

SAN FRANCISCO URBAN FOREST PLAN

What is the Urban Forest?

San Francisco's urban forest includes the collection of trees, vegetation and understory plantings found along the city's streets, within parks and in the built environment. The urban forest is distinguished by its **urban setting** full of paved surfaces, streets, buildings, vehicle traffic and large population. Given its location, it **requires constant maintenance** to keep roads, sidewalks and parks clear and safe. The concept of an "urban forest" allows us to think holistically about the trees and vegetation within a city, quantify their benefits, and manage this resource for the enjoyment of present and future generations.

669,000 *Estimated total number of trees in San Francisco.*

105,000 street trees

131,000 park trees

433,000 other (private + public trees)

Acer buergerianum

1 GREEN ROOFS & LIVING WALLS



Rooftop gardens, green roofs and living walls provide many planting and greening opportunities on buildings.

4 STREET TREES



Healthy tree-lined streets are a key component of the urban forest. An estimated 105,000 trees grow along San Francisco's streets.

6 PARK TREES



Approximately 131,000 trees grow in city parks and open spaces.

2 TREES ON PRIVATE PROPERTY



Trees and plantings on private property including the fronts and backyards of homes and apartment buildings make up a significant portion of the urban forest.

3 ON-GOING MAINTENANCE



Trees and plantings in the urban environment require consistent maintenance and care to ensure health and public safety.

5 UNDERSTORY: SHRUBS & SIDEWALK GARDENS



In addition to trees, landscaping and plantings located along sidewalks and medians provides the opportunity to increase plantable space and vegetation in the urban environment.

7 WILDLIFE



Aside from the benefits that trees provide for people, trees provide a host of benefits for birds, insects and other animals. These include food, nectar, cover and nesting spaces.

Who is Responsible?

San Francisco's approximately 700,000 trees are owned and managed by a diverse mix of public and private stakeholders. These include City, County, State and Federal agencies as well as the private sector.

DEPARTMENT OF PUBLIC WORKS (DPW)

The San Francisco Department of Public Works has jurisdiction over all trees and greening in the public right of way. DPW is the primary agency responsible for carrying out and enforcing the City's Urban Forestry Ordinance (Article 16 of the Public Works Code). The ordinance describes DPW's jurisdiction and oversight responsibilities including: tree planting and care requirements, removal procedures, and the landmark and significant tree programs. DPW prunes street trees, responds to tree emergencies, and performs tree inspections and tree-related sidewalk repair.

RECREATION & PARK DEPARTMENT (RPD)

The Recreation and Park Department (RPD) is responsible for 131,000 trees on 4,196 acres of parkland. These include trees in city parks, identified Natural Areas and public golf courses. Major sites include Golden Gate Park and Stern Grove.

PRIVATE PROPERTY OWNERS

Property owners are responsible for the care of approximately 65,000 street trees fronting their property (on identified streets) as well as trees and landscaping in backyards and front setbacks.

OTHER CITY AGENCIES

A number of other City agencies play an important role in caring for the city's trees. These include the SF Housing Authority, SF Public Utilities Commission (SFPUC), SF Municipal Transportation Agency (SMTA), SF International Airport (SFO), Port of San Francisco and Office of Community Investment and Infrastructure. These agencies are primarily responsible for management of trees on properties they manage such as housing sites, along transit lines, and at airport facilities.

FRIENDS OF THE URBAN FOREST (FUF)

The majority of street tree planting in San Francisco is carried out by the non-profit Friends of the Urban Forest. FUF and its volunteers have planted more than 48,000 new and replacement trees in San Francisco. FUF's programs are dedicated to growing the city's urban forest while bringing neighbors together and empowering residents to green their neighborhoods. The organization offers a variety of programs including planting, young tree care, sidewalk landscaping, community engagement, training and education. In addition, FUF advocates for city policy surrounding urban forestry and greening issues.

STATE AGENCIES

San Francisco is home to various State-owned lands with tree and landscape management needs. These include Candlestick Point State Recreation Area. In addition, educational institutions manage the trees on their landholdings including the University of California, San Francisco's Mount Sutro Open Space Reserve, the grounds of the San Francisco Unified School District, and San Francisco State University's campuses.

FEDERAL AGENCIES

A significant portion of the city's urban forest is cared for and managed by federal agencies including the Golden Gate National Recreation Area (Land's End, Fort Funston and Ocean Beach) and the Presidio Trust. The large number of trees, particularly in the Presidio, represent a significant piece of San Francisco's urban forest.

