



CITY OF MORRO BAY PUBLIC WORKS ADVISORY BOARD A G E N D A

The City of Morro Bay is dedicated to the preservation and enhancement of the quality of life. The City shall be committed to this purpose and will provide a level of municipal service and safety consistent with and responsive to the needs of the public.

**Thursday, April 18, 2013
Veteran's Memorial Building - 6:00 P.M.
209 Surf Street, Morro Bay, CA**

Matt Makowetski, Chair

Ron Burkhart
Janith Goldman
Marlys McPherson

Deborah Owen
Richard Rutherford
Stephen Shively

ESTABLISH QUORUM AND CALL TO ORDER
MOMENT OF SILENCE / PLEDGE OF ALLEGIANCE
ANNOUNCEMENTS / PRESENTATIONS

PUBLIC COMMENT PERIOD

Members of the audience wishing to address the Board on City business matters other than scheduled items may do so at this time. To increase the effectiveness of the Public Comment Period, the following rules shall be followed:

- When recognized by the Chair, please come forward to the podium and state your name and address for the record. Board meetings are audio and video recorded and this information is voluntary and desired for the preparation of minutes.
- Comments are to be limited to three minutes.
- All remarks shall be addressed to the Board, as a whole, and not to any individual member thereof.
- The Board respectfully requests that you refrain from making slanderous, profane or personal remarks against any elected official, commission and/or staff.
- Please refrain from public displays or outbursts such as unsolicited applause, comments or cheering.
- Any disruptive activities that substantially interfere with the ability of the Board to carry out its meeting will not be permitted and offenders will be requested to leave the meeting.
- Your participation in Board meetings is welcome and your courtesy will be appreciated.

In compliance with the Americans with Disabilities Act, if you need special assistance to participate in this meeting, please contact the Public Services' Administrative Technician at (805) 772-6291. Notification 24 hours prior to the meeting will enable the City to make reasonable arrangements to ensure accessibility to this meeting.

A. CONSENT CALENDAR

A-1 Approval of Minutes of February 21, 2013
Recommendation: Approve minutes.

A-2 Director's Report/Information Items
Recommendation: Receive and file.

B. OLD BUSINESS – None

C. NEW BUSINESS

C-1 Review Urban Forest Management Plan

Recommendation: Review plan and provide comments as necessary.

D. FUTURE AGENDA ITEMS

E. ADJOURNMENT

Adjourn to the next regularly scheduled Public Works Advisory Board meeting at the Veteran's Memorial Building, 209 Surf Street, on **Thursday, June 20, 2013** at 6:00 p.m.

This agenda is subject to amendment up to 72 hours prior to the date and time set for the meeting. Please refer to the agenda posted at the Public Services Department, 955 Shasta Avenue, for any revisions or call the department at 772-6291 for further information.

Materials related to an item on this Agenda are available for public inspection during normal business hours in the Public Services Department, at Mill's/ASAP, 495 Morro Bay Boulevard, or the Morro Bay Library, 695 Harbor, Morro Bay, CA 93442, or online at www.morro-bay.ca.us/pwab . Materials related to an item on this Agenda submitted to the Board after publication of the Agenda packet are available for inspection at the Public Services Department during normal business hours or at the scheduled meeting.

AGENDA ITEM: A-1

DATE: April 18, 2013

ACTION:

SYNOPSIS MINUTES - MORRO BAY PUBLIC WORKS ADVISORY BOARD
REGULAR MEETING – February 21, 2013
VETERAN’S HALL – 6:00 P.M.

Chairperson Makowetski called the meeting to order at 6:00 p.m.

PRESENT:	Matt Makowetski	Chairperson
	Ron Burkhart	Vice-Chairperson
	Marlys McPherson	Board Member
	Richard Rutherford	Board Member
	Stephen Shively	Board Member
STAFF:	Rob Livick	Public Services Director
	Rick Sauerwein	Capital Projects Manager

ESTABLISH QUORUM AND CALL TO ORDER
MOMENT OF SILENCE / PLEDGE OF ALLEGIANCE

ANNOUNCEMENTS/PRESENTATIONS – None

CONSENT CALENDAR

A-1 Approval of Minutes from January 14, 2013 - Recommendation: Approve minutes.

MOTION: Boardmember Burkhart moved to approve the January 14, 2013 minutes. The motion was seconded by Boardmember Rutherford and carried unanimously. (5-0).

A-2 Director’s Report/Information Items – Recommendation: Receive and file.

Boardmember Burkhart stated he would like the City to add a link on the City’s website specifically for street maintenance repair, as the current Let Us Know online format is unclear and difficult for the public to navigate.

Boardmember Rutherford asked about the status of the wastewater treatment plant upgrade project, specifically if the City has selected a new site for the facility. Livick stated the City is awaiting direction from the City Council and the Cayucos Sanitary District (CSD) Board of Directors. The City Council would like to make a decision soon and will be discussing the project at the next Joint Powers Agreement meeting which will be held on March 14, 2013. Livick noted the City Council members will be discussing letters to state and federal legislators at the upcoming City Council meeting so that when the City requests supplemental funding, the legislators will be aware of the project.

Boardmember Shively asked staff if the proposed site off of Highway 41 was examined in the original Environmental Impact Report. Livick stated it was not. He outlined the steps necessary to move forward with the upgrade project:

1. Investigate potential sites in the Morro Bay/Cayucos vicinity. There are currently 17 potential sites for the wastewater treatment plant;
2. Set goals and discuss the criteria for selecting a site, and given that criteria, select 2-3 sites for further investigation;
3. Select a preferred alternative site and go through facilities planning and environmental review for that site; and
4. Develop a preliminary design and determine a method for construction.

Boardmember Shively asked staff about the feasibility of completing the project in five years if a new site is chosen. Livick stated it is a City Council goal to complete the project as quickly as possible, and five years is the initial direction given to complete the project. Livick noted, however, the Regional Board historically does not fine if good progress is being made toward the project's end. Shively and Livick discussed the boundaries of the coastal zone and how it would apply to the Highway 41 site.

Boardmember McPherson asked staff if the site analysis conducted by the City is complete. Livick stated the new filters established by the City Council and the CSD will reveal new potential sites for the facility. Livick stated the City will need a consultant before entering into the analysis phase, and at this point the City does not have that direction.

Chairperson Makowetski and Livick discussed the possibility of establishing a subcommittee which would allow the public to discuss their ideas and concerns about the project. To streamline the process, Livick instead suggested the public attend the Public Works Advisory Board (PWAB) meetings to discuss such issues.

Chairperson Makowetski asked for clarification regarding the cause of the increased water production in December. Livick stated it was due to the state water shutdown. Livick discussed the status of the desalination plant upgrade. He stated the next step is to submit an application to the Coastal Commission addressing the facility's effects on marine life, its energy efficiency, and a complete look at the water portfolio showing how the City is meeting Local Coastal Plan goals with regard to water supply.

Boardmember Shively asked for clarification regarding whether it costs more to produce water from the desalination plant than from the state water supply. Livick confirmed the City currently maximizes its use of state water because it is less energy intensive and costs less than producing our own. Livick explained the City's water sources vary depending on the City's demand.

Boardmember McPherson asked staff how water rates will be affected later this year. Livick stated they will increase because the City is not meeting its required debt ratio. The City will conduct a rate analysis and carry out a Proposition 218 vote to impose new rates.

Chairperson Makowetski asked how funds have been spent from the last Proposition 218 vote. Livick stated some money has been banked and some has been used for collection system projects. Makowetski asked if there are other projects in the pipeline that would utilize these funds. Livick stated there are always yearly maintenance projects that need to be completed. Livick stated he will discuss the budget for these projects at the next meeting.

Chairperson Makowetski asked for clarification about the need to acquire permits for the Chorro Valley wells. Livick stated the City needs permits to install stream gauges. Additionally, based upon City Council direction, the City is working with property owners outside city limits and converting them to private wells so they are no longer connected to the City's water system.

Boardmember Shively and Livick discussed flow rate requirements for Chorro Creek.

Regarding the trolley season summary, Livick stated he was available to answer questions about the staff report.

OLD BUSINESS

B-1 Review of Streets Summit Recommendations and Memo to City Council – Recommendation: Review and approve memo to City Council.

Chairperson Makowetski opened public comment period.

Jim Polly, resident of Morro Bay, spoke against the proposal for an assessment district in north Morro Bay to pay for street repair and maintenance. He stated these matters should be paid for by the whole city.

Boardmember Shively clarified his proposal for an assessment district. When discussing potential new revenue sources at the last PWAB meeting, Shively noted it might be difficult to pass a citywide tax, as it requires a two-thirds majority, so he suggested an assessment district as an alternative means of revenue generation.

Polly suggested using existing funds generated from the gas tax, general property tax, or general fund to repair City streets instead of raising taxes to do so.

Boardmember Shively asked for clarification regarding the intent of the agenda item. Livick stated the intent discussed at the last PWAB meeting was to more equitably spread the funding between north and south Morro Bay.

Livick stated the City is currently inspecting the streets in north Morro Bay. The triple layer cape seal technique used in that area was a success, so the City will be modifying the Pavement Management Plan (PMP) and presenting it to the City Council after the inspection is complete.

Boardmember Shively discussed the feasibility of collecting developer fees to help upgrade the adjacent street. Livick confirmed Shively's recommendation for the record. Shively would like to collect fees from residential development and let the developers choose to either provide street improvements or pay an in lieu fee that would be used in same manner.

Boardmember McPherson asked staff about the feasibility of reallocating funds to the streets account. Livick stated there are no surplus funds available to do so at this time.

Boardmember Burkhart discussed the ineffectiveness of collecting developer fees from small-scale residential development as it would take a long time to establish a fund.

Boardmember Burkhart asked staff to clarify in the memo his previous comment regarding setting aside a fixed amount of money for street repair, as opposed to street maintenance.

Chairperson Makowetski and Livick discussed the goals outlined in the PMP and Makowetski suggested amending the goals to better reflect new funding programs in the future. Makowetski and Livick discussed the possibility of establishing a streets accumulation fund dedicated for matching of grant money and other outside funding sources. This verbiage is to be added to the memo.

Boardmember Burkhart stated he would like a line item added to the memo specifically for street repairs.

Livick discussed the City's funding sources and how they pertain to streets in north Morro Bay. He stated additional funds are necessary to meet the need in north Morro Bay.

Boardmembers and staff discussed how developer fees would be mandated if chosen as the preferable option to raise revenue for street repair in Morro Bay. Boardmember Shively noted the establishment of an assessment district would not be an ideal solution but it is realistic.

Boardmember McPherson asked staff if there is a minimum standard over which the City would be required to repair a street. Livick stated there is no minimum. He stated the City maintains a list of pavement conditions of all streets based on a physical inspection. McPherson and Livick discussed the necessity to keep streets in a safe condition, as the streets are not only for the vehicle but also for the pedestrian.

Chairperson Makowetski asked that verbiage be added to the memo regarding matching funds as they accumulate so that when grants become available, the City will be able to apply for them. Livick clarified how Makowetski's and the other Boardmembers' comments would be incorporated into the revised memo. Boardmember Burkhart clarified he would like a line item added regarding capital improvement projects, and not road maintenance.

Chairperson Makowetski closed public comment period.

MOTION: Boardmember Shively moved staff to make the corrections to the memo and submit it to Chairperson Makowetski who will authorize additional corrections and sign the corrected memo on the Board's behalf. The motion was seconded by Boardmember McPherson and carried unanimously. (5-0).

PUBLIC COMMENT PERIOD – None

NEW BUSINESS – None

FUTURE AGENDA ITEMS

Boardmember McPherson confirmed the wastewater treatment plant upgrade project will be discussed at the next PWAB meeting.

Boardmember Shively asked if the issue of increased water rates will be discussed at the next meeting. Livick stated staff is waiting for direction from the City Council regarding how to proceed on this issue.

Livick stated the Forestry Management Plan is almost complete and will be presented to the Board at the April PWAB meeting after it is reviewed by the volunteer citizens tree committee.

ADJOURNMENT

The meeting adjourned at 7:06 p.m. to the next scheduled meeting to be held at the Veteran's Memorial Hall on Thursday, April 18, 2013, at 6:00 p.m.

PUBLIC WORKS ADVISORY BOARD
City of Morro Bay, Department of Public Services
Director's Report / Information Items
Prepared: 04/15/2013

AGENDA NO.: **A-2**

DATE: **04/18/2013**

Category	Information Item	Staff Contact	Status
Transit	Morro Bay Trolley	Janeen Burlingame	The 2013 Trolley season will begin on Saturday of Memorial Day weekend. Service will operate Fridays through Mondays until Labor Day and then operate weekends only through the first weekend in October.
Wastewater	Joint Powers Agreement (JPA)	Bruce Keogh, Rob Livick	<u>Morro Bay – Cayucos WWTP</u>: Morro Bay staff is working closely with the City Council on the next steps required to move this important project forward. The City Council will be holding a special study session on the subject on April 29, 2013, (time and place to be determined). Staff is working on developing a Major Maintenance and Repair Plan to keep the treatment plant operating safely, efficiently and meeting all the discharge permit requirements for the next five or so years while the new plant site is being selected, permitted, designed and constructed. The City has solicited consultants through a request for proposal process to guide the City through the preliminary phase of site selection, and evaluation of treatment technology. Additionally, staff has initiated the appraisal process for the property that was the number two site on the fine screening analysis (the Righetti Property). Information on the status of the New Water Reclamation Facility (WRF) project can also be found on the City of Morro Bays website (http://ca-morrobay.civicplus.com/index.aspx?nid=352).
Other Capital Projects	Fire Station 53 Admin/Living Quarters Project	Rob Livick	Project is complete. Working on the final paperwork for FEMA and USDA.

Category	Information Item	Staff Contact	Status
Water	Resource Management, Operations	Rob Livick, Jamie James	- <u>Mandatory Water Conservation Measures</u>: Mandatory Water Conservation Measures are in effect. The community is currently at a Moderately Restricted Water Supply condition in accordance with Chapter 13 of the City of Morro Bay Municipal Code. - <u>State Water Project</u>: Thanks to early season storms, the Department of Water Resources today increased its water delivery estimate for calendar year 2013 from 30 to 40 percent of requested State Water Project water. That means that with the City's drought buffer (insurance), deliveries are adequate to ensure that Morro Bay will receive 100% of its entitlement. - <u>Potable Water Production</u>: Total potable annual water production for 2012 was 1204 acre feet with 4 acre feet of direct consumed groundwater, 70 acre feet of brackish reverse osmosis treated water, and 1130 acre feet of State Water. Total monthly water production for January 2013 was 30.4 million gallons with 28.5 million gallons of state water and 1.9 million gallons of water treated at the Brackish Water Reverse Osmosis plant for an average production of 0.98 mgd. Total monthly water production for February was 25.9 million gallons with 25.1 million gallons of state water, 0.7 million gallons of water treated at the Brackish Water Reverse, 0.1 million gallons from direct well water Osmosis plant for an average production of 0.93 mgd. Total monthly water production for March was 31.3 million gallons with 30.6 million gallons of state water, 0.2 million gallons of water treated at the Brackish Water Reverse, 0.5 million gallons from direct well water Osmosis plant for an average production of 1.01 mgd. <u>Chorro Valley</u>: The City has begun the process of securing construction permits for the installation of the gauges in the Chorro valley in order to resolve the outstanding permit issues. - <u>Morro Valley</u>: The City has retained council to advise the City on how to protect its interest in the Morro Valley groundwater basin and to help ensure that further nitrate contamination does not occur. - <u>Desal Plant Brackish Treatment System</u>: The newly installed BWRO treatment trains are being modified using funds from a California Department of Public Health grant to enable both the brackish and salt water trains to operate simultaneously. These modifications will likely run through 2013. The California Coastal Commission Permit to operate the salt water wells and outfall expired in 1999. The City has applied to for a permit to make those facilities permanent. <u>Water Rates</u>: The City will need to revise its water rate which was originally adopted in 1997 and has not been increased subsequently. Look to the City's website, an upcoming utility news letter, PWAB discussion, and council meetings on this topic later in 2013.

Category	Information Item	Staff Contact	Status
Collection System Capital Projects	Collection System	Jarrod Whelan Rob Livick	- <u>Lift Station 3 (Quintana Road)</u>: The project is complete, accepted and is in operation. - <u>Lift Station 2 (Front Street)</u>: The project is complete, accepted and is in operation.
Storm Water	Storm Water Plan	Rob Livick	New Post Construction control requirements are to be adopted by the City by September 6, 2013. A new phase II small MS4 general permit was adopted on February 5, 2013 by the State Resources Control Board. The City has 6 months to revise our current stormwater management plan to include these new permit requirements. Staff is continuing with water quality sampling near several outfalls in the bay and is testing for pathogens. Pathogens are the constituent for which the Regional Board has the most concern due to public contact and shellfish operations.
Streets/Sidewalks/ Storm Drain Maintenance	Local Street Maintenance Projects	Mike Wilcox, R&P	Street, Sidewalk, Street Tree and Storm drain maintenance has shifted to the Recreation and Parks Maintenance Division as of July 1, 2010. If you have street, street tree or storm drain maintenance issues please call 772-6278 so that it can be added to the list of work. The City will still be patching potholes and the best way to notify the City regarding a pothole that needs attention is to use our E-Notify system (on the City's website www.morro-bay.ca.us, click on City Departments, then on Recreation and Parks to the E-Request Form or http://morro-bay.ca.us/erequest). Upon receipt, those E-Requests will be reviewed, cataloged and entered into our database. Finally, the repairs will be scheduled. In the future, the City will be adding to the website a list or "Street Maintenance Queue" so you will be able to monitor the progress and see when your pothole may be repaired.
	Pavement Management Plan	Livick/Rands	The 2012 Street rehabilitation program is complete and accepted. Contact Barry Rands at 772-6215 for questions regarding this project.
Street Trees	Urban Forest Plan	Hanson	See Current Agenda

Category	Information Item	Staff Contact	Status
Misc			Notify Me: Sign up for Notify Me on the City's Website for notification of Council, Boards and Commissions information. Notify Me can be accessed from a link on the City's Homepage. Let Us Know: The City has added a new feature to the website, Let Us Know, which is replacing the Citizen E-Request link on the City's Homepage. With Let Us Know, citizens can submit a compliment, request, or report a concern to the City for predetermined issues without the need to phone the City during business hours (for example: reporting a pothole). Staff can also add requests to Let Us Know for someone over the phone or in the office if they do not have access to a computer. Each category in Let Us Know is assigned to the appropriate staff member to handle so citizens don't have to figure out what department to contact for an issue they need to report on.

*** Please contact individual staff members prior to the meeting if possible for more detailed information.**



AGENDA NO: C-1

MEETING DATE: April 18, 2013

Staff Report

TO: Public Works Advisory Board DATE: April 10, 2013

FROM: Rob Livick, PE/PLS – Public Services Director/City Engineer
Damaris Hanson – Engineering Technician IV

SUBJECT: Urban Forest Management Plan

RECOMMENDATION

That the Public Works Advisory Board review the Urban Forest Management Plan and provide recommendations to Planning Commission and City Council.

FISCAL IMPACT

No direct fiscal impact at this time other than staff time only in the preparation of the plan.

SUMMARY

The Urban Forest Management Plan (UFMP) will guide the City toward a healthy, sustainable urban forest. As part of the plan, the trees in the commercial districts have been surveyed using a Geographic Positioning System (GPS) unit and incorporated into a Geographic Information System (GIS) mapping program. This enables the City to have a better idea of the health, age, species diversity, and the overall quality of the trees in this area. The UFMP will help to determine specific levels of funding needed for tree maintenance and tree planting over a multi-year period. The plan developed goals which provide objectives and actions in order to achieve these goals. The plan is a living document that will grow with the urban forest and evolve with new goals, objectives and actions as needed.

BACKGROUND

The urban forest contributes to the well-being of the residents, businesses, and visitors of Morro Bay in many ways. Trees provide economic, environmental and social benefits.

Economic benefits:

- Research shows that business on treescaped streets show 20% higher income streams, compared to businesses in strip mall settings.
- Home and business values increase \$15,000-25,000 with street trees verses streets with no trees.

Environmental benefits:

- Trees contribute to improving our air quality, water quality, and providing wildlife habitat.
- Tree leaf and branch structures absorb approximately 30% of precipitation, allowing for evaporation back into the atmosphere.
- Carbon dioxide is absorbed for the photosynthetic process, but other emissions such as

nitrogen oxides, carbon monoxide, and volatile organic compounds are reduced significantly from the proximity to trees.

- Trees provide a canopy for birds to enjoy, a root structure and setting important for insects and bacterial life below the surface.

Social benefits:

- Trees make the urban life more aesthetically pleasing environment by providing a buffer from the buildings and hardscape of urban infrastructure.
- Trees have been credited with improving the health, emotion and wellbeing for people. The advantage of trees goes beyond the physical benefits, by creating a more calming, visually pleasing environment.

DISCUSSION

The Urban Forest Management Plan serves as a guide for perpetuating and enhancing Morro Bay's public trees. For the purposes of this plan, public trees are those located within the City Rights of Way (Street Trees). This plan establishes guiding principles and associated goals that result in specific strategies for addressing the needs of the public trees. These goals were developed from community input, City needs, environmental and urban conditions. They are flexible enough to account for future changes.

This plan is essential in guiding the City toward a healthy sustainable urban forest. Proper tree selection and placement is vital to our Urban Forest future. An Urban Forest Management Plan is an essential tool for protecting this valuable resource. This plan discusses the makeup of our tree population through the tree inventory. It looks at the health of our trees and addresses the questions:

- Is this the right tree in the right place?
- Is there adequate species diversity?
- How can we improve age diversity with our aging population of trees?

The management plan will contribute to public safety by managing the risk related to the public's infrastructure. The plan and tree inventory will provide lists of trees requiring priority removal and pruning that staff can carry out within the limits of budget and time constraints. City Council adoption of this Plan is the next significant step in Morro Bay's efforts to enhance the beautification of Morro Bay.

The UFMP has developed goals that have objectives and actions to follow in order to implement the goals.

Goal 1: Defining Public trees

The City has wide Rights of Way and therefore much of the public treats sections of unpaved Rights of Way as an extension of their property. For the most part the trees planted in the residential Rights of Way were planted by the residents for their personal pleasure/benefit. Due to the vast number of trees planted in these wide Rights of Way in the residential areas, it is a large financial and liability burden to the City. The City spends approximately 15% of the annual tree budget on these trees. The City would like to encourage residents to continue to plant and maintain these trees. In order to enhance and maintain the urban forest to the desired level, the City will need to limit the scope of trees to one that the City can manage. With the cost savings of not maintaining public trees in the residential areas, more money could be spent on replanting and maintaining public trees in the commercial/downtown districts. Currently the City has guidelines for private trees, but in order to protect private trees the City would need to adopt a tree ordinance for private trees.

Goal 2: Enhancing the Urban Forest

The enhancement of the Urban Forest considers the life cycle of the urban forest and recognizes that it is a dynamic, natural system. Establish and maintain an optimal level of age and species diversity and increased levels of trees to maximize ecosystem benefits provided by the urban forest, (maintain air quality, reduce energy use, moderate stormwater runoff, and provide a favorable environment for city residents).

Goal 3: Protecting Wildlife

Morro Bay is a bird sanctuary and therefore protecting the nesting birds is essential. Further define the nesting season and explore Best Management Practices for the nesting birds and tree trimming.

Goal 4: Educate the Public on the Benefits of Trees

Provide the public with a general understanding of the value and benefits that the Urban Forest provides. Educate residents, business owners, and the development community with Best management practices, including planting and care of trees.

Goal 5: Tree Conservation

Conservation of the Urban Forest is important to preserve the forest for future generations. The conservation efforts include maintenance standards for ongoing management of trees. The City's urban forest should be maintained with standards that are consistent with good cultural best management practices.

CONCLUSION

The urban forest is a dynamic natural system that is constantly changing. The UFMP establishes guiding principles and associated goals that result in specific strategies for address the needs of public trees. The residents and visitors of Morro Bay deserve a healthy urban forest that is conserved for future generations. Therefore sound guardianship of this unique and attractive community is necessary if the quality of life is to be maintained.

ATTACHMENT

ATTACHMENT 1: Urban Forest Management Plan

Urban Forest Management Plan

“A Plan for the Public Trees of Morro Bay”



Morro Bay City Tree species is the Monterey Cypress (Cupressus macrocarpa)

When one tugs at a single thing in nature, he finds it attached to the rest of the world.

