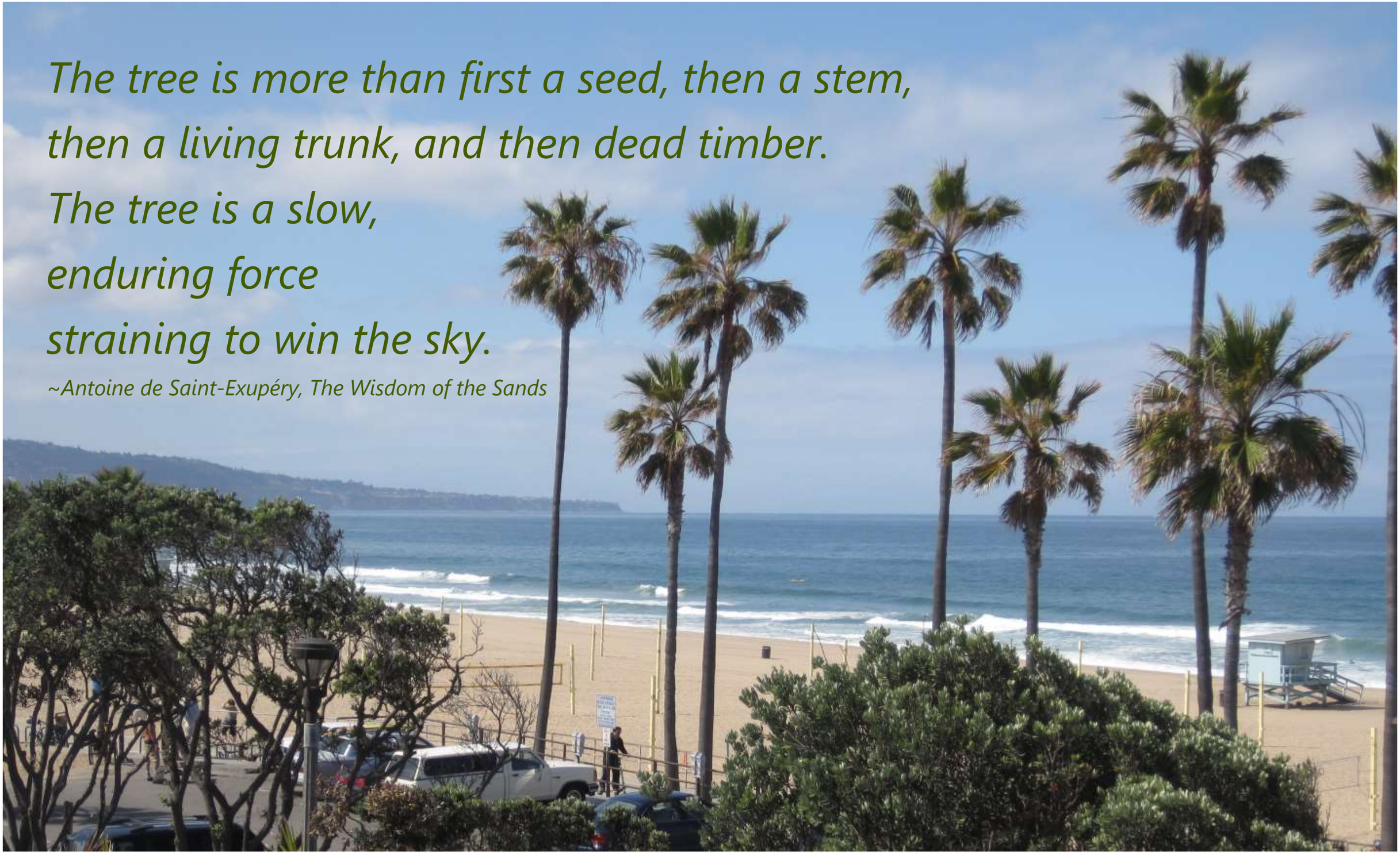
City of Manhattan Beach

Urban Forest Master Plan

Planning for Beauty, Benefits, and Sustainability


The tree is more than first a seed, then a stem,
then a living trunk, and then dead timber.
The tree is a slow,
enduring force
straining to win the sky.
~Antoine de Saint-Exupéry, The Wisdom of the Sands

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Planning for Beauty, Benefits, and Sustainability

2020

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TABLE OF CONTENTS

1 **Scope & Purpose**

2 **Executive Summary**

4 **Introduction**
- Background
- Mission
- Guiding Principles
- Community

6 **Benefits of Urban Tree Canopy**
- Air Quality
- Water Quality

7 Carbon Reduction

8 Energy Savings

Aesthetics & Socioeconomics

10 **What Do We Have?**

History of Urban Forestry in Manhattan Beach

11 Public Tree Resource
- Composition of the Inventoried Urban Forest

13
- Public Tree Benefits
- Benefits Versus Investment

14 Urban Tree Canopy Assessment
- Urban Tree Canopy & GIS

15 Existing Overall Land Cover

Environmental Benefits

16 Tree Canopy by Zoning Class

17 Tree Canopy by Maintenance Zone

18 Tree Canopy by Park

19 **Priority Planting Sites**
- Tree Planting
- Tree Care and Maintenance Cycles

21
- Design and Construction Standards
- Program Funding

22 **Policy and Regulation**
- Tree Protection

23
- Tree Permit Applications
- Tree Removal Permit Process

24 **Community Outreach**

25 **Conclusion**

26 **What Do We Want?**
- **Community Participation**
  - Public Meetings
  - Online Survey

27
  - Interviews

28
- **Plan Goals and Objectives**
  - Urban Forest Structure
  - Urban Forest Policy
  - Communicate a Focus on Benefits, Beauty and Sustainability

30 **How Do We Get There?**

31
- **Structure and Environmental Benefits**
  - Sustainable, Healthy and Safe

33
  - Preservation of Significant and High-Value Trees

34
  - Optimize Planting Space

35
- **Comprehensive Policies and Procedures**
  - Comprehensive User-Friendly Regulations and Policies

36
  - Optimize Urban Forestry Programing

37
  - Optimize Funding

38
- **Focus on Beauty, Benefits, and Sustainability**
  - Optimize Recreational Potential of Green Spaces

39
  - Increase Outreach and Education

40
  - Preserve and Enrich Wildlife Habitat

41
  - Review and Measure Attainment of the UFMP

42 **How Are We Doing?**
- **Monitoring and Measuring Results**
  - Annual Review
  - Resource Analysis
  - Canopy Analysis
  - i-Tree *Eco*
  - State of the Urban Forest Report
  - Community Satisfaction

44 **Appendices**
- **A. References**
- **B. Map**

45
- **C. Online Survey Results**

55
- **D Additional Public Comments**

57
- **E. Design Details**
  - Soil Volume and Tree Stature

58
  - Alternative Planter Designs

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SCOPE & PURPOSE

The purpose of the Manhattan Beach Urban Forest Master Plan (UFMP) is to provide a framework for the long-term management and preservation of the community urban forest. The City of Manhattan Beach manages 11,575 trees in the public right-of-way, including 4,116 City-maintained trees and 7,459 parkway trees that are, by ordinance, maintained by the adjacent property owner. The Plan recognizes the significance of environmental and socio-economic benefits from community trees and their relationship with community values and expectations for a high quality of life. This Plan is intended to support and guide urban forest programming over the next 25 years.