SAN FRANCISCO URBAN FORESTRY COUNCIL

The Urban Forestry Council is an advisory body for the Mayor, Board of Supervisors, and City departments on urban forestry issues. The Urban Forestry Council was established for the purpose of guiding the stewardship of San Francisco's trees by promoting a healthy and sustainable urban forest that benefits all San Franciscans, while ensuring public health and safety, and maximizing the full range of tree benefits into the future.

URBAN
FORESTRY
COUNCIL



SAN FRANCISCO URBAN FOREST PLAN

Benefits of Trees & Landscaping

San Francisco's trees work hard each day to improve our quality of life and environment. They purify the air, reduce stormwater runoff, beautify neighborhoods, increase property values, and improve health and well-being. **This green infrastructure is essential to the city's sustainability.** Below are some of the social, economic and environmental services provided by trees and other forms of landscaping.

Arbutus unedo



SOCIAL



Strengthen communities

Planting and caring for trees creates neighborhood pride, fosters social cohesion and promotes relationship building.



Reduce violence and crime

Greenery around houses and apartments is associated with lower crime, graffiti, vandalism, littering and domestic violence.¹



Improve physical health

The presence of trees makes people more likely to walk and participate in outdoor activities. Trees also filter airborne pollutants reducing causes of asthma and other respiratory problems. Views of trees and greenery have been shown to speed healing time from injury and illness in hospital patients.²



Calm traffic and promote pedestrian/bicyclist safety

The presence of trees can reduce driving speeds by narrowing the visual width of the roadway. Trees also help buffer pedestrians from vehicles.



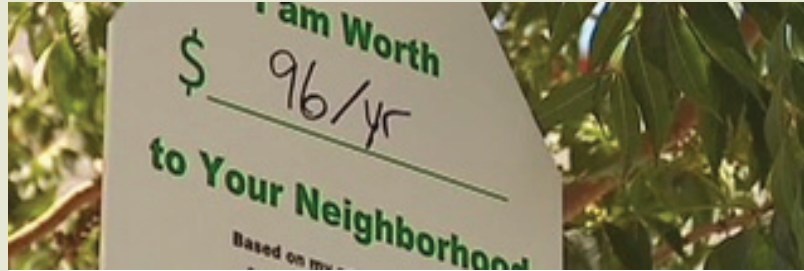
Create memorable and beautiful places

The visual characteristics of trees and landscaping (shape, colors, leaves) add to the aesthetics of urban streets and enhance the quality of the public realm.



Connect people to Nature ('Biophilia')

Humans are hardwired for regular contact with nature. Trees provide opportunities to connect with the natural world in a dense urban environment. This can help reduce stress and support emotional and spiritual wellbeing.



ECONOMIC

\$1,700,000,000

Estimated capital value of San Francisco's urban forest asset (i.e. the cost to replace all the existing trees within the city.)



Increase property values

\$98,272,878

Increase in property values provided by San Francisco's trees annually.

Healthy mature trees in front of homes have been shown to increase property values for residential properties with trees and vegetation.



Reduce infrastructure costs

Trees and other green infrastructure improvements can help reduce the need for expensive infrastructure systems to manage stormwater.



Reduce building heating & cooling costs

\$150-250 annually

Savings on energy costs per household with proper tree placement

Trees conserve energy by shading buildings from the sun and serving as windbreaks which slow the loss of heat from buildings.



Boost commercial activity

Trees create attractive environments that draw people and encourage them to linger. Trees are positively linked to shopping activity and a willingness to pay more for goods.¹



Increase worker productivity

Employees with views of nature are more productive, happier and healthier.



ENVIRONMENTAL

\$9,439,309

Value of environmental benefits (hydrological, air quality, and carbon storage) provided by the urban forest.



Improve air quality & absorb pollution

260 tons

Amount of atmospheric pollutants absorbed by the urban forest annually.

Trees clean the air by absorbing gaseous pollutants (carbon dioxide, sulphur dioxide, and nitrous oxide) and by capturing airborne particulate matter on leaf surfaces.



Provide wildlife habitat

Flowers, fruits, leaves, buds and woody parts of trees are used by many different species. Trees provide shelter, food and nesting areas for birds, insects and small animals.



Decrease noise pollution

Trees absorb sound and muffle noise from freeways and other sources.



Slow climate change

196,000 tons

Amount of carbon stored by the city's trees each year.

Urban trees capture greenhouse gases by storing atmospheric carbon dioxide in their tissue and reducing energy demand by shading buildings. In addition, trees turn carbon dioxide into fresh oxygen through photosynthesis.



Reduce stormwater runoff

516,468,000 gal

Gallons of water diverted from sewer system each year.

