STAFF REPORT

DATE: December 6, 2022

TO: City Council

FROM: Stan Gryczko, Director - Public Works Utilities and Operations
Charles Murphy, Urban Forestry Manager

SUBJECT: Urban Forest Management Plan Project Update

Recommendations
Informational Item

- Receive informational presentation on the status of the Urban Forest Management Plan (UFMP) project and consider providing additional comments, feedback or recommendations for the consultant to take into consideration as the initial phases of collaborator, public and internal input concludes.

Fiscal Impact
The total amount for the Urban Forest Management Plan is not to exceed $180,000, funded in part by a CAL FIRE Proposition 68 grant of $75,000. The grant and City match funding is a one-time expenditure for the UFMP. It is anticipated that the UFMP will include recommendations for additional resources to support the urban forestry program in the City of Davis. City staff will return to Council to discuss any additional resource requests during review and adoption of the UFMP and through the next budget process.

Council Goal(s)
This report and discussion of the UFMP is consistent with the following City Council goals: Ensure a safe, healthy, equitable community; pursue environmental sustainability; fund, maintain and improve infrastructure; enhance a vibrant downtown and thriving neighborhoods; and foster excellence in city services.

Commission Input
The UFMP has been a focus of the work of the Tree Commission since May of this year. A call for Commission liaisons to participate in the discussions of the UFMP was shared with all City Commissions. Currently there are liaisons from eight Commissions participating: Bicycling, Transportation and Street Safety Commission (BTSSC), Finance and Budget Commission (FBC), Historical Resources Management Commission (HRMC), Natural Resources Commission (NRC), Open Space and Habitat Commission (OSHC), Planning Commission (PC), Utilities Commission (UC), and Social Services Commission (SSC). These liaisons participate in the discussion, provide feedback, and report back to their respective commission on the progress of the UFMP.

Presentations to Commission
Prior discussion of the UFMP at the Tree Commission included the review of the UFMP scope in August of 2021. Portions of the UFMP have been presented to the Tree Commission each month since May of this year. The item presentation, reports where applicable and meeting video are summarized below.

Date	Meeting Video	Documents/Presentations
May 19	Draft Public Engagement Plan (Item 6B - starts approx. 2:34:16)	1. Urban Forest Management Plan – Public Engagement Plan Draft 2. Draft Public Engagement Plan
June 16	Framework of Tree Planning Efforts (Item 6B - starts approx. 1:47:30)	1. Framework of Tree Planting Efforts
July 21	City Tree Resource Analysis (Item 6B - starts approx. 25:12)	1. Urban Forest Management Plan: Resource/Land Use Analysis 2. City Tree Resource Analysis 3. Terms to Know 4. Urban Forest Summary 5. PowerPoint Presentation from Davey Resource Group: Davis Tree Resource Analysis
August 18	Opportunities & Challenges Learned So Far (Item 6B - starts approx. 1:13:00)	1. PowerPoint Presentation from Davey Resource Group: Scope & Progress/Challenges & Opportunities
September 15	Review & Consider 2002 Community Forest Management Plan Goals & Vision (Item 6B - starts approx. 1:53:20:00)	1. Urban Forest Management Plan: Review & Consider 2002 Community Forest Management Plan Goals & Vision 2. Excerpt from the 2002 Community Forest Management Plan
October 20	Review & Consider 2002 Community Forest Management Plan Goals & Vision, Cont'd (Item 6B - starts approx. 35:15:00)	
November 17	Review & Consider 2002 Community Forest Management Plan Goals & Vision, Cont'd (Item 6B - starts approx. 1:37:00:00)	

Background

The City of Davis received a CAL-FIRE Grant utilizing Proposition 68 funds to develop an UFMP and to plant 1,000 new trees within the city limits. Tree Davis, a non-profit community organization and co-applicant on the grant, took the lead in the planting of the 1,000 trees.

The UFMP will replace the current City's Community Forest Management Plan adopted in 2002. The UFMP will be a 40-year plan that will guide the management of Davis' urban forest program. The UFMP will look at key areas of the urban forest and develop recommendations for managing, budgeting, service level matrices, and process improvements that will help improve and optimize the overall management of the City's urban forest.

Detail on the project scope, tasks and the approach recommended by Davey Resource Group and consultant selection can be found in the staff report to City Council from August 31, 2021: 04B - Urban Forest Management Plan Consultant Selection

Project Work Undertaken To Date & Upcoming

The UFMP is required to be submitted to CAL FIRE by March 25, 2023. Throughout this process, weekly meetings with the consultant and City staff involved the discussion of data, operations, processes, best management practices, standards and guidelines.

The Tree Commission has participated in this process through the review of draft sections of the plan, beginning in May, by having conversations and providing comments based off presentations from the consultant and City staff. The specific presentations and timing are listed above. Their participation will continue through the adoption and into the implementation of UFMP recommendations where applicable.