--John Muir--

Acknowledgements

City Council

Jamie Irons, Mayor
Noah Smukler, Vice Mayor
Nancy Johnson, Councilmember
George Leage, Councilmember
Christine Johnson, Councilmember

City Staff

Rob Livick, Public Services Director
Joe Woods, Recreation and Parks Director
Mike Wilcox, Maintenance Supervisor
Damaris Hanson, Engineering Technician IV
Logan Budd, Forestry/GIS Intern

USDA Forest Service

Through the California Department of Forestry and Fire Protection
Urban and Community Forest Program
California Urban Forest Council and the Inland Urban Forest Council

Volunteer Tree Committee

Ann Reisner, Cory Paul, Gabriel Frank, Jim Mayer, Melinda Elster, Noah Smukler,
Norm Mayer, Robert Schreiber, Sean Ellis, Taylor Newton, Wally McCray

URBAN FOREST MANAGEMENT PLAN - “A PLAN FOR THE PUBLIC TREES OF MORRO BAY”

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Executive Summary

The preservation of the natural environment is essential to the resident and visitors of Morro Bay. The coastal setting and its stunning beauty of this area attracts people to visit and live here. The residents and visitors of Morro Bay deserve a healthy urban forest that is conserved for future generations. Therefore sound guardianship of this unique and attractive community is necessary if the quality of life is to be maintained. Many of such measures will have to be in the area of conservation and the maintenance of the urban forest. The Urban Forest Management Plan (UFMP) is a living document and a long range policy guide that will respond and develop over time.

The UFMP will require close partnership between policy makers, staff and the community. The UFMP will help the Public Services and the Recreation and Parks Departments define the goals for City of Morro Bay public trees. This UFMP is the road map for these departments and the Tree Committee to follow in order to get the desired results for the trees located in the public right of ways. The UFMP establishes guiding principles and associated goals that result in specific strategies for address the needs of public trees.



Vision Statement

A healthy urban forest with a thriving, sustainable mix of tree species which are cared for and valued by both the City and citizens of Morro Bay. As an essential environmental, economical and community asset, the urban forest provides an attractive location for businesses, residents and visitors. The Urban Forest Management Plan seeks to increase age and species diversity in the public tree population, and enhance the character and aesthetics of our City for the people who live and work here.

Mission Statement

The Urban Forest Management Plan seeks to ensure that all benefits of a healthy urban forest are available to Morro Bay's residents and visitors for future generations. The UFMP accomplishes this by increasing age and species diversity in the public tree population, augmenting biomass and canopy coverage, and enhancing the character and aesthetics of our City by achieving exemplary conservation and sustainable practices for the public trees from all who live, work and visit here.



Why we need an UFMP

The Urban Forest Management Plan serves as a guide for perpetuating and enhancing Morro Bay's public trees. Public trees are the trees located within the City Rights of Way. This UFMP establishes guiding principles and associated goals that result in specific strategies for addressing the needs of public trees. These goals were developed from community input, City needs, environmental and urban conditions. They are flexible enough to account for future changes.

The discipline of urban forestry strongly advocates for species and age diversity in the urban forest so that an invasive species cannot devastate the entire urban forest. From the picture below you can see that most trees present in 1931 were the Blue Gum Eucalyptus and were planted primarily as wind breaks.



Image 1: Morro Bay Aerial Photo (1931)

Morro Bay's entire urban forest has more than 1,500 trees. There are 675 trees in the City Rights of Way (public trees). The tree population is aging and these trees will eventually need to be removed and replaced. Of the Monterey Pines that were planted in the 1950's, many have succumbed to the turpentine beetle, and the few that are left have begun to reach the end of their useful life. Removal of these trees is a big "hit" to the community since they are so large and also provide a larger canopy cover compared to the small 15 gallon tree that planted in their place. The Red flowering eucalyptuses, while a beautiful tree, are in small undersized tree wells and the trees drop woody seed capsules on the sidewalk posing a hazard to pedestrians.

This UFMP is essential in guiding the City toward a healthy sustainable urban forest. Proper tree selection and placement is vital to our Urban Forest future. An Urban Forest Management Plan is an essential tool for protecting this valuable resource. This UFMP discusses the makeup of our tree population through the tree inventory. It looks at the health of our trees and addresses the questions:

- Is this the right tree in the right place?
- Is there adequate species diversity?
- How can we improve age diversity with our aging population of trees?

The management plan will increase the public safety by managing the risk related to the public's infrastructure. The UFMP and tree inventory will provide lists of trees requiring priority removal and pruning that staff can carry out within the limits of a budget and

time. Adoption of this UFMP is the next significant step in Morro Bay's efforts to enhance the beautification of Morro Bay.

Historical Context

"Morro Bay was always the stuff of which dreams were made. A spectacular setting, with its magnificent rock, its rolling breakers in the outer bay, its sandspit and quiet inner bay, its picturesque shoreline extending as far as the eye can see". (Gates, Morro Bay Yesterdays)

In 1542, Juan Rodrigues Cabillo, a Portuguese navigator, sailed in the bay he named "Los Esteros" to anchor near the rock he named "El Moro" to supply his ship with wood and fresh water. Cabrillo was credited as the first European to discover the land of upper California, including the area now known as Estero Bay and Morro Bay.

Morro Bay's history has provided a foundation for the manner in which this community has grown over the years. Morro Bay originally developed because it provided access to shipping, an important asset to nearby farmers and ranchers. In the late 19th century, it became apparent to City founders that this bay offered economic potential, so they began to develop the harbor. If it had not been for a slump in the national economy at this time, Morro Bay could have easily become a miniature San Francisco. Instead, Morro Bay grew to be an important fishing port and an attraction to the touring public. (Gates)

Prior to about 1850 the only known trees in the area were the California Bay, Arroyo Willow, Fremont Cottonwood, California

Sycamore, California Box Elder, Monterey Cypress, Tanbark Oak, Coat Live Oak, and Monterey Pine. After about 1875 the first home was built in Morro Bay by Franklin Riley at the intersection of Morro Bay Boulevard and Main Street. The home was made of the native willows. After the first few years, Riley realized the need for trees in the area. He made the first nursery at the intersection of Harbor Street and Morro Avenue where he grew Monterey Cypress and Blue Gum Eucalyptus. These trees were vital in stopping the sand filled wind and created a layer of topsoil as well as fire wood.



ARNOLD SCHNEIDER

First house built in Morro, it had two rooms and consisted of willow pines chinked with adobe clay. Franklin Riley, builder-owner, situated his home in what is now the locality of Main Street and Morro Bay Boulevard. He founded the town.

Image 2: Franklin Riley house, (Gates)

The City was incorporated in July of 1964 and the first tree ordinance was adopted in July of 1966. This ordinance has much of

the same language as the present day tree ordinance. Around the 1950's the Boy Scouts planted Monterey Pines throughout Morro Bay and in the early 1980's Mayor Warren Dorn had the Red Flowering Eucalyptus trees planted as street trees in the downtown area. After about 1985 the first Morro Bay Tree Committee was formed and created the first City master tree list. This list consisted of native drought tolerant and/or California native tree species. Also during this time the first Adopt A-Tree program was started. The tree committee was eventually eliminated and members of this committee were combined with the franchise committee to form the Public Works Advisory Board. In 2009, another Tree Committee was formed, a volunteer committee, which is very active in planting trees around the community. The Volunteer Tree Committee has developed a revised City master tree list, and also suggested trees for residential properties and open space.

Benefits of trees

Economic benefits - The urban forest contributes to the well-being of the residents of Morro Bay in many ways. Trees add value to adjacent homes and business. Research shows that businesses on treescaped streets show 20% higher income streams, which is often the essential competitive edge needed for “main street” store success, versus competition from plaza discount store prices. Realtor based estimates of street tree versus non street tree comparable streets relate a \$15-25,000 increase in home and business value (Burden). This in turn adds to the tax base and operations budgets of a City allowing for added street maintenance.

Environmental benefits - Trees contribute to improving our air quality, water quality, and providing wildlife habitat. Trees leaf and branch structure absorb the first 30% of most precipitation,

allowing evaporation back into the atmosphere. This moisture never hits the ground. Another 30% of precipitation is absorbed back into the ground and taken in and held onto by the root structure, then absorbed and transpired back to the air. Trees provide rain, sun and heat protection shielding wildlife, humans and structures. Tree coverage offers shade from direct sunlight, shelter from the rain and lowering the air temperatures by 5-15 degrees. Air quality is improved by trees and shrubs by absorbing carbon dioxide and other pollutants, removing dust and sand particulates, and releasing oxygen. Carbon dioxide is absorbed for the photosynthetic process, but other emissions such as nitrogen oxides, carbon monoxide, and volatile organic compounds are reduced significantly from the proximity to trees (Burden). The leaves and shrubs filter the air from moving dust and sand particles. Urban street trees provide a canopy, for birds to enjoy, a root structure and setting important for insect and bacterial life below the surface; at grade for pets and people to enjoy, all of which connects the urban human to the natural environment.

Social benefits – Trees seem to make life more pleasant in a couple of ways. They convert the streets, parking, and buildings into a more aesthetically pleasing environment. The paved roads, parking lots and structures that create cities are a grey visual and harsh environment without the trees and shrubs to soften and relieve the eye sore. Trees also improve health, emotion, and wellbeing for all ages. Studies have shown that trees can reduce stress, and that views of trees can speed the recovery of surgical patients (Burden). The advantage of trees expands past their physical benefits, by creating a more calming, visually pleasing environment for all to gain from.

Relationship to other City documents

General Plan- The UFMP is supported by elements of the City of Morro Bay's General Plan; Land Use Open Space, and Conservation Element. The City's General Plan, adopted in 1988, is a vintage document and the City will be updating this document in the coming years and incorporating new policies which also support the need for a strong urban forest program.

One of the "issues" identified in the Land Use, Conservation and Open Space element is: the maintenance of the natural image portrayed by the City and its surroundings must be guaranteed if one of the primary reasons people live in Morro Bay is to remain intact. The UFMP strives to do just this, by managing the trees and preserving the natural beauty in Morro Bay.

Morro Bay has taken steps to preserve the natural environment which could have easily been lost. As such, the City has attracted a population who has come not because it is close to where they work, but because of its qualities. Many of these qualities are environmental, but an equal amount has been created by such things as the atmosphere of the fishing port and its isolation from the faster paces of life. It is because the people of Morro Bay have more than a casual desire to live here that the need to take every measure possible to maintain this sense of identity is accentuated. Many of such measures will have to be in the area of conservation and the maintenance of the environment. It is also important to realize that the current residents were attracted, so too will the future residents be attracted. Therefore, sound guardianship of this unique and attractive community is necessary if the quality of life is

to be maintained. (Land use, conservation open space element)

Municipal Code- The City of Morro Bay's Municipal Code addresses street trees regulations (MBMC 12.08). The regulations include provisions on tree removal by City for cause, tree care, planting and replanting. The City also has a bird nesting season from February 1st through June 30th. No trees within the public right of way can be removed or trimmed during this time except in the case of an emergency as determined by the Director of Public Services. The municipal code also has a section on frontage improvements which require property owners and/or applicants for significant development permits to install frontage improvements. These frontage improvements require a street tree to be planted and the tree to be one from the City's approved street tree list. The City recently adopted a Landmark tree ordinance which provides the guidelines for residents to nominate a tree within the public right of way as a landmark tree. Currently there are several nominees but these trees have not yet been approved by City Council.

Tree City USA- The City has been recognized for over twenty years, since 1989, by Tree City USA. In order to meet the Tree City USA recognition the City must have a tree board or department, a tree care ordinance, a community forestry program with at least an annual budget of \$2 per capita and an Arbor Day observance and proclamation.



Environmental Setting

Morro Bay and its surrounding regions combine to form an environmental sensitive and delicate mixture of land, air, water and life. From Morro Rock, the sand spit, Black Hill, Morro, Chorro and Toro creeks down to the estuary itself, all make up the geologic region of Morro Bay. Morro Bay is part of the Franciscan Formation. It is made up of complex igneous, metamorphic and sedimentary rock layers formed in the Cretaceous period, 75 to 195 million years ago. The Morro's, or Seven Sister, including Morro Rock are volcanic plugs formed in the Pleistocene Period and are made up of serpentine and/or porphyritic dacite.

Soils

There are seven major soils groups that underline the City. These soils are Baywood Fines, Concepcion, Cropely, Diablo, Dune, Los Osos and Marimel. The most fertile areas in the Morro Bay area can be found in the valleys where most of the agriculture occurs. Streams have eroded soils upstream and have transported and deposited then along the valleys. There are two types of alluviums in Morro Bay. The older alluvium, characterized by coarse textured soils, is generally found in the Los Osos Creek Valley and coastal Plains of Morro Bay consisting of old stabilized dunes. These soils are subject to excessive drainage, rapid permeability, and wind and water erosion. The soils are generally not fertile and are used mainly for urban uses. The newer alluvium can be found in the Toro, Morro, and Chorro Valleys. These soils are characterized by level, but poorly drained clays.

The foothills of Morro Bay have been generally categorized as shallow uplands. Within this category, two soils groups can be identified. One consists of upland soils formed from firm shales, sandstones or mudslides and is highly prone to erosion. The second group is a clayey upland soil formed on shale or igneous bedrock. Situated on gently rolling terrain, erosion is moderate and the soil permeability is low.



Image 3: North Morro Bay's Soils

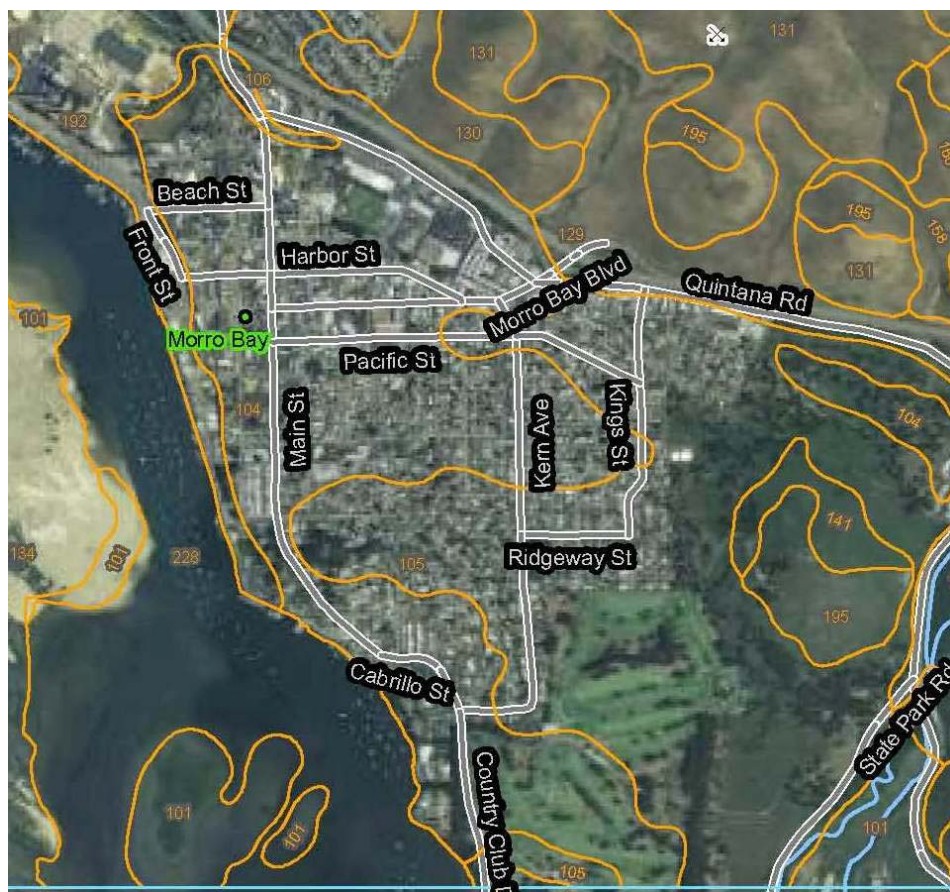


Image 4: South Morro Bay's Soils

104-106, Baywood fine sands series consist of deep, somewhat excessively drained soils in old sand dunes near the coast.

120, Conception series consists of a shallow loam layer with an abrupt textural change to a thick claypan limiting the transmittal of water.

128, Cropley series consists of moderately deep clay soils over silty clay loam soils, moderately well drained soils formed from alluvium.

128-132, Diablo series consists of moderately deep clay soils, poorly drained with weathered bedrock at around 58 inches.

134, Dune series consists of sand; these areas are the dune and beach areas.

158-161, Los Osos series consists of shallow loam soil over clay to sandy loam soils, moderately drained with weathered bedrock at about 39 inches.

*Soils information was acquired from the USDA Natural Resources Conservation Service (NRCS), see Appendix 2 for full soils description.

Climate

Morro Bay experiences a mild Mediterranean climate. Plants here seldom suffer a frost of any consequence. Morro Bay's climate is cool, wet winters, and cool summers with frequent fog or wind. The fog tends to come in high and fast, interposing a cooling and humidifying blanket between the sun and the earth, reducing the intensity of the light and sunshine.

Figure 1: Average Rainfalls in Morro Bay

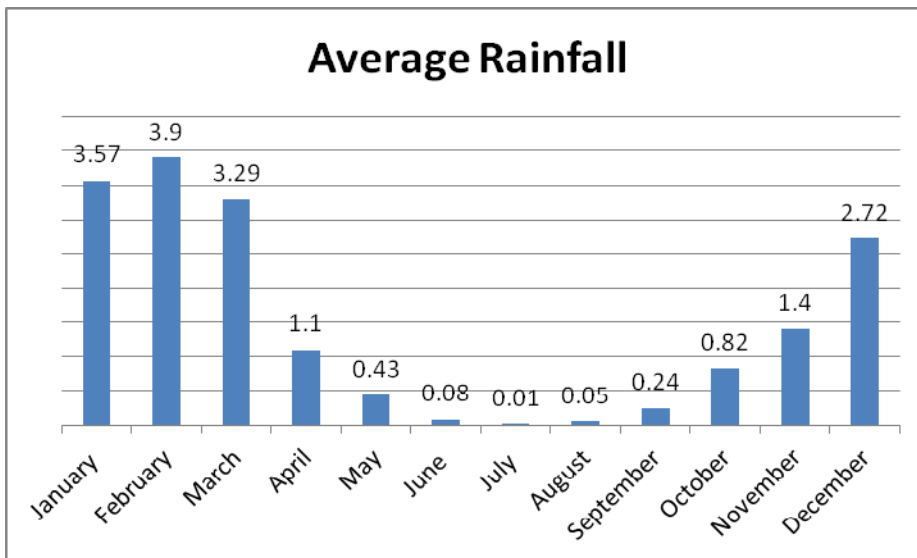
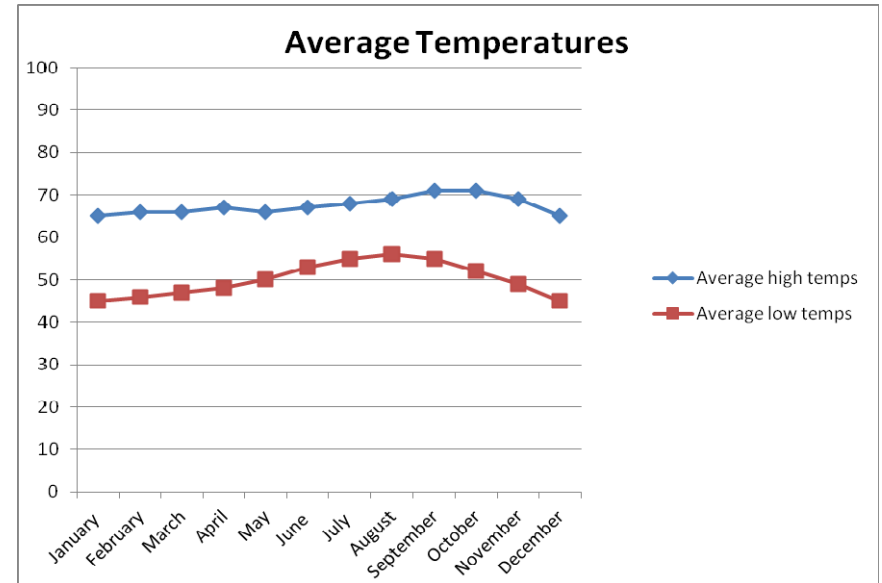


Figure 2: Average Temperatures in Morro Bay



The average temperature year round is 65 °F, typically with warmer winters and cooler foggy summers. Morro Bay does have several microclimates (see map below) which can affect the tree selection in various areas of town. For example several zones experience high winds with salt spray which can affect certain trees negatively. Therefore the tree selection in these areas should take into consideration the microclimates present here in Morro Bay.

The City has seven microclimate zones identified by the “A Yards and Neighbors Brochure for California’s Central Coastal Morro Bay Area”. These microclimates areas have distinct weather conditions. In this brochure different trees are identified as to which microclimate it best suits. This logic and information can be used to help specify specific tree lists for different areas of town according to their microclimate, soils and surrounding environment.

Image 5 shows the different microclimates for Morro Bay. Zones 1 and 2 are located on the beach and directly adjacent to the beach where there is little protection from the wind and salt spray. These two zones have the most extreme conditions for trees, and only a select variety can survive with good health and vigor. Zones 3, 4 and 5 are located in the residential and downtown areas in Morro Bay. They receive some wind and salt spray blockage from the frontage buildings and trees, which increases the number of tree species that can tolerate the conditions. Zones 6 and 7 stretch out to the city limits. Highway 41 is considered zone 6, and Little Morro Creek Road is zone 7. These zones have a higher frost potential and receive strong winds. These zones have a large list of tree species that can tolerate the conditions.

The following two tables were generated to show which tree species could tolerate the different microclimate zones for both street tree locations and open space locations. Street trees need to primarily be a single stem tree, with a canopy high enough to walk and drive under, in addition to a tree with deeper roots and doesn’t drop a lot of litter. Open space locations can include tree characteristics that are not favorable for street tree locations. All the tree species identified in the inventory along with potential trees were separated into the different zones. They were separated by current trees performances within the zones, along with tolerance ratings and suitable location information collected on each individual species.