By capturing rainwater that would otherwise flow into our combined storm-sewer system, trees replenish the aquifer and reduce the occasions on which polluted overflow floods our streets or runs into Ocean and Bay.



Produce local food

Fruiting trees and urban orchards increase food independence and reduce the distance that food must be transported to reach city dwellers through urban agriculture.

¹ Kuo, F.E. & Sullivan W.C. (2001). Aggression and violence in the inner city: Impacts of environment via mental fatigue. *Environment & Behavior*, 33(4), 543-571.

² Ulrich, R. S. "View through a Window May Influence Recovery from Surgery." *Science* 224:4647 (1984): 420-21.

¹ Wolf, Kathleen L. "Business District Streetscapes, Trees and Consumer Response." *Journal of Forestry* 103.8 (2005): 396-400.

² Wolf, Kathleen L. "Roadside Urban Trees, Balancing Safety and Community Values." *Absort News* Dec. 2006: 56-57.

City of San Francisco Resource Analysis of Inventoried Public Trees, Davey Resource Group (2013).
Assessing Urban Forest Effects and Values: San Francisco's Urban Forest, United States Forest Service (2007).
Based on estimate of an average 774 gallons intercepted annually per tree (Davey Resource Group 2013).
San Francisco Bay Area State of the Urban Forest Report, USDA Forest Service (2007).

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History of San Francisco's Urban Forest

San Francisco's urban forest is primarily the result of human determination and ingenuity. Massive tree planting efforts of the late 1800s and early 1900s transformed expanses of sandy dunes into the green oases of Golden Gate Park and the Presidio. Today, further budget cuts threaten the City's ability to provide critical maintenance services for San Francisco's trees. The Plan sets a vision for reviving the fervor of the early tree planters to inspire a bold vision for improving the health and beauty of the city by bringing more trees and greenery to our streets and public places while improving the ecological integrity, livability and beauty of the city.



Gay Gam Collection, San Francisco, CA

SF CIRCA 1880

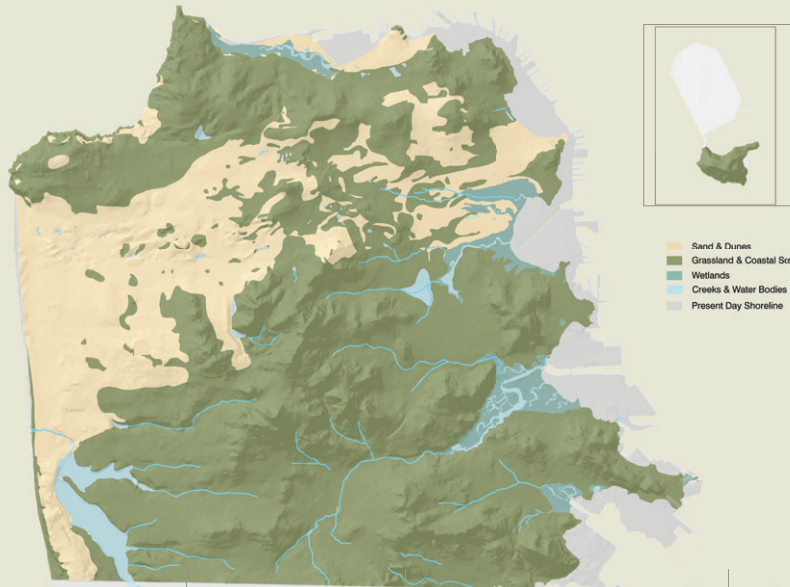


SF TODAY

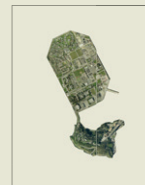
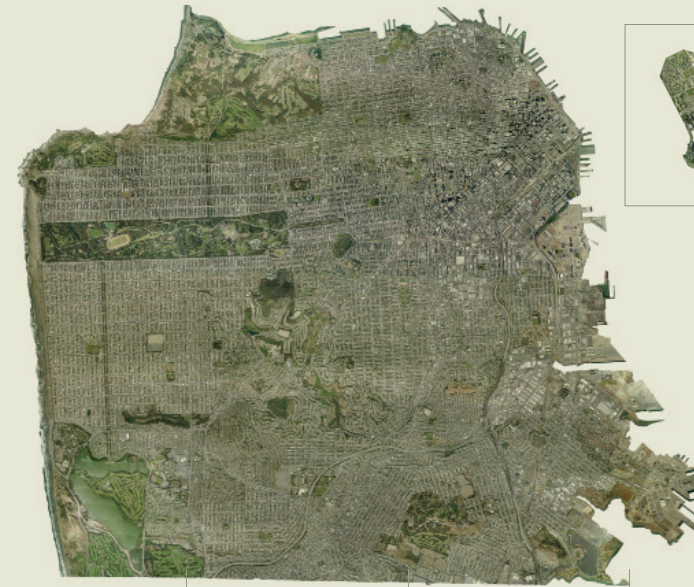
<https://www.flickr.com/photos/steve/photomash/40225673/steve/steve/steve/>