Additional efforts included collaborator interviews which had the City's consultant sit down with the individuals and representatives of groups in the community with vested interest and/or knowledge of Davis' urban forest. These conversations took place in late July of this year.

The public plays a key role in the creation and implementation of the UFMP. There have been three public events to date, with the fourth coming in the new year to discuss the draft of the UFMP. The most recent public event was held virtually on November 10th, 2022. The first two events were hosted at the Saturday Farmer's Market, about a month apart, the latter welcomed the conclusion of the Tree Davis Bike Tree Tour. Public comments have been collected online throughout the project; along with the Tree Photo Contest (hosted by Tree Davis).

Dates	Steps
May - present	The Tree Commission has participated in this process through the review of draft sections and providing comments. The specific presentations and timing are listed above.
July 21, 2022	The Tree Commission formed a UFMP subcommittee.
July 2022	Collaborator interviews which had our consultant sit down with the individuals and representatives of groups in the community with vested interest and/or knowledge of Davis' Urban Forest.
August 24 & September 24, 2022	Tabling at the Downtown Farmer's Market
August – November 2022	Tree Davis Photo Contest
November 10, 2022	Virtual Public Forum on the UFMP
Ongoing	**Steps**
	Public Comments on UFMP open (online)
Anticipated Dates	**Steps**
December 2022	Tree Commission finalize prioritization comments for Goals and Vision of UFMP
December & January 2022	Finalize comments from Commission and Public
January 2023	Draft of UFMP reviewed by Tree Commission
January 2023	Virtual Public Forum on the Draft UFMP
February & March 2023	Final UFMP review and adoption by City Council
March 2023	Master Tree List Update
March 25, 2023	Submit UFMP and Prop 68 Grant Report to CAL-FIRE

Anticipated Outcomes

It is anticipated that the UFMP will be a dynamic and engaging plan that will steer Urban Forestry for years to come. Through the use of a web-based story map, the plan will utilize frequent-interval updated data to both create and measure Urban Forestry capacity based off of transparent metrics. By cross-referencing the desired level of service with the current level of resourcing, a true understanding of expected program expansion can be presented in a data-driven model. Prior to the development of the UFMP, this level of data analysis would not have been possible.

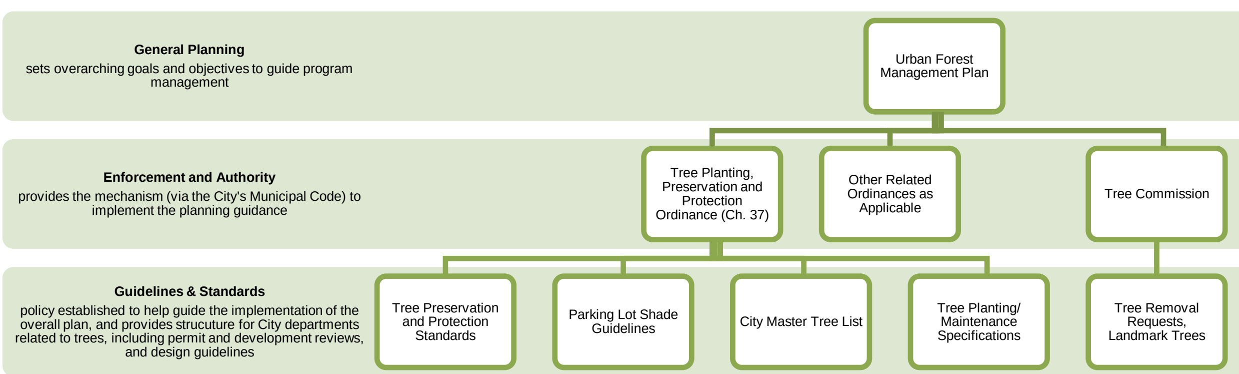
The UFMP will utilize our current inventory to point to immediate next steps in terms of strategies to maintain, improve and increase our urban tree canopy. This allows the prioritization of Urban Forestry efforts, including, but not limited to:

- Tree maintenance
- Tree planting
- Tree protection
- Education and outreach

Beyond the Plan

During public outreach efforts, two of the consistent comments to staff and the consultant focused on the desire for more narrowly focused plans (i.e. a downtown tree plan, or neighborhood-specific tree pallets) and the desire for publicly accessible tree inventory information. While the UFMP is not structured to include specific guidance for subsets of the community, the plan will include a basic foundation and data access that Urban Forestry staff will utilize, along with community members, to develop recommendations for specific neighborhoods when applicable. The story map model of the UFMP will also present tree inventory data to the public in a user-friendly platform.