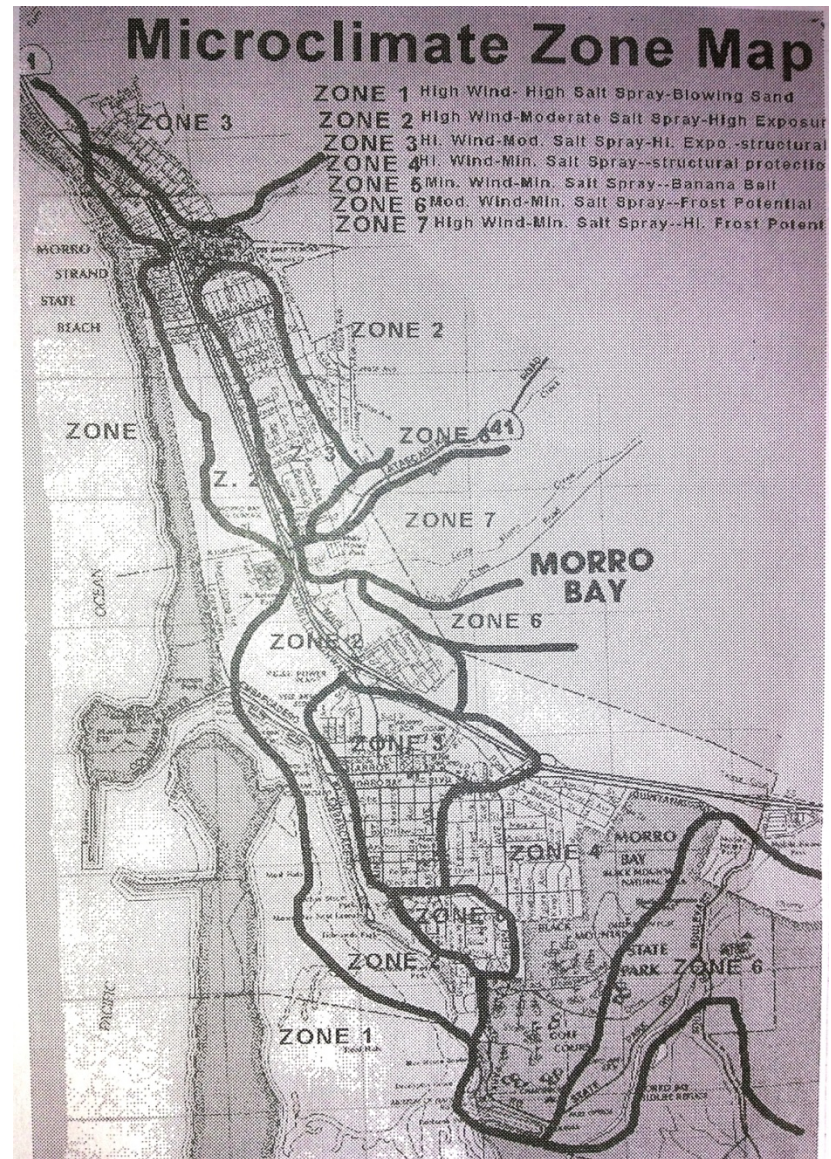


Image 5: Morro Bay Microclimate Zone Map

Table 1: Street Tree List

Zones 1-2		Zones 3-5		Zones 6-7	
Scientific name	Common name	Scientific name	Common name	Scientific name	Common name
<i>Agonis flexuosa</i>	Peppermint willow	<i>Agonis flexuosa</i>	Peppermint willow	<i>Agonis flexuosa</i>	Peppermint willow
<i>Cupressus macrocarpa</i>	Monterey cypress	<i>Arbutus marina</i>	Strawberry madrone	<i>Arbutus marina</i>	Strawberry madrone
<i>Leptospermum laevigatum</i>	Australian tea tree	<i>Callistemon citrinus</i>	Lemon Bottlebrush	<i>Callistemon citrinus</i>	Lemon Bottlebrush
<i>Mitrosideros excelsus</i>	New Zealeand Xmas tree	<i>Callistemon viminalis</i>	weeping bottlebrush	<i>Callistemon viminalis</i>	weeping bottlebrush
		<i>Ceanothus 'Ray Hartman'</i>	California Lilac	<i>Ceanothus 'Ray Hartman'</i>	California Lilac
		<i>Cupaniopsis anacardioides</i>	carrot wood	<i>Cupaniopsis anacardioides</i>	carrot wood
		<i>Cupressus macrocarpa</i>	Monterey cypress	<i>Cupressus macrocarpa</i>	Monterey cypress
		<i>Eucalyptus citriodora</i>	lemon scented gum	<i>Eucalyptus citriodora</i>	lemon scented gum
		<i>Eucalyptus gunnii</i>	cider gum	<i>Eucalyptus gunnii</i>	cider gum
		<i>Eucalyptus nicholii</i>	willow leafed peppermint	<i>Eucalyptus nicholii</i>	willow leafed peppermint
Current tree list		<i>Eucalyptus tricarpa</i>	red ironbark	<i>Eucalyptus tricarpa</i>	red ironbark
Inventoried trees		<i>Geijera parviflora</i>	Australian willow	<i>Geijera parviflora</i>	Australian willow
		<i>Ginko biloba</i>	maiden hair tree	<i>Ginko biloba</i>	maiden hair tree
		<i>Lagunaria patersonii</i>	Primrose tree	<i>Lagunaria patersonii</i>	Primrose tree
		<i>Leptospermum laevigatum</i>	Australian tea tree	<i>Leptospermum laevigatum</i>	Australian tea tree
		<i>Lyonothamnus floribundus</i>	Catalina ironwood	<i>Lyonothamnus floribundus</i>	Catalina ironwood
		<i>Melaleuca nesophila</i>	Pink Melaleuca	<i>Melaleuca nesophila</i>	Pink Melaleuca
		<i>Melaleuca quinquenervia</i>	Paper bark tea tree/Cajeput tree	<i>Melaleuca quinquenervia</i>	Paper bark tea tree/Cajeput tree
		<i>Mitrosideros excelsus</i>	New Zealeand Xmas tree	<i>Mitrosideros excelsus</i>	New Zealeand Xmas tree
		<i>Pinus canariensis</i>	Canary Island pine	<i>Persea americana</i>	Avocado
		<i>Pinus pinea</i>	Italian stone pine	<i>Phoenix canariensis</i>	Canary Island Date palm
		<i>Pittosporum undulatum</i>	victorian box	<i>Pinus canariensis</i>	Canary Island pine
		<i>Prunus cerasifera</i>	purple leafed plum	<i>Pinus pinea</i>	Italian stone pine
		<i>Pyrus calleryana</i>	ornamental pear	<i>Pinus radiata</i>	Monterey pine
		<i>Quercus agrifolia</i>	Coast live oak	<i>Pittosporum undulatum</i>	victorian box
		<i>Quercus tomentella</i>	Channel island oak	<i>Prunus cerasifera</i>	purple leafed plum
		<i>Quercus virginiana</i>	southern live oak	<i>Pyrus calleryana</i>	ornamental pear
		<i>Rhus integrifolia</i>	Lemonade sumac/Lemonade berry	<i>Quercus agrifolia</i>	Coast live oak
		<i>Rhus lancae</i>	African sumac	<i>Quercus tomentella</i>	Channel island oak
		<i>Tristania laurina</i>	Tristania	<i>Quercus virginiana</i>	southern live oak
		<i>Tristiana conferta</i>	Brush box	<i>Rhus integrifolia</i>	Lemonade sumac/Lemonade berry
		<i>Ulmus parvifolia</i>	Chinese elm	<i>Rhus lancae</i>	African sumac
				<i>Syagrus romanzoffianum</i>	Queen palm
				<i>Tristania laurina</i>	Tristania
				<i>Tristiana conferta</i>	Brush box
				<i>Ulmus parvifolia</i>	Chinese elm

Table 2: Open Space Tree List

Zones 1-2		Zones 3-5		Zones 6-7	
Scientific name	Common name	Scientific name	Common name	Scientific name	Common name
<i>Cupressus macrocarpa</i>	Monterey cypress	<i>cupressocyparis leylandii</i>	leyland cypress	<i>cupressocyparis leylandii</i>	leyland cypress
<i>Eucalyptus globulus</i>	Blue Gum	<i>Cupressus macrocarpa</i>	Monterey cypress	<i>Eucalyptus erythrocorys</i>	red cap gum
<i>Juniperus chinensis</i> 'Torulosa'	Hollywood juniper	<i>Eucalyptus cornuta</i>	Yate tree	<i>Eucalyptus ficifolia</i>	Red flowering eucalyptus
<i>Pinus pinea</i>	Italian stone pine	<i>Eucalyptus erythrocorys</i>	red cap gum	<i>Eucalyptus globulus</i>	blue gum
<i>Phoenix canariensis</i>	Canary Island Date palm	<i>Eucalyptus globulus</i>	blue gum	<i>Eucalyptus lehmannii</i>	Bushy yate
<i>Syagrus romanzoffianum</i>	Queen palm	<i>Eucalyptus gunnii</i>	cider gum	<i>Eucalyptus rudis</i>	desert gum
<i>Yucca aloifolia</i>	Spanish bayonet	<i>Eucalyptus rudis</i>	desert gum	<i>Heteromeles arbutifolia</i>	Toyon/Holly
		<i>Heteromeles arbutifolia</i>	Toyon/Holly	<i>Juniperus chinensis</i> 'Torulosa'	Hollywood juniper
		<i>Juniperus chinensis</i> 'Torulosa'	Hollywood juniper	<i>Yucca aloifolia</i>	Spanish bayonet
		<i>Persea americana</i>	Avocado		
		<i>Phoenix canariensis</i>	Canary Island Date palm		
		<i>Pinus pinea</i>	Italian stone pine		
		<i>Pinus radiata</i>	Monterey pine		
Current tree list		<i>Prunus lyonii</i>	Catalina cherry		
Inventoried trees		<i>Quercus agrifolia</i>	Coast live oak		
		<i>Quercus tomentella</i>	Channel island oak		
		<i>quercus virginiana</i>	southern live oak		
		<i>Rhus lancea</i>	African sumac		
		<i>Syagrus romanzoffianum</i>	Queen palm		
		<i>Yucca aloifolia</i>	Spanish bayonet		

Inventory

In the early planning of the Urban Forest Management Plan, it was decided that a complete inventory of all city owned trees in the commercial zones was needed. Data from prior sample inventories and tree maintenance records were useful, but in order to get a more accurate and updated impression of the urban forest, a complete inventory was completed with specific criteria surveyed for the data analysis process. The objective of the inventory was to collect information describing the characteristics and condition of the trees that later could be imported and analyzed in ArcMap and i-Tree Streets to create graphs, maps, and tables for forest management decisions. Environmental Systems Research Institute (Esri) is a supplier of GIS software applications. ArcMap is component of Esri's geospatial processing programs, which allows users to view, edit, create, and analyze geospatial data. ArcMap allows users to symbolize features and create maps. I-Tree is software developed by the USDA Forest Service that provides urban forestry analysis and benefits assessment.

Data Collection

The inventory was completed with a Topcon data collector, which has Global Positioning System (GPS) for identifying the location of the trees and ArcPad software for data collection. ArcPad is a mobile field mapping and data collections software developed by ESRI. The zones where trees were surveyed consisted of commercial areas including C-1, C-2, C-VS, G-O, MCR, and R-4. The inventory consisted of 672 trees in the public right of way, and at

each tree, information on 25 different fields was gathered. The 25 fields included: Tree ID number, Street name, building address, Species common name, Species scientific name, Diameter at breast height (DBH), Height, Live crown ratio, Canopy spread, number of trunks, Hazard rating, Health, Age class, Site type, Crown class, Open tree well, Use under tree, Occupancy, Defect, Defect present, Pruning required, Conflicts, Photo, Date collected, and Comments.

The tree ID number is a very important field, because it gives each tree a unique identification. Each tree received a tag with a number punched into it starting at 1001. The tags were either, nailed into the base of the trunk of the tree, nailed into the post holding up a young tree, or hammered into the curb directly in front of the tree. Unique tree identification numbers and tags allows for easy explanation of which tree is being discussed or need maintenance.



Image 6: Tree Identification Tag

Street name and building address are two fields that identify what street the tree is on and what building it is in front of. These fields allow for locating the tree and explaining what side of a building it is on.

Species common/scientific name are two fields that are very useful and important for making forest management decisions. Identifying each tree species permits combing data to find the overall health of a species, what species grows best in specific locations, or even what species is causing the most sidewalk pavement damage.

The tree height and tree diameter fields were collected using tools. The diameter field was completed with a D-tape, and measured at DBH which is 4.5 feet above the base of the tree on the uphill side. Direct readings were used and measured in inches. Tree height was measure at each tree using a clinometer. Surveying tree heights allows for finding growth rates of trees, proximity to power lines, and other important issues.

Live crown ratio, canopy spread, and number of trunks were fields that were collected at each tree through pacing and observing. Live crown ratio is found by observing the lowest alive branch on the tree and comparing that height to the height of the entire tree. Canopy spread was found by pacing from the trunk of the tree to the furthest out reaching branch multiple. Finding the canopy spread allows for finding the amount of storm water retention, and amount of shade produced. The number of trunks was recorded based on the number of trunks each tree had that split below DBH.

The hazard rating and health fields were identified by observing the tree from all sides and from different distances. The hazard rating field gives each tree a risk rating ranging from low to extreme risk. The risk rating is a number from 3-12 and each number has an interpretation and implication. The health field is also indentified by observing the tree. Depending on the foliage, tree height, bark and more factors each tree is given a health rating of one of the following: excellent, average, fair, or poor.

Age class, site type, crown class, open tree well, use under tree, and occupancy are all fields that are quick to identify. The age class field is used in replace of an increment borer. Each tree was examined and grouped in one of the following age classes: Over-mature,

mature, semi-mature, and young. The site type field explains what each tree is planted in. The majority of the trees surveyed in this inventory were planted in sidewalk tree wells, but the other options to choose from were open areas (lawn), raised bed, or a container. The crown class field identifies the height of each individual tree compared to the trees/buildings surrounding it. This field determines the amount of sunlight each tree receives. The options to choose from in the field were; dominate, co-dominate, intermediate, and suppressed. The open tree well field was created as a yes/no field to be able to locate all the open sidewalk tree wells that can be replanted. The use under tree field identifies what lies directly underneath that tree canopy. The options to choose from included: pedestrian, parking, recreation, traffic, utility lines, building, and landscape. In many cases there was more than one of the options underneath the tree canopy, and in those circumstances that most frequency use was selected. The occupancy field was created to identify how frequently human activity occurred under the tree canopy. The options to choose from in the field were; frequent use, occasional use, constant use, or intermittence use.

The defect, defect present, pruning required, and conflicts fields were all important for the data analysis process. The defect field gives each tree a rating based on the amount of defect evident on the tree. The defect present field has a long list of defects that are common and can be selected if the tree has evidence of the particular defect. The pruning field both identifies if the tree need pruning, and states what type of pruning needs to be performed. The conflicts field has a list of common conflicts that occur in unban forests. The most frequent conflict was sidewalk pavement damage.

Finally, the photo, date collected, and comments fields were all created for easier organization and identifying what time of the year

Inventory Results

A tree inventory establishes baseline data for a complete analysis of its street tree population by using ArcMap and software developed by the US Forest Service called i-Tree streets. ArcMap allows for detailed information to be combined and searched, to find specific criteria. By combining the data collected in the inventory along with city GIS information many important tree management queries can be answered including: where each tree species is growing best, which tree species is creating the least sidewalk damage, location of open tree wells along with what tree species will thrive in that location, and even what tree species is the least hazardous. In addition, the programs used in the data collector are only

the trees were surveyed, and in order to identify if a particular tree had anything out of the ordinary.

compatible with ArcMap for data extraction. The ArcMap software is also capable of creating maps with multiple layers showing the GPS location of every tree inventoried. The i-Tree streets analysis provides a dollar value indication of the environmental benefits provided by each tree. While i-Tree streets analysis provides information on the environmental performance of the entire forest, analyzing individual species provides detailed information on the performance of individual species. The i-tree streets software takes the information from the inventory and calculates the pounds of carbon absorbed, gallons of stormwater retained, and the amount of energy in kilowatt hours saved.



STREETS: Running a STRATUM Analysis



Species and Population Distribution

Data from the inventory indicates that the commercial zones in Morro Bay are comprised of over 40 different species of trees. The large majority of the urban forest is consisting of the Red Flowering Eucalyptus (*Eucalyptus ficifolia*). Of the 673 trees collected in the inventory, 259 of them were *Eucalyptus ficifolia*, which can be seen in Figure 4 and is over 38% of the tree population. Fifty Cajeput (*Melaleuca quinquenervia*) trees and thirty-two Blue gum eucalyptus (*Eucalyptus globulus*) trees were surveyed. The most frequently inventoried trees are shown in the figure 3 and figure 4, which comprise of 71.4% of the entire survey. The rest of species surveyed had populations of 13 or fewer and together comprised of 28.6% of the trees

Figure 3: Populations of the 10 Most Common Tree Species

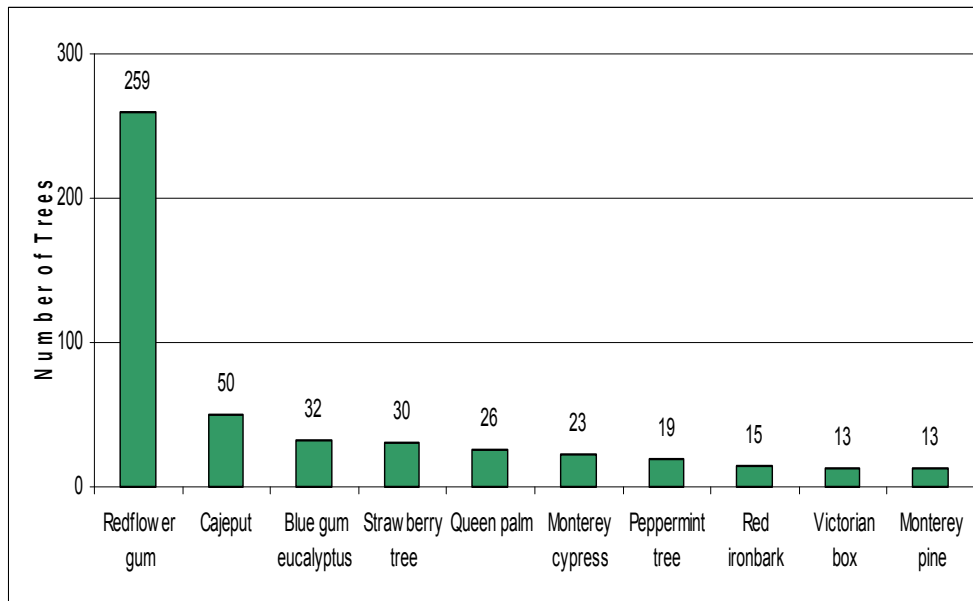
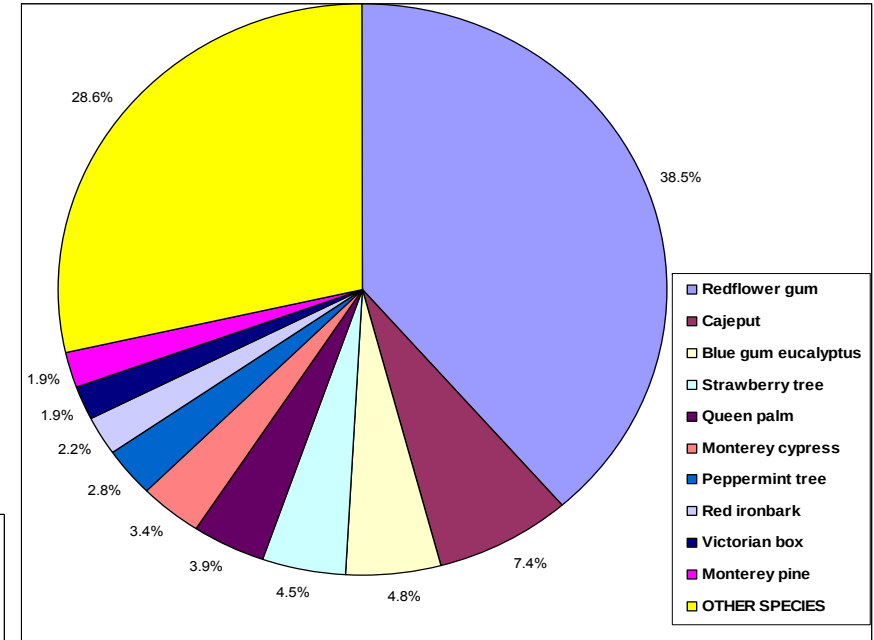


Figure 4: Species Distribution of Public Trees



surveyed. The distribution of tree species throughout the commercial zones is uniform for some species and isolated for others. The Red flowering eucalyptus tree is highly concentrated in the downtown area of Main Street, Morro Bay Boulevard, and Harbor Street, as well as scattered throughout the rest of the commercial zones on south Quintana, and north Main. The large Blue gum eucalyptus trees are distributed either on the Embarcadero, directly above the Embarcadero, or along the bike path at the Main street/Quintana road intersection. The following four maps show the location and distribution of individual trees by species for the entire inventory.

North Main area

Tree Species

- all other species

Species Common name, Scientific name

- Eucalyptus species, *Eucalyptus* spp.
- Lemon Bottlebrush, *Callistemon citrinus*
- Paper bark tea tree, *Melaleuca quinquenervia*
- open tree well,
- peppermint willow, *Agonis flexuosa*

Figure 6: Tree Map of Lower North Main Area

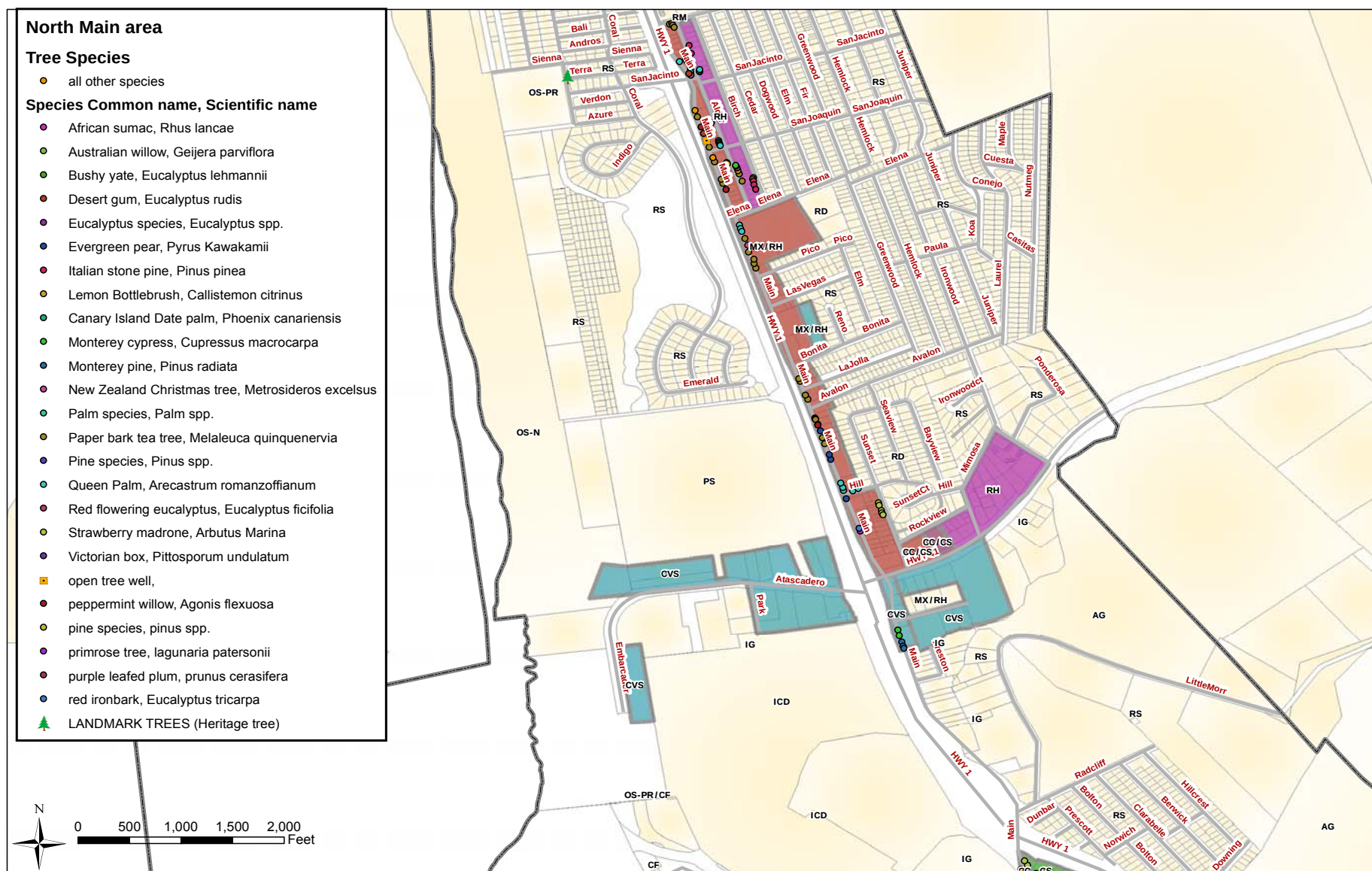
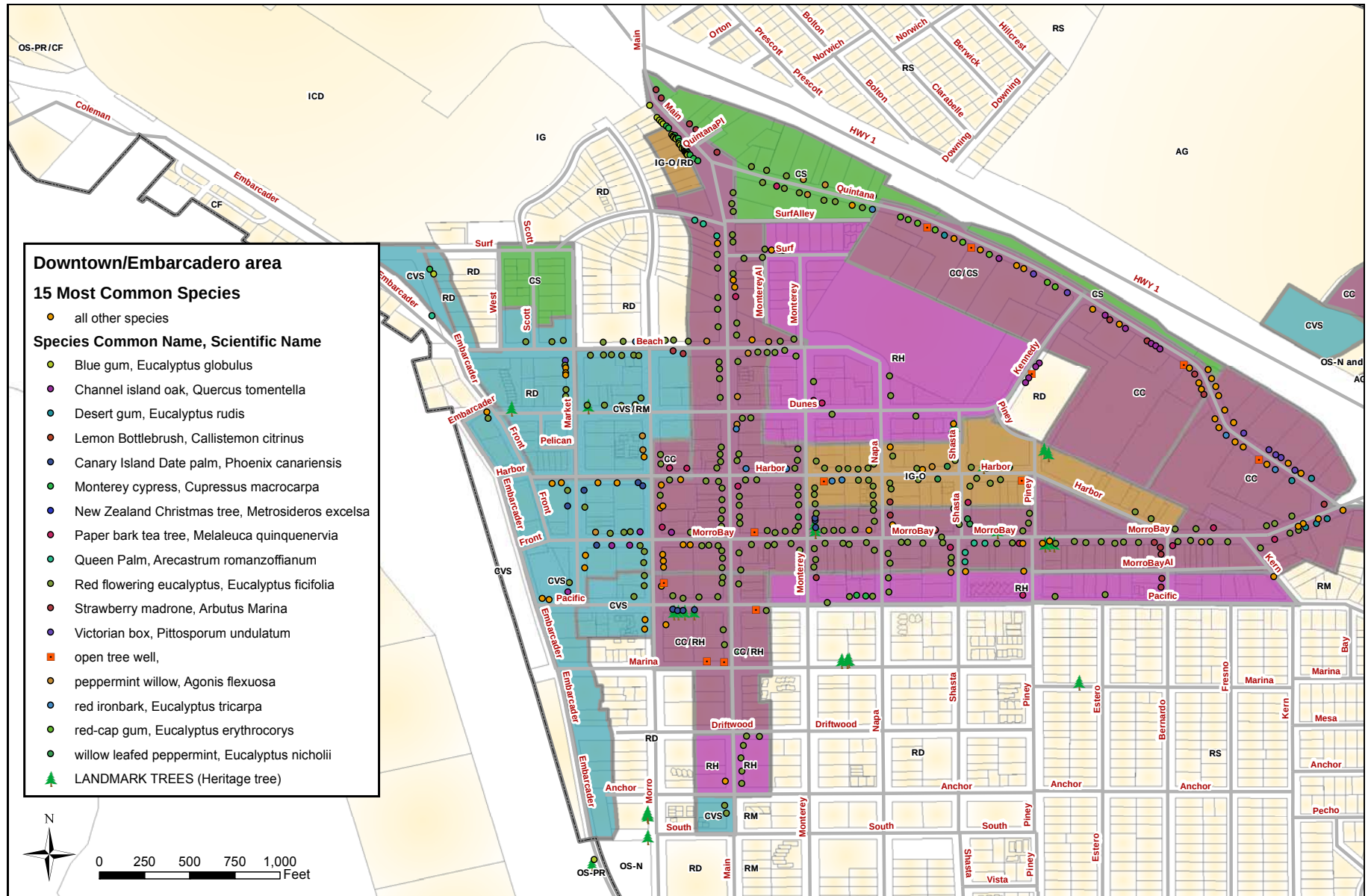


Figure 7: Tree Map of Downtown/Embarcadero Area



South Quintana area

Tree Species

- all other species

Species Common name, Scientific name

- African sumac, *Rhus lancae*
- Bushy yate, *Eucalyptus lehmannii*
- Desert gum, *Eucalyptus rudis*
- Monterey pine, *Pinus radiata*
- New Zealand Christmas tree, *Metrosideros excelsa*
- Palm species, *Palm spp.*
- Paper bark tea tree, *Melaleuca quinquenervia*
- Red flowering eucalyptus, *Eucalyptus ficifolia*
- Victorian box, *Pittosporum undulatum*
- open tree well,
- pine species, *pinus spp.*

Tree Characteristics

The data collected on tree characteristics from the inventory, was analyzed and put into tables that present the numbers clearly. The following four tables are express information on tree diameter, tree height, and canopy spread. More tables on tree characteristics can be found in the appendix.