Specifically, the Plan aims to:

- Provide an overview of the existing public tree inventory, including species, age distribution, condition, and benefits provided
- Identify best management practices that support the health, benefits, and safety of the community urban forest
- Ensure that tree protection ordinances and policies are clear, impartial, and supportive of community values and expectations
- Encourage community engagement, involvement, and appreciation for the urban forest and its environmental values
- Maintain a tree palette that compliments community aesthetics and increases the resiliency of the urban forest to withstand drought, temperature extremes, pests, and disease
- Provide alternative planter designs to optimize below ground rooting area and promote the capture and retention of stormwater runoff
- Compliment the Manhattan Beach General Plan and other long-range and strategic plans, including the Veteran's Parkway Master Plan and the proposed Parks Master Plan

The Plan includes objectives and action strategies for long- and short-term goals in support of this purpose. It identifies appropriate resources to adequately manage public trees. It is intended to remain flexible and dynamic, exploring and implementing the recommended actions as funding and resources permit.

The development of the UFMP included a comprehensive review of existing policies and regulations, current funding and maintenance levels, analysis of the extent, condition, and composition of the existing resources (i.e., trees), stakeholder concerns, and community input.

EXECUTIVE SUMMARY

Manhattan Beach's urban forest includes 11,575 trees in the public right-of-way along streets and in parks, city facilities, medians and encroachment areas. In addition, privately-owned, established trees in front and side yards in the city's tree protection zone are protected by City ordinance. Along with their aesthetic contribution, all of these trees provide valuable and critical services to the community, covering 14.7% of the city land area in leafy canopy. Urban forest services include benefits to air quality, water quality, energy savings, wildlife habitat, and socioeconomics. This Urban Forest Master Plan (UFMP) provides long-term management goals and vision for preserving and improving the health, value, and environmental benefits of this public resource.

The public urban forest includes 11,575 trees on streets, medians, and parkways, in parks, and at city facilities.

The design of the UFMP document is based on understanding what we have, what we want, how we get there, and how we are doing. This dynamic approach, referred to as adaptive management, is commonly used for resource planning and management (Miller, 1988) and provides a good conceptual framework for the process of improving urban forest management.

The plan development process involved a comprehensive review and assessment of the existing urban forest resource, including composition, value, and environmental benefits. This review found Manhattan Beach has a primarily established, young tree population in good condition, with good species diversity.

The process explored community values and vision, including those expressed in the Veteran's Parkway Master Plan Guidelines, and the report Working Toward a Greater, Greener Manhattan Beach, along with community design standards and existing regulations and policies that provide protection and preservation measures affecting the urban forest. This portion of the review found the existing reports internally consistent and supportive of preservation and enhancement of tree canopy in Manhattan Beach, while noting the community has several unique challenges related to trees which should be considered carefully if new tree sites are to be established.

The Plan development process also evaluated funding and the current service levels for both in-house and contracted tree maintenance staff. The City's commitment to maintenance of the tree resource is apparent from the ongoing contracted regular maintenance of trees, on a 1-2-year cycle, infrastructure maintenance, and emergency response. In addition to maintenance staff, there are multiple stakeholders, internal and external, who play a role in the planning, design, care, and advocacy of the urban forest. These stakeholders include City departments, residents, and contracted tree care personnel. Each of these stakeholders played a role and provided input for the development of this plan. Generally, the community expressed support for enhancing and expanding the urban forest, but residents requested greater transparency and clarity in tree permitting and policies.

Manhattan Beach's Urban Forest Benchmark Values

Community Urban Forest

City Maintained Trees	4,116
Privately Maintained City Trees	7,459
Total Right-of-Way Tree Population	**11,575**
Replacement Value (2010)	$20.6 million

Species Diversity

Total number of unique species	182
Prevalence of top ten species	46%
Species exceeding recommended 10%	0

Benefits

Total Annual Benefit	$3.1 million
Annual Per Tree Benefit	$266
Annual Per Capita Benefit	$88

Urban Tree Canopy Cover

Public Tree Canopy	2.1%
Overall City Canopy	14.7%

Environmental Benefits (i-Tree Estimate)

Overall Carbon Storage	$13,397
Annual Air Quality Benefits	$121,944

What Do We Have?

Manhattan Beach City staff work to provide exemplary municipal services while preserving the small beach town character and enhancing the quality of life for residents, businesses, and visitors.

The review process established that Manhattan Beach has strong regulation measures and protection requirements for trees, and a commitment to tree maintenance, balancing the interests of individual residents with the goals of the community as a whole. The community has a reputation for supporting environmental initiatives and many residents actively support continued and enhanced urban forest management.

The community urban forest is an established, relatively young population in good condition. Species diversity is nearly ideal with a wide range of species and genera. With continued maintenance and care, this resource has the potential to increase in value and provide even greater environmental and aesthetic benefits to area residents, visitors.

What Do We Want?

Interviews with internal and external stakeholders, community meetings, and an online survey were conducted to determine strengths of the existing program and opportunities for development. In gathering this information, several common themes were apparent. Increased communication and clarity, continued and enhanced tree maintenance and preservation, and planting the right tree in the right place were identified as important to many key stakeholders. These concepts were used to shape the guiding principles and goals of the UFMP.

How Do We Get There?

The UFMP identifies three (3) guiding principles and nine (9) goals for preserving the health, value, services, and sustainability of Manhattan Beach's urban forest. Each of these goals is supported by comprehensive objectives and actions. With this comprehensive plan, Manhattan Beach is poised to make some positive changes to the urban forestry program that will promote the enhancement and expansion of the urban forest with a focus on beauty, benefits, and sustainability.

How Are We Doing?

The long-term success of the UFMP will be measured through the realization of plan goals and demonstrated through increased value and environmental benefits. The Plan identifies methods of measurement and a target date for each of the objectives. The UFMP is intended to be an active tool that can and should be adjusted in response to available resources and emerging opportunities. Perhaps the greatest measurement of success for the UFMP will be its level of success in meeting community expectations for the care and preservation of the public tree resource.