Concurrent Efforts



While the UFMP will be the guiding force of the Urban Forestry division by setting overarching goals and objectives, it is not intended to be the end-all, be-all document in urban forestry management. As with any City Department, operations and activities are guided by a combination of planning and policy documents, as well as supported by the City's Municipal Code. The City's Municipal Code chapter on trees (Chapter 37) will require updates (and independent of the UFMP, efforts to update Chapter 37 have been underway for a few years), and policy guidance will also require updates. The UFMP is not intended to get into the details around inter-departmental processes or detailed best management practices (BMPs), it is anticipated the UFMP will point to the necessity of updating City planning & policy documents and the creation of a technical manual based on the goals and objectives set forth in the UFMP.

City operations are also managed by a number of other guiding documents, including the Downtown Specific Plan, the General Plan and the (currently draft) Climate Action and Adaptation Plan (CAAP) for example. In each of these documents and others, trees are referenced in some amount of detail. Much like these plans, the UFMP will not get in to the specifics of individual locations, rather would provide the data, goals and objectives to inform recommendations to improve and protect Davis' urban forest.

Identified Challenges and Opportunities So Far

Changes in the City's Urban Forestry Division

Urban Forestry is undergoing a number of transitions during the process of the UFMP, including the move of Urban Forestry to Public Works Utilities and Operations from Parks and Community Services and the onboarding of a new Urban Forestry Manager. The transition of the division also highlighted the need for updates with the City's tree inventory data, as multiple software programs and data sets require time and resources to reconcile. In discussions with the Tree Commission and the City's consultant, it is clear that the plan will address this concern with a likely recommendation to update the tree inventory.

Other Identified Challenges & Opportunities

In addition to challenges presented by the departure of long-time staff and inventory questions, collaborators (including the Tree Commission, local non-profit organizations and community members) have highlighted existing areas of opportunity with the Urban Forestry Division and the City's management of trees. The summary of these comments is included as an attachment to this report (Attachment 2). Highlighted opportunities include: sufficiency of staffing levels in urban forestry, need for better data and Best Management Practices, aging tree canopy, tree protection, and climate change.

Note: Climate change has caused the range of some of Davis' tree species to shrink, lessening the palette of the existing tree options. It is anticipated that the UFMP will focus on long and short term plans that will address the handful of species that likely must be phased out (or removed) and new climate-ready species to be planted. Making sure the City has up-to-date data that can be utilized for the purpose of both management and planning will be key to the success of Davis' urban forest.

The message that Davis loves trees came through clear in the interviews and discussions with the City's consultant on the UFMP. The City has an engaged and active volunteer base, along with local subject matter expertise, and is in a unique position with the UFMP to utilize data, research and partnerships in an effort to lead the charge of creating a climate-ready urban forest.

Feedback to Consider
Staff will return to Council with a draft UFMP after Tree Commission review, likely in February. Council is asked, for this update, to consider providing additional comments, feedback or recommendations for the consultant to take in to consideration as the initial phases of collaborator, public and internal input concludes.

Attachments

1. DRAFT – Resource/Land Use Analysis by Davey
2. Davis Collaborators' Challenges and Opportunities Summary

Davis, CA

Urban Forest Resource Analysis

2022

Davis
CALIFORNIA

DAVEY
Resource Group

Davis, CA

Urban Forest Resource Analysis

2022

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Acknowledgements:

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Table of Contents

Figures

Tables

Executive Summary

Community trees are trees in the public rights-of-way, including trees along streets, in medians, and in parks. Community trees play a vital role in the City of Davis. They provide numerous tangible and intangible benefits to residents, employees, visitors, and neighboring communities. The City recognizes that trees are a valued resource, a critical component of the urban infrastructure, and part of the community's identity.

The City of Davis contracted with Davey Resource Group, Inc. (DRG) to use the City's community tree inventory data in conjunction with i-Tree *Eco* benefit-cost modeling software to develop a detailed and quantified analysis of the current structure, function, benefits, and value of the community tree resource. This report details the results of that analysis.

Structure

A structural analysis is the first step towards understanding the benefits provided by community trees, as well as their management needs. As of 2022, Davis' community tree inventory includes 30,692 trees and 407 available planting sites. Considering species diversity, age distribution, condition, canopy coverage, and replacement value, DRG determined that the following information characterizes Davis' community tree inventory:

- 207 unique tree species
- *Platanus x acerifolia* (London planetree, 7.8%) is the most common species, followed by *Pistacia chinensis* (Chinese pistache, 6.6%), and *Lagerstroemia indica* (common crapemyrtle, 6.2%)
- 36% of trees are less than 8 inches in diameter (DBH[1]) and 9.8% of trees are larger than 24 inches in diameter, indicating a well-established age distribution
- 93.3% of community trees are in fair or better condition
- Community trees provide an estimated 1,355 acres of canopy cover
- The current stocking level[2] is 98.7%, based on a total 31,099 planting sites, including 30,692 trees and 407 vacant sites
- To date, community trees have stored more than 16,158 tons of carbon (CO_2) in woody and foliar biomass
- To replace Davis' 30,692 community trees with trees of equivalent size, species, and condition, would cost over $91.5 million
- 69% of Davis' community trees are susceptible to identified pests and disease threats such as polyphagous shot hole borer, defoliating moths, thousand cankers disease and Dutch elm disease

[1]DBH: Diameter at Breast Height. DBH represents the diameter of the tree when measured at 1.4 meters (4.5 feet) above ground (U.S.A. standard).

