this can be done:

- Convert standard turf to native grasses, which have a higher wildlife value (and require no summer water).
- Create shrubby edges to allow hiding and nesting places for wildlife.
- Include as many native species of plants as possible.
- Include plants that provide sources of food for a variety of creatures. A single oak, for example, can support more than 300 species of insects, which in turn support dozens of species of birds. Acorns from oaks also feed a wide variety of creatures.
- Set up nesting boxes for various birds (owls and other raptors adjust particularly well to these manmade homes). The local Audubon Society is one source of information for the specifics of this project.

The Role of Institutions

Schools offer perhaps the greatest opportunity for participation in community forest programs. Our youngest citizens are tomorrow's caretakers of the forest, so concentrating outreach efforts on them will have important long term benefits. The outdoor environment of most American schools consists of equal parts asphalt and grass, with a scattering of trees (often in street-tree-like rows), some play or recreation equipment, and lunch tables. This type of schoolyard is usually a sterile place, not conducive to outdoor learning or creative play. The extension of the community forest into the schoolyards of Signal Hill can help remedy this situation.

There are many creative ways to bring the community forest to the schools, such as:

- Plant groves of fruits, nuts, or hardwoods to act as hands-on educational labs as well as potential sources of revenue for the schools. Such groves would be best suited to high schools or colleges, where classes in the life sciences, agriculture, community forestry and woodworking could all have a hand in care and planting.
- Involve students of all ages in tree planting, particularly plantings at schools. Personal involvement in the process will reduce the likelihood of vandalism and damage due

to carelessness (a potential problem with young children unschooled in the ways of newly planted trees).

- Use the Master Plan in the classroom. The subject is a natural for civics classes as well as the sciences. Additionally, the California Department of Education provides resources for environmental education curriculum. A wide variety of topics are covered, including forestry and fire protection.
- Sponsor a workshop bringing together city staff and local teachers to brainstorm other ways to bring the community forest into the classroom.

Libraries are symbols of the community's commitment to lifelong learning. The library should act as the prime repository for books and publications on trees and community forestry, since it is accessible to the entire community.

Hospitals are the community's place for healing. As such, they are appropriate places to represent the overall health of the community as symbolized by the planting of trees. A grove of trees with medicinal value would make an appropriate "outdoor room" for patients, visitors and staff to use. One quarter of prescribed drugs in the U.S. pharmacopea contain plant derivatives; examples of species include Salix alba and the native Rhamnus pershiana.

Street trees waiting to be planted. Photo: Our City Trees

How Organizations Can Help

Environmental groups need no convincing about the benefits of trees. Some tasks that might be carried out with their help:

- Planting parking lots to reduce the heat-island effect in the city.
- Establishing "Clean Air Groves."
- Join the California ReLeaf network for statewide support of community forestry projects.
- Helping businesses convert company land to wildlife habitat.

Spreading the Word
The City can instigate a number of programs to increase community awareness of its forest resource. These actions fall into three broad categories: publicizing city policies (including this Master Plan), soliciting community support and enthusiasm, and educating people about trees and the forest as a whole. This section suggests ways to do this, organized in these categories.

Publicizing City Policies
- Publicize the Master Plan on the City website, in local newspapers (both online and print), and flyers posted at local nurseries.
- Invite citizens to a community forestry open house, attended by all city staff members involved in the forest's creation and care. This could be a special focus during Public Works Week.
- Make the Master Plan easily available; keep a digital file posted for public access on the City website.
-

Soliciting Community Support
- Publish a pamphlet that illustrates the steps a citizen needs to take to plant a tree. Include horticultural basics as well as bureaucratic steps. Include a reference to the planting and maintenance information found in this document. The pamphlet can be posted digitally to the city's website, as well as distributed to homeowner's associations and other community organizations. Printed copies can be made available at libraries and other public facilities.
- Support the Arbor/Earth Day celebration in April. Use this event as a venue for interaction between city staff, environmental groups, and the general community to build support for forestry efforts.

Providing Education
- Produce pamphlets that give residents guidance on tree planting and care. Pamphlet topics could include: proper tree pruning and reasons to not top trees, the benefits of deep-watering street trees, keeping a two-foot circle around the trunk free of other plantings, and keeping a minimum 4' x 6' planting area around street trees if installing pavement near them. These maintenance efforts will greatly enhance the health of the city's street trees.
- Offer hands-on tree-care workshops, either free or with fees going to support the community forest.

Conclusion
The creation of a Community Forest Plan or the future updates of the Street Tree Master Plan are important opportunities to build public awareness and appreciation of the community forest. The undertaking of a comprehensive community forestry program is an important initiative for Signal Hill, and as such should receive ample attention. The city should continue to involve residents in future editions of any tree plan.

APPENDIX

Slide Referenced: 1 2 3 6

Date	Voter	I live in Signal Hill.	I work in Signal Hill.	I own a business in Signal Hill.	I patronize businesses in Signal Hill.	I manage a property in Signal Hill.	I am a member of an HOA in Signal Hill.	My children attend school in Signal Hill.	I am retired.	Which zone do you live in?:	Did you know Signal Hill has a Street Tree Master Plan?:	Rate your opinion on the following statements:: I would water a street tree planted in front of my home.	Rate your opinion on the following statements:: I would like to see more trees in Signal Hill.	Rate your opinion on the following statements:: It is important to plant more native California trees in Signal Hill.
2022-10-24	1										Yes	4	5	4
2022-10-31	2	x			x					Other	Yes			
2022-11-01	3	x								3	Yes	2	5	5
2022-11-03	4	x								Other	Yes	4	5	5
2022-11-03	5	x								3	Yes	2	5	5
2022-11-05	6	x			x				x	1	Yes	5	5	5
2022-11-08	7		x		x					Other	Yes	5	5	5
2022-11-08	8	x	x		x		x			3	Yes	5	5	3
2022-11-08	9	x			x					1	Yes	5	5	4
2022-11-08	10		x							Other	Yes	3	5	5
2022-11-11	11	x								3	Yes	4	5	3
2022-11-14	12		x							3	Yes	4	5	5
2022-11-14	13	x								3	No	4	5	5
2022-11-15	14		x											
2022-11-15	15		x											
2022-11-15	16	x	x		x					3	No	5	5	5
2022-11-15	17	x					x			4	No	1	5	5
2022-11-15	18	x								1	No			
2022-11-15	19	x								4	?		3	4
2022-11-15	20	x	x			x				3	Yes	5	5	3
2022-11-15	21	x					x							
2022-11-15	22	x			x		x			4	Yes			
2022-11-15	23	x			x					4	?		5	5
2022-11-15	24	x								4	No			