Tree diameters were collected at every tree inventoried. Later the diameters were grouped into diameter classes in order to find the distribution of diameters citywide. In the diameter class distribution table on the right it shows that the 58.55% of the commercial zone trees have a diameter between 6 inches and 24 inches. The table also shows that less than 6% of the inventoried trees have diameters greater than 36 inches

Tree height is another important tree characteristic that was measured at every tree inventoried. Each tree heights was measured down to the foot, during the survey, and afterwards placed into height classes with 15 foot intervals. The tree height table on the right shows that 297 trees had a between 15 feet and 30 feet.

Canopy spread data was measured at each tree, and then later placed into canopy spread classes with 10 foot intervals. This table can be found in the appendix labeled "Canopy spread". The canopy cover table on the right was produced from the canopy spread data and city street information. The table shows that 4.42% of the .45sq mi area surveyed is covered with tree canopy. The table also illustrates that 11.54% of the 13 linear miles sidewalk is shaded by tree canopy as well.

The condition of each tree was recorded during the survey, and later placed in a table showing the number of excellent, average, fair or poor condition trees each species has. This table can be found in the appendix labeled "condition of trees". With this information we are able to identify if particular tree species grow better or can withstand the different microclimates. For example, the Cajeput tree (*Melaleuca quinquenervia*) has 19 trees that are either labeled fair or poor, 12 of which are located on the North main street pas HWY 41.

Table 3: Diameter Class Distribution

diameter class distribution	
Diameter class	Citywide total
0-3	9.06%
3-6	9.21%
6-12	19.02%
12-18	20.51%
18-24	19.02%
24-30	12.92%
30-36	4.46%
36-42	3.42%
>42	2.38%

Table 4: Tree Height

Tree Height		
Tree height classes	Tree count	% of public trees
0'-15'	134	19%
15'-30'	297	44%
30'-45'	177	26%
45'-60'	19	3%
60'+	35	5%
N/A	11	2%

Table 5: Canopy Cover

Canopy cover	canopy cover as % of total land area	Canopy Cover as % of Total streets and sidewalks
	4.42	11.54

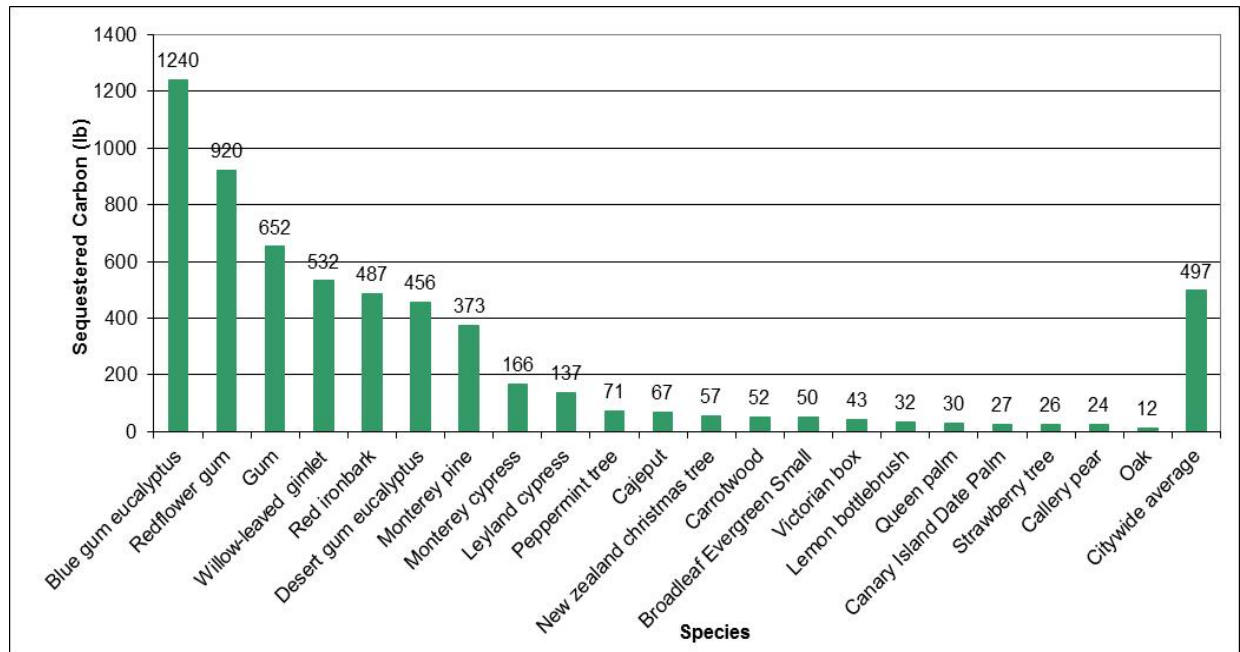
Environmental Benefits Results

Trees make our cities more attractive and provide many ecosystem services, including atmospheric carbon dioxide reduction, energy conservation, and stormwater interception. The information from the inventory was ran through software (i-tree streets) which calculated the pounds of carbon absorbed, amount of energy in kilowatt hours saved, and the gallons of stormwater retained annually by the urban forest. The size of the trees are included in the calculations to give an accurate representation of the current urban forest.



Image 7: Large Blue Gum Eucalyptus (*Eucalyptus globulus*) sequester more carbon than the other species

Figure 9: Pounds of Atmospheric Carbon Removed Annually by Individual Species



Carbon Sequestration Analysis

Carbon sequestration is the process by which carbon dioxide (CO₂) is absorbed out of the atmosphere through trees trunks, branches, leaves, and roots as they grow. Urban forests can act as a carbon sink when there are enough trees to store more carbon than is released over time (McPherson). The figure above shows the pounds of carbon each individual species tree is absorbing annually. The trees in the commercial zone areas together are absorbing 334,655 pounds of carbon each year. The graph illustrates that one Blue gum eucalyptus is annually absorbing 1240 lbs. of carbon each year. The Blue gum is the largest tree species in the urban forest, increasing its productivity. A Red flowering eucalyptus absorbs 920 lbs. of carbon annually making it the second most efficient species. In general the Eucalyptus species is a great carbon sequester. From the large Blue gum eucalyptus to the shorter willow leafed gimlet, red ironbark, Desert gum eucalyptus, and red flowering eucalyptus, they all are on the top for the amount of carbon absorbed each year making them important contributors to the environment and reduction of emissions. The citywide average for one individual tree is 497 lbs. sequestered each year.

Energy Savings Analysis

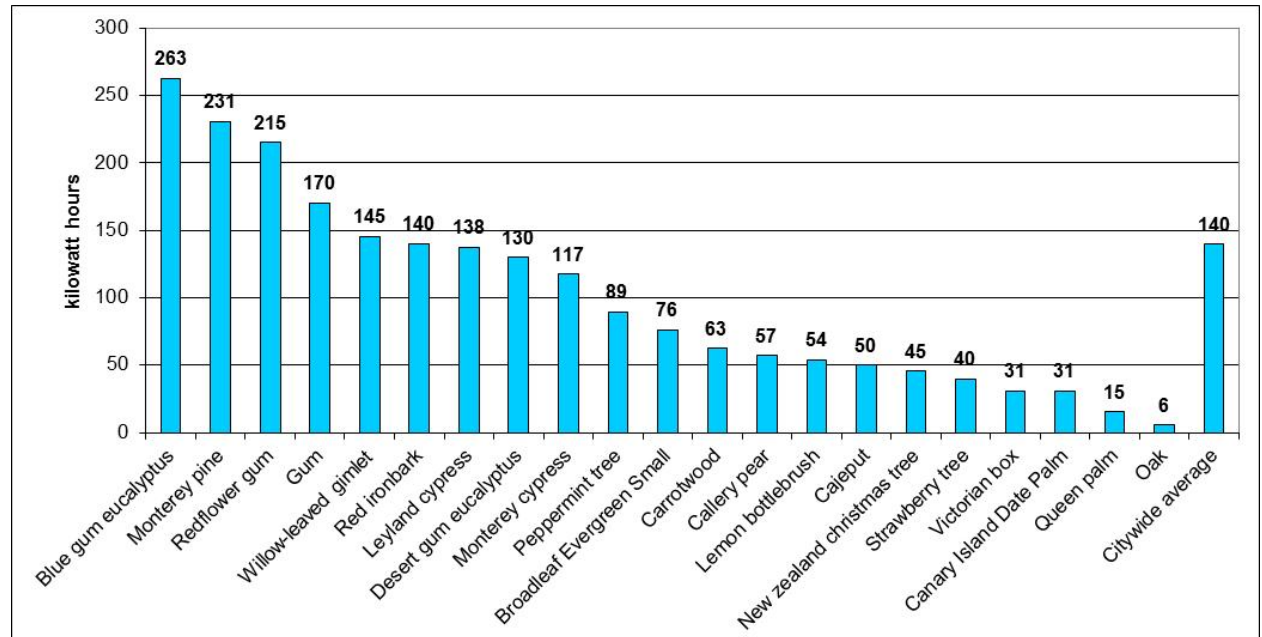
Trees modify temperatures and conserve building energy use in three principal ways: shading, evapotranspiration, and wind speed reduction. The shade from tree canopies cools an area and reduces the amount of heat absorbed and stored by buildings. Evapotranspiration converts liquid water to water vapor which cools air that would otherwise result in heated air from the sun. Furthermore, a trees canopy slows cold winter winds thereby reducing the amount of heat loss from a home, especially where conductivity is high such as windows or skylights.

The shade and protection provided by the urban trees in the commercial areas save 93,900 kilowatt hours per year. The Monterey pine (*Pinus radiata*) is the second highest ranked species to reduce annual energy consumption saving 231 KWh each year by a single tree. The Monterey pine trees in Morro Bay have large dense canopies that create shade in addition to overlapping branches that form a wind break. Figure 4 below shows the number of kilowatt hours a single tree saves annually by species. The Blue gum eucalyptus saves 263 kilowatt hours annually, and the citywide average is 140 kilowatt hours.



Image 8: The Monterey Pine (*Pinus radiata*) shown above produces shading and protection for the building behind

Figure 10: Annual Savings of Kilowatt Hours of Electricity by Individual Species



Stormwater Interception Analysis

Urban stormwater runoff flows directly into the bay and ocean. The urban forest plays an important role in reducing the amount of pollutants entering the bay and ocean each year. Trees reduce runoff in several ways including: intercepting and storing rainfall on their leaves and branches, roots increase the rate at which rainfall infiltrates soil, tree canopies reduce soil erosion, and transpiration through tree leaves reduce soil moisture. The commercial zone trees alone intercept 1,375,118 gallons annually from entering the bay. Mature Monterey pine and Red Flowering Eucalyptus trees both can retain over 3,000 gallons of stormwater in a year compared to the palms downtown that retain less than 300 gallons. Figure 5 below shows the citywide average for stormwater retained annually to be 2043 gallons. Considering Morro Bay's 18" of rain per year average generates over 140,000,000 gallons of stormwater on the commercial areas alone, the stormwater interception and retention benefit from urban trees is the most effective solution in reducing the amount of stormwater entering the bay and ocean.

Figure 11: Average Gallons of Stormwater Retained Annually by Individual Species

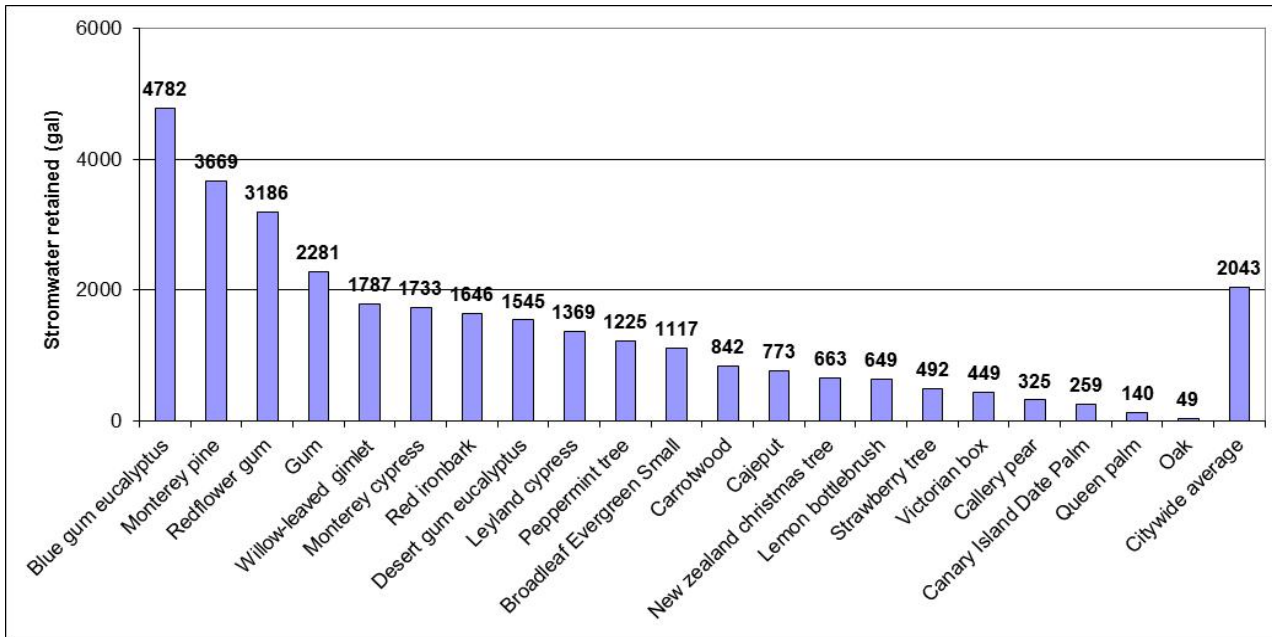
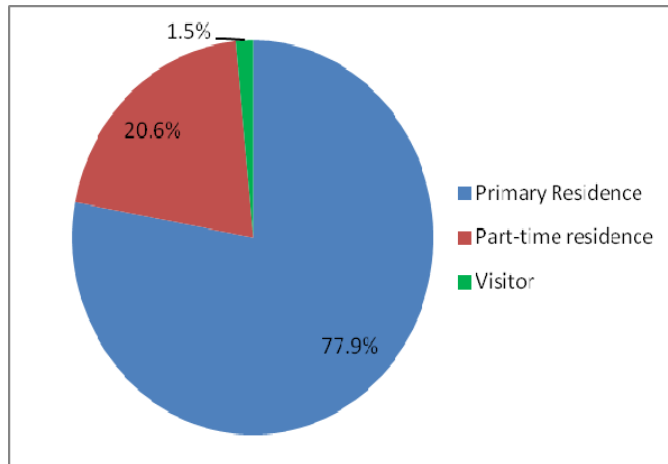


Image 9: The Red Flowering Eucalyptus shown above retains 3186 gallons of stormwater annually.

Stakeholders' Attitudes – Community Views of the Urban Forest

The wishes, attitudes and views of the community, have a large impact on our Urban Forest Management Plan. The City chose to conduct a survey to gather the community's input towards the UFMP and help develop various goals. The surveys were mailed with the water bills; therefore we reached a mix of residents, non residents, part-time residents and business owners.

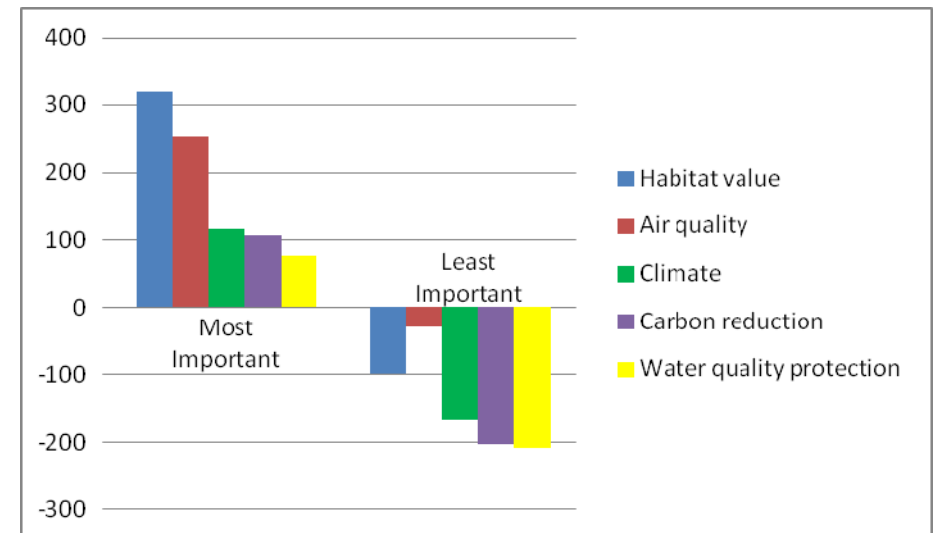
Figure 12: Survey Question 1



Survey Question 1 showed most of the respondents live in Morro Bay, but a portion, 21%, are part-time residents.

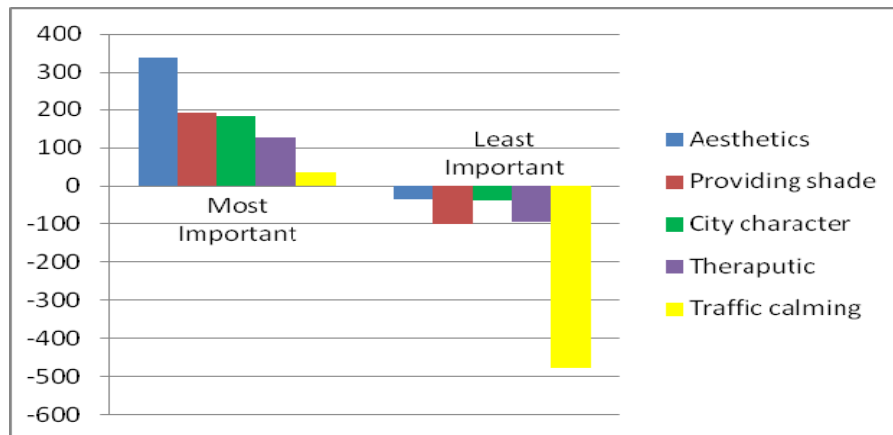
Typically with mailed surveys the response rate is low, less than 10%. The response rate of these surveys was very good, approximately 30% of surveys were returned. The survey results identified environmental benefits, social and economic qualities.

Figure 13: Survey Question 2



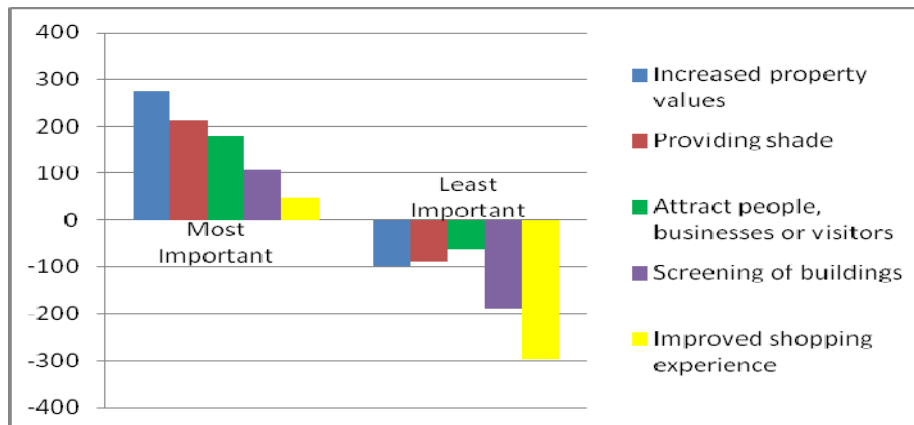
Survey respondents were asked in Question 2 what the most important environmental benefits are provided by public trees. Air quality and Habitat Value were viewed as the most important Environmental benefits provided by public trees.

Figure 14: Survey Question 3



Survey respondents were asked in Question 3 what the most important social benefit provided by public trees. The aesthetics and beauty of the City was viewed as the top social benefit given off by public trees.

Figure 15: Survey Question 4



Survey respondents were asked in Question 4 what is the most important economic benefit provided by public trees. Increased property value was viewed as the most important.

