

Recommended Guidelines for Managing Mature and Historic Tree Stands

San Francisco Urban Forestry Council Reference Document

Adopted June 23, 2015

Introduction:

The Urban Forestry Council (UFC) was established for the purpose of guiding the stewardship of San Francisco's trees by promoting a healthy and sustainable urban forest that benefits all San Franciscans while ensuring public health and safety

The UFC has developed this document outlining recommended guidelines for managing mature and historic tree stands in San Francisco, as an education and reference document for current and future UFC members, to assist the Council members with evaluation of management plans, project proposals, and design proposals that may affect mature and historic tree stands.

The purpose of the document is to provide UFC members with references for the arboricultural industry's current best management practices for urban forest management, within the context of San Francisco's existing mature and historic stands of trees.

This is not a policy document but an educational and informational document to assist UFC members with plan evaluation and comparison to industry standards. This document must be updated periodically to reflect current science, goals and management strategies. As written, the document is a snapshot in time, reflecting the conditions in 2015.

Challenges for San Francisco's Mature and Historic Tree Stands

San Francisco's history of management of public and open spaces, including forested areas, has resulted in a unique set of challenges to consider when making forestry management planning decisions. For the purpose of this resource document, Mature and Historic Tree Stands¹ are defined as: Groups of trees that are generally dominated by individuals older than 50 years, have a notably even-aged structure (see below), and share all of the management challenges common to other urban trees. In addition to general urban forestry management considerations, there are concerns and challenges specific to these trees; including:

- Even-aged forested areas: Much of San Francisco's existing urban forest was planted through large scale tree planting efforts over a relatively short period of time in the late 1800s and early 1900s. There has been little ongoing planting within these tree stands over the past 100+ years, little natural regeneration of Monterey pine and Monterey cypress and limited natural regeneration of blue gum eucalyptus. Many of the trees within San Francisco's mature and historic trees stands are of similar age and maturity, and Monterey pine and Monterey cypress are approaching the end of their lifespan. To better understand natural regeneration and species longevity in these areas, further study is needed.

- Very little species diversity: While notable stands of native woodland exist in the city, the majority of San Francisco's trees were planted by humans. Through these large scale planting

¹ Please note that this definition is not used as a legal term in this document. For more information about protected historic designation of landscapes and structures, visit the San Francisco Historic Preservation Commission website: <http://www.sf-planning.org/index.aspx?page=1892>

efforts, a handful of signature trees species were established that now comprise a large proportion of the total tree population. The 2007 UFORE Report² found that the 10 most common species in San Francisco account for 46.2% of the total number of trees and 65% of the city's total canopy cover, or "leaf area."

The three most common trees are:

- Blue Gum Eucalyptus - 15.9% of the city's trees and 10.7% of the leaf area
- Monterey Pine - 8.4% of the city's trees and 22.2% of the leaf area
- Monterey Cypress - 3.8% of the city's tree and 14.2% of the leaf area

Similar patterns were found by McBride and Froelich.³ Though their report (from 1984) is now somewhat outdated, it still appears to reflect the composition and condition of these large stands. It is important to note that this situation is not uncommon – many cities' forests are dominated by only a few tree species – yet it nevertheless presents a potential problem by exposing San Francisco's urban forest to increased mortality from pest outbreaks.

- Lack of management: With few exceptions, there has been a historical and ongoing lack of adequate funding to plant and care for trees. Volunteer groups have tackled some major maintenance needs, however volunteers are not equipped to perform mature tree care. As a result, tree maintenance efforts within established stands of trees is typically limited to responding to emergency conditions, without addressing the ever increasing need for management of the overall forested area.

-Complicated management structures: Under-funding for forestry management has been compounded by the multiple jurisdictional authorities charged with oversight. San Francisco's mature and historic tree stands are managed by a variety of public agencies, private landowners and institutions. This can make coordination and development of cohesive management strategies challenging to achieve across a forest stand that is spread out over many jurisdictions.

- Competing land use priorities and differing management practices: Significant portions of San Francisco's mature and historic tree stands exist within the City's identified Significant Natural Resource Areas managed by the Recreation and Parks Department. Through the Recreation and Open Space Element⁴, the City is charged with preserving and protecting these remnant fragments of San Francisco's original landscape. Thus, management priorities and decisions for some of the mature and historic tree stands may be different from management practices that are appropriate for other areas of the urban forest.