Slide Referenced: 1 2 3 6

Date	Voter	I live in Signal Hill.	I work in Signal Hill.	I own a business in Signal Hill.	I patronize businesses in Signal Hill.	I manage a property in Signal Hill.	I am a member of an HOA in Signal Hill.	My children attend school in Signal Hill.	I am retired.	Which zone do you live in?:	Did you know Signal Hill has a Street Tree Master Plan?:	Rate your opinion on the following statements:: I would water a street tree planted in front of my home.	Rate your opinion on the following statements:: I would like to see more trees in Signal Hill.	Rate your opinion on the following statements:: It is important to plant more native California trees in Signal Hill.
2022-11-15	25					x				2	No	5	5	5
2022-11-15	26	x			x			x		3	?	5	5	5
2022-11-15	27	x								3	No	5	5	5
2022-11-15	28		x							3	Yes			
2022-11-15	29	x								4	No			
2022-11-15	30	x								4	No			
2022-11-15	31				x					Other	?	4	5	5
2022-11-15	32	x			x					4	No	3	4	3
2022-11-15	33	x	x				x			4	?	4	5	5
2022-11-15	34	x			x					4	?	3	5	5
2022-11-15	35	x			x	x	x			3	No	5	5	5
2022-11-15	36	x		x			x			3	Yes	5	5	5
2022-11-15	37	x		x	x		x							
2022-11-15	38	x				x				3				
2022-11-15	39	x			x		x		x	4	Yes		4	4
2022-11-16	40		x		x					Other	Yes	2	5	5
2022-11-16	41		x							Other	No			
2022-11-17	42	x					x			1	Yes	5	5	5
2022-11-17	43	x								1	Yes	5	5	5
2022-11-17	44	x			x				x	1	Yes	5	5	5
2022-11-17	45	x								2	Yes	5	5	5
2022-11-17	46	x					x			4	No	5	5	5
2022-11-17	47	x			x		x			4	No	2	4	4
2022-11-17	48	x			x		x			4	No	4	4	5

Slide Referenced: 1 2 3 6

Date	Voter	I live in Signal Hill.	I work in Signal Hill.	I own a business in Signal Hill.	I patronize businesses in Signal Hill.	I manage a property in Signal Hill.	I am a member of an HOA in Signal Hill.	My children attend school in Signal Hill.	I am retired.	Which zone do you live in?:	Did you know Signal Hill has a Street Tree Master Plan?:	Rate your opinion on the following statements:: I would water a street tree planted in front of my home.	Rate your opinion on the following statements:: I would like to see more trees in Signal Hill.	Rate your opinion on the following statements:: It is important to plant more native California trees in Signal Hill.
2022-11-17	49	x		x						4	?	1	5	5
2022-11-18	50	x	x		x	x				3	Yes	5	5	5
2022-11-18	51	x								4	No			
2022-11-18	52	x			x		x			4	No	5	5	5
2022-11-18	53	x		x						2	No	5	5	5
2022-11-18	54	x			x		x			4	No	3	4	5
2022-11-18	55	x												
2022-11-18	56	x		x				x		4	?	5	5	5
2022-11-18	57	x								4	No	4	3	3
2022-11-20	58	x			x				x	4	No	1	3	2
2022-11-20	59	x		x	x									
2022-11-20	60									3	Yes	3	5	2
2022-11-20	61	x			x		x			4	Yes	1	3	5
2022-11-20	62	x			x				x	1	Yes	5	5	5
2022-11-21	63				x				x		Yes	1	1	3
2022-11-21	64	x								4	No	5	5	5
2022-11-21	65	x								2	?	5	5	5
2022-11-21	66	x			x		x		x	4	Yes	1	1	3
2022-11-22	67	x					x			3	?	5	5	5
2022-11-23	68	x			x		x			4	No	5	5	4
2022-11-23	69	x			x	x			x					
2022-11-23	70	x								3	No	5	5	5
2022-11-23	71	x	x		x					1	No	5	5	5
2022-11-23	72	x								1	No	1	1	1

Slide Referenced: 1 2 3 6

Date	Voter	I live in Signal Hill.	I work in Signal Hill.	I own a business in Signal Hill.	I patronize businesses in Signal Hill.	I manage a property in Signal Hill.	I am a member of an HOA in Signal Hill.	My children attend school in Signal Hill.	I am retired.	Which zone do you live in?:	Did you know Signal Hill has a Street Tree Master Plan?:	Rate your opinion on the following statements:: I would water a street tree planted in front of my home.	Rate your opinion on the following statements:: I would like to see more trees in Signal Hill.	Rate your opinion on the following statements:: It is important to plant more native California trees in Signal Hill.
2022-11-23	73		x		x					3	?	5	5	5
2022-11-27	74	x	x							3	No	5	5	5
2022-11-29	75				x					Other	No			
2022-11-30	76	x					x		x	4	No	5	5	4
2022-11-30	77		x							2	No			
2022-12-01	78	x								4	No	5	5	5
2022-12-01	79	x				x				4	?	1	5	2
2022-12-01	80	x								1	No	5	5	5
2022-12-01	81	x								1	No	5	5	5
2022-12-01	82	x						x		3	?	1	5	5
2022-12-01	83	x						x		3	?	5	5	5
2022-12-01	84	x								4	No			
2022-12-01	85	x								3	?	5	5	5
2022-12-01	86		x											
2022-12-02	87	x	x	x	x	x				4	No	4	4	5
2022-12-03	88	x			x					3	No	1	4	5
2022-12-08	89	x			x		x		x	4	No	3	5	5
2022-12-08	90	x			x					4	Yes	5	5	5
2022-12-09	91	x			x					Other	No	1	5	5
2022-12-17	92	x			x		x			3	No	5	5	5
2022-12-22	93	x		x										
2022-12-31	94	x			x		x		x					
2023-01-03	95		x		x					Other	Yes		4	4
2023-01-03	96		x							4	No			

Slide Referenced: 6 8

Voter	Rate your opinion on the following statements:: There are too many trees in Signal Hill.	Rank the importance of the different ways trees help Signal Hill. : Reducing heat / providing shade	Rank the importance of the different ways trees help Signal Hill. : Improving air quality / decreasing pollution	Rank the importance of the different ways trees help Signal Hill. : Improving water quality / capturing stormwater	Rank the importance of the different ways trees help Signal Hill. : Improving people's physical and mental health	Rank the importance of the different ways trees help Signal Hill. : Increasing property values / helping to drive economic development	Rank the importance of the different ways trees help Signal Hill. : Creating aesthetics / sense of place	Rank the importance of the different ways trees help Signal Hill. : Providing habitat / increasing biodiversity
1	1	1	2	3	4	5	6	7
2								
3	1	3	4	1	6	7	5	2
4	1	4	2	5	1	7	6	3
5	2	3	6	2	5	1	4	7
6	1	6	1	2	4		3	5
7	2	2	4	3			1	
8	1	4	1	6	5	7	3	2
9	1	6	1	7	4	5	2	3
10	1	5	1	6	7	4	3	2
11	1	3	5	4	1	7	6	2
12	1	3	5	7	6	2	1	4
13	1	1	5	3	4	7	6	2
14								
15								
16	1	5	1	2	3		6	4
17	3	7	3	6	4	2	1	5
18								
19	1	4	6	7	1	5	2	3
20	1	5	1	7	2	4	3	6
21								
22								
23	1	3			2	1		
24								