Mission

The mission of the City of Manhattan Beach is to *provide exemplary municipal services, preserving our small beach town character and enhancing the quality of life for our residents, businesses and visitors*

Guiding Principles	Maintain and improve the structure and environmental benefits from the community urban forest	Establish comprehensive policies and procedures for tree preservation, planting, and maintenance	Communicate a vision for the urban forest that focuses on beauty, benefits, and sustainability
Goals	▪ Sustain a healthy and safe community tree resource ▪ Preserve of significant and high-value trees ▪ Optimize available planting space for beauty and benefits	▪ Make regulations and policies comprehensive and user-friendly ▪ Optimize urban forestry programming ▪ Optimize funding and identify new opportunities	▪ Optimize the recreational potential of public green spaces for pedestrian use ▪ Increase outreach and education ▪ Review and measure attainment of the UFMP ▪ Preserve and enrich wildlife habitat
Primary Objectives	▪ Apply best management practices and industry standards to all tree care operations ▪ Develop a tree planting and replacement plan with an emphasis on planting the right tree in the right place ▪ Increase diversity of the community tree resource ▪ Promote design and construction standards that increase soil volume and planting space ▪ Develop guidelines to identify and preserve significant trees ▪ Promote infrastructure repair strategies that preserve tree roots while providing accessible sidewalks ▪ Continue to promote tree preservation during development balancing private property rights with community goals	▪ Provide comprehensive, reasonable, and transparent policies and procedures for tree removal, replacement, and protection ▪ Revise 10.52.120 Tree Preservation and Restoration Ordinance ▪ Revise 7.32 Tree, Shrub and Plant Regulations ▪ Create an urban forester position to mangae the community urban forest resource, interfacing with residents, providing expertise in arboriculture, and serving as a single point of contact for all tree concerns ▪ Explore funding mechanisms for the care of public trees in neighborhoods and parkways ▪ Coordinate with existing and new planning documents to reference and align with the UFMP	▪ Optimize trees and vegetation along sidewalks and pathways to promote walkability ▪ Ensure accessibility of sidewalks by continuing regular maintenance of infrastructure disruptions ▪ Enhance and maintain the City webpage for the community urban forestry program ▪ Develop new and revise current informational brochures (e.g., pruning, right tree right place) ▪ Report on success and ongoing challenges (i.e., State of the Urban Forest Report) ▪ Reestablish Tree City USA status

INTRODUCTION

Background

Trees play an essential role in the community of Manhattan Beach by providing numerous benefits, tangible and intangible, to residents, businesses, and visitors. Research demonstrates that healthy urban trees can improve the local environment and lessen the impact resulting from urbanization and industry (CUFR[1]). Trees improve air quality, reduce energy consumption, help mitigate stormwater, reduce erosion, provide critical habitat for wildlife, and promote a connection with nature.

In addition to these environmental improvements, healthy urban trees increase the overall attractiveness of a community and have been proven to increase the value of local real estate by 7 to 10% (Dwyer et al, 1992). Trees in retail districts promote longer and more frequent shopping and greater sales (Wolf, 2007). Urban trees support a more livable community, fostering psychological health, and providing residents with a greater sense of place (Ulrich, 1986; Kaplan, 1989). In Manhattan Beach, street trees are an essential element in creating the small beach town character.

In 2013, the City completed an inventory of 11,575 public trees on streets, in parks, and at city facilities. In this plan, these inventoried trees are referred to as the "community urban forest". In addition to publicly-owned trees, some privately-owned trees are protected through City ordinance. These protected trees are trees over 12-inches in diameter at breast height (DBH) within the front 20-feet of residential properties, and 3-10-feet of a side yard. They cannot be removed without a permit and must be pruned according to ANSI A300 pruning standards. The UFMP addresses management of both the community urban forest and protected trees. Yard trees less than 12-inches DBH and/or in back yards are not considered by this Plan.

In 2015, the City of Manhattan Beach contracted with Davey Resource Group (DRG) to develop the UFMP for the long-term care and preservation of this resource. The project included analysis of the existing resource (inventory) in conjunction with i-Tree *Streets*, a STRATUM Analysis Tool (Streets v5.1.5; i-Tree v6.0.9). The analysis provides a comprehensive picture of the current structure, benefits, and value of this public asset. The community urban forest plays a prominent role in the environmental benefits provided to the community and residents rely on the City of Manhattan Beach to protect and enhance this vital resource. The UFMP, in conjunction with tree inventory data and the current resource analysis, provide a strong foundation for managing the current health and sustainability of Manhattan Beach's urban forest.

In developing this Plan, DRG worked closely with City staff to examine the current structure of both the tree resource and its management. The process included a complete review of existing policies and regulations, internal and interdepartmental relationships, the current status of the tree inventory, and an exploration of community values and support for urban forestry. The result is a plan that will guide community leaders, planners, and Public Works staff in making decisions about matters affecting the management, development, and policies for the community urban forest.

Mission

"The City of Manhattan Beach is dedicated to providing exemplary municipal services, preserving our small beach town character and enhancing the quality of life for our residents, businesses and visitors."

Guiding Principles

The guiding principles for the Urban Forest Master Plan are:

- Maintain and improve the structure and environmental benefits from the community urban forest
- Establish comprehensive policies and procedures for tree preservation, planting, and maintenance
- Communicate a vision for the urban forest that focuses on beauty, benefits, and sustainability

This plan outlines goals, both long- and short-term, in support of these guiding principles and provides objectives for their accomplishment. The implementation of the plan provides valuable benchmarks for measuring and tracking achievement over time.

Community

Manhattan Beach is a desirable coastal community. With a historic pier and well-groomed beach, a vibrant downtown core with unique shops and restaurants, and ample opportunities for outdoor recreation, residents are drawn to the charm of this small beach town in the South Bay. The city has several unique neighborhoods, or sections, each with its unique features and character. Major sections include the Tree Section (named for its tree street names), the Sand Section, which is closest to the coast, the Hill Section, Manhattan Village, and the Liberty Village Section. The Sand Section boasts the second highest mean household income in Los Angeles County. Across the city, the public schools are the third best performing district in the State of California. CNN Money recently named

[1] CUFR. Center for Urban Forest Research, USDA Forest Service Pacific Southwest Research Station

Manhattan Beach as the top city for the "Rich and Single". The median home price is approximately $2 million.

As market demand for larger homes increases, older beach cottages and bungalows are being replaced by structures with larger footprints. As a result, space for trees and other landscaping is reduced. Some areas of the city have opted to route utilities underground, providing better views and more space for street trees. However, lots in these areas often have smaller setbacks, which can limit space for tree growth and make small and medium stature tree species the only appropriate choice. On designated walk streets, vegetation encroachment is limited to preserve the ocean view.

Along primary streets, space for trees is highly variable. Main commercial streets, including Rosecrans, Sepulveda, and Aviation Corridors, provide substantial space for trees in the public right-of-way. The 21-acre Veterans' Parkway includes an established tree canopy in an enhanced median located between N. Ardmore and N. Valley Dr. In residential areas, the average parkway width varies, with an average of 4-feet.

Despite these limitations to vegetation, trees are still very important to many residents, as they help define the character of the community as a small beach town. Moreover, the community has a reputation for having strong environmental values and a desire to preserve trees. The City recently implemented a Going Green program with a goal to make Manhattan Beach the most environmentally responsible city it can be. In the coming years, Manhattan Beach intends to take these efforts to new levels as the city council has made sustainability a priority goal. The 2008 report "Working Toward a Greater, Greener Manhattan Beach" outlines many environmentally friendly practices and policies the city currently employs and outlines additional actions to consider.

The City has many opportunities for outdoor recreation, and residents enjoy walking, running, biking, and exercising in parks and along the many pedestrian- friendly streets. Certain streets are designated bike routes, and year-round, many residents and visitors are seen enjoying these amenities.

Public parks are regularly used and well maintained. In addition to the clean and regularly-groomed beach, the Veterans Parkway is a popular street with a 3-mile long, 20-acre trail, popular with joggers and dog-walkers. The City's second largest park, Polliwog Park, features a small lake, an open-air concert amphitheater, playgrounds, picnic areas, and a fenced dog area. These parks are important to the City's urban forest because they provide the most optimal locations for large-stature trees.