-Changing climate and changing environmental pressures: In the 2014 Annual Urban Forest Report⁵, San Francisco land managers identified declining health of approximately 100 redwood trees due to severe drought conditions. Water is becoming a more precious resource and it is important to note that the lack of water can cause serious negative effects to mature

² The 2007 San Francisco UFORE Report is available here:

http://www.fs.fed.us/psw/programs/uesd/uep/products/2/psw_cufr719_SFBay.pdf

³ McBride, J. R. and Froehlich, D. 1984. Structure and Condition of Older Stands in Parks and Open Spaces of San Francisco, California. In: Urban Ecology 8:166-178

⁴ The City's adopted Recreation and Open Space Element is available here:

http://openspace.sfplanning.org/docs/Recreation-and-Open-Space-Element_APRIL-2014-ADOPTED.pdf

⁵ The 2014 Annual Urban Forest Report is available here: <http://www.sfenvironment.org/article/urban-forestry/annual-urban-forest-reports>

trees. While the current severe drought conditions have not been clearly linked to global climate change, overall climate warming is likely exacerbating drought conditions.⁶ Rising temperatures could cause continuing and worsening drought conditions, sea level rise and flooding, shifting seasonality, and increased fire risk, among other concerns.⁷ All of these potential effects could negatively affect mature trees and should be considered when planning for the future.

⁶ New York Times article describing research showing how climate change may be responsible for exacerbating drought conditions: <http://www.nytimes.com/2015/04/02/science/california-drought-is-worsened-by-global-warming-scientists-say.html>

⁷This white paper synthesizes data on potential effects of climate change in the Bay Area. Climate Change Impacts, Vulnerabilities, and Adaptation in the San Francisco Bay Area: <http://www.energy.ca.gov/2012publications/CEC-500-2012-071/CEC-500-2012-071.pdf>

Recommended Guidelines for Managing Mature and Historic Tree Stands

There are several primary considerations to explore when reviewing urban forest design or management proposals. It is important to note that it may not be possible to achieve the ideal urban forestry conditions described by each guiding principle below, without significant negative impacts on the other guiding principles, established site uses, and community access. Therefore, successful plans should do their best to address the factors described below, balanced against each of the other guiding principles, community needs, the existing established landscape needs, future plans for the site, public safety, and the realities of the limited resources available for management. For further reading on each of these guiding principles, please see the resources section at the end of this document.

- Ensure Public Safety: Trees in urban spaces must be managed to protect human safety related to falling trees or tree parts, fire, and erosion. As trees grow, some may over time acquire structural defects (e.g., poorly-attached stems, etc.) or may be subjected to mechanical damage (e.g., root cutting) or pest/pathogen attack (e.g., fungal infection) that increase their potential for failures. Additionally, build-up of dry plant material (e.g., grass, dead shrubs, or accumulated leaves, twigs and bark) can increase fire danger, while on the other hand inappropriate removal of trees (e.g., without consideration of topography) can increase erosion potential. It is critical to maintain a firebreak around structures as described in California Code of Regulations Title 19, Regulations of the State Fire Marshal.⁸ Both fire and erosion potential should be assessed by professionals familiar with and capable of determining the factors contributing to and methods for assessing these risks.

Properly managed trees should have any defects addressed early in the establishment period and should be regularly monitored throughout their lifespan to prevent and reduce risks to public safety. For all trees with the demonstrable potential to fall onto areas where people may congregate outdoors, onto paths and roadways, or onto buildings, risk management must be the priority over all other management goals. Established forest areas with mature trees should be regularly examined for safety and any necessary risk management actions should be taken as soon as possible.

- Increase Age, Structural, and Species Diversity: An ideal healthy urban forest contains a mix of tree species and ages to help prevent the loss of large percentages of trees at once due to pests, diseases, and changing environmental conditions.