Slide Referenced: 6 8

Voter	Rate your opinion on the following statements:: There are too many trees in Signal Hill.	Rank the importance of the different ways trees help Signal Hill. : Reducing heat / providing shade	Rank the importance of the different ways trees help Signal Hill. : Improving air quality / decreasing pollution	Rank the importance of the different ways trees help Signal Hill. : Improving water quality / capturing stormwater	Rank the importance of the different ways trees help Signal Hill. : Improving people's physical and mental health	Rank the importance of the different ways trees help Signal Hill. : Increasing property values / helping to drive economic development	Rank the importance of the different ways trees help Signal Hill. : Creating aesthetics / sense of place	Rank the importance of the different ways trees help Signal Hill. : Providing habitat / increasing biodiversity
25	1	2	1					3
26	3	5	1	2	6	7	3	4
27	1	2	1	4	3	7	5	6
28								
29								
30								
31	1	2	4	6	3	7	5	1
32	1	5	3		1		2	4
33	1	2	1	5	3	7	4	6
34	1	5	1	7	2	4	3	6
35	1	6	2	4	5	3	1	7
36	1	6	1	7	3	2	5	4
37								
38								
39	1	4	2	1	3	7	5	6
40	1	2	1	3	4	6	7	5
41								
42	1	4	5	7	6	3	1	2
43	1	2	3	6	1	7	5	4
44	1	1	3	6	4	7	5	2
45	1							1
46	1	5	1	3	4	7	6	2
47	1		1					
48	1		1					

Slide Referenced: 6 8

Voter	Rate your opinion on the following statements:: There are too many trees in Signal Hill.	Rank the importance of the different ways trees help Signal Hill. : Reducing heat / providing shade	Rank the importance of the different ways trees help Signal Hill. : Improving air quality / decreasing pollution	Rank the importance of the different ways trees help Signal Hill. : Improving water quality / capturing stormwater	Rank the importance of the different ways trees help Signal Hill. : Improving people's physical and mental health	Rank the importance of the different ways trees help Signal Hill. : Increasing property values / helping to drive economic development	Rank the importance of the different ways trees help Signal Hill. : Creating aesthetics / sense of place	Rank the importance of the different ways trees help Signal Hill. : Providing habitat / increasing biodiversity
49	1				3	2	1	
50	1	6	4	7	3	2	1	5
51								
52	1	2	1	5	6	7	3	4
53	1	5	3	2	4	7	6	1
54	1	2	4		3		5	1
55								
56	1	4	1	3				2
57	2	2	1	4	6	7	5	3
58	1	1	2	3	5	6	4	7
59								
60	1	4	3	6	5	2	1	7
61	1	2	1	3	6	4	7	5
62	1	1	5	2	4	6	7	3
63	5	5	2	6	3	7	1	4
64	1	2	3	5	6	4	7	1
65	1	1	3		4	2		
66	3		1					
67	1	7	2	4	5	1	3	6
68	1	1	2		3	4		
69								
70	1	5	6	7	3	1	2	4
71	1	2	1	5	4	7	6	3
72	1	4	7	2	3	5	1	6

Slide Referenced: 6 8

Voter	Rate your opinion on the following statements:: There are too many trees in Signal Hill.	Rank the importance of the different ways trees help Signal Hill. : Reducing heat / providing shade	Rank the importance of the different ways trees help Signal Hill. : Improving air quality / decreasing pollution	Rank the importance of the different ways trees help Signal Hill. : Improving water quality / capturing stormwater	Rank the importance of the different ways trees help Signal Hill. : Improving people's physical and mental health	Rank the importance of the different ways trees help Signal Hill. : Increasing property values / helping to drive economic development	Rank the importance of the different ways trees help Signal Hill. : Creating aesthetics / sense of place	Rank the importance of the different ways trees help Signal Hill. : Providing habitat / increasing biodiversity
73	1	1	6	4	3	7	5	2
74	1	5	1	6	4	7	3	2
75								
76	1			2	1			3
77								
78	1				1			
79	1	3	2	1	5	4	6	7
80	1	6	7	5	1	4	2	3
81	1	2	1	7	5	3	4	6
82	2	2	7	3	5	1	6	4
83	1	3	1	2	6	7	5	4
84								
85	1	6	2	1	4	7	5	3
86								
87	1	4	3	5	7	6	1	2
88	1	1	2	4	3	6	7	5
89	1	1	2	4	3	7	6	5
90	1	1	2	6	4	5	3	7
91	1	5	1	2	4		6	3
92	1	1	2	3	4	7	5	6
93								
94								
95	1	2	7	6	5	3	1	4
96								

Slide Referenced: 12 14 17 18

Voter	Which of the following options do NOT have an effect on Urban Heat Islands?:	What is your favorite tree type?: 1	Rate the importance of these street tree planting factors. : Size	Rate the importance of these street tree planting factors. : Shape	Rate the importance of these street tree planting factors. : Foliage Type	Rate the importance of these street tree planting factors. : Growth Rate	Rate the importance of these street tree planting factors. : Litter (fruit, leaves, flowers and seeds)	Rate the importance of these street tree planting factors. : Water Use	Rate the importance of these street tree planting factors. : View	Rate the importance of these street tree planting factors. : Root Damage	Which scenario would you choose?:
1	Ice cream production	Flowering	9	3	6	4	5	10	2	7	
2											
3	Ice cream production	Evergreen	10	10	10	10	10	10	10	10	
4	Ice cream production	Deciduous	10	6	4	7	8	9	5	10	
5	Ice cream production	Evergreen	4	6	6	6	6	7	6	10	
6	Ice cream production	Deciduous	10	10	10	10	5	8	1	10	
7	Ice cream production	Flowering	10	10	5	10	10	10	10	10	
8	Ice cream production	Evergreen	10	10	6	6	10	10	10	9	
9	Ice cream production	Evergreen	9	7	6	6	9	10	6	10	
10	Ice cream production	Evergreen	10	5	5	10	10	5	5	10	
11	Ice cream production	Deciduous									
12	Ice cream production	Flowering	10	10	9	9	9	9	7	9	
13	Ice cream production	Flowering	8	8	9	7	8	10	5	7	
14											
15											
16	Roof color	Evergreen	6	5	2	3	10	10	6	10	
17	Ice cream production	Deciduous	10	7	4	1	10	6	6	10	
18											
19	Ice cream production	Flowering	8	1	1	7	3	10	3	1	
20	Tree canopy	Evergreen	10	10	10	10	10	10	10	10	
21											
22											
23	Ice cream production		1	1	1	1	1	10	1	1	
24											

Slide Referenced: 12 14 17 18

Voter	Which of the following options do NOT have an effect on Urban Heat Islands?:	What is your favorite tree type?: 1	Rate the importance of these street tree planting factors. : Size	Rate the importance of these street tree planting factors. : Shape	Rate the importance of these street tree planting factors. : Foliage Type	Rate the importance of these street tree planting factors. : Growth Rate	Rate the importance of these street tree planting factors. : Litter (fruit, leaves, flowers and seeds)	Rate the importance of these street tree planting factors. : Water Use	Rate the importance of these street tree planting factors. : View	Rate the importance of these street tree planting factors. : Root Damage	Which scenario would you choose?:
25	Ice cream production	Flowering	10	10	10	10	10	10	10	10	
26	Ice cream production	Evergreen	7	7	7	7	8	8	6	9	
27	Ice cream production	Flowering	1	4	5	5	6	8	6	7	
28											
29											
30											
31	Ice cream production	Flowering	10	9	8	10	5	9	3	10	
32	Ice cream production	Flowering	9	9	9	7	6	4	10	5	
33	Ice cream production	Evergreen	8	5	8	9	5	10	5	5	
34	Ice cream production	Evergreen	10	6	6	6	10	5	6	10	
35	Tree canopy	Evergreen	9	10	10	10	10	10	10	10	
36	Ice cream production	Flowering	9	9	9	10	10	10	7	10	
37											
38											
39	Ice cream production	Deciduous	5	5	5	8	8	8	5	8	
40	Ice cream production	Flowering	3	2	3	6	7	9	2	9	
41											
42	Ice cream production	Evergreen	9	10	10	6	9	4	4	4	
43	Ice cream production	Deciduous	5	4	3	4	6	7	6	7	
44	Ice cream production	Deciduous	8	8	5	9	3	10	2	2	
45	Ice cream production		1	1	1	1	1	1	1	1	
46	Ice cream production	Flowering	6	5	5	8	8	10	8	9	
47											
48	Ice cream production	Flowering	8	6	3	8	8	10	10	8	