[2]Stocking level is the measure of the number of planting sites occupied by trees, relative to the total number of potential planting sites.

Benefits

Many of the benefits from urban trees cannot be accurately quantified with current formulas and peer-reviewed consensus. Numerous studies indicate that urban trees have innumerable critical benefits to natural ecosystems, economies, and human health and welfare. However, i-Tree *Eco* is currently limited to quantifying the benefits from trees to air quality, stormwater runoff reduction, and carbon sequestration.

Annually, community trees provide quantifiable benefits to the community totaling $213,857. The average annual benefit per tree is $6.97. These benefits include:

- 2.7 million gallons of avoided stormwater runoff, valued at $24,552, an average of $0.80 per tree
- 10.4 tons of air particulates removed, improving air quality, and reducing adverse health incidents for a value of $117,423, an average of $3.83 per tree
- 421.5 tons of carbon directly sequestered, valued at $71,882, an average of $2.34 per tree

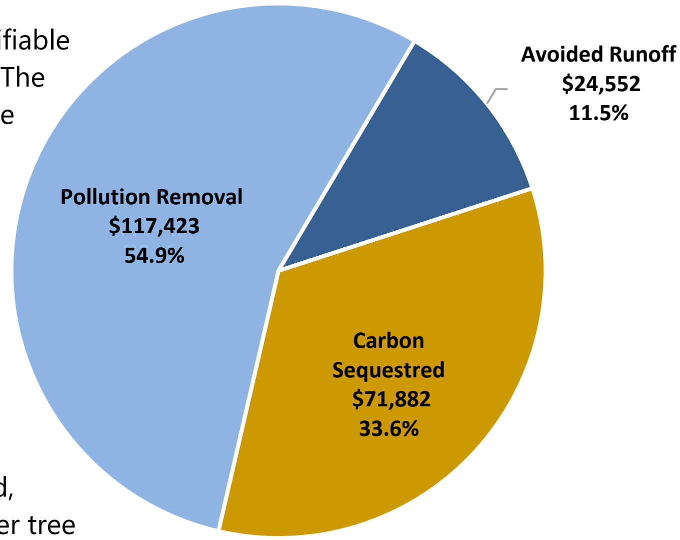


Figure 1: Annual Benefits from the Community Tree Resource

Management & Investment

Annually, the City invests approximately $1.6 million ($51.41/tree, $22.77/capita) to manage public trees. The quantifiable benefits from i-Tree *Eco* offset this investment by $213,857, for a net investment of $1.4 million. However, this offset amount is inarguably a conservative estimate of the true environmental and socioeconomic benefits from this vital resource, including, benefits to wildlife, property values, and public health and welfare. Additionally, when tree data includes the distance and direction from nearby buildings, i-Tree *Eco* can calculate estimated energy savings (gas and electric) resulting from the shade and protection of trees. The inventory does not currently include these metrics.

The City of Davis' tree inventory is a dynamic resource that requires continued investment to maintain and realize its full benefit potential. Trees are one of the few community assets that have the potential to increase in value with time and proper management. Appropriate and timely tree care can substantially increase lifespan and benefit yield. When trees live longer, they provide greater benefits. As individual trees mature, and aging trees are replaced, the overall value of the community forest and the amount of benefits provided grow as well. However, this vital living resource is vulnerable to a host of stressors and requires ecologically sound and sustainable best management practices to ensure a continued flow of benefits for future generations.