The majority of the trees in San Francisco were planted over a short time frame more than 100 years ago. Many trees planted during this period, especially Monterey pines and Monterey cypress, are reaching the end of their normal life span in an urban environment. Additionally, there is little to no natural regeneration occurring within mature tree stands. As such, these stands are potentially vulnerable to significant losses. These stands have an immediate and

⁸ California Code of Regulations Title 19, §3.07. Clearances, requires 30'-100' vegetative clearances around structures and property lines, with allowances for, "...single specimens of trees, ornamental shrubbery, or similar plants which are used as ground cover, if they do not form a means of rapidly transmitting fire from the native growth to any building or structure." See code at this link for more information:
<https://law.resource.org/pub/us/ccr/gov.ca.oal.title19.html>

unmet need for increased management efforts to improve the health of individual trees and manage the stands for longevity.

A mosaic of tree species, plant communities and tree ages across the landscape will provide the best opportunities for long-term success and sustainability, including improvements to tree health, disease and insect resilience, wildlife habitat, and reduced maintenance costs in the long term.

While increasing species diversity will help to reduce the potential of wholesale loss of a species to insects and diseases, doing so at the cost of healthy and mature trees may not be appropriate. Where increasing species diversity would be inconsistent with site use, efforts to increase age diversity and structural diversity (for example, increasing the species diversity of understory plantings) should be considered and implemented where appropriate. Additionally, as trees reach the end of their lifespan or succumb to disease, forest managers should take the opportunity to increase species diversity to improve the overall health of the forest

Age diversity will help reduce the potential for wholesale loss of a signature species to age-related decline, reducing the necessity for concentrated efforts to regenerate the forest. Efforts to increase species, structural, or age diversity should be a gradual process, unless an acute hazard due to a major pest or disease, weather event, or other impact has caused irreparable harm that must be mitigated to ensure public safety. Forested areas with little diversity should be regularly monitored to ensure any developing pests or diseases are identified and controlled as early as possible. Efforts should be taken to preserve healthy mature trees, as larger healthy trees provide higher levels of environmental, social, and economic benefits.⁹

- Protect habitat and wildlife, including endangered species: The city's urban forests are part of the greater ecological community and provide benefits to more than just people.

San Francisco is located in a biological hot spot, the California Floristic Province¹⁰, where many endemic and rare species of plants and animals have evolved. The San Francisco Bay is also a major stop for migratory birds along the Pacific Flyway. The Migratory Bird Treaty Act¹¹ protects all migratory birds, their nesting sites, and their eggs from any harm, including removal or transport.

Public land managers are obligated to manage urban forest and other vegetation types in ways that ensure protection of endangered plant and animal species¹², indigenous biological diversity and migratory and nesting birds. Rare and endangered species, and migratory and nesting birds must be identified and a plan developed by a professional for their preservation and/or protection. Proposals should include any necessary provisions for protection and restoration of endangered plant and animal species and habitats. Any proposal to remove or prune trees in

⁹ USDA factsheet: *The Large Tree Argument: The Case for Large Trees vs. Small Trees*.
http://www.fs.fed.us/psw/programs/uesd/uep/products/cufr_419.pdf

¹⁰ The San Francisco Bay Area is located in one of 34 globally recognized biodiversity hotspots. Combined, these areas support about half of the plant and animal species on earth yet cover only 2.3% of the earth's surface. Source: *Conservation International (2015)* <http://www.conservation.org/How/Pages/Hotspots.aspx>

¹¹ A Guide to the Laws and Treaties of the United States for Protecting Migratory Birds, from the US Dept of Fish and Wildlife: <http://www.fws.gov/migratorybirds/regulationspolicies/treatlaw.html>

¹² Query an up-to-date list of endangered species on the US Dept and Fish and Wildlife, Sacramento Fish and Wildlife Office website: http://www.fws.gov/sacramento/es_species/Lists/es_species_lists-form.cfm

areas where there is a possibility that migratory or nesting birds may be present should engage a professional to investigate the area before work begins and to develop a protection plan.

- Protect and sustain iconic forest stands: Many of the mature and historic tree stands in San Francisco are character defining features of the city that provide unique experiences to those who enjoy them.

Protecting and managing these stands is important to the continuity of the landscape and the experience of the public. These stands provide important cultural and social benefits to urban residents and visitors that use these areas for recreation, as evidenced by community groups that have formed around the protection and management of these sites.