PRIOR TO 1800

Unlike cities with naturally occurring forests, San Francisco's original landscape had very few trees. Prior to European arrival and until it became a city, San Francisco's environment was a mosaic of sand dunes, grasslands, wetlands, riparian and coastal scrub vegetation (see map). Small, scattered stands of native trees grew near creeks and in canyons and on the city's less foggy eastern side.



Sand & Dunes
Grassland & Coastal Scrub
Wetlands
Creeks & Water Bodies
Present Day Shoreline



SAN FRANCISCO TODAY (2014)

Today, San Francisco is a vibrant city with a highly altered natural environment. Creeks, wetlands, and parts of the Bay have been filled to accommodate urban development. Massive tree planting efforts throughout the years have created an urban forest where none existed. Although much of the landscape is now urbanized, opportunities exist for the urban forest to help strengthen the city's ecological function while also beautifying our public spaces.

PRE 1760

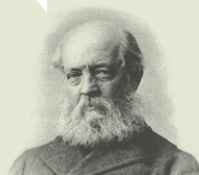
DUNES & GRASSLAND

Before the arrival of the Spanish, San Francisco is a largely treeless landscape covered by sand dunes, coastal scrub and grasslands. The land supports native human inhabitants and diverse wildlife.



"There is not a full grown tree of beautiful proportions near San Francisco. It would not be wise nor safe to undertake to form a park...which assumed as a certainty that trees which would delight the eye can be made to grow near San Francisco."

Frederick Law Olmsted (1867)



1850 -70s

GOLDEN GATE PARK

Coastal dunes are transformed into a newly forested recreation and open space to create Golden Gate Park. By 1879, approximately 155,000 trees are planted, primarily Blue Gum Eucalyptus, Monterey pine and Monterey Cypress.



STERN GROVE

George Greene (1871) plants a forest of fast growing eucalyptus trees on his land.



Mary Ellen Pleasant, "the Mother of Civil Rights in California" who helped slaves along the Underground Railroad during the Gold Rush, left her mark on San Francisco by planting twenty enormous blue gum eucalyptus trees along Octavia Street between Bush & Sutter Streets. These are among the city's few landmarked trees.

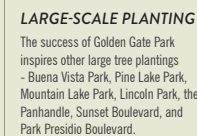
Mary Ellen Pleasant (1870)



1880s

PRESIDIO

Major W. A. Jones proposes a massive tree planting program (1883) for the military base at the Presidio. Coastal scrub and grasslands are covered with an estimated 350,000 trees to reduce wind and visually isolate the base. Eucalyptus, Monterey Pine and Monterey Cypress are the primary species planted.



1886

FIRST ARBOR DAY

Adolph Sutro organizes the state's first Arbor Day on Nov. 15, 1886. A large celebration is held on Yerba Buena Island where thousands of children plant trees donated by Sutro.



"The people of the Pacific Coast...will wander through the majestic groves rising from the trees we are now planting, reverencing the memory of those whose foresight clothed the earth with emerald robes and made nature beautiful to look upon."



Adolph Sutro (1886)

SUTRO'S FOREST

Adolph Sutro buys large tracts of land west of Twin Peaks. His passion for trees leads him to plant thousands of mostly Blue Gum Eucalyptus trees over the next twenty years in Glen Canyon Park, St. Francis Wood, Ingleside Terrace, Westwood Park, Mount Sutro, Mount Davidson, and Twin Peaks.



EARLY 1900s

GOLF COURSES

Thousands of trees are planted in the city's new golf courses - the Olympic Club, San Francisco Golf Club, and Harding Park.

STREET TREES

Some major streets are planted with trees - Dolores Street, Sunset Boulevard, Park Presidio Boulevard.



1950s

TREELESS STREETS

Photos from the 1950s show the majority of city streets without any significant tree plantings. Nikita Khrushchev, leader of the Soviet Union, visits San Francisco in 1959 and remarks on the startling lack of trees in the city.