Definitions

Community Urban Forest: The Community Urban Forest is comprised of publicly-owned trees on streets, medians, and parkways, in parks, and at city facilities.

Protected Private Trees: In Manhattan Beach, trees over 12-inch DBH in the first 20-feet of residential front yards, and 3-10-feet of side yards on corner lots

Arboriculture: The science, art, technology, and business of tree care.

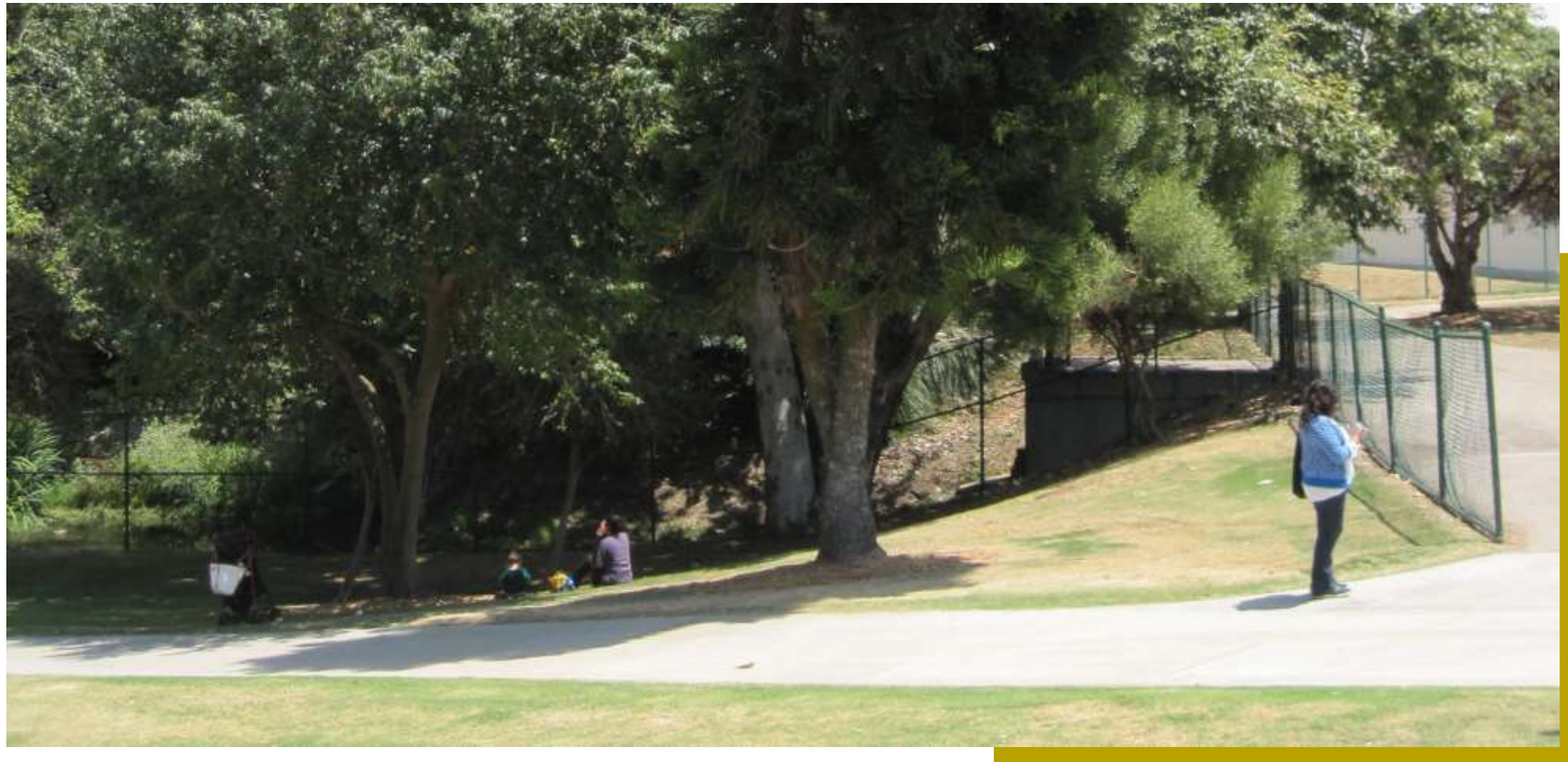
Urban Forestry: The cultivation and management of native or introduced trees and related vegetation in urban areas for their present and potential contribution to the economic, physiological, sociological, and ecological well-being of urban society.

City-maintained Tree: A tree located in a street median, park, or at a city facility.

Resident-maintained Public Tree: A tree located on public property, typically neighborhood streets, and maintained by the adjacent property owner.

Right Tree - Right Place: The practice of installing the optimal species for a particular planting site. Site considerations include existing and planned utilities and other infrastructure, planter size, soil characteristics, water needs, as well as the intended role and characteristics of the species. Species considerations include mature stature, invasiveness of roots, drought tolerance, salt tolerance, flowering, and potential fruit production.

Parkway: Any area of the street that is not sidewalk or roadway.



Benefits of Urban Tree Canopy

Community urban forests work constantly to mitigate the effects of urbanization and development and to protect and enhance lives within the community in many ways.

Air Quality

Trees play an essential role in the community of Manhattan Beach, providing numerous tangible and intangible benefits to residents, visitors, neighboring communities, and wildlife.

As environmental awareness continues to increase, governments are paying particular attention to global warming and the effects of greenhouse gas (GHG) emissions. As energy from the sun (sunlight) strikes the Earth's surface it is reflected back into space as infrared radiation (heat). Greenhouse gases absorb some of this infrared radiation and trap the heat in the atmosphere, increasing the temperature of the Earth's surface. Many chemical compounds in the Earth's atmosphere act as GHGs, including methane (CH_4), nitrous oxide (N_2O), carbon dioxide (CO_2), water vapor, and human-made gases/aerosols. An increase in the average temperature of the Earth may result in changes in weather and weather patterns, sea levels, and land-use patterns, which together are commonly referred to as "climate change."

In the last 150 years, since large-scale industrialization began, the levels of some GHGs, including CO_2, have increased significantly (U.S. Energy Information Administration). California's Global Warming Solutions Act (AB 32), passed in 2006, set the 2020 GHG emissions reduction goal into law. In December 2007, the California Air Resources Board (ARB) approved the 2020 emission limit of 427 million metric tons of carbon dioxide equivalent (CO_2e). As of 2007, regulations require that the largest industrial sources of GHG must report and verify their emissions. In 2011, the ARB adopted the cap-and-trade regulation. Under a cap-and-trade system, an upper limit (or cap) is placed on GHG emissions. This cap can be applied to any source, industry, region, or other jurisdictional level (e.g., state, national, global). Regulated entities are required to either reduce emissions to the required limits or purchase (trade) emission offsets in order to meet the cap. In 2011, the ARB approved four offset protocols for issuing carbon credits under cap-and-trade including the Forest Offset Protocol (ARB, 2011). This Protocol recognizes the important role forests play in fighting climate change.