Slide Referenced: 12 14 17 18

Voter	Which of the following options do NOT have an effect on Urban Heat Islands?:	What is your favorite tree type?: 1	Rate the importance of these street tree planting factors. : Size	Rate the importance of these street tree planting factors. : Shape	Rate the importance of these street tree planting factors. : Foliage Type	Rate the importance of these street tree planting factors. : Growth Rate	Rate the importance of these street tree planting factors. : Litter (fruit, leaves, flowers and seeds)	Rate the importance of these street tree planting factors. : Water Use	Rate the importance of these street tree planting factors. : View	Rate the importance of these street tree planting factors. : Root Damage	Which scenario would you choose?:
49	Roof color	Flowering									
50	Ice cream production	Deciduous	10	10	10	10	10	10	10	10	
51											
52	Ice cream production	Flowering	9	9	10	9	4	10	7	10	
53	Roof color	Flowering	10	10	10	10	6	10	10	10	
54	Ice cream production	Evergreen	7	8	7	6	10	10	8	10	
55											
56	Ice cream production	Flowering	8	8	1	8	1	1	1	1	
57	Ice cream production	Evergreen	7	6	6	5	9	10	9	10	
58	Ice cream production	Evergreen	6	6	6	8	9	9	9	9	
59											
60	Ice cream production	Flowering	8	9	9	9	9	7	9	8	
61	Ice cream production	Flowering	6	1	1	1	1	10	6	10	
62	Ice cream production	Deciduous	10	10	9	8	1	6	1	10	
63	Ice cream production	Flowering	9	6	6	6	2	3	10	6	
64	Ice cream production	Flowering	10	5	1	7	7	10	6	10	
65	Ice cream production	Flowering	6	6	6	10	7	6	6	6	
66			10	10	10	10	10	10	10	10	
67	Ice cream production	Flowering	5	3	2	7	8	8	10	5	
68	Ice cream production	Flowering	6	7	1	8	8	1	6	10	A small tree with a partial view
69											
70	Tree canopy	Evergreen	9	8	8	8	10	10	10	10	A large tree with an impacted view
71	Ice cream production	Evergreen	8	3	3	9	1	10	1	3	A large tree with an impacted view
72											

Slide Referenced: 12 14 17 18

Voter	Which of the following options do NOT have an effect on Urban Heat Islands?:	What is your favorite tree type?: 1	Rate the importance of these street tree planting factors. : Size	Rate the importance of these street tree planting factors. : Shape	Rate the importance of these street tree planting factors. : Foliage Type	Rate the importance of these street tree planting factors. : Growth Rate	Rate the importance of these street tree planting factors. : Litter (fruit, leaves, flowers and seeds)	Rate the importance of these street tree planting factors. : Water Use	Rate the importance of these street tree planting factors. : View	Rate the importance of these street tree planting factors. : Root Damage	Which scenario would you choose?:
73	Ice cream production	Evergreen	10	10	10	10	1	10	5	8	A large tree with an impacted view
74	Ice cream production	Evergreen	10	7	7	7	9	9	5	10	A small tree with a partial view
75											
76	Ice cream production	Evergreen	8	5	4	10	8	9	10	10	A small tree with a partial view
77											
78	Ice cream production	Deciduous	8	8	4	5	3	5	7	9	A large tree with an impacted view
79	Tree canopy	Flowering	1	1	1	1	1	10	1	10	A large tree with an impacted view
80	Ice cream production	Evergreen	8	8	8	4	4	10	10	10	A large tree with an impacted view
81	Ice cream production	Evergreen	10	10	9	9	9	10	10	9	A small tree with a partial view
82											
83	Ice cream production	Evergreen	10	10	7	7	10	8	9	10	A large tree with an impacted view
84											
85	Ice cream production	Evergreen	6	6	6	6	10	10	5	10	A small tree with a partial view
86											
87	Tree canopy	Evergreen	10	7	7	7	10	10	10	10	A small tree with a partial view
88	Ice cream production	Flowering									
89	Ice cream production	Deciduous	10	10	10	10	10	10	10	10	A small tree with a partial view
90	Ice cream production	Flowering	10	10	5	5	8	9	8	10	A large tree with an impacted view
91	Ice cream production	Deciduous									
92	Ice cream production	Flowering	7	7	5	8	7	7	2	2	A large tree with an impacted view
93											
94											
95	Ice cream production	Evergreen	8	7	7	7	9	8	8	9	A small tree with a partial view
96											

Slide Referenced: 21 22 25 27 30

Voter	Would you like to see Signal Hill increase its tree canopy by filling vacant street tree sites?: 1	Rank the following methods of filling the street tree sites. : Half medium & half small trees	Rank the following methods of filling the street tree sites. : 1/3 small, 1/3 medium, and 1/3 large trees	Rank the following methods of filling the street tree sites. : All large trees	Rank the following methods of filling the street tree sites. : Other	Chinese Elms comprise 15% of the current street tree canopy. What kinds of trees would you like to see replace Chinese elms in future?: 1	What is the native ecology of Signal Hill?: 1	Rate these statements about the importance of native trees. : Adapted to local environment
1							Coastal Sage Scrub	9
2								
3	Yes	1	2	3		Climate Ready Trees	Coastal Sage Scrub	10
4	Yes	2	1	3		Climate Ready Trees	Wet Meadow	10
5	Yes	1	2	4	3	Climate Ready Trees	Coastal Sage Scrub	10
6	Yes		1			Native California Trees	Coastal Sage Scrub	10
7	Yes	2	1			Climate Ready Trees	Coastal Sage Scrub	10
8	Yes		1			Climate Ready Trees	Chaparral	5
9	Yes	2	1	4	3	Climate Ready Trees	Coastal Sage Scrub	9
10	Yes	3	2	4	1	Climate Ready Trees	Coastal Sage Scrub	8
11								
12	Yes	2	3	1		Native California Trees	Coastal Sage Scrub	10
13	Yes	1	3	2		Climate Ready Trees	Desert	9
14								
15								
16	Yes	2	1	3		Native California Trees	Coastal Sage Scrub	10
17	Yes	2	1	3		Native California Trees	Coastal Sage Scrub	10
18								
19	Yes	3	2	1		Native California Trees	Chaparral	10
20	Yes	3	2	1	4	Native California Trees	Oak Woodland	10
21								
22								
23	Yes		1			Climate Ready Trees	Desert	10
24								