1955 - 1974

CITY PLANTING PROGRAM

The City expands its municipal tree program. The Tree Planting Division of the Department of Public Works (DPW) is established. DPW works with residents and the volunteer group San Francisco Beautiful to plant trees along city streets. An estimated 100,000 street trees are planted. New tree species are introduced such as Ficus, Blackwood Acacia and Myoporum.

Soviet premier Nikita Khrushchev visited San Francisco in 1959 and "thought it was a very nice city, but not enough trees," recalled a member of Friends of the Urban Forest's original board of directors.

Nikita Khrushchev (1959)

1981

TREE PLANTING HALTED

Municipal budget cuts halt City sponsored tree planting. DPW's urban forestry program discontinues street tree planting and shifts focus to tree maintenance.

FRIENDS OF THE URBAN FOREST

In response to City budget cuts, a non-profit, Friends of the Urban Forest (FUF), is formed to continue city-wide street tree planting efforts. FUF works with neighbors to organize tree plantings and plants thousands of trees.



Founded in 1981, Friends of the Urban Forest (FUF) has been instrumental in engaging residents in neighborhood street tree planting and care. FUF and its volunteers have planted approximately 48,000 trees in San Francisco.

Friends of the Urban Forest (1981)



2005

25,000 NEW TREES

Mayor Gavin Newsom's "Trees for Tomorrow" campaign commits to planting 5,000 trees per year for five years to create a greener city.



2007 - 2011

MORE CUTS

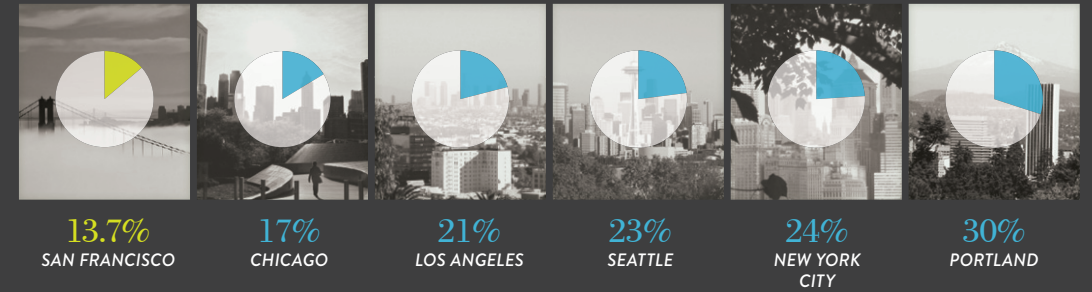
In the wake of global financial crisis, DPW's Bureau of Urban Forestry is hit hard by successive years of budget cuts. Lack of funding causes DPW to initiate a Tree Maintenance Transfer Plan. The plan proposes transferring maintenance responsibility for thousands of trees under City care to private property owners.

SOURCES:
Trees for San Francisco: A Guide to Street Tree Planting and Care Friends of the Urban Forest (1995).
The Trees of San Francisco: A Plan for the Management of the City's Urban Forest City & County of San Francisco, Department of Public Works (1991).
The Trees of San Francisco Sullivan, Mike (2004).

SAN FRANCISCO URBAN FOREST PLAN

Tree Canopy in San Francisco

San Francisco prides itself on being “green,” but is it really? The City tops lists of the world’s greenest cities for its renewable energy and zero-waste policies, but it suffers from a literal lack of green. San Francisco has one of the smallest tree canopies of any major U.S. city. The Plan strives to achieve a more equitable distribution of greening throughout the city by encouraging planting in areas lacking tree cover and supporting alternate greening methodologies (i.e. sidewalk gardens, parklets, green walls/roofs) where trees may not be appropriate.