Urban trees improve air quality in five fundamental ways:

- Reducing particulate matter (dust)
- Absorbing gaseous pollutants
- Shade and transpiration
- Reducing power plant emissions
- Increasing oxygen levels

They protect and improve air quality by intercepting particulate matter (PM_{10}), including dust, ash, pollen, and smoke. The particulates are filtered and held in the tree canopy where they are eventually washed harmlessly to the ground. Trees and forests absorb harmful gaseous pollutants like ozone (O_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). Shade and transpiration reduce the formation of O_3, which is created during higher temperatures. In fact, scientists are now finding that some trees may absorb more volatile organic compounds (VOC's) than previously thought (Karl et al, 2010). VOC's are a class of carbon-based particles emitted from automobile exhaust, lawnmowers, and other human activities. In addition, by reducing energy needs, trees reduce emissions from the generation of power. And, through photosynthesis, trees and forests increase oxygen levels.

The USDA Forest Service's Urban Ecosystems and Social Dynamics Program (UESDP) (formerly called the Center for Urban Forest Research (CUFR)) recently led the development of an Urban Forest Project Reporting Protocol. The protocol, which incorporates methods of the Kyoto Protocol and Voluntary Carbon Standard (VCS), establishes methods for calculating reductions, provides guidance for accounting and reporting, and guides urban forest managers in developing tree planting and stewardship projects that could be registered for GHG reduction credits (offsets). The protocol can be applied to urban tree planting projects within municipalities, campuses, and utility service areas anywhere in the United States.

Water Quality

Trees and forests improve and reduce water pollution in the ocean, by reducing the impacts of stormwater runoff through:

- Interception
- Increasing soil capacity and rate of infiltration
- Reducing soil erosion

By absorbing some stormwater and slowing the flow, trees in Manhattan Beach reduce pollution and contamination of oceans and beaches.

Trees intercept rainfall in their canopy, which act as a mini-reservoir (Xiao et al, 1998). During rain events, this interception reduces and thus slows runoff. In addition to capturing stormwater, canopy interception lessens the impact of raindrops on bare soils. Tree roots can also increase the capacity and rate of soil infiltration. Through rainfall interception and

increased soil infiltration, flow and volume of stormwater runoff is reduced. This aids in preventing sediments and other pollutants from entering the ocean.

In Manhattan Beach, run-off water from storm drains flows directly to the ocean without any benefit of treatment. By absorbing some stormwater and slowing the flow, trees in Manhattan Beach reduce pollution and contamination of oceans and beaches. Requirements for stormwater management are becoming more stringent and costly. Reducing runoff and incorporating urban trees in stormwater management planning has the potential to turn pipes and paved culverts into green infrastructure assets.

Carbon Reduction

Trees and forests reduce atmospheric carbon dioxide (CO_2) in two ways:

- Directly, through growth and carbon sequestration
- Indirectly, by lowering the demand for energy

Trees and forests directly reduce CO_2 in the atmosphere through growth and sequestration of CO_2 as woody and foliar biomass. Indirectly, trees and forests reduce CO_2 by lowering the demand for energy and reducing the CO_2 emissions from the consumption of natural gas and the generation of electric power.

Manhattan Beach's urban tree canopy is directly sequestering 343 tons of carbon each year.

On average, a single Aleppo pine annually sequesters 185 pounds of carbon.

~Manhattan Beach Urban Tree Resource Analysis, 2015

As environmental awareness continues to increase, governments and individuals are paying particular attention to climate change and the effects of greenhouse gas emissions. Two national policy options are currently making headlines; the establishment of a carbon tax and a greenhouse gas cap-and-trade system, aimed at reducing atmospheric CO_2 and other greenhouse gases. A carbon tax places a tax burden on each unit of greenhouse gas emissions and would require regulated entities to pay for their level of emissions. Alternatively, in a cap-and-trade system, an upper limit (or cap) is placed on global (federal, regional, or other jurisdiction) levels of greenhouse gas emissions and the regulated entities are required to either reduce emissions to required limits or purchase emissions allowances in order to meet the cap (Williams et al, 2007).

In 2006, California adopted the Global Warming Solutions Act (AB32) which commits California to reduce its greenhouse gas emissions to 1990 levels by 2020.

Beginning in 2013, a statewide cap on greenhouse gases places a mandatory limit on large businesses that emit more than 25,000 metric tons of CO_2. The limit is set to decline 2-3% each year and to expand the scope of businesses and industries that are regulated. Companies that are regulated must obtain an allowance (or permit) for each ton of carbon they emit. These allowances have value and can be traded on the open market.

The concept of purchasing emission allowances (offsets) has led to the acceptance of carbon credits as a commodity that can be exchanged for financial gain. As a result, some communities are exploring the concept of planting trees to develop a carbon offset (or credit). The Center for Urban Forest Research Pacific Southwest Research Station and USDA Forest Service recently led the development of Urban Forest Greenhouse Gas Reporting Protocol (McPherson et al, 2008/2010). The protocol incorporates methods of the Kyoto Protocol and Voluntary Carbon Standard and establishes methods for calculating reductions, provides guidance for accounting and reporting, and guides urban forest managers in developing tree planting and stewardship projects that could be registered for greenhouse gas reduction credits.

Energy Savings

Urban trees and forests modify climate and conserve energy in three principal ways:

- Shading dwellings and hardscape
- Transpiration
- Wind reduction

Shade from trees reduces the amount of radiant energy absorbed and stored by hardscapes and other impervious surfaces, thereby reducing the heat island effect, a term that describes the increase in urban temperatures in relation to surrounding locations. Transpiration releases water vapor from tree canopies, which cools the surrounding area. Through shade and transpiration, trees and other vegetation within an urban setting modify the environment and reduce heat island effects. Temperature differences of more than 9°F (5°C) have been observed between city centers without adequate canopy cover and more vegetated suburban areas (Akbari et al, 1992).

Trees reduce wind speeds by up to 50% and influence the movement of warm air and pollutants along streets and out of urban canyons. By reducing air movement into buildings and against conductive surfaces (e.g., glass and metal siding), trees reduce conductive heat loss from buildings, translating into potential annual heating savings of 25% (Heisler, 1986). This benefit of lowering the energy needs from buildings in turn reduces carbon dioxide (CO_2) emissions from fossil fuel power plants, which are a primary source of greenhouse gas emitted through human activity.