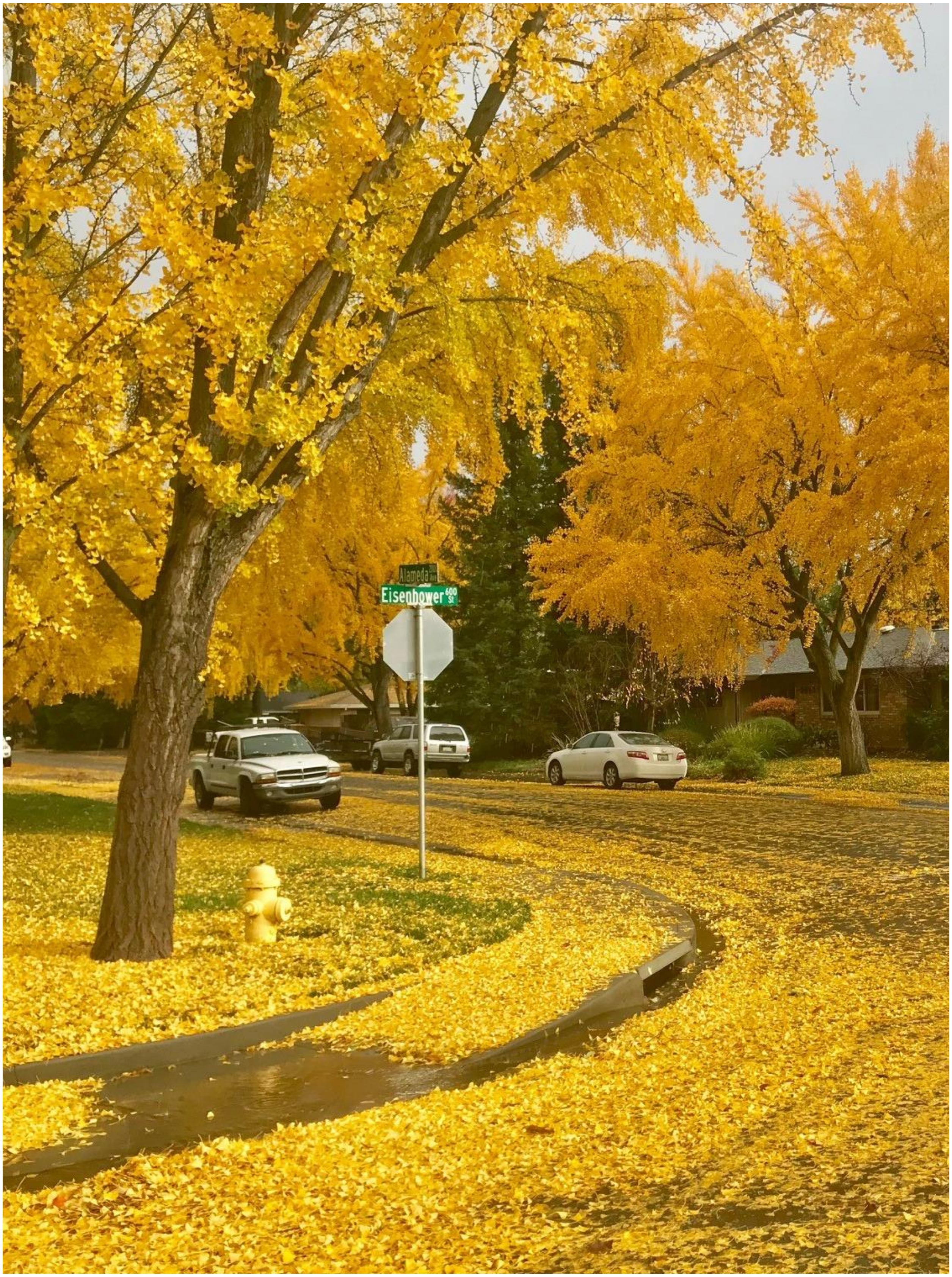
Although urban forest managers cannot foresee when a pest or pathogen may be introduced to the urban forest, being aware of and able to identify potential threats allows them to approach management and prevention in a way that fits the community's culture and available resources. Using best management practices to prepare for and/or manage pests and pathogens can lessen the detrimental impacts they have on the urban forest.

Overall, the public tree inventory is a resource in fair or better condition with a well-established age distribution. With proactive management, planning, and new and replacement tree planting, the benefits from this resource will continue to increase as young trees mature.

Based on this resource analysis, DRG recommends the following:

- Regularly inspect trees to identify and mitigate structural and age-related defects to manage risk and reduce the likelihood of tree and branch failure.
- Provide structural pruning for young trees and a routine pruning cycle for all trees.
- Increase species diversity in new and replacement tree plantings to reduce reliance on the most prevalent species.
    - Discontinue planting species that are classified as invasive.
- Monitor species performance (e.g., health, structure, longevity, pest and disease resistance) and consider new, promising species in future tree plantings.
- Consider successional planting of important species, based on relative performance and relative age distributions.
- Replace trees that have been removed and increase the stocking level for optimal benefits.
- Plant large-stature species for greater benefits wherever space allows.
- Follow best management practices, when monitoring for and dealing with pests and diseases.
- Maintain and update the inventory database to include all public trees (including in open space), track tree growth and condition, and consider adding distance and direction from buildings to calculate energy benefits.