DIGITIZED TREE CANOPY MAP

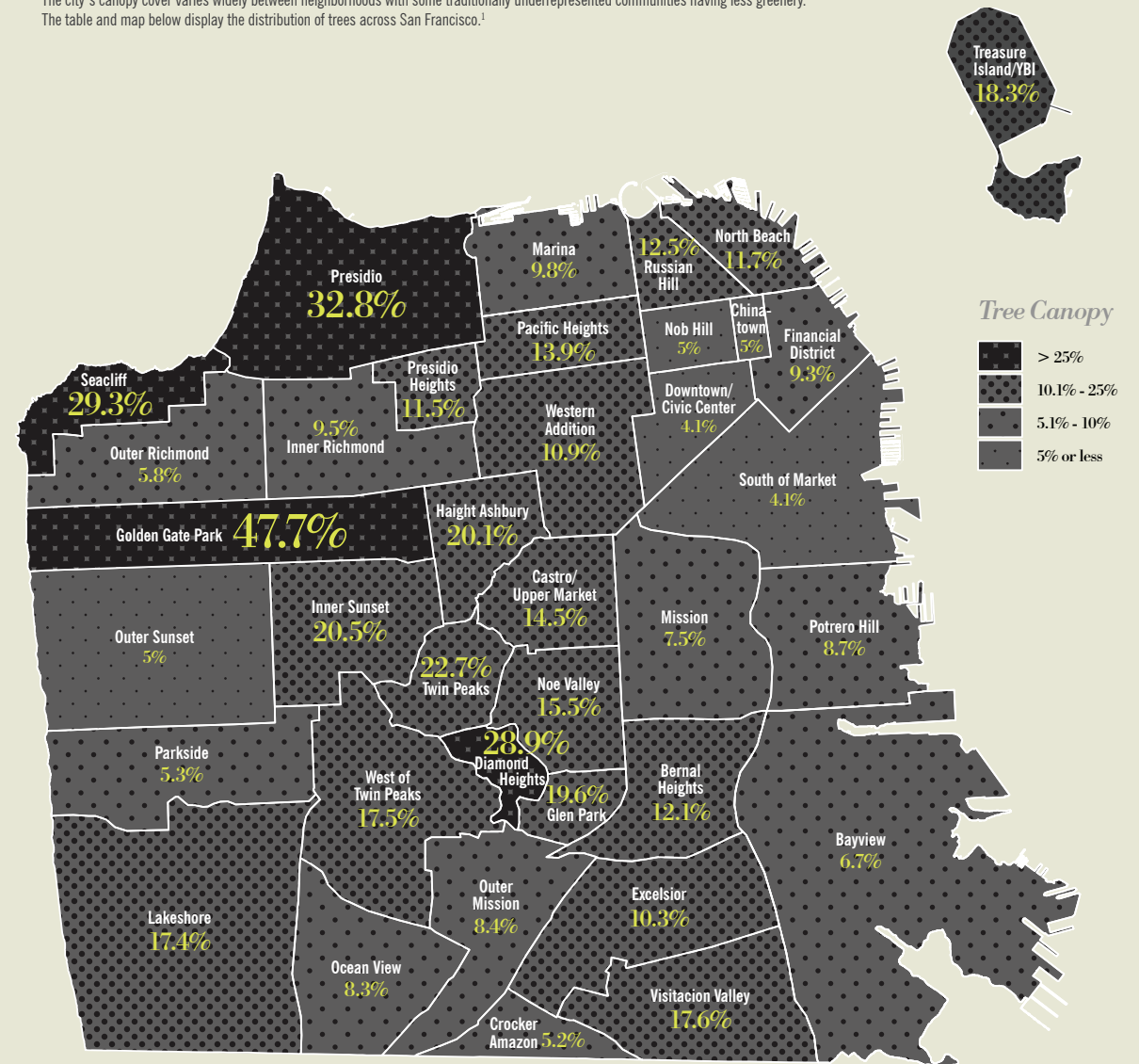
This map features a digitized display of San Francisco's tree canopy as identified using aerial photos and tree-related data. It indicates areas of high canopy cover such as Golden Gate Park and streets like Sunset Boulevard. Locations with little or few trees appear as mostly grey.



Source: SF Planning Department (2012)

TREE CANOPY COVERAGE BY NEIGHBORHOOD

The city's canopy cover varies widely between neighborhoods with some traditionally underrepresented communities having less greenery. The table and map below display the distribution of trees across San Francisco.¹



Source: SF Planning Department (2012)

¹ Canopy analysis relies on technology and photos that may be affected by urban conditions such as the presence of buildings blocking some trees.

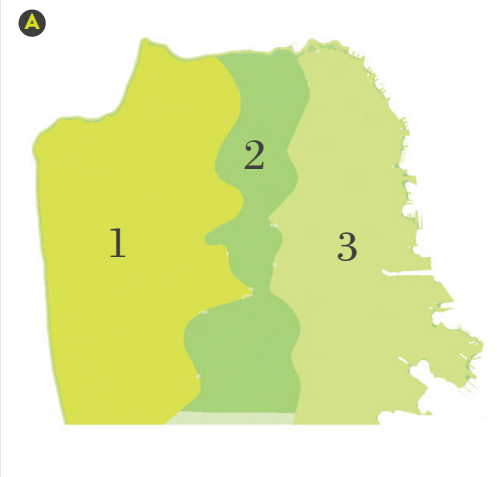
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Environmental Conditions

San Francisco exists in a unique place on Earth. Surrounded by the Pacific Ocean and San Francisco Bay and located at the tip of an environmentally diverse peninsula, the city is a phenomenal mosaic of topography, weather, geology, ecology and urban life.