Aesthetics & Socioeconomics

While perhaps the most difficult to quantify, the aesthetic and socioeconomic benefits from trees may be among their greatest benefits, including:

- Beautification, comfort, and aesthetics
- Shade and privacy
- Wildlife habitat
- Opportunities for recreation and passive recreation
- A reduction in violent crime
- Creation of a sense of place and history
- Human health
- Reduced reliance on medication and quicker recovery from injury or illness

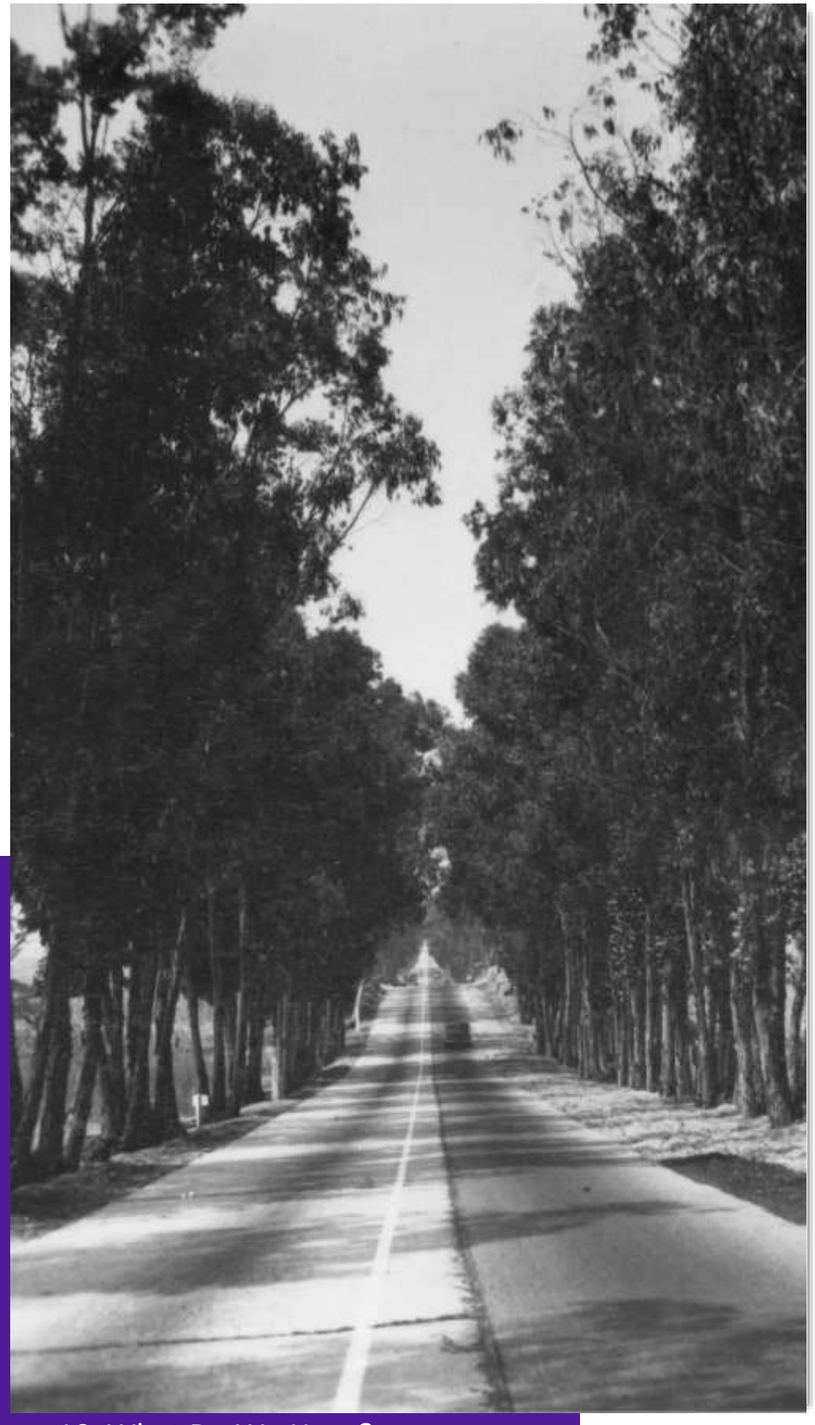
Many of these benefits are captured as a percentage of property values, through higher sales prices where individual trees and forests are located.

Some of the benefits of forests are intangible and/or difficult to quantify, such as impacts on physical and psychological health, crime, and violence, however, empirical evidence of these benefits does exist. A 2012 study of crime, such as burglary and vandalism, by Donovan and Prestemon, found that trees in the public right-of way were associated with lower crime rates as long as the trees did not obstruct lines of sight for security and law enforcement personnel. This reinforced similar findings by Kuo and Sullivan in 2001, whose study focused on inner city areas. The authors speculated the trees indicated to criminals the house was better cared for, and therefore, subject to more effective authority than a comparable house with fewer trees. In a 1989 study, Kaplan and Kaplan found that views of trees and nature impacted people's emotional states positively. Ulrich (1986) found hospital patients with a view of trees and vegetation required less medication and recovered more quickly from injury.

In addition, trees and forests have positive economic benefits for retailers. There is documented evidence that trees promote better business by stimulating more frequent and extended shopping and a willingness to pay more for goods and parking (Wolf, 2007).

Finally, trees provide opportunities for recreation, offering a healthful respite from the pressures of work and everyday stress.

WHAT DO WE HAVE?



History of Urban Forestry in Manhattan Beach

Recognized today for its iconic pier and beachside promenade (a.k.a. "The Strand"), Manhattan Beach has its origins as a seaside resort in the South Bay. In the 1920s and 30s developers leveled uneven sandy sites, exported excess sand, and constructed modest homes for families, including many veterans after WWII. The population increased steadily from 859 residents in 1920 to 6,398 in 1940, as families moved into the Tree and Hill Sections. The greatest population growth occurred in the post WWII-war period as new sections were developed including Manhattan Village, Liberty Village, Bermuda Village, and Victory Village. By the mid-1950s, the Property Owners Association had established new schools, storm drains, a fire station, a post office, parks, and a branch of the Los Angeles County Library.

Urban trees have been a part of Manhattan Beach history since the early 1900s. Historical records show that eucalyptus trees were planted along main streets for windbreaks, firewood, shade, and beauty. Rosecrans Avenue., El Camino Real (today Sepulveda Boulevard), and Center Street., (today Manhattan Beach Boulevard), were all lined with eucalyptus in the 1900s to 1930s. In the 1930s, during the widening of Center Street., 284 eucalyptus trees were determined to be hazardous, and removed. Eucalyptus are less widely planted today due to their large stature at maturity, and disease issues such as red gum lerp psyllids (*Glycapsis brimblecombei*). With the availability of a diverse palette of broadleaf evergreens, the urban forest has grown and expanded to include more medium stature, lower maintenance species, including some smaller-stature eucalyptus varieties.

Balancing Development with Open Space

Increased structure footprint size and reduced setbacks from streets are important components of increasing urban density and reducing sprawl, but these factors limit space for trees and landscaping. Over the years, as land prices have increased, larger homes are replacing many of the early bungalows. A greater portion of residential lots are covered by structures, leaving less plantable area. With new development, some areas of the city have opted to reroute utilities underground, improving views, and more space for street trees However, these areas often also have small lot setbacks, which can limit space for tree growth, and make small to medium stature trees more appropriate in the landscape. On designated walk streets (motorized vehicle-free streets), vegetation encroachment is limited to preserve the ocean view. Despite these limitations, urban forest managers are striving to preserve existing public trees and to promote the appropriate species where available space is limited.

The City and residents work together to ensure attractive landscaping on public and private property. In neighborhoods with mature trees, greater canopy cover creates a distinct character and feel, particularly within neighborhoods in the Tree Section and others along the Valley/Ardmore greenbelt of Veterans Parkway. Because of its beautiful and desirable neighborhoods, Manhattan Beach continues to be a desirable and popular coastal community.