With adequate protection and planning, the value of the community tree resource will continue to increase over time. Proactive management and a tree replacement plan are critical to ensuring that the community continues to receive a high level of benefits. Along with new tree installations and replacement plantings, funding for tree maintenance and inspection is necessary to preserve benefits, prolong tree life, and manage risk and public safety. Existing mature trees should be maintained and protected whenever possible since the greatest environmental benefits accrue from the continued growth and longevity of the existing canopy. Urban forest managers can take pride in knowing that community trees support the quality of life for residents and neighboring communities.



The greatest benefits accrue from the continued growth and longevity of the existing canopy.

Introduction

Davis is a small city located in the Central Valley of California, roughly 15 miles west of the California State Capitol in Sacramento. The area has reputation as a center of agriculture for its rich soil, multimillion dollar agricultural industry/commodities, and the nation's top rated agricultural college, the University of California at Davis. As a City, Davis is known for its walkable downtown, friendly community, and farmers markets which showcase the surrounding agricultural industry of the area. The City of Davis, perhaps most well known for being a bicycle-friendly community, has earned the title of the 'Bicycle Capital of America' as early as 1964 and was the first city in the United States to earn the Platinum Bicycle Friendly Community award from the League of American Bicyclists in 2006. Today, careful planning, not only for bicycle use but for growth as a whole, is seen throughout the city and evidenced by a connected network of greenbelts, dedicated bike and pedestrian paths, and bicycle tunnels and bridges.

Davis experiences a Mediterranean climate with an average of 21 inches of rainfall each year, most of which occurs in the winter and spring months. Most of the precipitation falls in the winter, with daytime temperatures that average in the 50s. In the summer, daytime temperatures in Davis average in the mid-90s. There are 267 days of sunshine each year and temperatures do not typically drop below freezing (Sperling's Best Places, n.d.).

Urban trees play an essential role in the community providing many benefits, tangible and intangible, to residents, visitors, and neighboring communities. Research demonstrates that healthy urban trees can improve the local environment and lessen the impact resulting from urbanization and industry (Center for Urban Forest Research, 2017). Trees improve air quality, reduce energy consumption, help manage stormwater, reduce erosion, provide critical habitat for wildlife, and promote a connection with nature. When taken together, the urban forest contributes to a healthier, more livable, and prosperous Davis.

The tree inventory data were analyzed with i-Tree *Eco* benefit-cost modeling software (Eco v6.0.25) to generate the data for this resource analysis. The software uses inventory data collected in the field along with local hourly air pollution and meteorological data to quantify urban forest structure, environmental effects, and value to the community. The program is a central computing engine that makes scientifically sound estimates of the effects of urban forest using peer-reviewed scientific equations to predict environmental and economic benefits. Aesthetic, human health, socio-economic, property value, and wildlife benefits are not calculated as part of this study although they are certainly part of the important benefits provided by Davis' community tree resource.

This report provides an assessment of the structure and composition of the current tree inventory, consisting of 30,692 trees. Where possible, it also quantifies the benefits derived from the tree resource. This baseline data can be used to make effective resource management decisions, develop policy, and set priorities. Ultimately, the results of the analysis allow the City of Davis to better understand, prioritize, and manage the tree resource.

This summary report provides the following information:

- A description of the current structure of the community tree resource and an established benchmark for future management decisions.
- Quantifiable economic value of benefits from the community tree resource to air quality, stormwater runoff reduction, and carbon sequestration.

- Data that may be used by resource managers in the pursuit of alternative funding sources, local assessment fees, legislative initiatives, and collaborative relationships with utility purveyors, non-governmental organizations, air quality districts, watershed managers, and federal and state agencies.

Urban trees play an essential role in the community of Davis by providing many benefits, tangible and intangible, to residents, visitors, and neighboring communities.

Resource Structure

A tree resource is more thoroughly understood through examination of composition and structure. Consideration of stocking level, species diversity, canopy cover, age distribution, condition, and performance provide a foundation for planning and strategic management. Inferences based on this data can help managers understand the importance of individual trees and species populations to the overall forest as it exists today and provide a basis to plan for and project the future potential of the resource.

Species Diversity

Species diversity is calculated as the proportion of species representing the total community tree resource (Table 1). The community tree resource includes a mix of 207 unique species (Appendix C), with 17.4% native to California.