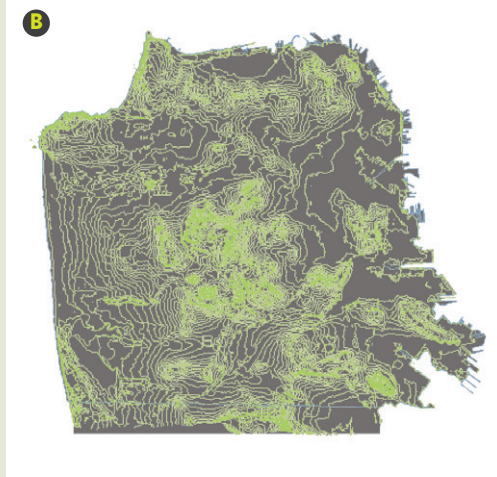
Environmental Conditions

San Francisco's unique environmental conditions exert a strong influence on the trees and vegetation that grow throughout the city.



MICROCLIMATES

The city's topography and proximity to the Bay and Ocean create distinct microclimates marked by differences in temperature, sun and fog. These microclimates can vary dramatically between neighborhoods influencing the type and species of trees and vegetation able to grow. San Francisco's major microclimates fall into three zones: 1.) Coastal Zone/Fog Belt, 2.) Transitional Zone and 3.) Bay Zone/Sun Belt.



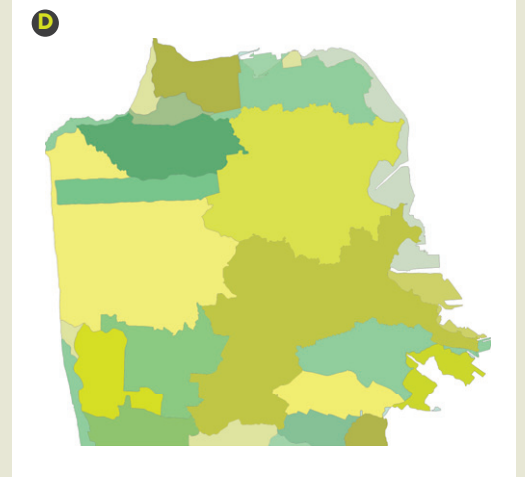
TOPOGRAPHY

San Francisco's terrain is characterized by hills and valleys. Many streets ascend steep topography. The hills slow wind and fog approaching from the ocean. They can also channel wind creating patterns of sun and shade that affect tree growth. Many of the city's largest hills were planted with tall trees like Eucalyptus and Monterey Cypress to serve as wind breaks.



SOILS

Soil conditions vary throughout San Francisco with sandy soils found closer to the ocean and artificial fill and mud found near the city's Bayside. Typical urban soil conditions closer to the surface require amendments to supply nutrients for tree and plant growth. Rocky areas on or near hills have little soil volume for tree growth. Tree species selection and size should be compatible with soils to ensure health and adequate structural support.



WATERSHEDS

Urban watersheds comprise the system of surface and below ground water flows from rainfall, natural water bodies and storm and sewer infrastructure. San Francisco has eight distinct watersheds, three on the Westside where stormwater flows towards the Pacific Ocean, and five on the Bayside where stormwater flows towards San Francisco Bay. Trees and vegetation support watershed health by helping manage stormwater naturally and recharging groundwater. Plantings should be carefully considered for potential conflicts with underground collection and conveyance systems.

Urban Conditions

San Francisco's largely built-out environment exerts a significant influence on the urban forest. While the city's dense urban development limits available planting spaces, it also creates opportunities to involve a wide range of residents and community groups in tree planting and care.



BUILT ENVIRONMENT

The city's urban forest grows within a dense built environment. Large amounts of impervious surfaces from buildings and roads limit available planting spaces. Most buildings are constructed up to the sidewalk and directly adjacent to each other with no front setbacks or sideyards. The pattern of rear yard open space throughout residential areas provides increased potential for trees, gardens and informal habitat corridors. Removal of excess concrete and the greening of structures with living roofs and walls should be explored to expand the forest into the built environment.



STREETS & TRANSPORTATION

Many of the city's trees can be found planted along the grid of streets and sidewalks throughout San Francisco. Trees planted here create green corridors throughout the city, help calm traffic and buffer pedestrians from traffic. Regular maintenance is important to keep clearances over streets and sidewalks for vehicles and people and to ensure quick removal of hazard or storm felled trees.