Outdoor Recreation and Pedestrian Friendliness

Public parks are popular and regularly maintained. Large unpaved areas provide appropriate locations for large-stature trees, and residents enjoy many outdoor activities in well-shaded park areas. Residents enjoy running, biking, and exercising in parks and along the many pedestrian-friendly city streets. Certain streets are designated bike streets, and year-round, many residents and visitors are seen enjoying these amenities. The trees and associated vegetation are an important element in creating a vibrant, beautiful community.

In some neighborhoods, parkways do not provide adequate space for large-stature trees. In many instances where large-stature street trees are planted, inadequate root space results in the uplifting and displacement of sidewalks, streets and driveways. In the early 1990s, the city implemented a sidewalk repair program which included tree inspections for those trees that were causing infrastructure damage.

Through the sidewalk repair program, Public Works staff inspects sidewalks, and if a problem is found, work with a consulting arborist to assess the condition and health of the tree. If the tree is not dead, dying, diseased or exhibiting structural instability, it is most often preserved, and the sidewalk or road is scheduled for repair. Public Works staff notifies the property owner of the need for repairs, completes the work, and repair costs are forwarded to the property owner. This program keeps sidewalks safe and accessible for residents and visitors but there is interest in ensuring street trees planted in the future will create fewer infrastructure conflicts. One of the objectives of this UFMP is to address this through appropriate species selection while maintaining the high level of care the sidewalk repair program currently provides.

History of Inventories and Ordinances

To better manage and develop options for the maintenance of public trees, the City has periodically conducted public tree inventories. The trees were inventoried 2000 and in 2013. The 2013 inventory data was used to establish the value and benefits of existing trees and to provide benchmarks for the UFMP.

To guide residents and staff in the planting, maintenance, and removal of community trees, two main sections of the city ordinance were established in 1970 and 1993. Street, park, and city facility trees are regulated by the City

Ordinance Section 7.32 – Tree, Shrub, and Plant Regulations, which was first established in 1970 and has been periodically updated over time. Trees under the jurisdiction of 7.32 are maintained by adjacent property owners or by the City, depending on their location. Typically, parkway trees are maintained by adjacent property owners. Trees on streets and medians, in parks and at city facilities are maintained by the City.

In 1993, the City established ordinance 10.52.120 – Tree Preservation and Restoration in Residential Zones, Area Districts I and II, which further regulates trees over 12-inches DBH in the front yards (20-feet) of residential homes. The ordinance states that property owners are required to maintain these trees and seek permission for removal from the City. Protecting these trees demonstrates Manhattan Beach's ongoing dedication to preserving the urban forest.

Public Tree Resource

Public trees play a critical role in the City of Manhattan Beach. They provide numerous benefits both tangible and intangible, to residents, visitors, and neighboring communities. Dedicated to proactively managing an inventoried population of 11,575 public trees, the City's Public Works Department has demonstrated that trees are a valued community resource, an important component of the urban infrastructure, and a recognized part of the City's identity.

Replacing Manhattan Beach's public trees would cost over $20.6 million.

An urban forest is a living and dynamic resource, changing over time and in constant response to its environment. The health and stability of the urban forest can be influenced by many factors, including pruning, irrigation, climate fluctuations, emerging pests and disease, as well as development and new tree planting. A complete understanding of the current structure, condition, and maintenance needs is essential to making the best possible management decisions. To date, the City has inventoried all trees on streets (except vehicle-free zones known as "walk streets"), in parks, and at city facilities.

Composition of the Inventoried Urban Forest

Understanding the composition of an urban forest is essential to developing effective management strategies. The urban forest composition is defined by its population (species frequency and diversity), age distribution, condition, and replacement value.

More than half of Manhattan Beach's trees are broadleaf evergreens and over a quarter are palm species.

The Urban Forest Resource Analysis (2015) found the following characteristics define Manhattan Beach's public urban forest:

- 4,116 trees (36%) are located along major streets, medians, parks, and city facilities. These trees are city-maintained annually (palms) or on a two or three year cycle (non-palm species)
- 7,459 trees (64%) are in residential areas, maintained by adjacent property owners
- The inventory includes more than 180 unique species
- Evergreen broadleaf trees comprise 54% of the population
- 26% are palm species
- The ten most common species represent 46% of the population
- The resource is a young, establishing population with 60% of non-palm species in the 6-12-inch DBH range
- 92% of trees are in good condition
- Public trees provide 55 acres of canopy cover, an average of 2.2% of the overall land area in Manhattan Beach
- To date, public trees have sequestered 3,240 tons of carbon, valued at $97,206
- Replacement of Manhattan Beach's 11,575 public trees with trees of similar size, species, and condition would cost over $20.6 million

Tree Types

Broadleaf: Hardwood trees with flat leaves which may be either evergreen or deciduous

Evergreen: Leaves do not fall at one time and last several years. This category includes both conifers and broadleaf trees.

Deciduous: Leaves fall at once, seasonally

Conifer: Usually bearing cones and needles or scale-shaped leaves

Palm: Unbranched evergreens with crowns of feathered or fan-shaped leaves

Tree Type

A diverse population is important to forest health and to maintain a stable flow of benefits. Dominance of any species or genus can make a forest more susceptible to damage from storms, disease and pest outbreaks, climate change, and other environmental stressors.

Figure 1 shows Manhattan Beach's tree types. More than half of the public trees are broadleaf evergreens and palms comprise over a quarter.

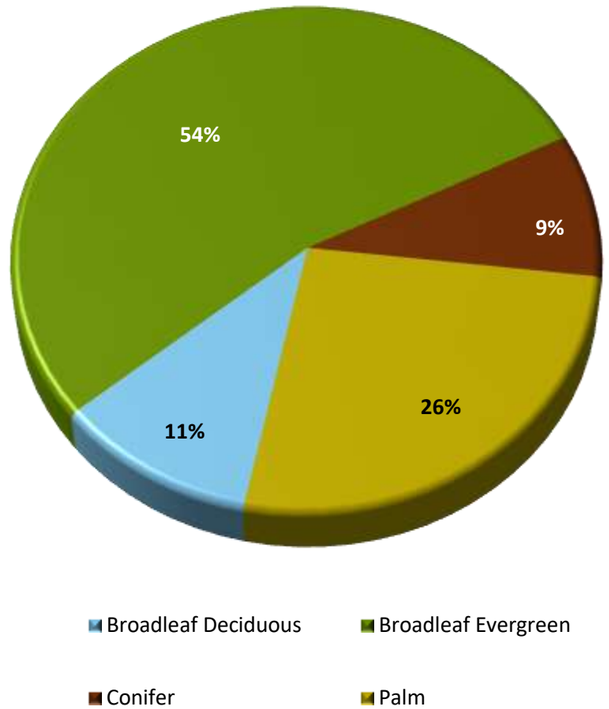


Figure 1. Tree Type Distribution

Species Distribution

The predominant tree species are queen palm (*Syagrus romanzoffianum*, 9.58%), and cajeput tree (*Melaleuca quinquenervia*, 6.76%). Species diversity in Manhattan Beach is relatively high. There is a widely accepted rule that no single species should represent greater than 10% of the total population, and no single genus more than 20% (Clark et al, 1997). The tree diversity in Manhattan Beach is well distributed and no species exceeds the recommended species threshold of 10%, although queen palm comes close. That genus of palm, *Syagrus*, is also the most common genus in the population, but is well under the 20% threshold for genera.