Slide Referenced:		21	22			25	27	30
Voter	Would you like to see Signal Hill increase its tree canopy by filling vacant street tree sites?: 1	Rank the following methods of filling the street tree sites. : Half medium & half small trees	Rank the following methods of filling the street tree sites. : 1/3 small, 1/3 medium, and 1/3 large trees	Rank the following methods of filling the street tree sites. : All large trees	Rank the following methods of filling the street tree sites. : Other	Chinese Elms comprise 15% of the current street tree canopy. What kinds of trees would you like to see replace Chinese elms in future?: 1	What is the native ecology of Signal Hill?: 1	Rate these statements about the importance of native trees. : Adapted to local environment
25	Yes	2	1		3	Trees that look similar to Chinese Elms	Wet Meadow	10
26	Yes	1	2	3	4	Native California Trees	Coastal Sage Scrub	
27	Yes	2	1	3	4	Native California Trees	Coastal Sage Scrub	7
28								
29								
30								
31	Yes	2	1			Native California Trees	Chaparral	10
32	I don't care		1			Trees that look similar to Chinese Elms	Coastal Sage Scrub	9
33	Yes	2	3	1	4	Native California Trees	Coastal Sage Scrub	10
34								
35	Yes	2	1	3	4	Native California Trees	Desert	10
36	Yes	2	3	1		Native California Trees	Coastal Sage Scrub	10
37								
38								
39	Yes	2	1			Climate Ready Trees	Chaparral	8
40	Yes	3	1	2		Native California Trees		
41								
42	Yes	2	3	1	4	Native California Trees	Coastal Sage Scrub	10
43	Yes	2	1	3	4	Native California Trees	Coastal Sage Scrub	9
44	Yes	1	3	2	4	Native California Trees	Wet Meadow	9
45	Yes				1	Native California Trees	Coastal Sage Scrub	10
46	Yes	2	1	3	4	Native California Trees	Wet Meadow	10
47								
48	Yes		1			Climate Ready Trees	Coastal Sage Scrub	8

Slide Referenced: 21 22 25 27 30

Voter	Would you like to see Signal Hill increase its tree canopy by filling vacant street tree sites?: 1	Rank the following methods of filling the street tree sites. : Half medium & half small trees	Rank the following methods of filling the street tree sites. : 1/3 small, 1/3 medium, and 1/3 large trees	Rank the following methods of filling the street tree sites. : All large trees	Rank the following methods of filling the street tree sites. : Other	Chinese Elms comprise 15% of the current street tree canopy. What kinds of trees would you like to see replace Chinese elms in future?: 1	What is the native ecology of Signal Hill?: 1	Rate these statements about the importance of native trees. : Adapted to local environment
49								
50	Yes	2	1	3	4	Native California Trees	Coastal Sage Scrub	10
51								
52	Yes	3	1	2	4	Native California Trees	Coastal Sage Scrub	10
53	Yes	2	3	1	4	Native California Trees	Coastal Sage Scrub	10
54	Yes	2	1	3		Native California Trees	Coastal Sage Scrub	8
55								
56	Yes	1	2	3		Other	Coastal Sage Scrub	9
57		2	1			Climate Ready Trees		10
58	Yes	3	1	2	4	Trees that look similar to Chinese Elms	Coastal Sage Scrub	5
59								
60	Yes	3	2	1	4	Native California Trees		
61	Yes	2	1		3	Native California Trees	Chaparral	10
62	Yes	2	1	3		Climate Ready Trees	Coastal Sage Scrub	10
63	Yes		2	1		Other	Coastal Sage Scrub	8
64	Yes	1	2	3		Native California Trees	Oak Woodland	10
65								
66	No	1				Native California Trees		
67	Yes	3	1	2		Native California Trees	Chaparral	5
68	Yes	2	1	3	4	Native California Trees		
69								
70	Yes	2	1	3	4	Native California Trees	Valley Grassland	9
71	Yes					Native California Trees	Chaparral	10
72								

Slide Referenced:	21	22				25	27	30
Voter	Would you like to see Signal Hill increase its tree canopy by filling vacant street tree sites?: 1	Rank the following methods of filling the street tree sites. : Half medium & half small trees	Rank the following methods of filling the street tree sites. : 1/3 small, 1/3 medium, and 1/3 large trees	Rank the following methods of filling the street tree sites. : All large trees	Rank the following methods of filling the street tree sites. : Other	Chinese Elms comprise 15% of the current street tree canopy. What kinds of trees would you like to see replace Chinese elms in future?: 1	What is the native ecology of Signal Hill?: 1	Rate these statements about the importance of native trees. : Adapted to local environment
73	Yes	3	1	2	4	Native California Trees	Wet Meadow	10
74	Yes	2	1	3		Native California Trees	Chaparral	8
75								
76	Yes	1				Climate Ready Trees	Coastal Sage Scrub	5
77								
78	Yes	3	2	1		Native California Trees	Chaparral	7
79	Yes	3	1		2	Native California Trees	Desert	10
80	Yes	2	3	1		Trees that look similar to Chinese Elms	Oak Woodland	10
81	Yes	2	4	1	3	Trees that look similar to Chinese Elms	Chaparral	10
82								
83	Yes	1	3	2	4	Climate Ready Trees	Coastal Sage Scrub	10
84								
85	Yes	1	2	3	4	Native California Trees		4
86								
87	Yes	1	2		3	Native California Trees	Desert	10
88								
89	Yes	2	1	4	3	Climate Ready Trees	Oak Woodland	10
90	Yes	1	2	3		Native California Trees	Oak Woodland	10
91	Yes						Desert	
92	Yes	3	1	2	4	Native California Trees	Coastal Sage Scrub	10
93								
94								
95	Yes	2	1	3		Climate Ready Trees	Coastal Sage Scrub	8
96								

Slide Referenced:	30		33	34				35	
Voter	Rate these statements about the importance of native trees.: Provide food & habitat for local wildlife	Rate these statements about the importance of native trees.: Beautiful	Which Climate Ready Tree do you like best?: 1	Rank these items in term of importance in selecting a tree in front of your home.: Water use	Rank these items in term of importance in selecting a tree in front of your home.: Cleanliness	Rank these items in term of importance in selecting a tree in front of your home.: Aesthetics	Rank these items in term of importance in selecting a tree in front of your home.: Shade provided	Would you participate in a community tree-planting program?:	
1	6	4	Island Oak, Quercus tomentella	2	3	4	1	Yes	
2									
3	10	6	Island Oak, Quercus tomentella				1	Yes	
4	3	5	Island Oak, Quercus tomentella	1	4	2	3	Yes	
5	0	7	Red Push Pistache, Pistacia 'Red Push'	3	1	2	4	Yes	
6	10	10	Island Oak, Quercus tomentella	3	4	2	1	Yes	
7	6	8	Red Push Pistache, Pistacia 'Red Push'	3	1	2	4	No	
8	10	5	Red Push Pistache, Pistacia 'Red Push'	3	4	2	1	Yes	
9	10	9	Mulga, Acacia aneura	2	3	1	4	Yes	
10	7	8	Island Oak, Quercus tomentella	4	3	2	1	No	
11									
12	9	10	Island Oak, Quercus tomentella	2	1	4	3	Yes	
13	9	8	Island Oak, Quercus tomentella	3	1	4	2	Not sure	
14									
15									
16	10	5	Island Oak, Quercus tomentella	2	1	4	3	Yes	
17	6	10	Island Oak, Quercus tomentella	1	4	2	3	Not sure	
18									
19	7	10	Red Push Pistache, Pistacia 'Red Push'	2	3	1		Yes	
20	10	10	Island Oak, Quercus tomentella	4	3	1	2	Yes	
21									
22									
23	10	10	Red Push Pistache, Pistacia 'Red Push'	1				Yes	
24									