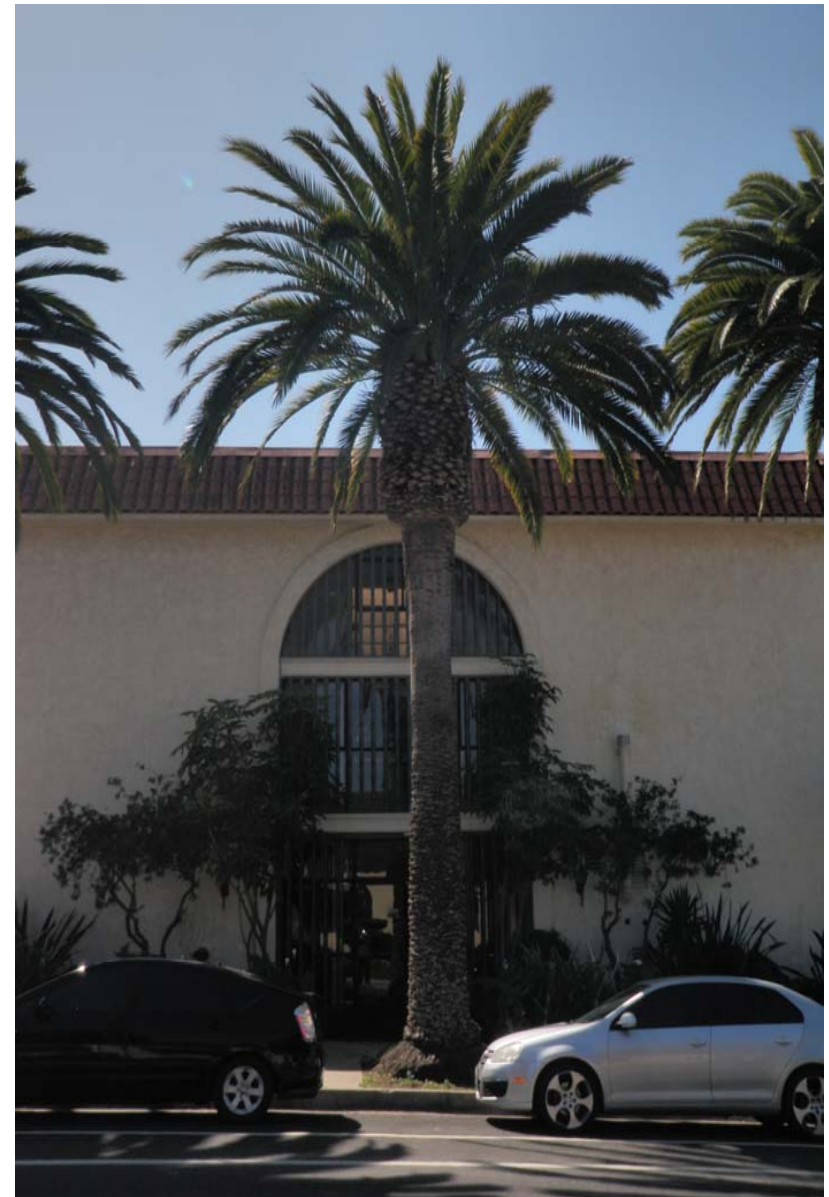
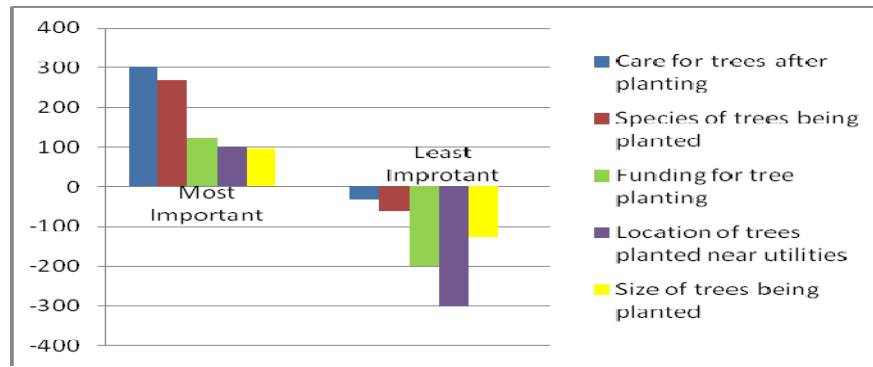


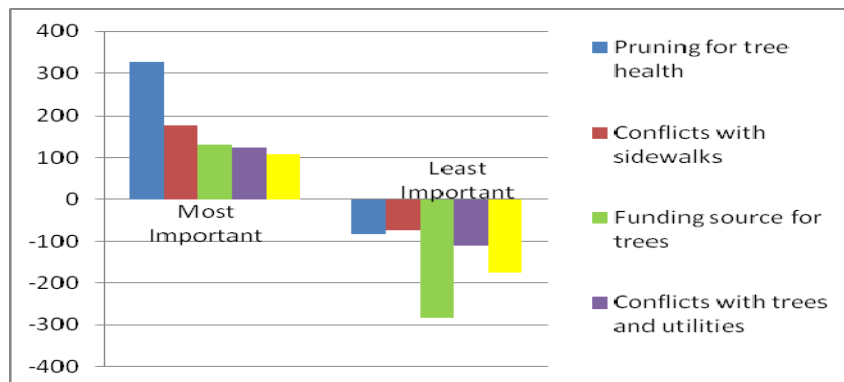
Image 10: Canary Island Date Palm

Figure 16: Survey Question 5



Survey participants were asked in Question 5 what the most important concern related to public tree planting. Both care of trees after planting and choosing the species of tree being planted were very important. Location of trees planted near utilities was viewed as the least important.

Figure 17: Survey Question 6



Survey participants were asked in Question 6; what are the most important considerations to you related to public tree maintenance and removal. Pruning for good shape and vigor as well as to stimulate new growth of the tree was viewed as the most important consideration.



Image 11: Pruning for Good Shape

Survey participants were asked in Question 9, in their neighborhood do they feel there are too many or too few public trees. Most thought there were not enough trees in their neighborhoods, compared to very few participants felt that there were too many trees.

Figure 18: Survey Question 9

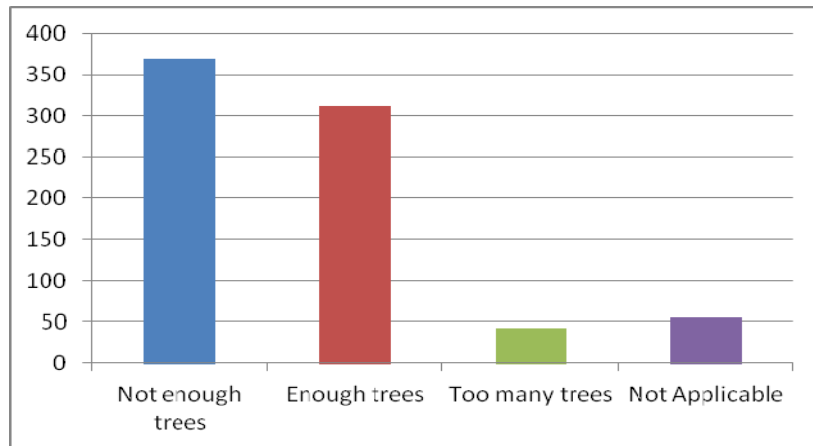


Image 12: Street View of Trees

The participants were also asked in Question 8; across the City are there too many or too few trees. Again most participants said there are not enough trees in the City.

Figure 19: Survey Question 8

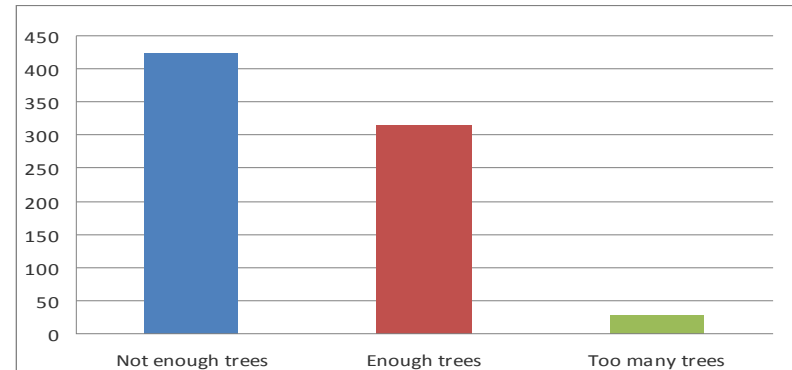


Image 13: Aerial View of Trees

Survey participants were asked in Question 10, how they perceive the condition or health of public trees in the City. Over six hundred of the respondents believed that the public tree conditions are either moderate health or average health.

Figure 20: Survey Question 10

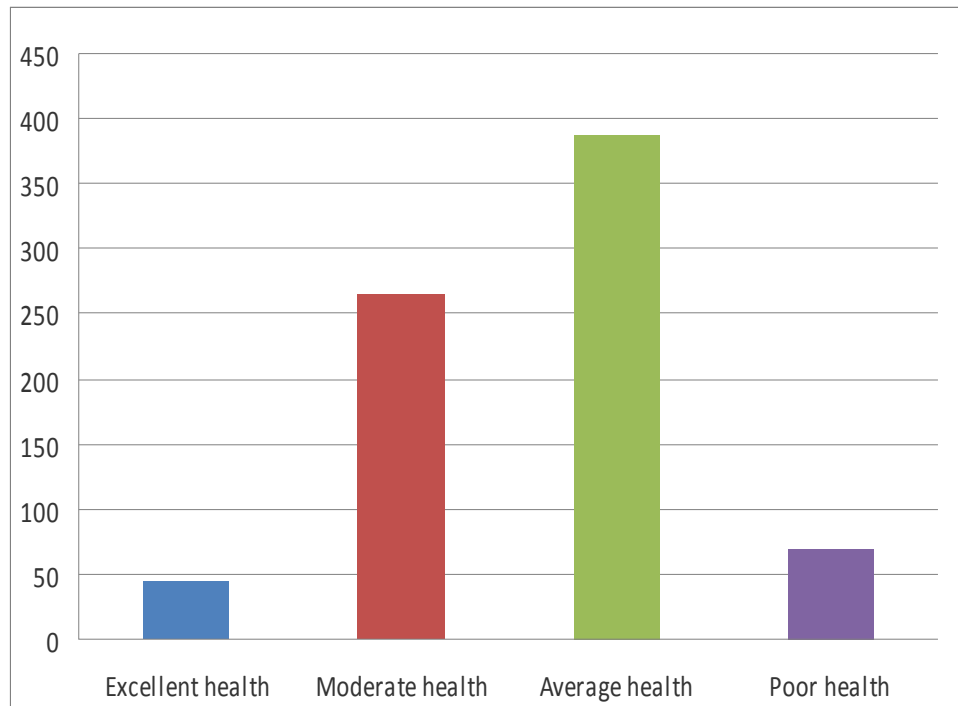
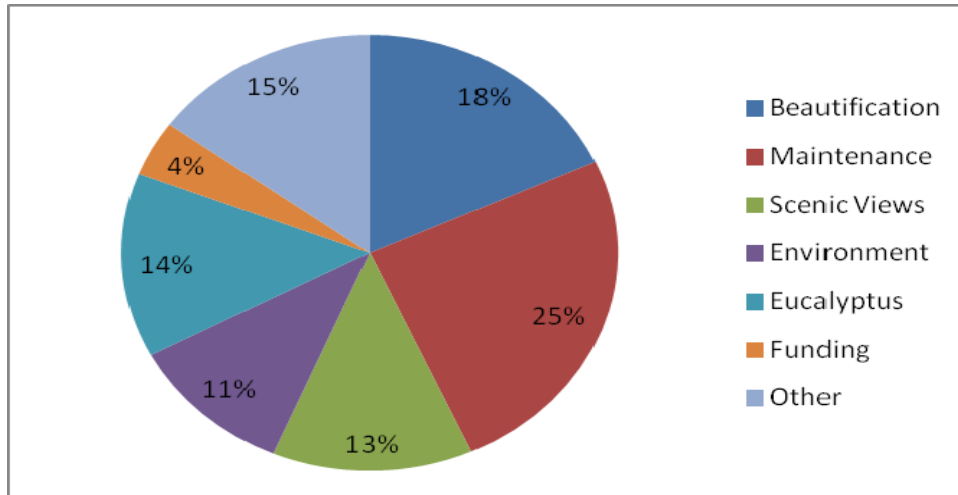


Image 14: Young Oak Tree

Figure 21: Common Resident Concerns



The community was asked what the number one goal of the Urban Forest Management Plan should be. The input ranged from broad ideas to specific policy changes. The topics that survey participants brought up the most are shown in Figure 14.

Maintenance was the number one topic expressed as a goal for the UFMP. Ideas within the maintenance topic included: adding more trees, sidewalk damage, root damage, trimming/pruning, removal of trees, keeping branches away from power lines, and care of trees after planting.

Beautification was the second highest topic expressed as a goal for the UFMP. The beautification ideas incorporated: tree shape, colorful flowers, aesthetics, aiding the beautification of the city, nice landscaping, planting beautiful looking trees, replacing ugly trees with nice ones, and improving the appearances of the entryways to the city.

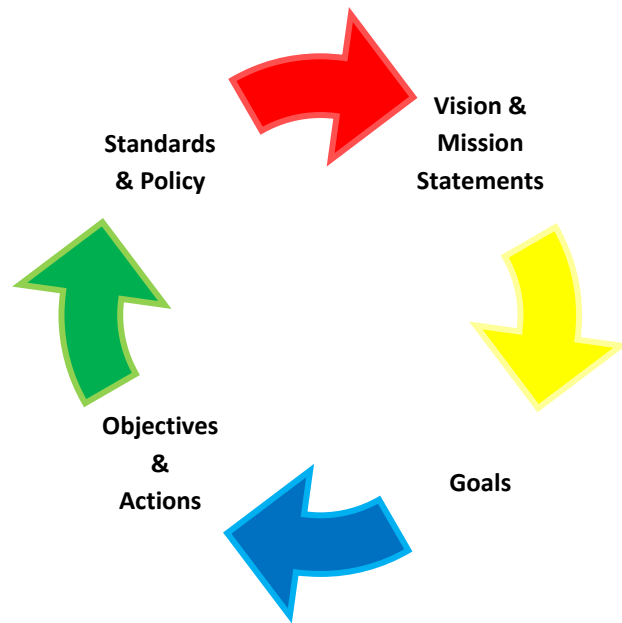
Scenic views were another topic commonly expressed for a goal of the UFMP. Responses for this topic included: removing tree for views, stop blocking ocean views, screening fence along Highway 1, planting trees on the barren hills, planting more short trees, blocking the wind, blocking views of mobile home parks, and decreasing property value.

Another topic that was expressed by citizens as a goal for the UFMP fell under the Eucalyptus topic. This topic was mainly referring to the hazards Blue gum and Red flowering eucalyptus, but also included: getting rid of the downtown trees, removing red sappy trees, plant more variety than eucalyptus, remove smelly eucalyptus, plant native trees instead of eucalyptus, plant trees that don't make you trip, leaving the eucalyptus tree along.

The environment was a topic that 11% of the respondents thought should be the number one goal for the UFMP. Ideas within the topic included: reducing carbon, providing habitat for birds, less pollen, native wildlife habitats, trees that resist pests, providing shade, drought tolerant trees, improve air quality, and Stormwater treatment.

The other topic expressed as a goal was funding for the UFMP. Combined they consisted of 19% of the responses, but only a handful were about the same specific idea or problem. Many of the responses were either off topic or about a problem relating to a specific tree on their property.

Strategic Plan



Developing Policy and Standards through the Urban Forest Goals

The goals were developed through the Stakeholders survey results and further refined through the Vision and Mission statements. The goals define the objectives and actions which give the road map on implementing this UFMP. These goals provide opportunities for continuous improvement and flexibility in the future. As the urban forest continues to grow and evolve, new strategies that develop

will be incorporated as part of this living document.

The City of Morro Bay's public trees are an important part of the City's infrastructure. Public trees located along the City streets offset the impacts of the urban environment and provide residents and tourist a healthy, sustainable, peaceful place for recreation or social interaction while providing habitat for urban wildlife. Trees are an important part of the City's infrastructure by treating stormwater runoff, shading streets and buildings to reduce the urban heat island effect, reduces air pollution, controls erosion, stores and sequesters carbon, and provides human and wildlife habitat.

The Citizens who participated in the survey expressed tree maintenance as the number one goal for the Urban Forest Management Plan. The City agrees maintenance of the trees is vital for the long term sustainability of the urban forest. Due to the limited funding available to maintain the City's street trees one solution could be to limit the areas where the City is responsible to maintain trees, therefore Goal #1, defining public trees was developed. The survey participants expressed beautification as the second goal for the urban forest management plan. In order for the City to achieve this goal the City developed goal #2, enhancing the Urban Forest. The other goals expressed by the survey participants are integrated into all the goals of the UFMP, e.g. scenic view, goal #1, Eucalyptus goal #2 and the environment in goal #2 and goal #3.

Goal 1: Defining Public trees

The City has wide Right of Ways and therefore much of the public treats sections of unpaved Rights of Way as an extension of their property. For the most part the trees planted in the residential Rights of Way were planted by the residents for their personal pleasure/benefit. Due to the vast number of trees planted in these wide Rights of Way in the residential areas, it is a large financial and liability burden to the City. The City spends approximately 15% of the annual tree budget on these trees. The City would like to encourage residents to continue to plant and maintain these trees. In order to enhance and maintain the urban forest to the desired level, the City will need to limit the scope of trees to one that the City can manage. With the cost savings of not maintaining public trees in the residential areas, more money could be spent on replanting and maintaining public trees in the commercial/downtown districts. Currently the City has guidelines for private trees, but in order to protect private trees the city would need to adopt a tree ordinance.

Objective 1.1

Define the Downtown and Commercial Right of Way areas where the City will maintain the trees. Propose an ordinance revision which requires the City to maintain those trees in the Right of Ways of the Downtown and commercial sections of town. The trees in the residential areas will be maintained by the adjoining property owners.

Action 1.1

The Public Services Department will define these trees areas and develop the ordinance by 2015.

Objective 1.2

Maintain tree inventory in Downtown and commercially zoned areas.

Action 1.2

The Public Services Department will complete the inventory by 2014 and maintain the inventory on an ongoing basis.

Objective 1.3

Develop regulations for the private trees that will protect and enhance the urban forest over time. Define the public trees that the City will maintain.

Action 1.3

Adopt a private tree ordinance by 2016 that will accomplish the goals of the urban forest for the private trees in Morro Bay. Include in this ordinance the defined public trees that will be the City's responsibility to maintain.

Goal 2: Enhancing the Urban Forest

The enhancement of the Urban Forest considers the life cycle of the urban forest and recognizes that it is a dynamic, natural system. Establish and maintain an optimal level of age and species diversity and increased levels of trees to maximize ecosystem benefits provided by the urban forest, (maintain air quality, reduce energy use, moderate stormwater runoff, and provide a favorable environment for city residents).

Objective 2.1

Plant the appropriate species of tree in vacant or replacement locations with diligent consideration of age diversity, climate, soil type, wind, salt spray, utilities, and public safety. Utilizing the

existing street tree list, add additional species, if needed, of trees to provide more diversity, focusing in the seven microclimates.

Action 2.1

The Public Services and Recreation and Parks Departments will develop and define a list of trees suitable for the appropriate location. These departments will work with the Tree Committee to determine a list of tree species for each different zone in Morro Bay. This will begin in 2014.

Objective 2.2

Develop a master tree planting scheme for the commercial areas within the City focusing on species diversity, and microclimates.

Action 2.2

The Public Services and Recreation and Parks Departments will work with the Tree Committee to develop the tree planting scheme plan, to be completed by 2016.

Objective 2.3

In order to diversify the tree species, new trees should always be planted as trees are removed. Identify vacant tree wells in downtown areas, and work with the Tree Committee to find volunteer residents who are willing to care for the tree for the first 2 years. Develop a subcommittee of the Volunteer Tree Committee and a staff member to determine which tree species to plant for a given tree well and define the watering for the trees survival.

Action 2.3

The Public Services Department will work with the Recreation and Parks Department and the Tree Committee to define this subcommittee and implement a tree watering program. This will be

completed by 2015.

Objective 2.4

Monitor canopy cover every five years. Compare with previous data.

Action 2.4

The Public Services Department will check will Cal Fire in March 2015 to see if State-provided information is available on canopy cover and when it is available, compare coverage every 5 years.

Objective 2.5

Assess the progress regarding environmental benefits gained from the urban forest. Prepare a report on these environmental benefits and provide it on the City's website.

Action 2.5

The baseline has been established in the inventory section, and the Public Services Department will update the information every 5 years on the website.

Goal 3: Protecting Wildlife

Morro Bay is a bird sanctuary and therefore protecting the nesting birds is essential. Further define the nesting season and explore Best Management Practices for the nesting birds and tree trimming.

Objective 3.1

Research and determine the appropriate time frame for nesting birds throughout the Central Coast.

Action 3.1

The Public Services Department will research the appropriate nesting season for Morro Bay by 2015.

Objective 3.2

Identify pruning needs of various tree species and the appropriate time of year trimming. Investigate Best Management Practices (BMP) for trimming and or removals during nesting season. Develop a policy and protocol that integrates the bird nesting patterns and the appropriate timing for trimming the trees.

Action 3.2

The Public Services Department will research the appropriate time of year for trimming trees, BMPs for trimming and removals during these times and correlate this with the nesting season, by 2015.

Goal 4: Educate the Public on the Benefits of Trees

Provide the public with a general understanding of the value and benefits that the Urban Forest provides. Educate residents, business owners, and the development community with Best Management Practices, including planting and care of trees.

Objective 4.1

Provide information on the City's website regarding the City's tree care program, benefits of trees, landmark trees, and proper tree care.

Action 4.1

The Public Services Department will make available this information on the City website by 2014.

Objective 4.2

Continue the partnership with the Volunteer Tree Committee.

Action 4.2

The Public Services and the Recreation and Parks Departments will continue this partnership with the UFMP adoption and throughout

the entire life of the UFMP.

Objective 4.3

Enhance the City's Arbor Day program and its Tree City USA status.

Action 4.3

The Recreation and Parks Department will ensure the City keep the Tree City USA status and continue with the Arbor Day program from the UFMP adoption and throughout the entire life of the UFMP.

Goal 5: Tree Conservation

Conservation of the Urban Forest is important to preserve the forest for future generations. The conservation efforts include maintenance standards for ongoing management of trees. The City's urban forest should be maintained with standards that are consistent with good cultural best management practices.

Objective 5.1

Maintain trees using tree care guidelines provided in Appendix 3, in order to get the maximum benefits possible from the urban forest. City crews are to be trained in these maintenance practices.

Action 5.1

Recreation and Parks Department will train staff on these standards in Appendix 3 in year 2015.

Objective 5.2

Maintain the comprehensive GIS data base of all public trees in the City. Routine data will be entered into the database as trees are pruned, removed or planted.

Action 5.2

A comprehensive update will be performed by the Public Services

Department every 7 years.

Objective 5.3

Develop a tree care program that includes appropriate trimming schedules, integrated pest management policy.

Action 5.3

The Recreation and Parks Department will develop this program by 2016.