Table 1: Population Summary of Most Prevalent Species

	DBH Class (inches)									
Species	**0 - 4**	**4 - 8**	**8 - 12**	**12 - 18**	**18 - 24**	**24 - 30**	**30 - 36**	**>36**	**# of Trees**	**% of Pop.**
Platanus x acerifolia	201	332	550	791	308	124	62	12	2,380	7.75
Pistacia chinensis	266	419	621	530	139	32	8	0	2,016	6.57
Lagerstroemia indica	834	731	207	84	40	13	6	2	1,918	6.25
Quercus lobata	359	306	301	601	161	59	20	25	1,833	5.97
Sequoia sempervirens	59	140	269	635	294	87	21	14	1,518	4.95
Pyrus calleryana	25	138	367	699	205	44	4	2	1,484	4.84
Triadica sebifera	15	99	321	557	235	77	16	3	1,322	4.31
Celtis sinensis	36	105	183	354	206	102	34	8	1,028	3.35
Fraxinus holotricha	12	10	67	323	258	121	25	2	818	2.67
Vitex agnus-castus	64	128	127	144	129	140	50	5	787	2.56
Casuarina cunninghamiana	8	47	62	189	205	103	34	13	661	2.15
Pinus canariensis	7	20	36	139	197	110	47	8	564	1.84
Celtis australis	121	27	48	109	104	76	42	14	541	1.76
Ulmus parvifolia	237	114	77	64	22	10	0	1	525	1.71
Ginkgo biloba	392	36	10	27	33	8	1	0	507	1.65
Acer buergerianum	243	84	52	48	4	0	0	0	431	1.40
Koelreuteria paniculata	26	97	165	100	20	3	1	0	412	1.34
Pinus brutia	32	23	42	69	78	78	42	14	379	1.23
Gleditsia triacanthos	6	26	32	126	130	39	3	1	363	1.18
Quercus douglasii	280	44	22	15	1	0	0	0	362	1.18
Fraxinus velutina	5	3	4	26	91	130	89	6	354	1.15
Quercus suber	71	39	39	69	43	32	19	13	325	1.06
Fraxinus americana	188	54	17	38	18	4	0	1	320	1.04
Platanus racemosa	1	29	59	128	79	11	4	2	313	1.02
All other species	3,152	1,356	1,294	1,854	940	532	241	163	9,531	31.05
Total	**6,640**	**4,407**	**4,971**	**7,719**	**3,941**	**1,935**	**769**	**309**	**30,692**	**100%**

The species diversity in community tree resource is higher than the mean of 185 species reported from 18 California communities (Muller and Bornstein, 2010). Four species in the inventory are considered invasive according to California Invasive Species Advisory Committee, including *Triadica sebifera* (Chinese tallowtree), *Schinus molle* (California peppertree), *Ailanthus altissima* (tree of heaven), and *Eucalyptus globulus* (blue gum) (2010).

The most prevalent species are *Platanus x acerifolia* (London planetree, 7.8%), *Pistacia chinensis* (Chinese pistache, 6.6%), *Lagerstroemia indica* (common crapemyrtle, 6.2%), and *Quercus lobata* (California white oak, 6.0%) (Table 1 and Figure 2). These four species make up nearly 27% of the overall population. The 24 most prevalent species (representing >1% of the overall population) make up 68.9% of the overall population.