Slide Referenced: 30 33 34 35

Voter	Rate these statements about the importance of native trees.: Provide food & habitat for local wildlife	Rate these statements about the importance of native trees.: Beautiful	Which Climate Ready Tree do you like best?: 1	Rank these items in term of importance in selecting a tree in front of your home.: Water use	Rank these items in term of importance in selecting a tree in front of your home.: Cleanliness	Rank these items in term of importance in selecting a tree in front of your home.: Aesthetics	Rank these items in term of importance in selecting a tree in front of your home.: Shade provided	Would you participate in a community tree-planting program?:	
25	10	10	Island Oak, Quercus tomentella	1	3		2	Yes	
26									
27	5	5	Island Oak, Quercus tomentella	4	3	1	2	Yes	
28									
29									
30									
31	10	8	Red Push Pistache, Pistacia 'Red Push'			2	1	Yes	
32	9	8				2	1	Not sure	
33	10	10	Island Oak, Quercus tomentella	3	4	2	1	Yes	
34									
35	10	10	Mulga, Acacia aneura		1			Not sure	
36	8	10	Island Oak, Quercus tomentella	2	3	1	4	Yes	
37									
38									
39	8	8	Island Oak, Quercus tomentella	1	3	2	4	Not sure	
40									
41									
42	5	10	Island Oak, Quercus tomentella	4	2	1	3	Yes	
43	9	10	Mulga, Acacia aneura	3	4	2	1	Yes	
44	4	9	Island Oak, Quercus tomentella	3	4	2	1	Not sure	
45	10	10	Island Oak, Quercus tomentella					Yes	
46	10	1	Island Oak, Quercus tomentella	1	2	4	3	Yes	
47									
48	7	9	Island Oak, Quercus tomentella			1		Not sure	

Slide Referenced:	30		33	34				35	
Voter	Rate these statements about the importance of native trees.: Provide food & habitat for local wildlife	Rate these statements about the importance of native trees.: Beautiful	Which Climate Ready Tree do you like best?: 1	Rank these items in term of importance in selecting a tree in front of your home.: Water use	Rank these items in term of importance in selecting a tree in front of your home.: Cleanliness	Rank these items in term of importance in selecting a tree in front of your home.: Aesthetics	Rank these items in term of importance in selecting a tree in front of your home.: Shade provided	Would you participate in a community tree-planting program?:	
49									
50	10	10	Mulga, Acacia aneura	4	3	1	2	Yes	
51									
52	9	10	Island Oak, Quercus tomentella	2	4	1	3	Not sure	
53	10	10	Island Oak, Quercus tomentella	2	3	1	4	Yes	
54	10	8	Island Oak, Quercus tomentella		1			Yes	
55									
56	8	10	Red Push Pistache, Pistacia 'Red Push'			1	2	Not sure	
57	9	8	Red Push Pistache, Pistacia 'Red Push'	2	1	3	4	Not sure	
58	5	6	Island Oak, Quercus tomentella	3	1	4	2	No	
59									
60									
61	10	8	Red Push Pistache, Pistacia 'Red Push'	1	2	3	4	Yes	
62	10	10	Red Push Pistache, Pistacia 'Red Push'	2	3	4	1	Yes	
63	9	10	Red Push Pistache, Pistacia 'Red Push'	3	4	1	2	Not sure	
64	10	10	Red Push Pistache, Pistacia 'Red Push'	1			2	Yes	
65									
66									
67	3	10	Island Oak, Quercus tomentella	2	4	1	3	Yes	
68									
69									
70	9	9	Red Push Pistache, Pistacia 'Red Push'	3	2	1	4	Yes	
71	10	5	Island Oak, Quercus tomentella	1	4	3	2	Yes	
72									

Slide Referenced:	30		33		34				35
Voter	Rate these statements about the importance of native trees.: Provide food & habitat for local wildlife	Rate these statements about the importance of native trees.: Beautiful	Which Climate Ready Tree do you like best?: 1	Rank these items in term of importance in selecting a tree in front of your home.: Water use	Rank these items in term of importance in selecting a tree in front of your home.: Cleanliness	Rank these items in term of importance in selecting a tree in front of your home.: Aesthetics	Rank these items in term of importance in selecting a tree in front of your home.: Shade provided	Would you participate in a community tree-planting program?:	
73	10	10	Island Oak, Quercus tomentella				1	Yes	
74	8	9	Island Oak, Quercus tomentella	3	2	1	4	Not sure	
75									
76	6	6	Mulga, Acacia aneura			2	1	Yes	
77									
78	9	7	Red Push Pistache, Pistacia 'Red Push'	3	4	2	1	Yes	
79	10	0	Red Push Pistache, Pistacia 'Red Push'	1				Not sure	
80	10	10	Mulga, Acacia aneura	1	4	2	3	Yes	
81	10	10	Island Oak, Quercus tomentella	2	4	1	3	Not sure	
82									
83	9	10	Red Push Pistache, Pistacia 'Red Push'	3	1	2	4	Not sure	
84									
85	10	3	Red Push Pistache, Pistacia 'Red Push'	2	1	4	3	Yes	
86									
87	10	10	Mulga, Acacia aneura	1	2	3	4	Not sure	
88									
89	10	10	Mulga, Acacia aneura	3	2	4	1	Not sure	
90	10	8	Mulga, Acacia aneura	4	2	3	1	Yes	
91									
92	10	10	Mulga, Acacia aneura	4	2	3	1	Yes	
93									
94									
95	8	7	Red Push Pistache, Pistacia 'Red Push'	2	1	4	3	No	
96									

Slide Referenced: 4 26

Voter	Why are trees important?	What is your favorite kind of tree and why? Would you like to see it planted in Signal Hill?
1	shade	Quercus agrifolia--it's beautiful
2	Shade	
3	Shade, Carbon Dioxide, Aesthetics, Minimize Carbon Footprint, Climate Control	
4	Shade, Aesthetic, Erosion Control, Environmental Benefits	Oak trees. They are beautiful.
5	Green space, shade, Beautification, Environmental benefit	small trees
6	shade, beauty, health	Western Redbud, Cercis occidentalis, is a very good tree for this area, so plant more of them. Western Sycamore, Platanus racemosa, is a good tree for this area, so plant more of them. Western Dogwood, Cornus nuttallii, would be a good tree in this area. One or more of the four species of maple (Acer) notive to CA would be good street trees.
7	shade, cooling, air, beauty	One item of concern is where view might be impacted by trees.
8	clean air, support wildlife, provide food, store carbondioxide, reduce ambient temp	Acacia, Crape Myrtle, Palo Blanco, Red Push Pistachio
9	environment, clean air, shade, animal habitat, aesthetics	Australian willow. Deep root system. Low water once established.
10	canopy, oxygen, carbon, view, beautification	No favorite tree.
11	Oxygen, Clean Air Quality, Life, Nature	
12	clean air, attractive, inviting to sit under, shade, welcoming	no preference
13	Shade, Beauty, Environment, Birds, Climate	Brazilian Cedarwood (Cedrela fissilis) can reach 40' to 50' in Southern California. Tolerates most soil types that drain well, and is considered drought tolerant.
14		
15		
16	Climate change, Ground Water retention, Pollinators birds bugs, Clean air	Palo blanco, it looks like weeping willow but is native and climate ready. Ghost gum, beautiful appearance native to CA and clinate ready.
17	Shade, Oxygen, Greenery, Gathering spot, Scenic	I like the palm trees
18		
19	Relaxing, Shade, Wellbeing, Wildlife	
20	Green, Clean, Beautiful, Shade	
21		
22		
23	Beauty, Relaxing, Green, Environmental	
24		