Proposals should seek to maximize benefits now and into the future, recognizing that increased management of the landscape to improve the health of the forest will increase the longevity of individual trees and the overall forested, and the benefits that are derived from it. Further discussion on the social and community benefits of forested areas and trees are included below in the “Social Benefits” section.

Management of these stands may require continuity of species at the cost of species diversity. Proposals to change the texture or the aesthetic impact of the landscape must consider the negative social and cultural impacts that these changes will cause and seek to mitigate and minimize these negative effects. Where possible, features that provide positive influences on the human enjoyment of the site, of the biophilia¹³, should be retained. For example, solitary old specimen trees may be an important textural (focal) element of the landscape, and thus the managers may choose to retain them and mitigate risk by reducing access (around the tree) instead of tree removal. Landscape management efforts must be sensitive to the benefits of these iconic stands.

- Increase environmental benefits: Large, healthy, and mature trees contribute greater levels of environmental benefits, providing more support in mitigating the effects of human habitation in urban areas, than younger and smaller trees are able to.

The urban forest provides a wide range of environmental benefits including air pollution reduction, storm water management, and carbon sequestration. Trees are a valuable component of the city’s green infrastructure and must be recognized for their functional value in addition to their amenity value. The 2007 UFORE Report¹⁴ estimated that every year San Francisco’s trees divert more than 500M gallons of storm water, sequester 196K tons of carbon, and filter 260 tons of atmospheric pollutants; these environmental benefits are valued at nearly \$9.5M every year. Trees that are actively inspected and managed on a 3-5 year pruning cycle have longer lifespans and are more likely to reach an age and size to provide the most benefits.

Every reasonable effort should be made to reduce canopy/tree loss, including providing early and ongoing care. Tree removal is an important and necessary part of managing healthy and safe forests. When tree removals are necessary, every reasonable effort should be made to

¹³ Term used by Edward O. Wilson in his 1984 book *Biophilia*; references “love of life or living systems,” and Wilson’s hypothesis regarding the human need for connection to nature and living systems.

¹⁴ *The 2007 San Francisco UFORE Report* is available here: http://www.nrs.fs.fed.us/pubs/rb/rb_nrs008.pdf

reuse and recycle wood on the site where it is generated or to use the wood in recycled urban wood projects, such as for furniture, building materials, paper, art and biomass energy, to help the City achieve its Zero Waste policy goals and retain the stored carbon¹⁵.

- Increase Social benefits: Healthy trees improve the quality of life and health of urban residents, making the city a more desirable place to live, work, and visit.^{16 17}

The presence of trees and well maintained publically accessible landscapes helps to support public health and safety in urban areas, and encourages city residents to spend time outdoors.¹⁸ Improvements to the quality of outdoor areas increase opportunities to engage in physical activity, resulting in improved health for children¹⁹ and increased longevity for senior citizens.²⁰ Urban residents can experience significant positive health impacts from visiting established forested areas, including stress reduction, reduction in cortisol, and increased immune function. Studies indicate that hospital patients in rooms that have views of trees and green spaces recover from surgery and injuries faster, and require fewer doses of pain medication to heal.²¹ Urban residents with access to high quality forested areas and green space experience a reduction in “mental fatigue,” which is caused by the level of focus required by urban life and is characterized by an increase in irritability, irrationality and aggression; through increasing access to forested areas and green spaces, community members can experience a reduction in mental fatigue, allowing them to recover from stressful situations more rapidly, which can result in a decrease of incidences of violence.²² Conversely, overgrown and untended forested areas can result in decreased visibility and community access, which in turn can lead to negative impacts on community safety by attracting unwanted behavior and decreasing individuals’ relative perception of safety within these areas. Community members are more likely to access forested areas that they feel safe visiting.

These benefits should be maximized by ensuring that all trees receive an adequate level of care early in their life to improve health and increase life spans, and by increasing tree planting where appropriate. Improving tree management and strategically increasing tree planting to augment the experiential qualities of a site will help improve social benefits. Additionally, increasing forestry monitoring activities, improving trails and site accessibility, reducing thick

¹⁵ See the *Urban Forest Wood Re-Use Report* for more on local urban wood reuse opportunities.