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APPENDIX 1

Tree Inventory

Morro Bay

Annual Energy Benefits of Public Trees By Species

2/4/2013

Species	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Redflower gum	55.7	7,375	1,310.5	1,710	9,085	(N/A)	38.5	59.8	35.08
Cajeput	2.5	333	35.7	47	380	(N/A)	7.4	2.5	7.60
Blue gum eucalyptus	8.4	1,110	158.1	206	1,316	(N/A)	4.8	8.7	41.12
Strawberry tree	1.2	157	26.1	34	191	(N/A)	4.5	1.3	6.36
Queen palm	0.4	53	12.1	16	69	(N/A)	3.9	0.5	2.66
Monterey cypress	2.7	361	56.2	73	434	(N/A)	3.4	2.9	18.88
Broadleaf Evergreen	1.6	214	32.2	42	256	(N/A)	3.1	1.7	12.19
Gum	3.4	443	82.7	108	551	(N/A)	3.0	3.6	27.56
Peppermint tree	1.7	221	32.2	42	263	(N/A)	2.8	1.7	13.82
Oak	0.1	10	2.7	4	14	(N/A)	2.7	0.1	0.77
Red ironbark	2.1	279	57.7	75	354	(N/A)	2.2	2.3	23.62
Lemon bottlebrush	0.7	90	14.7	19	110	(N/A)	1.9	0.7	8.43
Monterey pine	3.0	394	58.0	76	470	(N/A)	1.9	3.1	36.14
Victorian box	0.4	58	6.8	9	67	(N/A)	1.9	0.4	5.15
Mexican fan palm	0.4	48	10.9	14	62	(N/A)	1.9	0.4	4.76
Willow-leaved gimlet	1.6	217	43.8	57	274	(N/A)	1.6	1.8	24.89
New zealand christmas	0.5	63	6.4	8	72	(N/A)	1.6	0.5	6.50
Desert gum eucalyptus	1.3	173	35.4	46	219	(N/A)	1.5	1.5	21.95
Carrotwood	0.5	64	9.7	13	77	(N/A)	1.2	0.5	9.62
Leyland cypress	1.1	147	26.1	34	182	(N/A)	1.2	1.2	22.69
Callery pear	0.4	48	8.8	12	60	(N/A)	1.0	0.4	8.50
OTHER STREET TREES	4.3	562	88.6	116	678	(N/A)	7.9	4.5	12.79
Citywide total	93.9	12,422	2,115.6	2,760	15,182	(N/A)	100.0	100.0	22.56

Canopy Spread for Public Trees by Zone

2/4/2013

Zone	Canopy Spread	Tree Count	Standard Error	% of Zone	% of Public Trees
1	0'-10'	174	(N/A)	25.85	25.85
	10'-20'	182	(N/A)	27.04	27.04
	20'-30'	198	(N/A)	29.42	29.42
	30'-40'	70	(N/A)	10.40	10.40
	40'-50'	35	(N/A)	5.20	5.20
	50'+	12	(N/A)	1.78	1.78
	N/A	2	(N/A)	0.30	0.30
	Total	673	(N/A)	100.00	100.00
Citywide	0'-10'	174	(N/A)	25.85	25.85
	10'-20'	182	(N/A)	27.04	27.04
	20'-30'	198	(N/A)	29.42	29.42
	30'-40'	70	(N/A)	10.40	10.40
	40'-50'	35	(N/A)	5.20	5.20
	50'+	12	(N/A)	1.78	1.78
	N/A	2	(N/A)	0.30	0.30
	Total	673	(N/A)	100.00	100.00

Structural (Woody) Condition of Public Trees by Species

2/4/2013

Species	Condition	Tree Count	Standard Error	% of Species	% of Public Trees
African sumac	excellent	0 (N/A)		0.00	0.00
	average	2 (N/A)		100.00	0.30
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	2 (N/A)		100.00	0.30
Aloe yucca	excellent	0 (N/A)		0.00	0.00
	average	1 (N/A)		100.00	0.15
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Araucaria	excellent	1 (N/A)		50.00	0.15
	average	0 (N/A)		0.00	0.00
	fair	1 (N/A)		50.00	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	2 (N/A)		100.00	0.30
Avocado	excellent	0 (N/A)		0.00	0.00
	average	1 (N/A)		50.00	0.15
	fair	0 (N/A)		0.00	0.00
	poor	1 (N/A)		50.00	0.15
	N/A	0 (N/A)		0.00	0.00
	Total	2 (N/A)		100.00	0.30
Bailey acacia	excellent	0 (N/A)		0.00	0.00
	average	1 (N/A)		100.00	0.15
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Blue gum eucalyptus	excellent	19 (N/A)		59.38	2.82
	average	13 (N/A)		40.63	1.93
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	32 (N/A)		100.00	4.75
Brisbane box	excellent	4 (N/A)		100.00	0.59
	average	0 (N/A)		0.00	0.00
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	4 (N/A)		100.00	0.59
Broadleaf Evergreen Small	excellent	9 (N/A)		42.86	1.34
	average	9 (N/A)		42.86	1.34
	fair	3 (N/A)		14.29	0.45
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	21 (N/A)		100.00	3.12
Bushy yate	excellent	1 (N/A)		100.00	0.15
	average	0 (N/A)		0.00	0.00
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15

Structural (Woody) Condition of Public Trees by Species

2/4/2013

Species	Condition	Tree Count	Standard Error	% of Species	% of Public Trees
Cajeput	excellent	10 (N/A)		20.00	1.49
	average	21 (N/A)		42.00	3.12
	fair	12 (N/A)		24.00	1.78
	poor	7 (N/A)		14.00	1.04
	N/A	0 (N/A)		0.00	0.00
	Total	50 (N/A)		100.00	7.43
Callery pear	excellent	0 (N/A)		0.00	0.00
	average	6 (N/A)		85.71	0.89
	fair	1 (N/A)		14.29	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	7 (N/A)		100.00	1.04
Carrotwood	excellent	1 (N/A)		12.50	0.15
	average	4 (N/A)		50.00	0.59
	fair	1 (N/A)		12.50	0.15
	poor	2 (N/A)		25.00	0.30
	N/A	0 (N/A)		0.00	0.00
	Total	8 (N/A)		100.00	1.19
Cherry plum	excellent	1 (N/A)		25.00	0.15
	average	2 (N/A)		50.00	0.30
	fair	1 (N/A)		25.00	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	4 (N/A)		100.00	0.59
Cicer gum eucalyptus	excellent	1 (N/A)		100.00	0.15
	average	0 (N/A)		0.00	0.00
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Coast redwood	excellent	1 (N/A)		100.00	0.15
	average	0 (N/A)		0.00	0.00
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Conifer Evergreen Medium	excellent	2 (N/A)		40.00	0.30
	average	2 (N/A)		40.00	0.30
	fair	0 (N/A)		0.00	0.00
	poor	1 (N/A)		20.00	0.15
	N/A	0 (N/A)		0.00	0.00
	Total	5 (N/A)		100.00	0.74
Conifer Evergreen Small	excellent	2 (N/A)		50.00	0.30
	average	1 (N/A)		25.00	0.15
	fair	0 (N/A)		0.00	0.00
	poor	1 (N/A)		25.00	0.15
	N/A	0 (N/A)		0.00	0.00
	Total	4 (N/A)		100.00	0.59
Deodar cedar	excellent	0 (N/A)		0.00	0.00
	average	1 (N/A)		50.00	0.15
	fair	1 (N/A)		50.00	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	2 (N/A)		100.00	0.30

Structural (Woody) Condition of Public Trees by Species

2/4/2013

Species	Condition	Tree Count	Standard Error	% of Species	% of Public Trees
Desert gum eucalyptus	excellent	1 (N/A)		10.00	0.15
	average	7 (N/A)		70.00	1.04
	fair	2 (N/A)		20.00	0.30
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	10 (N/A)		100.00	1.49
Evergreen pear	excellent	0 (N/A)		0.00	0.00
	average	4 (N/A)		100.00	0.59
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	4 (N/A)		100.00	0.59
Ginkgo	excellent	2 (N/A)		100.00	0.30
	average	0 (N/A)		0.00	0.00
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	2 (N/A)		100.00	0.30
Gum	excellent	5 (N/A)		25.00	0.74
	average	9 (N/A)		45.00	1.34
	fair	6 (N/A)		30.00	0.89
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	20 (N/A)		100.00	2.97
Hawthorn	excellent	0 (N/A)		0.00	0.00
	average	1 (N/A)		100.00	0.15
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Italian stone pine	excellent	4 (N/A)		66.67	0.59
	average	1 (N/A)		16.67	0.15
	fair	1 (N/A)		16.67	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	6 (N/A)		100.00	0.89
Lemon bottlebrush	excellent	3 (N/A)		23.08	0.45
	average	6 (N/A)		46.15	0.89
	fair	4 (N/A)		30.77	0.59
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	13 (N/A)		100.00	1.93
Lemonscented gum	excellent	1 (N/A)		100.00	0.15
	average	0 (N/A)		0.00	0.00
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Leyland cypress	excellent	0 (N/A)		0.00	0.00
	average	5 (N/A)		62.50	0.74
	fair	1 (N/A)		12.50	0.15
	poor	2 (N/A)		25.00	0.30
	N/A	0 (N/A)		0.00	0.00
	Total	8 (N/A)		100.00	1.19

Structural (Woody) Condition of Public Trees by Species

2/4/2013

Species	Condition	Tree Count	Standard Error	% of Species	% of Public Trees
Live oak	excellent	0 (N/A)		0.00	0.00
	average	2 (N/A)		100.00	0.30
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	2 (N/A)		100.00	0.30
Lyontree	excellent	0 (N/A)		0.00	0.00
	average	0 (N/A)		0.00	0.00
	fair	2 (N/A)		100.00	0.30
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	2 (N/A)		100.00	0.30
Mexican fan palm	excellent	11 (N/A)		84.62	1.63
	average	2 (N/A)		15.38	0.30
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	13 (N/A)		100.00	1.93
Monterey cypress	excellent	16 (N/A)		69.57	2.38
	average	6 (N/A)		26.09	0.89
	fair	1 (N/A)		4.35	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	23 (N/A)		100.00	3.42
Monterey pine	excellent	2 (N/A)		15.38	0.30
	average	8 (N/A)		61.54	1.19
	fair	3 (N/A)		23.08	0.45
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	13 (N/A)		100.00	1.93
New zealand christmas tree	excellent	6 (N/A)		54.55	0.89
	average	5 (N/A)		45.45	0.74
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	11 (N/A)		100.00	1.63
Oak	excellent	1 (N/A)		5.56	0.15
	average	14 (N/A)		77.78	2.08
	fair	2 (N/A)		11.11	0.30
	poor	1 (N/A)		5.56	0.15
	N/A	0 (N/A)		0.00	0.00
	Total	18 (N/A)		100.00	2.67
Palm Evergreen Medium	excellent	0 (N/A)		0.00	0.00
	average	1 (N/A)		100.00	0.15
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Peppermint tree	excellent	9 (N/A)		47.37	1.34
	average	8 (N/A)		42.11	1.19
	fair	2 (N/A)		10.53	0.30
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	19 (N/A)		100.00	2.82

Structural (Woody) Condition of Public Trees by Species

2/4/2013

Species	Condition	Tree Count	Standard Error	% of Species	% of Public Trees
Primrose tree; cow itch tree	excellent	1 (N/A)		100.00	0.15
	average	0 (N/A)		0.00	0.00
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	1 (N/A)		100.00	0.15
Queen palm	excellent	10 (N/A)		38.46	1.49
	average	13 (N/A)		50.00	1.93
	fair	2 (N/A)		7.69	0.30
	poor	0 (N/A)		0.00	0.00
	N/A	1 (N/A)		3.85	0.15
	Total	26 (N/A)		100.00	3.86
Red ironbark	excellent	2 (N/A)		13.33	0.30
	average	12 (N/A)		80.00	1.78
	fair	1 (N/A)		6.67	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	15 (N/A)		100.00	2.23
Redflower gum	excellent	59 (N/A)		22.78	8.77
	average	164 (N/A)		63.32	24.37
	fair	25 (N/A)		9.65	3.71
	poor	9 (N/A)		3.47	1.34
	N/A	2 (N/A)		0.77	0.30
	Total	259 (N/A)		100.00	38.48
Strawberry tree	excellent	24 (N/A)		80.00	3.57
	average	5 (N/A)		16.67	0.74
	fair	1 (N/A)		3.33	0.15
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	30 (N/A)		100.00	4.46
Victorian box	excellent	0 (N/A)		0.00	0.00
	average	10 (N/A)		76.92	1.49
	fair	1 (N/A)		7.69	0.15
	poor	2 (N/A)		15.38	0.30
	N/A	0 (N/A)		0.00	0.00
	Total	13 (N/A)		100.00	1.93
Wilga; australian willow	excellent	1 (N/A)		33.33	0.15
	average	2 (N/A)		66.67	0.30
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	3 (N/A)		100.00	0.45
Willow-leaved gimlet	excellent	1 (N/A)		9.09	0.15
	average	10 (N/A)		90.91	1.49
	fair	0 (N/A)		0.00	0.00
	poor	0 (N/A)		0.00	0.00
	N/A	0 (N/A)		0.00	0.00
	Total	11 (N/A)		100.00	1.63

Population Summary of Public Trees

2/4/2013

Species	DBH Class (in)									Total Standard Error
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Broadleaf Deciduous Large (BDL)										
Oak	18	0	0	0	0	0	0	0	0	18
BDL OTHER	0	0	0	0	0	0	0	0	0	0
Total	18	0	0	0	0	0	0	0	0	18 (±NaN)
Broadleaf Deciduous Medium (BDM)										
Callery pear	0	6	1	0	0	0	0	0	0	7
BDM OTHER	0	2	0	0	0	0	0	0	0	2
Total	0	8	1	0	0	0	0	0	0	9 (±NaN)
Broadleaf Deciduous Small (BDS)										
BDS OTHER	1	3	1	0	0	0	0	0	0	5
Total	1	3	1	0	0	0	0	0	0	5 (±NaN)
Broadleaf Evergreen Large (BEL)										
Blue gum eucalyptus	1	1	0	5	5	3	2	5	10	32
Gum	0	0	6	7	3	2	1	1	0	20
Red ironbark	0	0	4	9	2	0	0	0	0	15
Desert gum eucalyptus	0	1	3	4	2	0	0	0	0	10
BEL OTHER	1	3	2	1	1	0	0	0	0	8
Total	2	5	15	26	13	5	3	6	10	85 (±NaN)
Broadleaf Evergreen Medium (BEM)										
Redflower gum	7	1	4	51	96	66	19	13	2	259
Cajeput	1	7	23	18	1	0	0	0	0	50
Victorian box	0	8	3	2	0	0	0	0	0	13
Willow-leaved gimlet	0	0	3	5	3	0	0	0	0	11
New zealand christmas	1	1	6	3	0	0	0	0	0	11
BEM OTHER	0	0	7	2	0	0	0	0	0	9
Total	9	17	46	81	100	66	19	13	2	353 (±NaN)
Broadleaf Evergreen Small (BES)										
Strawberry tree	14	7	7	1	1	0	0	0	0	30
Broadleaf Evergreen	4	3	8	3	0	1	1	0	1	21
Peppermint tree	0	4	6	8	1	0	0	0	0	19
Lemon bottlebrush	1	5	7	0	0	0	0	0	0	13
Carrotwood	3	1	2	1	1	0	0	0	0	8
BES OTHER	0	0	6	1	0	0	0	0	0	7
Total	22	20	36	14	3	1	1	0	1	98 (±NaN)
Conifer Evergreen Large (CEL)										
Monterey cypress	6	3	3	2	2	5	0	1	1	23
Monterey pine	0	0	0	1	4	2	3	1	2	13
CEL OTHER	1	0	4	0	2	2	1	1	0	11
Total	7	3	7	3	8	9	4	3	3	47 (±NaN)
Conifer Evergreen Medium (CEM)										
Leyland cypress	0	1	1	3	3	0	0	0	0	8
CEM OTHER	0	1	2	1	1	0	0	0	0	5
Total	0	2	3	4	4	0	0	0	0	13 (±NaN)
Conifer Evergreen Small (CES)										
CES OTHER	1	1	1	0	0	0	0	1	0	4
Total	1	1	1	0	0	0	0	1	0	4 (±NaN)
Palm Evergreen Large (PEL)										
PEL OTHER	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0 (±NaN)
Palm Evergreen Medium (PEM)										
PEM OTHER	0	0	1	0	0	0	0	0	0	1

Population Summary of Public Trees

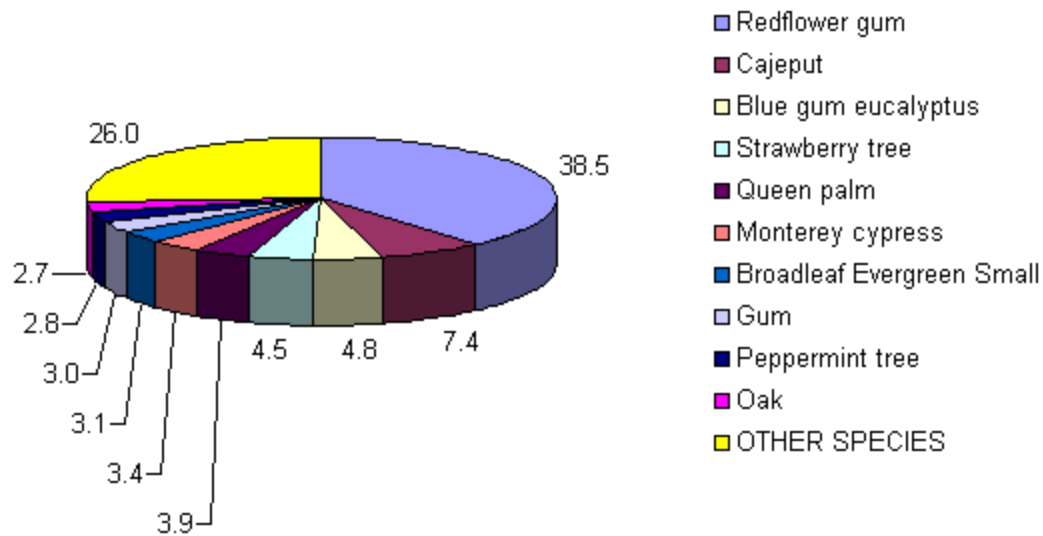
2/4/2013

Species	DBH Class (in)									Total Standard Error
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	
Total	0	0	1	0	0	0	0	0	0	1 (±NaN)
Palm Evergreen Small (PES)										
Queen palm	1	2	12	10	0	1	0	0	0	26
Mexican fan palm	0	0	5	0	0	5	3	0	0	13
PES OTHER	0	1	0	0	0	0	0	0	0	1
Total	1	3	17	10	0	6	3	0	0	40 (±NaN)
Grand Total	61	62	128	138	128	87	30	23	16	673 (±0)

Morro Bay

Species Distribution of All Trees (%)

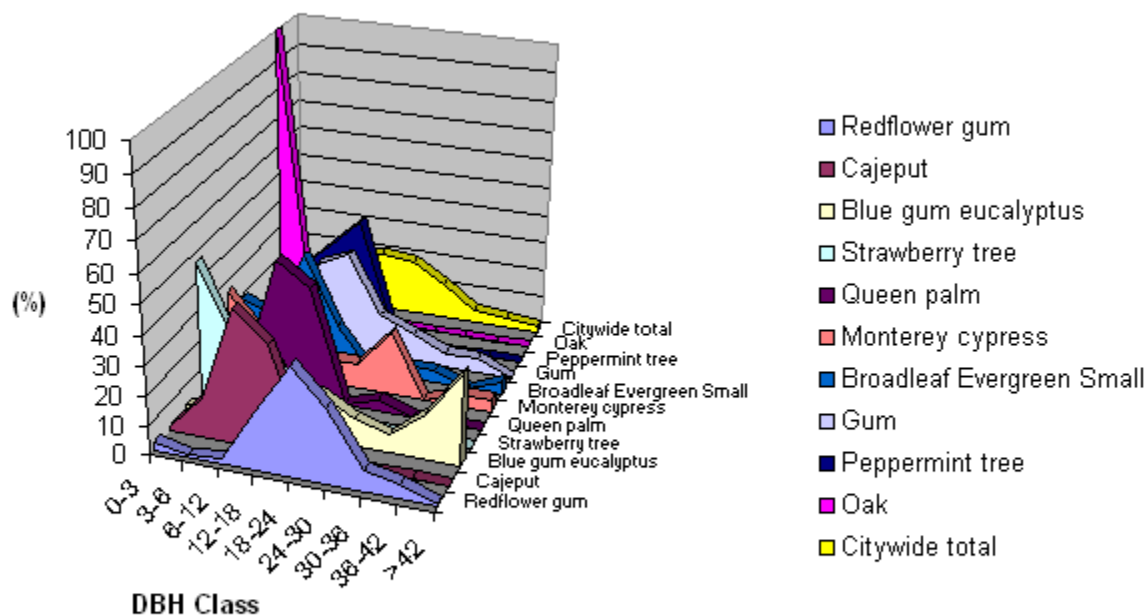
2/4/2013



Species	Percent
Redflower gum	38.5
Cajeput	7.4
Blue gum eucalyptus	4.8
Strawberry tree	4.5
Queen palm	3.9
Monterey cypress	3.4
Broadleaf Evergreen	3.1
Gum	3.0
Peppermint tree	2.8
Oak	2.7
OTHER SPECIES	26.0
Total	100.0

Relative Age Distribution of Top 10 Public Tree Species (%)

2/4/2013



Species	DBH class (in)								
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42
Redflower gum	2.70	0.39	1.54	19.69	37.07	25.48	7.34	5.02	0.77
Cajeput	2.00	14.00	46.00	36.00	2.00	0.00	0.00	0.00	0.00
Blue gum eucalyptus	3.13	3.13	0.00	15.63	15.63	9.38	6.25	15.63	31.25
Strawberry tree	46.67	23.33	23.33	3.33	3.33	0.00	0.00	0.00	0.00
Queen palm	3.85	7.69	46.15	38.46	0.00	3.85	0.00	0.00	0.00
Monterey cypress	26.09	13.04	13.04	8.70	8.70	21.74	0.00	4.35	4.35
Broadleaf Evergreen	19.05	14.29	38.10	14.29	0.00	4.76	4.76	0.00	4.76
Gum	0.00	0.00	30.00	35.00	15.00	10.00	5.00	5.00	0.00
Peppermint tree	0.00	21.05	31.58	42.11	5.26	0.00	0.00	0.00	0.00
Oak	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Citywide total	9.06	9.21	19.02	20.51	19.02	12.93	4.46	3.42	2.38

Morro Bay

Annual CO₂ Benefits of Public Trees by Species

2/4/2013

Species	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Released (\$)	Avoided (lb)	Avoided (\$)	Net Total (lb)	Total Standard (\$ Error)	% of Total Trees	% of Total \$	Avg. \$/tree
Redflower gum	238,345	1,788	-31,993	-30	-240	46,860	351	253,182	1,899 (N/A)	38.5	69.1	7.33
Cajeput	3,355	25	-512	-6	-4	2,118	16	4,954	37 (N/A)	7.4	1.4	0.74
Blue gum eucalyptus	39,688	298	-8,588	-4	-64	7,049	53	38,146	286 (N/A)	4.8	10.4	8.94
Strawberry tree	780	6	-66	-4	-1	995	7	1,705	13 (N/A)	4.5	0.5	0.43
Queen palm	777	6	-172	-3	-1	339	3	941	7 (N/A)	3.9	0.3	0.27
Monterey cypress	3,815	29	-624	-3	-5	2,293	17	5,481	41 (N/A)	3.4	1.5	1.79
Broadleaf Evergreen	1,059	8	-207	-2	-2	1,359	10	2,209	17 (N/A)	3.1	0.6	0.79
Gum	13,047	98	-1,558	-2	-12	2,816	21	14,303	107 (N/A)	3.0	3.9	5.36
Peppermint tree	1,357	10	-143	-2	-1	1,401	11	2,613	20 (N/A)	2.8	0.7	1.03
Oak	207	2	-2	-2	0	66	0	268	2 (N/A)	2.7	0.1	0.11
Red ironbark	7,307	55	-533	-2	-4	1,773	13	8,546	64 (N/A)	2.2	2.3	4.27
Lemon bottlebrush	418	3	-27	-2	0	575	4	964	7 (N/A)	1.9	0.3	0.56
Monterey pine	4,846	36	-919	-2	-7	2,505	19	6,430	48 (N/A)	1.9	1.8	3.71
Victorian box	565	4	-66	-2	-1	369	3	865	6 (N/A)	1.9	0.2	0.50
Mexican fan palm	348	3	-120	-2	-1	303	2	529	4 (N/A)	1.9	0.1	0.31
Willow-leaved gimlet	5,848	44	-464	-1	-3	1,376	10	6,758	51 (N/A)	1.6	1.9	4.61
New zealand christmas	622	5	-89	-1	-1	401	3	932	7 (N/A)	1.6	0.3	0.64
Desert gum eucalyptus	4,558	34	-345	-1	-3	1,101	8	5,313	40 (N/A)	1.5	1.5	3.98
Carrotwood	412	3	-45	-1	0	409	3	774	6 (N/A)	1.2	0.2	0.73
Leyland cypress	1,097	8	-110	-1	-1	937	7	1,923	14 (N/A)	1.2	0.5	1.80
Callery pear	169	1	-8	-1	0	305	2	465	3 (N/A)	1.0	0.1	0.50
OTHER STREET	6,035	45	-704	-6	-5	3,573	27	8,897	67 (N/A)	7.9	2.4	1.26
Citywide total	334,655	2,510	-47,298	-79	-355	78,922	592	366,199	2,747 (N/A)	100.0	100.0	4.08

Morro Bay

Stored CO2 Benefits of Public Trees by Species

2/4/2013

Species	Total Stored CO2 (lbs)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Redflower gum	3,332,603	24,995	(N/A)	38.5	67.6	96.50
Cajeput	53,318	400	(N/A)	7.4	1.1	8.00
Blue gum	894,538	6,709	(N/A)	4.8	18.2	209.66
Strawberry tree	6,919	52	(N/A)	4.5	0.1	1.73
Queen palm	17,922	134	(N/A)	3.9	0.4	5.17
Monterey cypress	65,048	488	(N/A)	3.4	1.3	21.21
Broadleaf	21,580	162	(N/A)	3.1	0.4	7.71
Gum	162,315	1,217	(N/A)	3.0	3.3	60.87
Peppermint tree	14,879	112	(N/A)	2.8	0.3	5.87
Oak	250	2	(N/A)	2.7	0.0	0.10
Red ironbark	55,514	416	(N/A)	2.2	1.1	27.76
Lemon bottlebrush	2,792	21	(N/A)	1.9	0.1	1.61
Monterey pine	95,718	718	(N/A)	1.9	1.9	55.22
Victorian box	6,922	52	(N/A)	1.9	0.1	3.99
Mexican fan palm	12,551	94	(N/A)	1.9	0.3	7.24
Willow-leaved	48,379	363	(N/A)	1.6	1.0	32.99
New zealand	9,315	70	(N/A)	1.6	0.2	6.35
Desert gum	35,905	269	(N/A)	1.5	0.7	26.93
Carrotwood	4,735	36	(N/A)	1.2	0.1	4.44
Leyland cypress	11,479	86	(N/A)	1.2	0.2	10.76
Callery pear	818	6	(N/A)	1.0	0.0	0.88
OTHER STREET	33,287	550	(N/A)	7.9	1.5	10.38
Citywide total	4,926,885	36,952	(N/A)	100.0	100.0	54.91

The value of stored carbon dioxide is calculated as the total amount of carbon dioxide sequestered annually over the life of each tree, summed for the population. This value should not be added to the Replacement Value or double-counting of the carbon dioxide storage benefit will occur.