Slide Referenced: 4 26

Voter	Why are trees important?	What is your favorite kind of tree and why? Would you like to see it planted in Signal Hill?
25		
26	Flooding, Oxygen, Habitat for animals	
27	Beauty, Environment, Urban Sprawl, Oxygen Lifr	I love the Pepper Trees, the Elms are unique too, I am not sure what tree we should plant more off but I'm sure it will add beauty
28	Better air quality, Provide shade	
29		
30	LIFE	
31	Nature, Fresh air, Peace, Environmental justice, Children	I like magnolias because they have pretty flowers. I also like oak trees because they look beautiful
32	Beauty, Air quality, Habitats	
33	improve air quality, shade	pine trees and eucalyptus tress for the good look the nice smell
34	Oxygen, Beautiful, Green	
35	Shade, Birds, Beauty, Oxygen	Palm trees and trees that create a shade canopy.
36	Better air quality, Makes the city looks nice	Jacaranda tree. It doesn't consume too much water and it gets flowery makes the city looks pretty
37		
38		
39	Erosion, Climate, Carbon Monoxide, Shade	Willow
40	Air, Shade, Ambiance	
41		
42	Aesthetic, Reduce pollution, House animals, Provide shade	Acacia Aneura, Western Redbud, Desert Willow, Western Sycamore, Atlas Cedar. Flowering trees. Don't really have a favorite.
43	Shade, climate, habitat, happiness, wellbeing	Crape myrtles are non-native but pretty & good for limited space. Sycamores are native and amazing but thirsty. Mesquite trees (like at 33rd & Gundry) are really cool looking!
44	Oxygen, Wildlife, Shade, Beauty, Neighborhood	Oak trees aesthetically pleasing
45	Native Trees like coast Live oak can restore Ecosystems	Native trees
46	Oxygen, Well-being, Animal homes, Shade, Beauty	Fruit trees of any kind. I would like trees to have a purpose which is to provide oxygen and also give back and help feed the community.
47	Air, Green, Peaceful	
48	Air, Green, Health, Peace	
49	Improves the beauty, Provides shade, Provides fruit, Shelter for small animals	
50	Beautification, Shade, Variety, Environmental	I love the jacaranda tree. Its bloom of purple flowers is very beautiful. When not in bloom, the green leaves also look very nice and provide lots of shade. Eucalyptus tree. I love how they're very tall and majestic. The tree bark looks light and smooth. Maple tree. I love the shape of the leaves and the bright colors during autumn. Reminds me of the countryside.

Slide Referenced: 4 26

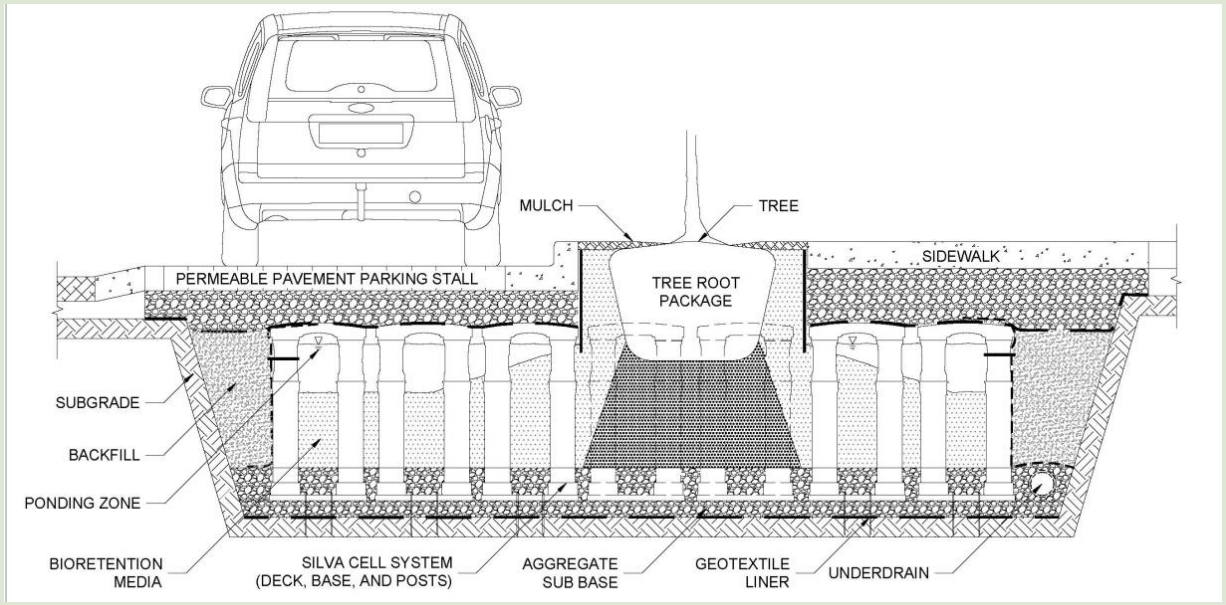
Voter	Why are trees important?	What is your favorite kind of tree and why? Would you like to see it planted in Signal Hill?
51		
52	Oxygen, Shade, Beautify	Jacaranda - love the flowers and the color they provide when they bloom
53	Animals, Air, Shade, Gut Immune Health, Beauty	Doesn't matter about it being my favorite tree, we should always plant native trees, flowers to our environment.
54	Oxygen, Beautify, Shade	I love our palm trees. They represent being in Southern California and being near the beach.
55		
56	Jacaranda	
57	Land stabilization, Beauty, Shade, Natural habitat	
58	Shade, Beauty, Environment, Nature, Habitat	Jaranda over greens away from cars and picnic spots. Lush fir trees. Other
59		
60	Beauty, Shade	
61	Oxygen, Global Warming, Erosion, Beauty	No favorite tree
62	Shade, Wildlife, Cooling, Beautiful	
63	beauty, air quality, shade, birds	Jacaranda - they are beautiful and really set Long Beach/Signal Hill apart in beauty. They bring much joy.
64	Shade, Air, Habitat, Green spaces, Fruit	I'm allergic to Chinese elm. Having other trees with shade and flowers would be great!
65	Look nice	
66		
67	environment, oxygen, beautification, aesthetic, property value	Tree-lined residential streets are beautiful. I would love to see more in my neighborhood.
68	Beautiful, Relaxing, Comforting, Provide shade, Help clean air we breathe	Willow. They provide lots of shade and their branches move gracefully in the wind.
69		
70	Enhances beauty around, Improves air quality, Increase property value, Helps wildlife, Creates shade	I see a lot of pepper trees in Signal hill. I think adding more or something similar like willow trees would help define our area more.
71	shade, oxygen, beauty, birds	I don't have a favorite tree but I think a priority should be planting California native trees - do oaks or walnuts work well as street trees? I'd love to also see more large native chaparral plants in our parks like lemonade berry and toyon
72	Beauty, Green	
73	habitat, Clean air, Cooling, Shade, Water	Favorite is redwood but not from here so California coast live oak. Any California Native tree and plants.
74	oxygen, Shade, wildlife, fruit, visually	
75		
76	Healthy, Beauty, Attractive, Shade, Drought	I have no favorite tree. However, I do want something that is going to provide shade for people to sit under and rest and to help prevent water evaporation. Also, please consider having the HOAs partner with the city to plant trees in their areas.
77		