<http://www.presidio.edu/userfiles/file/Case%20Study/Presidio%20Graduate%20School%20-%20SF%20Wood%20Re-Use%20Study%20-%20Report%20to%20UFC.pdf>

¹⁶ Street trees can add the equivalent value of an additional 129 square feet of living space to home sales prices, according to a study in Portland, OR, described in this *Walls Street Journal* article: *How Trees Can Boost a Home Sale Price*. <http://www.wsj.com/articles/SB10001424052702303722604579113230353966564>

¹⁷ *Benefits of Urban Trees*, a compendium: <http://www.naturewithin.info/UF/TreeBenefitsUK.pdf>

¹⁸ Trees and outdoors greenery encourage increased physical activity. *Active Living - A Literature Review*. By Wolf, K. at the University of Washington. Available at: http://depts.washington.edu/hhw/TMn_ActiveLiving.html

¹⁹ Urban youth have improved health metrics, such as lower obesity rates, when they live in areas with more parks and outdoors space. *Neighborhood Greenness and 2-Year Changes in body Mass Index of Children and Youth*. Bell, J.F., et al.

²⁰ Senior citizens living near walkable greenspace live longer. *Urban residential environments and senior citizens’ longevity in megacity areas: the importance of walkable green spaces*, Takano T., Nakamura K., Watanabe M. <http://jech.bmj.com/content/56/12/913.full>

²¹ Increasing greenery and access to outdoor spaces helps patients heal faster and reduce the amount of painkillers they need: <http://www.scientificamerican.com/article/nature-that-nurtures/>

²² Urban residents who live near trees and greenspace have improved emotional health and mental resiliency, and are less aggressive. *Aggression and violence in the inner city effects of environment via mental fatigue*. Kuo, F. E., & Sullivan, W. C. http://conservation.ufl.edu/urbanforestry/Resources/PDF%20downloads/Kuo_violence_2001.pdf

and overgrown brush, reducing excess dry fuels where appropriate, and reducing any litter or illegal dumping will help to make a site feel safer and more accessible.

- Consider Economic benefits: Well-maintained trees and other plants improve property values, increase activity along commercial corridors, and improve worker productivity. These benefits should be maximized through strategically increasing the number of trees within and adjacent to commercial corridors, business districts, and residential areas, and through improving the health of all trees in the city.

The 2007 San Francisco Bay Area State of the Urban Forest report²³ found that the greatest benefit derived from San Francisco's trees are increased property values, which account for 95% of the overall monetized benefits of San Francisco's trees. Residences and commercial spaces close to greenbelts and with views of forested areas command increased rent and purchase prices. Shoppers spend more time and are willing to spend 11% more money in commercial areas that have well maintained trees and green spaces. Commercial areas with more trees and green spaces also see an increase in foot traffic. Workers with views of green space and plants are happier and more productive, and have fewer sick days.²⁴

Increasing tree planting and tree care as part of neighborhood revitalization efforts, improvements to commercial corridors, and as part of capital improvements by large land holders, can increase property value and revenue.

- Adhere to established policies: Tree protection, removal, and planting regulations are included in Public Works, Rec and Park, Planning, Environment, and other city codes. These policies, along with state and federal policies related to trees, open space management, and wildlife protection, must be adhered to.

Planting, maintaining, and removing trees on public property is subject to regulation and oversight. Policies related to a specific site may differ, depending on the agency or department that has jurisdiction over the parcel, but may include requirements to disclose any protected trees and provide protection plans when necessary, as well as potentially require planting of new and replacement trees. San Francisco has adopted Pruning Standards for care of public trees and an Integrated Pest Management (IPM) policy that effectively reduces pest populations while minimizing human health and environmental hazards. Where conflicts between trees and solar panels may exist, California's Solar Shade Control Act and Solar Easement Law provide guidance.

Proposals must identify any necessary tree protection, tree removal, and tree planting plans and any associated required permits as outlined by existing city policy. Proposals must adhere to the wildlife protection and San Francisco's IPM policy. Ensuring appropriate species diversity, optimal growing conditions, and regular tree maintenance by skilled tree workers, such as International Society of Arboriculture Certified Arborists, can help reduce insect and disease susceptibility and maintain tree and urban forest health and longevity.