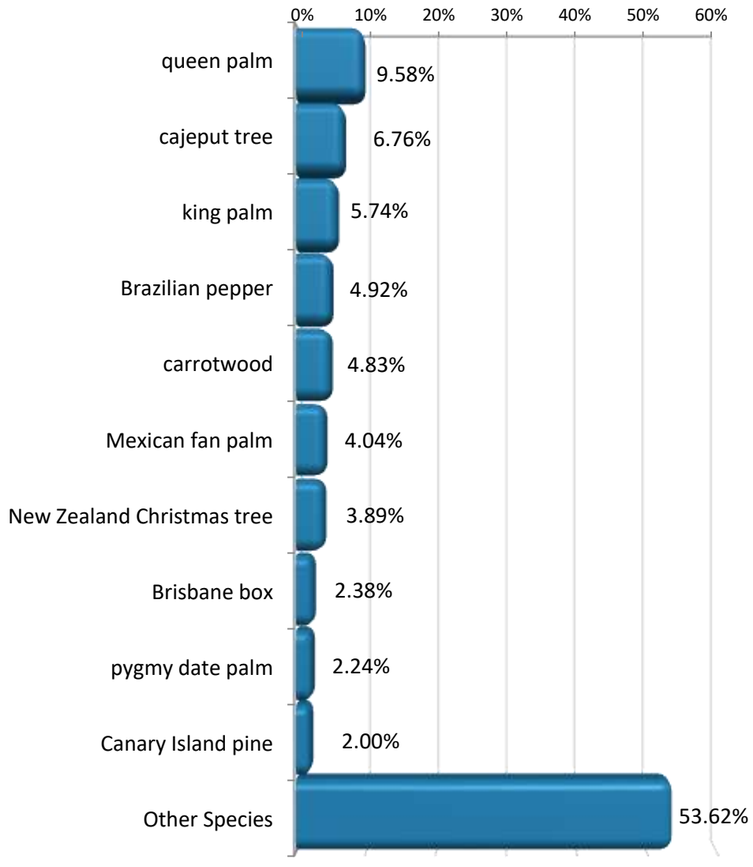


Figure 2. Prevalent species in Manhattan Beach's Urban Forest

Age Distribution

The age distribution of the urban forest is a key indicator, and driver, of maintenance needs. Palms are not included in this age distribution since the diameter at breast height (DBH) of palm species does not increase incrementally with age. Palm tree age is more closely correlated with height. Among hardwoods and conifers, which do increase in DBH over time, the age distribution of Manhattan Beach's public tree population is positively weighted in established but young trees, with 60% of the overall population 6-12-inches DBH (Figure 3). Twenty seven percent (27%) of the population consists of young trees with a DBH between 0 and 6 inches. Ten percent (10%) of the population is mature, in the 12–18-inches DBH Range and just 3% are over 18-inches DBH.

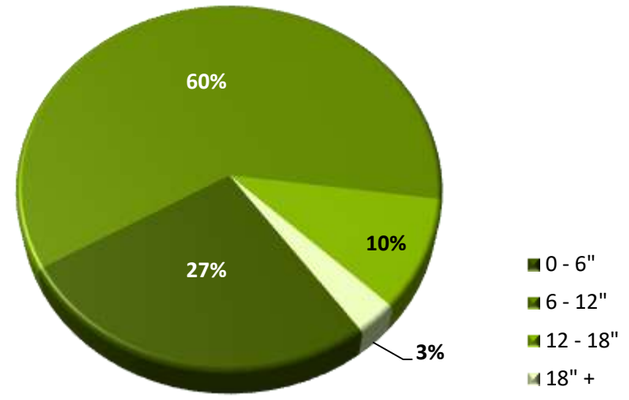


Figure 3. Relative Age Distribution of Non-Palm Species

Public Tree Benefits

Calculating Tree Benefits

The benefits provided by the urban forest are dependent upon the species, age, and condition of the tree population.

Communities can calculate the benefits of their urban forest by using a complete inventory or sample data in conjunction with the USDA Forest Service i-Tree software tools. This state-of-the-art, peer-reviewed software suite considers regional environmental data and costs to quantify the ecosystem services unique to a given urban forest resource.

Individuals can calculate the benefits of trees to their property by using the National Tree Benefit Calculator or with i-Tree Design. (www.itreetools.org/design)

The benefits provided by the urban forest are dependent upon the species, age (size), and condition of the tree population. The urban forest is one asset that has the potential to increase in value over time and with proper care.

Based on the 2013 inventory, Manhattan Beach's public trees provide cumulative benefits to the community at an average value of $266 per tree, for a total gross value of $3.1 million per year. There is potential for these benefits to increase over time as young, medium and large stature trees mature. Currently, this resource provides the following benefits each year:

Energy Savings

Through shading and modification of their immediate environment, public trees reduce electricity by 292 MWh and natural gas use by 2,122 therms for an overall benefit of $42,933, an average of $3.71 per tree.

Carbon Reduction

By converting carbon dioxide into woody and foliar biomass, Manhattan Beach's public trees sequester an additional 343 tons of atmospheric CO_2 for a net value of $13,397 and an average of $1.16 per tree.

Air Quality

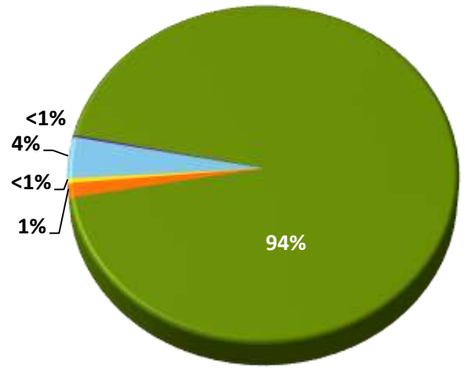
Net air quality improvements, as a result of decreased ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM_{10}), are valued at $121,944, an average per tree benefit of $10.54.

Stormwater Management

Manhattan Beach's public trees intercept nearly 3.3 million gallons of stormwater annually for a total value of $5,989, an average of $0.52 per tree.

Aesthetic & Socioeconomic Benefits

The total annual benefits Manhattan Beach's public trees to property values, health, aesthetics, and socioeconomics is nearly $2.9 million, an average of $250 per tree.



	Total	Per Tree
Energy	$42,933	$3.71
CO2	$13,397	$1.61
Air Quality	$121,944	$10.54
Stormwater	$5,989	$0.52
Aesthetic	$2,899,478	$250.49

Figure 4. Annual Benefits of Public Trees

Benefits Versus Investment

In order to recognize the full value of the benefits from Manhattan Beach's public urban forest, it is important to take into account the investments (costs) of caring for this resource. Annually, the City invests approximately $515,000 for public tree maintenance, including administration, liability claims, and infrastructure repairs resulting from tree roots. Considering this resource provided $3.1 million in total benefits, **for every $1 invested in caring for public trees, the community currently receives $5.99 in benefits.**