Morro Bay

Annual Stormwater Benefits of Public Trees by Species

2/4/2013

Species	Total rainfall interception (Gal)	Total (\$)	Standard Error	% of Total Trees	% of Total \$	Avg. \$/tree
Redflower gum	825,234	3,301	(N/A)	38.5	60.0	12.75
Cajeput	38,642	155	(N/A)	7.4	2.8	3.09
Blue gum eucalyptus	153,032	612	(N/A)	4.8	11.1	19.13
Strawberry tree	14,747	59	(N/A)	4.5	1.1	1.97
Queen palm	3,628	15	(N/A)	3.9	0.3	0.56
Monterey cypress	39,870	159	(N/A)	3.4	2.9	6.93
Broadleaf Evergreen Small	23,459	94	(N/A)	3.1	1.7	4.47
Gum	45,611	182	(N/A)	3.0	3.3	9.12
Peppermint tree	23,273	93	(N/A)	2.8	1.7	4.90
Oak	880	4	(N/A)	2.7	0.1	0.20
Red ironbark	24,683	99	(N/A)	2.2	1.8	6.58
Lemon bottlebrush	8,443	34	(N/A)	1.9	0.6	2.60
Monterey pine	47,697	191	(N/A)	1.9	3.5	14.68
Victorian box	5,838	23	(N/A)	1.9	0.4	1.80
Mexican fan palm	3,373	13	(N/A)	1.9	0.3	1.04
Willow-leaved gimlet	19,654	79	(N/A)	1.6	1.4	7.15
New zealand christmas tree	7,288	29	(N/A)	1.6	0.5	2.65
Desert gum eucalyptus	15,446	62	(N/A)	1.5	1.1	6.18
Carrotwood	6,738	27	(N/A)	1.2	0.5	3.37
Leyland cypress	10,949	44	(N/A)	1.2	0.8	5.47
Callery pear	2,272	9	(N/A)	1.0	0.2	1.30
OTHER STREET TREES	54,360	217	(N/A)	7.9	4.0	4.10
Citywide total	1,375,118	5,501	(N/A)	100.0	100.0	8.17

Tree Height for Public Trees by Zone

2/4/2013

Zone	Tree Height	Tree Count	Standard Error	% of Zone	% of Public Trees
1	0'-15'	134	(N/A)	19.91	19.91
	15'-30'	297	(N/A)	44.13	44.13
	30'-45'	177	(N/A)	26.30	26.30
	45'-60'	19	(N/A)	2.82	2.82
	60'+	35	(N/A)	5.20	5.20
	N/A	11	(N/A)	1.63	1.63
	Total	673	(N/A)	100.00	100.00
Citywide	0'-15'	134	(N/A)	19.91	19.91
	15'-30'	297	(N/A)	44.13	44.13
	30'-45'	177	(N/A)	26.30	26.30
	45'-60'	19	(N/A)	2.82	2.82
	60'+	35	(N/A)	5.20	5.20
	N/A	11	(N/A)	1.63	1.63
	Total	673	(N/A)	100.00	100.00

APPENDIX 2

Soils

(North Morro Bay)



Soil Map—San Luis Obispo County, California, Coastal Part
(North Morro Bay)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot



Very Stony Spot



Wet Spot



Other

Special Line Features



Gully



Short Steep Slope



Other

Political Features



Cities

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads

MAP INFORMATION

Map Scale: 1:24,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

Date(s) aerial images were photographed: 6/6/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Map Unit Legend

San Luis Obispo County, California, Coastal Part (CA664)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
107	Beaches	71.7	2.6%
110	Briones-Tierra complex, 15 to 50 percent slopes	34.2	1.3%
120	Concepcion loam, 2 to 5 percent slopes	199.6	7.3%
127	Cropley clay, 0 to 2 percent slopes	6.2	0.2%
128	Cropley clay, 2 to 9 percent slopes	227.3	8.3%
129	Diablo clay, 5 to 9 percent slopes	5.8	0.2%
130	Diablo and Cibo clays, 9 to 15 percent slopes	83.7	3.1%
131	Diablo and Cibo clays, 15 to 30 percent slopes	81.2	3.0%
132	Diablo and Cibo clays, 30 to 50 percent slopes	148.7	5.5%
133	Diablo-Lodo complex, 15 to 50 percent slopes	64.8	2.4%
134	Dune land	176.4	6.5%
142	Gaviota fine sandy loam, 15 to 50 percent slopes	69.6	2.6%
148	Lodo clay loam, 15 to 30 percent slopes	53.2	2.0%
149	Lodo clay loam, 30 to 50 percent slopes	100.1	3.7%
150	Lodo clay loam, 50 to 75 percent slopes	7.6	0.3%
156	Lopez very shaly clay loam, 30 to 75 percent slopes	33.3	1.2%
160	Los Osos loam, 15 to 30 percent slopes	39.8	1.5%
161	Los Osos loam, 30 to 50 percent slopes	98.5	3.6%
164	Los Osos-Diablo complex, 15 to 30 percent slopes	6.6	0.2%
165	Los Osos-Diablo complex, 30 to 50 percent slopes	72.8	2.7%
170	Marimel silty clay loam, drained	49.3	1.8%
178	Nacimiento silty clay loam, 30 to 50 percent slopes	10.5	0.4%
183	Obispo-Rock outcrop complex, 15 to 75 percent slopes	115.4	4.2%
192	Psamments and Fluvents, occasionally flooded	156.9	5.8%
198	Salinas silty clay loam, 2 to 9 percent slopes	112.6	4.1%
223	Xerorthents, escarpment	2.8	0.1%
Subtotals for Soil Survey Area		2,028.9	74.5%
Totals for Area of Interest		2,723.5	100.0%

(South Morro Bay)



Map Scale: 1:25,200 if printed on A size (8.5" x 11") sheet.



Soil Map—San Luis Obispo County, California, Coastal Part
(South Morro Bay)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot



Very Stony Spot



Wet Spot



Other

Special Line Features



Gully



Short Steep Slope



Other

Political Features



Cities

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads

MAP INFORMATION

Map Scale: 1:25,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

Date(s) aerial images were photographed: 6/6/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Map Unit Legend

San Luis Obispo County, California, Coastal Part (CA664)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
101	Aquolls, saline	105.3	3.2%
104	Baywood fine sand, 2 to 9 percent slopes	493.6	15.1%
105	Baywood fine sand, 9 to 15 percent slopes	462.7	14.2%
106	Baywood fine sand, 15 to 30 percent slopes	11.8	0.4%
107	Beaches	40.6	1.2%
109	Briones-Pismo loamy sands, 9 to 30 percent slopes	7.7	0.2%
110	Briones-Tierra complex, 15 to 50 percent slopes	41.1	1.3%
128	Cropley clay, 2 to 9 percent slopes	56.7	1.7%
129	Diablo clay, 5 to 9 percent slopes	177.6	5.4%
130	Diablo and Cibo clays, 9 to 15 percent slopes	54.2	1.7%
131	Diablo and Cibo clays, 15 to 30 percent slopes	276.3	8.5%
132	Diablo and Cibo clays, 30 to 50 percent slopes	45.2	1.4%
134	Dune land	231.7	7.1%
141	Gaviota sandy loam, 50 to 75 percent slopes	74.1	2.3%
148	Lodo clay loam, 15 to 30 percent slopes	8.7	0.3%
149	Lodo clay loam, 30 to 50 percent slopes	2.5	0.1%
158	Los Osos loam, 5 to 9 percent slopes	19.7	0.6%
160	Los Osos loam, 15 to 30 percent slopes	44.4	1.4%
161	Los Osos loam, 30 to 50 percent slopes	16.7	0.5%
183	Obispo-Rock outcrop complex, 15 to 75 percent slopes	13.9	0.4%
192	Psamments and Fluvents, occasionally flooded	180.0	5.5%
195	Rock outcrop-Lithic Haploxerolls complex, 30 to 75 percent slopes	139.0	4.3%
197	Salinas silty clay loam, 0 to 2 percent slopes	61.1	1.9%
223	Xerorthents, escarpment	0.3	0.0%
226	Zaca clay, 30 to 50 percent slopes	18.0	0.6%
228	Water	361.8	11.1%
Subtotals for Soil Survey Area		2,944.5	90.3%
Totals for Area of Interest		3,259.6	100.0%

San Luis Obispo County, California, Coastal Part

104—Baywood fine sand, 2 to 9 percent slopes

Map Unit Setting

Elevation: 0 to 500 feet

Mean annual precipitation: 15 to 20 inches

Mean annual air temperature: 57 degrees F

Frost-free period: 325 to 350 days

Map Unit Composition

Baywood and similar soils: 85 percent

Minor components: 12 percent

Description of Baywood

Setting

Landform: Dunes

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Talf

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Eolian sands

Properties and qualities

Slope: 2 to 9 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): 3s

Land capability (nonirrigated): 6e

Ecological site: SANDY (R014XD059CA)

Typical profile

0 to 36 inches: Fine sand

36 to 90 inches: Fine sand

Minor Components

Oceano sand

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 3 percent

Baywood/concepcion

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

105—Baywood fine sand, 9 to 15 percent slopes

Map Unit Setting

Elevation: 0 to 500 feet

Mean annual precipitation: 15 to 20 inches

Mean annual air temperature: 57 degrees F

Frost-free period: 325 to 350 days

Map Unit Composition

Baywood and similar soils: 85 percent

Minor components: 12 percent

Description of Baywood

Setting

Landform: Dunes

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Talf

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Eolian sands

Properties and qualities

Slope: 9 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): 3s

Land capability (nonirrigated): 6e

Ecological site: SANDY (R014XD059CA)

Typical profile

0 to 36 inches: Fine sand

36 to 90 inches: Fine sand

Minor Components

Oceano sand

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 3 percent

Capistrano sandy loam

Percent of map unit: 3 percent

Fine sand over loam soil

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

106—Baywood fine sand, 15 to 30 percent slopes

Map Unit Setting

Elevation: 0 to 500 feet

Mean annual precipitation: 15 to 20 inches

Mean annual air temperature: 57 degrees F

Frost-free period: 325 to 350 days

Map Unit Composition

Baywood and similar soils: 85 percent

Minor components: 12 percent

Description of Baywood

Setting

Landform: Dunes

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Talf

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Eolian sands

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability (nonirrigated): 6e

Ecological site: SANDY (R014XD059CA)

Typical profile

0 to 36 inches: Fine sand

36 to 90 inches: Fine sand

Minor Components

Oceano sand

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 3 percent

Capistano sandy loam

Percent of map unit: 3 percent

Garcy

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

120—Concepcion loam, 2 to 5 percent slopes

Map Unit Setting

Elevation: 10 to 800 feet

Mean annual precipitation: 17 to 24 inches

Mean annual air temperature: 57 degrees F

Frost-free period: 300 to 330 days

Map Unit Composition

Concepcion and similar soils: 85 percent

Minor components: 12 percent

Description of Concepcion

Setting

Landform: Terraces

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from sedimentary rock

Properties and qualities

Slope: 2 to 5 percent

Depth to restrictive feature: 10 to 21 inches to abrupt textural change

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability (nonirrigated): 3e

Ecological site: LOAMY CLAYPAN (R014XD105CA)

Typical profile

0 to 19 inches: Loam

19 to 47 inches: Clay

47 to 63 inches: Sandy clay loam

Minor Components

Cropley clay

Percent of map unit: 3 percent

Los osos loam

Percent of map unit: 3 percent

Tierra loam

Percent of map unit: 3 percent

San simeon sandy loam

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

128—Cropley clay, 2 to 9 percent slopes

Map Unit Setting

Elevation: 100 to 700 feet

Mean annual precipitation: 14 to 20 inches

Mean annual air temperature: 57 degrees F

Frost-free period: 250 to 330 days

Map Unit Composition

Cropley and similar soils: 85 percent

Minor components: 6 percent

Description of Cropley

Setting

Landform: Alluvial flats, alluvial fans

Landform position (two-dimensional): Toeslope, footslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from sedimentary rock

Properties and qualities

Slope: 2 to 9 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water

(Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): 2s

Land capability (nonirrigated): 3s

Ecological site: CLAYEY (R014XD001CA)

Typical profile

0 to 36 inches: Clay

36 to 60 inches: Silty clay loam

Minor Components

Los osos loam

Percent of map unit: 3 percent

Salinas silty clay loam

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

129—Diablo clay, 5 to 9 percent slopes

Map Unit Setting

Elevation: 200 to 600 feet

Mean annual precipitation: 14 to 25 inches

Mean annual air temperature: 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Diablo and similar soils: 85 percent

Minor components: 6 percent

Description of Diablo

Setting

Landform: Hills

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Crest, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from mudstone, sandstone
and/or shale

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: 45 to 58 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water

(Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability (nonirrigated): 3e

Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 38 inches: Clay

38 to 58 inches: Clay

58 to 62 inches: Weathered bedrock

Minor Components

Cropley clay

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

129—Diablo clay, 5 to 9 percent slopes

Map Unit Setting

Elevation: 200 to 600 feet

Mean annual precipitation: 14 to 25 inches

Mean annual air temperature: 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Diablo and similar soils: 85 percent

Minor components: 6 percent

Description of Diablo

Setting

Landform: Hills

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Crest, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from mudstone, sandstone
and/or shale

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: 45 to 58 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water

(Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability (nonirrigated): 3e

Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 38 inches: Clay

38 to 58 inches: Clay

58 to 62 inches: Weathered bedrock

Minor Components

Cropley clay

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

130—Diablo and Cibo clays, 9 to 15 percent slopes

Map Unit Setting

Elevation: 200 to 600 feet

Mean annual precipitation: 14 to 25 inches

Mean annual air temperature: 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Cibo and similar soils: 45 percent

Diablo and similar soils: 45 percent

Minor components: 3 percent

Description of Diablo

Setting

Landform: Hills

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from mudstone, sandstone
and/or shale

Properties and qualities

Slope: 9 to 15 percent

Depth to restrictive feature: 45 to 58 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water

(Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability (nonirrigated): 3e

Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 38 inches: Clay

38 to 58 inches: Clay

58 to 62 inches: Weathered bedrock

Description of Cibo

Setting

Landform: Hills

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from metasedimentary rock

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability (nonirrigated): 3e
Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 31 inches: Clay
31 to 39 inches: Clay
39 to 43 inches: Unweathered bedrock

Minor Components

Zaca soils

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part
Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

131—Diablo and Cibo clays, 15 to 30 percent slopes

Map Unit Setting

Elevation: 200 to 3,000 feet

Mean annual precipitation: 14 to 28 inches

Mean annual air temperature: 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Cibo and similar soils: 45 percent

Diablo and similar soils: 45 percent

Minor components: 8 percent

Description of Diablo

Setting

Landform: Hills, mountains

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountainflank, side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex

Parent material: Residuum weathered from mudstone, sandstone and/or shale

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: 45 to 58 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability (nonirrigated): 4e

Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 38 inches: Clay

38 to 58 inches: Clay

58 to 62 inches: Weathered bedrock

Description of Cibo

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountainflank, side slope, crest

Down-slope shape: Linear, convex

Across-slope shape: Convex

Parent material: Residuum weathered from metasedimentary rock

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability (nonirrigated): 4e

Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 31 inches: Clay

31 to 39 inches: Clay

39 to 43 inches: Unweathered bedrock

Minor Components

Lodo clay loam

Percent of map unit: 2 percent

Los osos loam

Percent of map unit: 2 percent

Zaca clay

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 2 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

132—Diablo and Cibo clays, 30 to 50 percent slopes

Map Unit Setting

Elevation: 200 to 3,000 feet

Mean annual precipitation: 14 to 28 inches

Mean annual air temperature: 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Cibo and similar soils: 45 percent

Diablo and similar soils: 45 percent

Minor components: 9 percent

Description of Diablo

Setting

Landform: Hills, mountains

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountainflank, crest, side slope

Down-slope shape: Convex, linear

Across-slope shape: Convex

Parent material: Residuum weathered from mudstone, sandstone and/or shale

Properties and qualities

Slope: 30 to 50 percent

Depth to restrictive feature: 45 to 58 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water capacity: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e

Land capability (nonirrigated): 6e

Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 38 inches: Clay

38 to 58 inches: Clay

58 to 62 inches: Weathered bedrock

Description of Cibo

Setting

Landform: Hills, mountains

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountainflank, crest, side
slope

Down-slope shape: Convex, linear

Across-slope shape: Convex

Parent material: Residuum weathered from metasedimentary rock

Properties and qualities

Slope: 30 to 50 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 6e

Land capability (nonirrigated): 6e

Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 31 inches: Clay

31 to 39 inches: Clay

39 to 43 inches: Unweathered bedrock

Minor Components

Lodo clay loam

Percent of map unit: 3 percent

Los osos loam

Percent of map unit: 3 percent

Rock outcrop

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

134—Dune land

Map Unit Composition

Dune land: 90 percent

Minor components: 9 percent

Description of Dune Land

Setting

Landform: Dunes

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Interpretive groups

Land capability classification (irrigated): 8e

Land capability (nonirrigated): 8e

Typical profile

0 to 6 inches: Fine sand

6 to 60 inches: Fine sand

Minor Components

Baywood

Percent of map unit: 3 percent

Capistrano soils

Percent of map unit: 3 percent

Beaches

Percent of map unit: 3 percent

Landform: Beaches

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

158—Los Osos loam, 5 to 9 percent slopes

Map Unit Setting

Elevation: 100 to 2,000 feet

Mean annual precipitation: 15 to 25 inches

Mean annual air temperature: 55 to 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Los osos and similar soils: 85 percent

Minor components: 14 percent

Description of Los Osos

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountaintop, crest, side slope

Down-slope shape: Convex

Across-slope shape: Linear, convex

Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability (nonirrigated): 3e

Ecological site: LOAMY CLAYPAN (R015XD049CA)

Typical profile

0 to 14 inches: Loam

14 to 32 inches: Clay

32 to 39 inches: Sandy loam, loam, clay loam

39 to 43 inches: Weathered bedrock

Minor Components

Cibo clay

Percent of map unit: 2 percent

Diablo clay

Percent of map unit: 2 percent

Gazos clay loam

Percent of map unit: 2 percent

Lodo clay loam

Percent of map unit: 2 percent

Millsap loam

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 2 percent

Unnamed

Percent of map unit: 2 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

160—Los Osos loam, 15 to 30 percent slopes

Map Unit Setting

Elevation: 100 to 3,000 feet

Mean annual precipitation: 15 to 35 inches

Mean annual air temperature: 55 to 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Los osos and similar soils: 85 percent

Minor components: 15 percent

Description of Los Osos

Setting

Landform: Hills, ridges

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountaintop, crest, side slope

Down-slope shape: Convex

Across-slope shape: Convex, linear

Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e

Land capability (nonirrigated): 6e

Ecological site: LOAMY CLAYPAN (R015XD049CA)

Typical profile

0 to 14 inches: Loam

14 to 32 inches: Clay

32 to 39 inches: Sandy loam

39 to 43 inches: Weathered bedrock

Minor Components

Cibo clay

Percent of map unit: 2 percent

Diablo clay

Percent of map unit: 2 percent

Gazos clay loam

Percent of map unit: 2 percent

Lodo clay loam

Percent of map unit: 2 percent

Millsap loam

Percent of map unit: 2 percent

Lompico

Percent of map unit: 2 percent

Mcmullin

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 1 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part
Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

161—Los Osos loam, 30 to 50 percent slopes

Map Unit Setting

Elevation: 100 to 3,000 feet

Mean annual precipitation: 15 to 35 inches

Mean annual air temperature: 55 to 59 degrees F

Frost-free period: 275 to 350 days

Map Unit Composition

Los osos and similar soils: 85 percent

Minor components: 14 percent

Description of Los Osos

Setting

Landform: Hills, ridges

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountaintop, crest, side slope

Down-slope shape: Convex

Across-slope shape: Convex, linear

Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 30 to 50 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): 7e

Land capability (nonirrigated): 7e

Ecological site: LOAMY CLAYPAN (R015XD049CA)

Typical profile

0 to 14 inches: Loam

14 to 32 inches: Clay

32 to 39 inches: Sandy loam

39 to 43 inches: Weathered bedrock

Minor Components

Cibo clay

Percent of map unit: 2 percent

Diablo clay

Percent of map unit: 2 percent

Gazos clay loam

Percent of map unit: 2 percent

Lodo clay loam

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 2 percent

Lompico

Percent of map unit: 2 percent

Mcmullin

Percent of map unit: 2 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

183—Obispo-Rock outcrop complex, 15 to 75 percent slopes

Map Unit Setting

Elevation: 200 to 4,000 feet

Mean annual precipitation: 8 to 35 inches

Mean annual air temperature: 45 to 57 degrees F

Frost-free period: 110 to 350 days

Map Unit Composition

Obispo and similar soils: 50 percent

Rock outcrop: 30 percent

Minor components: 20 percent

Description of Obispo

Setting

Landform: Mountain slopes, ridges

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank, mountaintop

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Residuum weathered from serpentinite

Properties and qualities

Slope: 15 to 75 percent

Depth to restrictive feature: 8 to 20 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): 7e

Land capability (nonirrigated): 7e

Ecological site: SHALLOW CLAYEY SERPENTINE
(R015XD146CA)

Typical profile

0 to 11 inches: Clay

11 to 18 inches: Weathered bedrock

18 to 22 inches: Unweathered bedrock

Description of Rock Outcrop

Setting

Landform: Hills

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex

Across-slope shape: Convex

Properties and qualities

Slope: 15 to 75 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): 8

Land capability (nonirrigated): 8

Typical profile

0 to 60 inches: Unweathered bedrock

Minor Components

Diablo clay

Percent of map unit: 7 percent

Henneke clay loam

Percent of map unit: 7 percent

Unnamed

Percent of map unit: 6 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

San Luis Obispo County, California, Coastal Part

192—Psamments and Fluvents, occasionally flooded

Map Unit Setting

Elevation: 10 to 1,500 feet

Mean annual precipitation: 14 to 25 inches

Mean annual air temperature: 57 degrees F

Frost-free period: 275 to 325 days

Map Unit Composition

Fluvents and similar soils: 45 percent

Psamments and similar soils: 45 percent

Minor components: 10 percent

Description of Psamments

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 4w

Land capability (nonirrigated): 6w

Typical profile

0 to 12 inches: Sand

12 to 48 inches: Sand

48 to 60 inches: Stratified gravelly sand to gravelly loamy sand

Description of Fluvents

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 4w

Land capability (nonirrigated): 6w

Typical profile

0 to 12 inches: Loamy sand

12 to 48 inches: Loamy sand

48 to 60 inches: Stratified gravelly sand to gravelly loamy sand

Minor Components

Riverwash

Percent of map unit: 2 percent

Landform: Drainageways

Unnamed

Percent of map unit: 2 percent

Landform: Depressions

Unnamed

Percent of map unit: 2 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Corralitos

Percent of map unit: 2 percent

Tujunga

Percent of map unit: 2 percent

Data Source Information

Soil Survey Area: San Luis Obispo County, California, Coastal Part

Survey Area Data: Version 4, Jan 2, 2008

APPENDIX 3

Tree Care Guidelines

Irrigation Guidelines for Establishing Young Trees

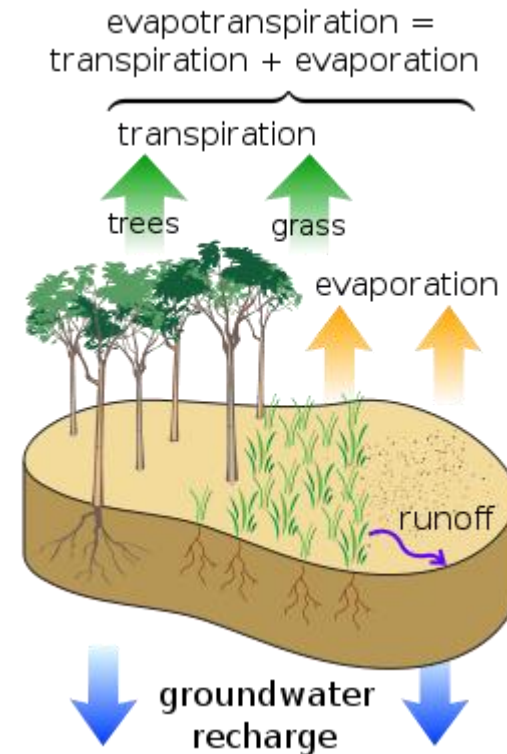
Plant health and vigorous growth are important for young trees to quickly fulfill their landscape purposes. The amount of water that might be saved by being frugal is not worth the possible result of reduced growth or even death. New plantings require more frequent watering (especially at the rootball) until they develop established root systems. Be cautious when transitioning to minimum irrigation because plants must adapt to lower soil moisture conditions.