²³ Large trees can provide \$4,440 in annual environmental, social, and economic benefits, while a small tree can provide \$270. *USDA factsheet: The Large Tree Argument: The Case for Large Trees vs. Small Trees.* http://www.fs.fed.us/psw/programs/uesd/uep/products/cufr_419.pdf

²⁴ Workers with a view to green space are happy and experience 23% less sick time. <http://www.naturewithin.info/UF/TreeBenefitsUK.pdf>

- Establish a plan for ongoing management: Site use priorities and goals need to be identified before management decisions can be made. Urban forestry management decisions need to fit within the overall objectives for the site, including the context of citywide urban forestry management goals and site specific needs, objectives, and priorities. Trees and green infrastructure should be at the forefront of the planning process, rather than as an afterthought.

Plans for new tree plantings, tree replacements, and tree removal are appropriate elements of forestry management planning. These activities are required to ensure ongoing overall forest health, meet canopy coverage goals, manage natural regeneration, care for existing trees, and plan for senescence. Proposals should demonstrate understanding of any existing operational/management issues, including existing regulatory conditions, as well as available and unmet resource requirements. To adequately assess a program's success and opportunities for improvement, periodic monitoring and comparison to benchmarks/performance standards must be performed.

The UFC extends its gratitude to the many speakers who provided input into these guiding principles through the UFC's listening series:

Save Sutro -Rupa Bose
Sutro Stewards -Craig Dawson
Golden Gate Audubon -Noreen Wheedon and Roy Leggitt
Presidio Trust - Peter Erlich
Presidio Trust - Lew Stringer
San Francisco Forest Alliance - Dee Seligman
California Invasive Plant Council - Doug Johnson
Hills Conservation Network- Dan Grassetti
UC Coop Extension- Igor Lacan
UC Berkeley- Joseph McBride
UCSF Mt Sutro - Maric Munn
SF Fire Department - Michie Wong, Fire Marshal
RPD; Natural Areas Program manager - Lisa Wayne
SFE Biodiversity coordinator - Peter Brastow
SFSU - Michael Vasey
Alliance for Natural Areas - Ruth Gravanis
Friends of the oak woodlands - Rob Bakewell
SF Green Party- Eric Brooks
California Native Plant Society Yerba Buena Chapter - Jake Sigg
Naturalist - Josiah Clark

References and Further Reading

San Francisco Urban Forestry Council Materials:

The main UFC information page is located here: <http://sfenvironment.org/UFC>

Comments from the presentations provided to the UFC at their June 24, Sept. 26th, and December 12th hearings are available on-line; please see links below for more information.

June 24, 2014 UFC meeting agenda and meeting notes:

<http://sfenvironment.org/about/taskforce/urban-forestry-council/agendas/june-24-2014-urban-forestry-council-meeting-approved-minutes>

September 26, 2014 UFC meeting agenda and meeting notes:

<http://sfenvironment.org/about/taskforce/urban-forestry-council/agendas/september-26-2014-urban-forestry-council-meeting-approved-minutes>

December 12, 2014 UFC meeting agenda and meeting notes:

<http://sfenvironment.org/about/taskforce/urban-forestry-council/agendas/december-12-2014-urban-forestry-council-meeting-draft-minutes>

The Urban Forest Plan, Phase One: Street Trees can be accessed at this link:

<http://www.sf-planning.org/index.aspx?page=3166#financing>

The Urban Forest Plan Street Tree Financing Study can be accessed at this link:

http://www.sf-planning.org/ftp/files/plans-and-programs/planning-for-the-city/urban-forest-plan/UFP_Street_Tree_Report_FINAL_Dec_2013.pdf

Additional supplemental reading for the recommended guiding principles:

Please note that any website address provided below may change.

Tree hazards and risk management:

Urban Tree Risk Management: A Community Guide to Program Design and Implementation
<http://www.na.fs.fed.us/spfo/pubs/uf/utrm/>

ISA Tree Risk Assessment Form Instructions:

http://www.isa-arbor.com/education/resources/isabasictreeriskassessmentform_instructions.pdf

ISA Tree Risk Assessment Form:

http://www.isa-arbor.com/education/resources/BasicTreeRiskAssessmentForm_FirstEdition.pdf

Urban tree diversity and condition

McBride, J. R., & Froehlich, D. *Structure and condition of older stands in parks and open space areas of San Francisco, California*. *Urban Ecology*, 8(1), (1984). 165-178.