HUMAN POPULATION & CULTURE

People are an essential component of the urban forest. Almost all of the trees in the city today are a result of plantings and maintenance carried out by individuals or groups. Trees and landscaping also interact with the city's rich cultural environment by helping support diverse ethnic and cultural identities such as Japan-town's annual Cherry Blossom Festival.



URBAN WILDLIFE

San Francisco is home to diverse ecological communities of native habitats, plants and animals - some of which can be found nowhere else on earth. While some of the richest habitats can be found in parks and natural areas, the plantings along the city's streets provide potential to create habitat and support wildlife.

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Habitat & Biodiversity

San Francisco is home to diverse ecological communities of native habitats, plants and animals - some of which can be found nowhere else on earth. These include ten federally-listed endangered species, dozens of globally rare plants, and hundreds of species of resident and migratory birds that stop here along the Pacific Flyway. The city is situated at a biogeographic crossroads with many species at the southern limit of their ranges, while others are at the northern limit. The Plan strives to increase the carrying capacity of the city's urban forest to support wildlife. Strategies include diversifying plantings on streets with wildlife-serving native as well as non-native trees, shrubs, grasses and perennials.

THE PACIFIC FLYWAY

The Pacific Flyway is a major north-south route of travel for migratory birds throughout North and South America, extending from Alaska to Patagonia. Every year, migratory birds travel some or all of this distance both in spring and in fall, to follow food sources, find breeding grounds, or reach overwintering sites. The San Francisco Bay consists of many protected estuaries and mountain open space preserves which provides suitable winter quarters for birds as they fly south. San Francisco's trees, parks and water bodies provide important habitat for these migratory birds.



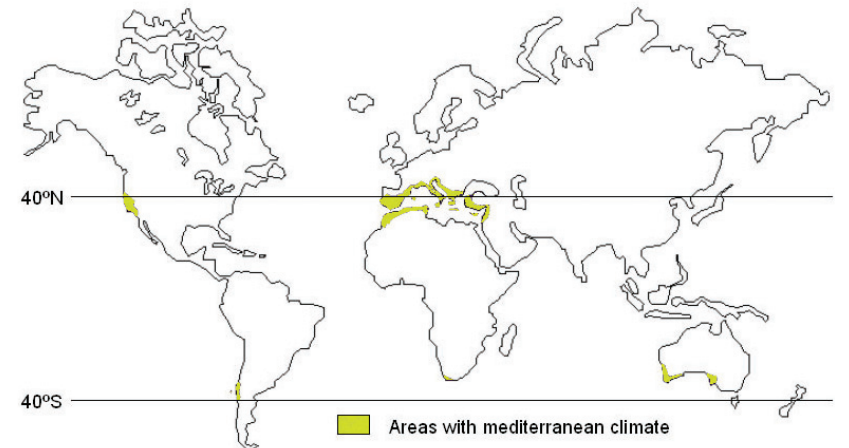
BIODIVERSITY HOTSPOT

San Francisco is located in one of one of 34 worldwide biodiversity hotspots. Combined, these hotspots contain about half of the plant and animal species on earth yet cover only 2.3% of the earth's surface. Hotspots are defined by their exceptional number of animal and plant species including high number of endemic (found nowhere else) species.



MEDITERRANEAN CLIMATE

San Francisco's proximity to the ocean and moderate climate spare the city from extremes of hot and cold. Typical of the California coast, our Mediterranean climate is characterized by dry summers and wet winters. Similar climatic conditions are found in parts of Australia, South America, Africa, and the Mediterranean, making species of animals, plants and trees from around the globe able to thrive here.



Wild Parrot



Green Hairstreak Butterfly



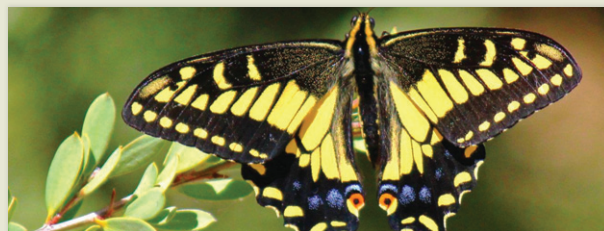
Mission Blue Butterfly



Yellow-faced Bumble Bee
Bombus vosnesenskii



Clarkia Rubicunda



Western Tiger Swallowtail Butterfly



Coyote



Great Horned Owl

Credit: Greg Cope



Anna's Hummingbird

Credit: Alan Vernon



Black-Tailed Jackrabbit

Credit: Wikimedia Commons



American Dune Grass

Credit: Wikimedia Commons



Coast Buckwheat

Credit: ianoutthorpe.com