Shallow watering encourages surface rooting, which makes the tree more vulnerable to drying out during periods of drought. Infrequent, deep soakings encourage the production of a deeper root system and more drought-tolerant trees. If the soil is allowed to dry between irrigations, natural shrinking and swelling improves soil structure. Conversely, frequent, shallow irrigation tends to compact the soil surface and reduce the rate of water infiltration.

Water should be distributed evenly to as much of the root system as possible. Watering the lower trunk (root collar) should be avoided because it can lead to increased fungal decay problems for the tree. Topography affects water distribution. Soil tends to dry faster on hills, while water may accumulate in valleys and low areas. The water application rate should not exceed the soil infiltration rate. If water is applied too quickly, runoff can cause erosion problems and reduced infiltration. Ponding or runoff that results from high application rates wastes water and can be detrimental to root growth and function.

Understanding Soil/Plant/Water Relationships

Plant and soil water loss (evapotranspiration, or ET) are commonly used to schedule irrigations and to indicate how much water to apply. ET rates are dependent on environmental conditions, including light, temperature, wind, and humidity. The California Irrigation Management Information System (CIMIS) supplies this information (<http://www.cimis.water.ca.gov/cimis/welcome.jsp>), and your organization may already subscribe to it.



Irrigation Guidelines for Establishing Young Trees

Variations in the weather and length of day, adequacy of previous irrigation or rainfall, depth and spread of roots, and size of the tree top affect the moisture requirements. Besides measuring ET, you can employ some hands-on techniques.

Observe the trees. Most plants wilt noticeably when too little water is available. Leaves that were once shiny become dull, and bright green leaves turn gray-green. You do not want your trees to reach this level of stress.

Feel the soil. With experience, the moisture content can be estimated by the feel of the soil provided it is representative of the site. Collect a sample with a soil probe or shovel. To estimate moisture adequacy, roll or squeeze small sample of soil into a ball. If the soil will not mold into a ball, it is too dry to supply adequate water to plants. If the ball formed will not crumble when rubbed, the soil is too wet. If it can be molded into a ball that will crumble when rubbed, the moisture is probably about right. Sandy soils, however, will crumble even when wet.

Soil moisture sensors, such as tensiometers, can also be used to determine irrigation needs.

By the end of the first year, if the trees are growing vigorously, you may be able to reduce the amount of water applied by 15 to 20 percent, but some trees still may require irrigation on this same schedule.

Container material is the most common type of nursery stock in California, however bare root tree stock in the winter is a good alternative when appropriate.

Selecting Quality Container Nursery Stock

Trees should meet the following minimum standards. Trees that do not meet these requirements should be rejected. Tree planting specifications for selection of quality tree stock should be as follows:

- All trees should be true to type or botanical name as ordered or shown on planting plans or contract orders.
- All trees should have a single, relatively straight trunk with a good taper and branch distribution vertically, laterally and radially with a live crown ratio (distance from bottom of canopy to tree top/tree height) of at least sixty percent (60%). All branches in the canopy should be less than two-third (2/3) the trunk diameter and free of included bark. The trunk and main branches should be free of wounds except for properly made pruning cuts, damaged areas, conks, bleeding and signs of insects or disease.
- All trees should be healthy, have a form typical for the species or cultivar, and be well-rooted and pruned as appropriate for the species.
- All trees should have sufficient trunk diameter and taper so that it can remain vertical without the support of a nursery stake within six months.
- The root ball of all trees should be moist throughout and the crown should show no sign of moisture stress.

Individual tree specifications are as follows:

- The tree should be well rooted in the soil mix. The point where the topmost root in the root ball emerges from the trunk should be visible at the soil surface of the root ball. When the container is removed, the root ball should remain intact. When the tree is lifted, the trunk and root system should move as one.
- All trees should comply with federal and state laws requiring inspection for plant diseases and pest infestations.
- No tree should be accepted that has been severely topped, headed back or lion-tailed.
- No tree should be accepted with co-dominant stems or excessive weak branch attachments that cannot be correctively pruned without jeopardizing the natural form of the species.
- No tree should be accepted that is root bound, shows evidence of girdling or kinking roots, or has roots protruding above the soil (a.k.a. “knees”).
- No tree should be accepted that has roots greater than one-fifth (1/5) the size of the trunk diameter growing out of the bottom of the container.

Planting Specifications

General

The City of Morro Bay shall be the responsible authority for determining the appropriate species or variety of trees planted within the public rights-of-way or easements.

Specific Planting Policies

- a. Trees shall be planted in conformance with the approved master plan and in accordance with Public Services Engineering Standard Specifications.
- b. A minimum of one street tree shall be planted per lot. Property with frontage of 65 feet or more shall have trees planted at an average maximum spacing of 35 feet (tree to tree) on center. The actual number of trees and spacing for planting will be based on the established canopy width of the designated species as approved by the (department name). To preserve the integrity of the street pattern, where site constraints preclude planting of a street tree within the right-of-way trees may be planted on private property in those instances where an easement for that purpose has been provided.
- c. Property owners may plant trees at the owner's expense in accordance with Department

standards and subject to prior written approval of the Department.

- d. Planting of street trees shall be required at the time the property abutting the right-of-way is developed. The owner of the abutting property shall be responsible for the costs of furnishing, installing and providing a minimum of the first two years of maintenance for all street tree plantings.
- e. To maximize the square footage of tree canopy and its benefit to the City, all new and redeveloped properties both residential and commercial shall be required to provide funding for public trees. Fees are established by the City Council. The City through its (contractor or in house staff) will schedule planting of the street trees on or before the time occupancy permits are issued.
- f. The Department within 120 days of removal shall replace trees removed by the Department. If possible, no trees will be planted by the City between June 1st and September 30th.
- g. Tree removal through a permit by other agencies shall be subject to both a mitigation and replacement fee and shall be replaced by the City's (dept. responsible) within 120 days. If possible no trees will be planted by the city between June 1st and September 30th.

Planting Specifications

- h.** Watering of all street trees within the City shall be the responsibility of the abutting property owner, except in reverse frontage and median strips that are maintained by the city. The Department is responsible for all other maintenance after completion of the maintenance period and the written acceptance by the Department.
 - i.** Trees shall not be required to be planted in street right-of-way abutting undeveloped property. If the property owner desires to plant the street right-of-way abutting the owner's undeveloped property, the owner must provide an automatic irrigation system and shall be responsible for the cost of installation and maintenance. The Director may require the posting of a bond of a sufficient amount to guarantee the installation and care of the appropriate improvements.
 - j.** When the sidewalk is located next to the curb, the trees shall be planted a minimum of one foot from the right-of-way line within the public street right-of-way line or easement. Where right-of-way is not available adjacent to the sidewalk, the trees should be planted in easements behind the sidewalk whenever possible. When a tree well in the sidewalk is the only possible solution, a tree will be selected that will not cause or result in long-range curb and or sidewalk damage.
- B.** In the interest of public safety and maintenance trees shall be planted:
 - a.** A minimum distance from the intersection to provide adequate sight distance. Minimum distance shall be 30 feet from beginning of curve at the curb return, except at secondary and arterial streets; the minimum shall be 50 feet.
 - b.** Five (5) feet minimum from fire hydrants, service walks and driveways.
 - c.** Ten (10) feet minimum from sewer laterals, other utility services laterals and water meters.
 - d.** Fifteen (15) feet minimum from lamp standards.
 - e.** With consideration given to those varieties of trees that will not create a conflict with existing overhead electric utility lines.
 - f.** All trees, other than palm trees, shall be planted a minimum 15-gallon size in residential areas and 24" box size in commercial areas. A 15-gallon or 24" box is defined/determined by the American Association of Nurserymen. Smaller/larger sizes may be permitted/required by the City if warranted.

Planting Specifications

- g.** All newly planted trees shall have the nursery stakes removed and replaced with others per Department standards.
- h.** All staked trees shall be inspected twice a year and the stakes are to be adjusted or removed as necessary.
- i.** All trees planted in tree wells shall be installed and irrigated in a manner to promote deep rooting per Department standards. All trees in wells shall be installed with an automatic irrigation system.

Tree Planting Procedures

Percolation and Soil Fertility

Prior to planting the following procedure should be followed:

- Check the soil type and structure. If the soil is compacted, then it should be physically cultivated and have organic material added. Tree should be selected to match the soil type.

Sites for New Street Trees

Typically street trees will be planted where there is an existing vacancy that is unoccupied, as a replacement tree, or if there is a break in the established street tree pattern that should be filled.

Street trees will not be approved for planting under the following conditions:

- The tree would interfere with the growth of other trees in the area.
- The vacant tree well site is overshadowed by other trees nearby creating an unsuitable growing condition for the proposed new tree.
- Utility meters are in the way.
- The tree could block scenic views or views of oncoming traffic.

Street Tree Spacing

The following guidelines shall be followed when planting new street trees. The standard street tree spacing is as follows:

- 30-35 feet on center
- 30 feet from the corner property line

- 20-25 feet on center for smaller statured trees
- 10 feet from driveway approaches
- 10 feet from light poles
- 5 feet from utility meter boxes
- 1 tree per 50feet of property frontage

Planting Procedures

- All planting locations shall be checked for underground conflicts. It is mandatory that Dig Alert is notified to detect all underground utilities prior to any digging.
- Dig planting holes 2-3 times as wide as the container. The depth of the planting pit shall be equal to the size of the rootball. Place the tree in the planting pit so the trunk flare or the top of the rootball is at least one-half inch to 1 inch (1/2" to 1") above finish grade. In grass covered parkways the top of the rootball shall be higher than the surrounding soil by one-half inch to one inch (1/2" to 1"). In a concrete tree well, the rootball shall be one inch (1") above the level of the finished surface of the surrounding concrete.
- When obtaining a tree from a nursery, always carry the tree by its container or rootball, never by the trunk.
- After removing the tree from the container, cut circling roots and matted roots off the bottom. Check for any circling roots missed during initial inspection. Any roots less than one-third (1/3) the size of the trunk shall be removed with a sharp pruning tool.
- Before placing the tree in the planting pit, examine the root ball for injured roots and the canopy for broken branches. Damaged roots shall be cleanly cut off at a point

Tree Planting Procedures

just in front of the break. Broken branches shall be cut out of the canopy making sure that the branch collar is not damaged.

- Backfill with soil removed from the planting hole. Only add fertilizer or compost if soil analysis indicates it is required. Build a temporary four to six inches (4" to 6") water retention berm around the root ball to allow for establishment watering. Immediately after planting the tree, water it thoroughly by filling the water retention basin twice.
- Eliminate all air pockets while backfilling the planting pit by watering the soil as it is put into the hole. Do not compact the backfill by tamping it down.
- All trees shall be staked with two wooden lodge poles and two ties per pole. The minimum diameter of a lodge pole is two inches (2"), but may be larger for 36" and 48" box trees. Place the tree ties at one-third (1/3) and two-third (2/3) of the trunk height. Drive the stake into the ground approximately twenty-four to thirty inches (24" to 30") below grade making sure not to penetrate the root ball.
- Mulch with a two to four inch (2" to 4") layer of mulch where appropriate to conserve soil moisture, provide protection from extreme temperatures and prevent damage from weed eaters. Mulch shall be kept three to four inches (3" to 4") away from the tree trunk and shall extend at minimum to the boundary of the water retention basin. It may extend further if desired.
- The soil around the new tree shall be kept moist, but not saturated, by watering at least once a week during the cooler winter months and twice a week during the hot summer months.

Tree Planting by Residents

Residents are allowed to plant the approved designated street tree in a parkway or tree well. Residents may plant any size tree they choose however the minimum size acceptable to the City will be in a 15-gallon container. Tree planting may only be done after obtaining a permit issued by the Public Services Department. The City will request that the resident water the tree for the first year to ensure the will survive. The tree will then be incorporated into the City's tree inventory and become the City's responsibility to maintain.

Tree Preservation Guidelines

Trees are an essential element of Morro Bay's image and quality of life. Hardscape elements, such as sidewalks, curbs, gutters, and driveways are also indicative of the City of Morro Bay's commitment to maintain its infrastructure. Over the years, broken and damaged sidewalks, curbs, and gutters and driveways will have to be replaced throughout the City as a result, many trees will be involved. Whenever possible, curbs, gutters, and sidewalks should be meandered away from the tree thereby providing more growing space for roots. Trees will probably also be impacted during new construction and need to be protected. To manage this process and protect existing trees, the following guidelines have been established:

1. Root Pruning

- a.** Whenever sidewalk, curb gutter or driveway replacements occurs within four feet of a tree, the site will be inspected by an Arborist for tree impact assessment. Root pruning may be performed on any tree that a certified arborist in coordination with the Recreation and Parks Department determines can be safely performed without jeopardizing the life of the tree.
- b.** All roots greater than two (2) two inches in diameter must be cleanly cut to encourage good callus tissue. It is recommended that roots be pruned back to the next root node.

2. Sidewalk Renovation

Trees that would be seriously impacted by root pruning during sidewalk replacements will be inspected by a certified arborist in coordination with the Recreation and Parks Department to determine whether:

- a.** The repair work can be deferred and a temporary asphalt patch used to eliminate any hazard until other steps can be reviewed and implemented.
- b.** The tree can be saved by narrowing the sidewalk near the tree, while still leaving sufficient sidewalk width for disabled access. Standard disability access width is four (4) feet with variances given to 38 inches where absolutely necessary.
- c.** Relocating the sidewalk onto private property and negotiating the appropriate easement with the adjacent property owner can save the tree.
- d.** The tree can be saved by replacing the sidewalk with minimal disruption of the roots (alternatives: a temporary asphalt sidewalk; rubberized sidewalk; use of root barrier fabric; raising the grade over the roots; and immoral walkway; or other options).

Tree Preservation Guidelines

- e. To remove the tree and replace it with a minimum 24" boxed replacement tree.

3. Curb and Gutter Replacement

Trees that would be seriously impacted by root pruning during curb/gutter replacement will be inspected by a certified arborist in coordination with the Recreation and Parks Department to determine whether:

- a. The repair work can be deferred if it does not create drainage problems or otherwise increase street maintenance unnecessarily and is not a hazard.
- b. The tree can be saved by relocating the curb and gutter into the street at least one foot (ideally two (2) to six (6) feet), thereby narrowing the street width, which in effect may cause the elimination of some street parking.
- c. Where six or more trees along one side of a block are severely affected, consideration is to be given to relocating the curb and gutter into the street along the entire block.
- d. The tree can be saved by replacing the curb and gutter with minimal disruption of the roots (alternatives: temporary asphalt curb and

gutter, use of root barrier fabric: or other similar options).

4. Recovery Period

When significant root pruning on two sides of a tree is required, there will be a 24-month separation between sidewalk and curb/gutter repair to allow time for the tree roots to recover. An exception to this policy may be made if the curb/gutter or sidewalk is relocated away from the tree or other measures are employed that reduce or eliminate root involvement or it is otherwise determined by the (responsible party, department etc.) that the root involvement is minimal.

5. Construction Projects

The following guidelines have been developed to protect trees on City property during construction projects:

- a. A root protection zone shall be defined by a minimum 42" high barrier constructed around any potentially impacted tree. This barrier shall be at the drip line or at a distance from the trunk equal to 6 inches for each inch of trunk diameter 4.5 feet above the ground if this method defines a larger area.

Tree Preservation Guidelines

- b. Should it be necessary to install irrigation lines within this area, the line shall be located by boring, or an alternate location for the trench is to be established.

The minimum clearance between an open trench and a street tree shall be one (1) foot or six inches for each inch of trunk diameter measured at 4.5 feet above existing grade if this method defines a larger distance. The maximum clearance shall be ten (10) feet.

- c. At no time shall any equipment, materials, supplies or fill be allowed within the prescribed root protection zone unless otherwise directed by the agency.

It is recognized that failure to abide by these provisions will result in substantial root damage to trees that may not be immediately apparent. The City can therefore assess damages according to the International Society of Arboriculture standards and bill the responsible party.

Tree Pruning Guidelines

Need for Pruning

Trees are pruned principally to preserve their health and appearance and to prevent damage to human life and to property. Broken, dead, or diseased branches are pruned to prevent decay from spreading. Live branches are removed to permit penetration of sunlight and air circulation which helps maintain a strong and healthy tree.

All of Morro Bay's street trees should be completely pruned on a periodic basis based on species needs. Frequency also depends on funding levels.

Additional tree pruning is done on an "as needed" basis. Specific examples of where "as needed" work is authorized are:

- Pruning tree limbs that interfere with utility lines.
- Pruning tree limbs that interfere with street, parking lot or security light illumination.
- Pruning tree limbs that interfere with buildings or other private or public facilities.
- Pruning hazardous limbs, such as large dead limbs greater than two (2) inches in diameter, hangers, and structurally unsound limbs.
- Pruning tree limbs that interfere with safe vehicular or pedestrian traffic.
- Sucker pruning.

Property Owners Ability to Prune Trees

The public may apply for a permit (a no fee encroachment permit) and hire their own contractor who is licensed and insured to trim the tree(s) according to these standards contained here in.

Tree Pruning Specifications

Any tree work performed on a City tree should be done according to the specifications outlined here in. There are different criteria for pruning depending on the purpose for the pruning.

- Complete Pruning Specifications are used when the entire tree needs to be fully pruned.
- Safety Pruning Specifications require less pruning and are used when specific, possibly hazardous (dead/dying) limbs need removal to eliminate all safety concerns. Safety pruning may be recommended in some circumstances instead of complete pruning. Safety pruning specifications are used for "as needed" pruning and address only safety concerns. Safety pruning includes only the basic requirements to address the problem.

Tree Pruning Guidelines

Tree Pruning and Removal near overhead power lines

Where overhead wires pass through trees, safety and reliability of service demand that tree trimming be done in order that the wires may clear branches and foliage by a reasonable distance. The City allows PG&E to maintain their power lines on a yearly basis. PG&E is required by rules and regulations adopted by the California Public Utilities Commission (CPUC) to maintain certain clearances between vegetation and power lines and otherwise maintain its facilities to ensure the safe and reliable provision of electric power to the state. Local jurisdictions do not have the discretion to change or veto these rules and regulations or to second guess the utility's vegetation management program. Thus, they lack the authority to require PG&E to obtain discretionary tree trimming and removal permits because the operation and maintenance (including vegetation management and removal activities) of electric power lines fall within the jurisdiction of the California Public Utilities Commission (CPUC) and is preempted.

Method of Operation

The following trimming specifications are for the use of any pruning of City trees.

- a. Lightly trim all trees to lighten and balance the trees, removing no more than 15 to 20% of the tree.
- b. Remove dead wood and cross branches.
- c. Remove all suckers.
- d. Remove all diseased branches.
- e. Encourage radial distribution of all branches to provide sufficient number of scaffold branches to fill the circular spaces as concentrically as possible around the trunk.
- f. Final trimming cuts shall be made without leaving a stub. Cuts shall be made just outside the shoulder ring area. Extremely flush cuts, which produce large wounds and weaken the tree at the cut, shall not be made.
- g. All trimming shall provide adequate clearance for any obstructed (street, directional etc.) sign, streetlight, safety light or other approved standard.
- h. Over sidewalks, limbs shall be raised a minimum of seven and a maximum of eight feet from grade to wood. Where sidewalks do not occur or are located on the street side of a parkway, limbs may be retained below the minimum elevation as long as they conform to the natural shape of the species.
- i. Over residential streets, limbs shall be raised gradually from ten (10) feet to fourteen (14) feet over traffic lanes from grade to wood giving the appearance of an arch rather than an angle. Near driveways where automated refuse containers are placed, it is imperative to have fifteen (15) feet of clearance. (Insert all, some or none if appropriate)
- j. Over arterial streets, limbs should be raised a minimum of twelve (12) and a maximum of fourteen (14) feet from grade to wood. A major arterial street

Tree Pruning Guidelines

may require a higher maximum over central traffic lanes for existing, mature canopy-forming limbs. (Use if appropriate)

- k. Whether over sidewalk or street, where the lowest limb is attached to a trunk above the desired elevation but extends below that elevation, if possible, rather than removed all together, in order to avoid giving the trunk a skinned appearance.
- l. Trimming shall not exceed the amount necessary to achieve the specified elevation at the time of raising. NO attempt to trim to a higher elevation to allow for future growth shall be permitted.
- m. No limb over three inches in diameter will be removed without prior (agency name) approval.
- n. No lion-tailing. An effect known as “lion-tailing” results from pruning out the inside lateral branches. Lion-tailing, by removing all the inner foliage, displaces the weight to the ends of the branches and may result in sunburned branches, water sprouts, weaken branch structure and limb breakage.
- o. Topping, stump cutting, hat raking pollarding, etc. is not acceptable.

Trees with known pathogens

Trees with known pathogens that can be spread with pruning tools shall be pruned using additional caution.

Avoid pruning on windy days in order to reduce the transmission of spores - Sterilize tools in between cuts on

diseased trees that can be transmitted on pruning tools. Acceptable sterilization methods include fifty percent (50%) bleach solution for ten (10) minutes or handheld butane torch heating for fifteen (15) seconds per side.

Wood with known wood boring insect infestations shall be chipped into pieces smaller than four inches (4”) and spread. - Wood that is infected with disease shall be handled and disposed of in a manner that minimizes the possibility of transmission of disease. This may include:

- a. Not working on windy days to reduce transmission of spores.
- b. Transporting greenwaste in covered containers.

General Staff Requirements

- a. **City Tree Workers** – All persons performing tree work on City trees should be trained according to tree care standards accepted by the International Society of Arboriculture.
- b. **Certified Arborists** – Any contracted tree company shall employ a full-time, permanent Certified Arborist, as accredited by the International Society of Arboriculture. This person is responsible for ensuring that the contractor’s crews are performing work according these specifications. This individual must be present along with the crew at all times.

Tree Pruning Guidelines

- c. **Contractor Qualifications** – All contractors are required to have a state contractor’s license for tree work (C-61) and that the contractor adheres to the specifications provide in the bid documents.

General Work Site Requirements

- a. Proper disposal of all tree green products generated is required mindful of recycling.
- b. Assure good traffic control and minimum disruptions to the public.
- c. Assure adequate safety of employees and the public.

Wildlife Avoidance/Migratory Bird Treaty Compliance

The Migratory Bird Treaty Act, the Endangered Species Act and local laws protect birds and wildlife located in trees. An arborist that is also a Certified Wildlife Protector can inspect trees. To minimize conflicts with nests, trees should be inspected carefully for nests and cavities using binoculars prior to pruning. The recommended criteria shall apply to tree pruning or removal activities to protect wildlife:

- As feasible, trees should be scheduled for removal during non-breeding/non-nesting season.
- Trees scheduled for pruning or removal during the breeding/nesting seasons shall be visually inspected at ground-level.

- If wildlife is located in the tree, the tree shall not be pruned and the Public Services Department notified.

Safety Tree Pruning Specifications

Safety tree pruning shall consist of the total removal of those dead or living branches as may menace the future health, strength and attractiveness of trees. Specifically, trees shall be pruned according to the Tree Pruning Specifications as outlined previously in this section.