McBride, J. R. *The History, Ecology and Future of Eucalyptus Plantations in the Bay Area: a lecture at the Commonwealth Club of San Francisco*, April 2014:

https://www.youtube.com/watch?v=_5pGVH3ya8E and a link to his Power Point

<http://sfforest.net/2014/07/10/understanding-eucalyptus-in-the-bay-area-dr-joe-r-mcbride/>

McPherson, G. & Kotow, L. *A municipal forest report card: Results for California, USA* *Urban Forestry & Urban Greening* 12 (2013) 134–143. Retrieved March 17, 2015, from

http://www.fs.fed.us/psw/publications/mcpherson/psw_2013_mcpherson002.pdf

Main Page. *Cal Poly at San Luis Obispo Urban Forest Ecosystems Institute Website*. (n.d.)

Retrieved March 17, 2015 from <http://ufei.calpoly.edu/websites.lasso>

Wildlife and Urban Trees

Endangered species lists generator - Form. (n.d.). Retrieved 17 March 2015, from

http://www.fws.gov/sacramento/es_species/Lists/es_species_lists-form.cfm

Laws and Treaties Protecting Migratory Birds. (n.d.). Retrieved April 3, 2015, from

<http://www.fws.gov/migratorybirds/regulationspolicies/treatlaw.html>

Environmental Benefits of San Francisco's Urban Trees

Simpson, J., & McPherson, E. (2007, December). *San Francisco Bay Area State of the Urban Forest Final Report*. Retrieved April 3, 2015, from

http://www.fs.fed.us/psw/programs/uesd/uep/products/2/psw_cufr719_SFBay.pdf

NOWAK, D., HOEHN III, R., CRANE, D., STEVENS, J., & WALTON, J. (2007, February). *Assessing Urban Forest Effects and Values*. Retrieved April 3, 2015, from http://www.nrs.fs.fed.us/pubs/rb/rb_nrs008.pdf

Urban Wood Re-Use

Dirrenberger, J., Dorsey, C., Miller, R., & O'Claire, S. (2014, May 1). *San Francisco Urban Wood Re-Use Study*. Retrieved April 3, 2015, from http://www.sfenvironment.org/sites/default/files/agenda/attach/sf_urban_forest_wood_reuse_study_0.pdf

Social and Health Benefits of Trees

Forest bathing enhances human natural killer activity and expression of anti-cancer proteins. (n.d.). *Int J Immunopathol Pharmacol.*, 20(2 Suppl 2):3-8. Retrieved March 17, 2015 from <http://www.ncbi.nlm.nih.gov/pubmed/17903349>

Donovan, G. H., Michael, Y. L., Butry, D. T., Sullivan, A. D., & Chase, J. M. (2011). *Urban trees and the risk of poor birth outcomes*. *Health & place*, 17(1), 390-393. Retrieved March 15, 2015 from <http://donovan.hnri.info/urbanstudies.html>

Donovan, G. H., Butry, D. T., Michael, Y. L., Prestemon, J. P., Liebhold, A. M., Gatzolis, D., & Mao, M. Y. (2013). *The relationship between trees and human health: evidence from the spread of the emerald ash borer*. *American journal of preventive medicine*, 44(2), 139-145. Retrieved March 15, 2015 from <http://donovan.hnri.info/urbanstudies.html>

Kuo, F. E., & Sullivan, W. C. (2001). *Aggression and violence in the inner city effects of environment via mental fatigue*. *Environment and behavior*, 33(4), 543-571. Retrieved March 15, 2015 from http://conservation.ufl.edu/urbanforestry/Resources/PDF%20downloads/Kuo_violence_2001.pdf

Ulrich, R. (April 27, 1984) *View through a window may influence recovery*. *Science*, 224(4647), 224-225. Retrieved March 15, 2015 from <https://mdc.mo.gov/sites/default/files/resources/2012/10/ulrich.pdf>