Slide Referenced: 4 26

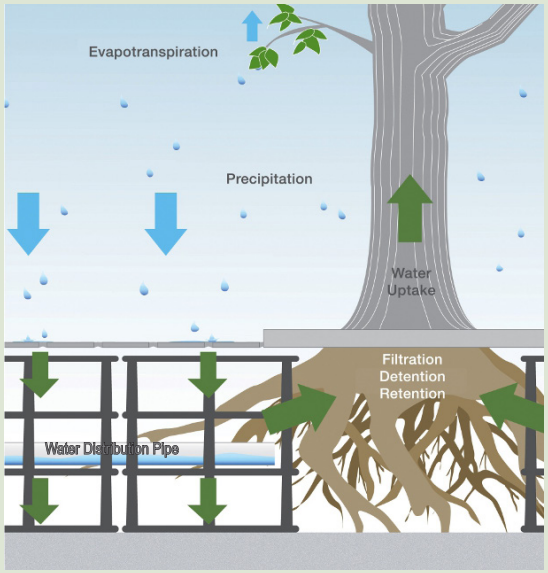
Voter	Why are trees important?	What is your favorite kind of tree and why? Would you like to see it planted in Signal Hill?
78	Environment, Ambiance, Health, Happy place, Prett	I love peppercorn trees because they smell great, are useful, and provide good shade. We need more shade in signal hill!
79	Clean air, Greenery, Reduce chemical pollution	Any tree that will help clean air and less water use
80	Beauty, Health	Stcamore
81	Environment, Esthetics, Cooling	I like sycamore trees, large round trees.
82		
83	Provide oxygen, Beautiful	
84	Nature, Good for the environment, Good for the earth	
85	Environment, Offsetting carbon, Ofsetting carbon, Loweing emissions, Global warming	Any trees and shrubs native to california that are drought resistent. And do not shed leaves all over vehicles, damage vehicle paint.
86		
87	oxygen, shade, erosion, beauty, wildlife	Desert willow? Drought tolerant native with colorful flowers.
88	Shade, Cool down environment, Oxygen	
89	Shade, Cleaner air, Beauty, Homes for critters, Windbreaks	Ginkgo! Beautiful leaves, color in autumn, irregular graceful shape
90	Heat reduction, Air quality, Property value, Walkabiltiy, Community	Sycamores, cedars and California Live Oak are my favorite big trees. Medium would be crepe myrtles or Chinese lanterns.
91	Environment	Survey too long
92	Shade, Air quality, Beauty, Manage runoff and erosion, Recreation	
93		
94		
95	Aesthetics, Cleanliness, Beauty, Air, Value	
96		

Modular Suspended Pavement Systems

Modular suspended pavement systems consist of a network of support structures beneath pavement form which a framework to hold the pavement in place above and create a void below the surface to hold soil, air, water, and tree roots. The modular nature of the system allows for versatility in fitting various urban spaces. Additionally, when large sections of sidewalk are replaced with modular suspended pavement systems, exponentially more space is created for health roots to grow, enabling street trees to thrive. Such systems also help retain and filter stormwater, a cruical benefit in Southern California, especially in times of drought.



There are several different kinds of systems available, including the Silva Cell, Stratavault, and RootSpace. The systems can be filled with local soil or loam, and trees will have plenty of nutrients available to them. Additionaly, their roots are protected, and no longer subject to the effects of compaction. Because of these benefits, it is recommended that Signal Hill use these systems when possible in future development. Information on a successful project using Silva Cells in Davis, CA can be found here.



Photos & Diagrams: DeepRoot, North Carolina Department of Environmental Quality

Inventory Checklist

Location: Address (if applicable) and GPS coordinates

Botanical name (family, genus, species) and **common name**

Size: Use the following classes: *0 to 15ft., 15 to 30ft., 30 to 45 ft., 45 to 60ft., 60ft. or greater*, to 1) estimate tree height and 2) estimate the canopy spread.

Girth: Measure trunk at 4-1/2 ft. above ground level (DBH). Use the following classes: *0" to 3", 3" to 6", 6" to 12", 12" to 18", 18" to 24" 24" to 30" , 30" to 36", and 36"+.*

Number of trunks (if there is more than one trunk visible at ground level)

Form: Select one: *Symmetrical, Minor Asymmetry, Major Asymmetry*

Crown class: Select one: *Dominant, Co-Dominant, Intermediate, Suppressed*

Trunk Condition: Select applicable: *single, multiple, leaning, weak trunk crotches, cavity/ wounds, surficial damage, fire damage, physical contact with ground, water stressed, visible insect/ disease damage*

Pests/disease observations: Provide notes
Condition of Branches: Select applicable: *dead, broken, tip decline, fire damage, physical contact with ground, water stressed*

Foliage:
Foliage cover: Select one: *normal, chronic, necrotic*

Foliage density: Select one: *normal, sparse, patchy*

Annual shoot growth: Select one: *excellent, average, poor*

Epicormics Select: *yes or no*

Overhead obstructions:

Overhead utilities: high voltage (primary), or low voltage (secondary, telephone, or cable TV)

Interference of natural crown spread due to buildings or private trees.

Date of last sidewalk and curb repair
Type and size of growing space: median, sidewalk tree well, etc. Record to nearest 6".

Presence of underground utilities

Vacant sites: The Public Works Director or designee will determine what constitutes a vacant site.
All vacant sites will be described for presence of overhead obstructions and underground utilities.

Crown Light Exposure
Direction to Building
Distance to Building
} **See iTree Eco Specifications**

Roadway width and type (local, collector, or arterial)

Landmark tree status or potential: Based on City criteria.

Dates of servicing or inventory assessments.

Citizen complaints or inquiries.

Permits.

Appropriate planting and removal dates: Based on species' life expectancy.

Additional notes and comments.

Photographs (with dates recorded).

Maintenance Classifications
All trees should be classified for one or more of the following:

Routine Prune: Trees that will need inspection and/ or pruning in the next maintenance cycle. Recently pruned trees or those with growth habit that requires little maintenance receive this designation.

Corrective Prune: Trees that have been damaged, improperly pruned, or have developed undesirable growth habits.

Immediate Prune: Trees that pose potential liability risks from large, excessive deadwood or visible decay.

Pruning for Clearance: Trees with low-hanging branches or suckers obstructing traffic (vehicular, bicycle or pedestrian) or city signs. Vehicle obstruction occurs below 13 feet in height, pedestrian at 9 feet.

Removal: Trees that meet the City's removal criteria.

Treat Pests/Disease

rincon swa City of Signal Hill