Wolf, K. (1998) *Urban Forest Values: Economic Benefits of Trees in Cities*, University of Washington College of Forest Resources, Factsheet #29. Retrieved April 1, 2015 from <http://www.naturewithin.info/UF/TreeBenefitsUK.pdf>

Wolf, K. (1998) *Trees in Business Districts - Positive Effects on Consumer Behavior*, University of Washington College of Forest Resources, Factsheet #30. Retrieved April 1, 2015 from <http://www.naturewithin.info/UF/TreeBenefitsUK.pdf>

Wolf, K. (1998) *Trees in Business Districts - Comparing Values of Consumers and Business*, University of Washington College of Forest Resources, Factsheet #31. Retrieved April 1, 2015 from <http://www.naturewithin.info/UF/TreeBenefitsUK.pdf>

Wolf, K.L. 2010. *Active Living - A Literature Review*. Green Cities: Good Health. College of the Environment, University of Washington. Retrieved March 15, 2015 from: http://depts.washington.edu/hhwb/Thm_ActiveLiving.html

Economic Benefits of Urban Trees

Donovan, G. H., & Butry, D. T. (2009). *The value of shade: estimating the effect of urban trees on summertime electricity use*. Energy and Buildings, 41(6), 662-668. Retrieved March 2, 2015 from <http://donovan.hnri.info/urbanstudies.html>

Donovan, G. H., & Butry, D. T. (2010). *Trees in the city: Valuing street trees in Portland, Oregon*. Landscape and Urban Planning, 94(2), 77-83. Retrieved March 2, 2015 from <http://donovan.hnri.info/urbanstudies.html>

Simpson, J., & McPherson, E. (2007, December). *San Francisco Bay Area State of the Urban Forest Final Report*. Retrieved April 3, 2015, from http://www.fs.fed.us/psw/programs/uesd/uep/products/2/psw_cufr719_SFBay.pdf

Planning for a Healthy urban Forest

Matheny, N., & Clark, J. (1998). *Trees and development: A technical guide to preservation of trees during land development*. Champaign, IL: International Society of Arboriculture.

Climate Change

Ekstrom, J., & Moser, S. (2012, July) *Climate Change Impacts, Vulnerabilities, and Adaptation in the San Francisco Bay Area*. California Energy Commission. Retrieved April 24, 2015 from <http://www.energy.ca.gov/2012publications/CEC-500-2012-071/CEC-500-2012-071.pdf>

Fountain, H. (2015, April 1) *California Drought Is Worsened by Global Warming, Scientist Say*. New York Times. Retrieved April 24, 2015 from <http://www.nytimes.com/2015/04/02/science/california-drought-is-worsened-by-global-warming-scientists-say.html>

Local and State Regulations Pertaining to Trees

Street trees in San Francisco's public right-of-way: The Urban Forestry Ordinance – Article 16 of the SF Public Works Code. Retrieved March 2, 2015 from

[http://www.amlegal.com/nxt/gateway.dll/California/publicworks/publicworkscodes?f=templates\\$fn=default.htm\\$3.0\\$vid=amlegal:sanfrancisco_ca\\$sync=1](http://www.amlegal.com/nxt/gateway.dll/California/publicworks/publicworkscodes?f=templates$fn=default.htm$3.0$vid=amlegal:sanfrancisco_ca$sync=1)

Trees in San Francisco's Open Space: *The San Francisco Recreation and Open Space Element*. Retrieved April 2, 2015 from

http://openspace.sfplanning.org/docs/Recreation-and-Open-Space-Element_APRIL-2014-ADOPTED.pdf

San Francisco's Integrated Pest Management Program website Retrieved April 3, 2015, from

<http://www.sfenvironment.org/article/city-staff/pest-management>

California Civil Code Section 801.5, "Solar Easement Law," Retrieved April 3, 2015, from

<http://www.leginfo.ca.gov/cgi-bin/displaycode?section=civ&group=00001-01000&file=801-813>

California Public Resources Code Section 25980-25986, "Solar Shade Control Act," Retrieved April 3, 2015, from

<http://www.leginfo.ca.gov/cgi-bin/displaycode?section=prc&group=25001-26000&file=25980-25986>

California Code of Regulations Title 19, Regulations of the State Fire Marshal

<https://law.resource.org/pub/us/ccr/gov.ca.oal.title19.html>