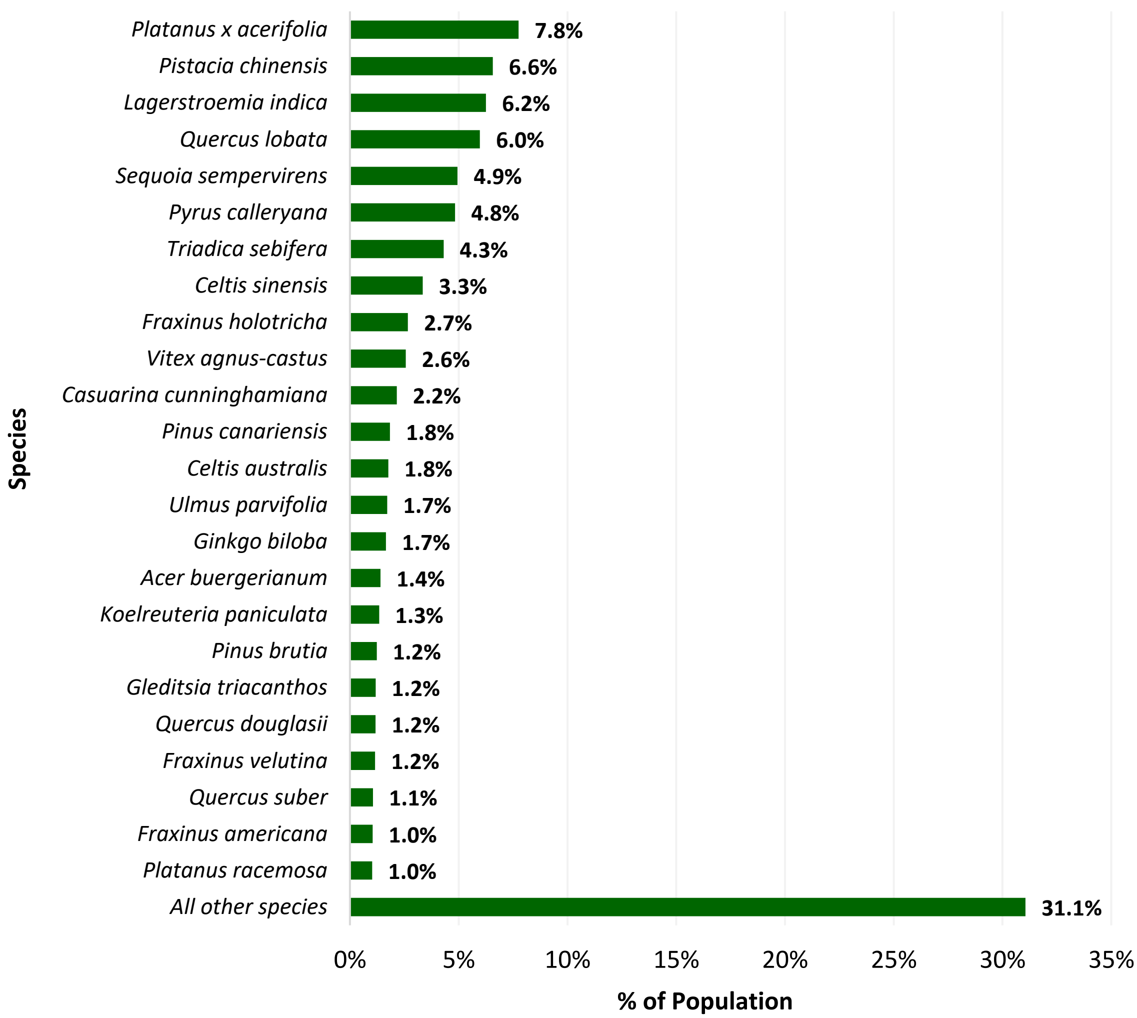


Figure 2: Species Diversity in Davis' Community tree Resource

Maintaining diversity in a community tree resource is important. Dominance of any single species or genus can have detrimental consequences in the event of storms, drought, disease, pests, or other stressors that can severely affect a community tree resource and the flow of benefits and costs over time. Catastrophic pathogens, such as Dutch elm disease (*Ophiostoma ulmi*), emerald ash borer (*Agrilus planipennis*), Asian longhorned beetle (*Anoplophora glabripennis*), and sudden oak death (*Phytophthora ramorum*) are some examples of unexpected, devastating, and costly pests and pathogens that highlight the importance of diversity and the balanced distribution of species and genera.

Recognizing that all tree species have a potential vulnerability to pests and disease, urban forest managers have long followed a rule of thumb that no single species should represent greater than 10% of the total population and no single genus more than 20% (Santamour, 1990). Among Davis' community tree population, no single species or genera exceed these widely accepted rules. Managers should continue to strive for increased diversity to promote greater resiliency and reduce the risk of a significant loss in benefits should any species become a liability.

Importance Value

To quantify the significance of any one species in Davis' community tree resource, an importance value (IV) is derived for each of the most prevalent species. Importance values are particularly meaningful to community tree resource managers because they indicate a reliance on the functional capacity of a species. **i-Tree *Eco* calculates importance value based on the sum of two values: percentage of total population and percentage of total leaf area.** Importance value goes beyond tree numbers alone to suggest reliance on specific species based on the benefits they provide. The importance value can range from zero (which implies no reliance) to 200 (suggesting total reliance). A complete table, with importance values for all species, is included in Appendix C.

To reiterate, research strongly suggests that no single species should dominate the composition of a community tree resource. Because importance value goes beyond population numbers, it can help managers to better comprehend the resulting loss of benefits from a catastrophic loss of any one species. When importance values are comparatively equal among the 10 to 15 most prevalent species, the risk of significant reductions to benefits is reduced. Of course, suitability of the dominant species is another important consideration. Planting short-lived or poorly adapted species can result in short rotations and increased long-term management costs.

Table 2 lists the importance values of the most prevalent species in Davis' community tree resource. These 24 species represent 68.9% of the overall population and 71.0% of the total leaf area for a combined importance value of 141.3. Of these, Davis relies most heavily on *Platanus x acerifolia* (London planetree, IV=19.1), followed by *Quercus lobata* (California white oak, IV=13.0), and *Sequoia sempervirens* (coast redwood, IV=11.6). Together these three species represent 18.7% of the inventory and have a combined importance value of 43.7 (21.9% of the total). These species contribute significant benefits and a sense of place and are crucial to the inventory and key to sustaining the benefits provided by the community tree resource, as well as preserving the essence of Davis for years to come.

For some species, low importance values are primarily a function of species stature and/or age distribution. Immature or small-stature species frequently have lower importance values than their representation in the inventory might suggest. This is due to their relatively small leaf area and canopy coverage. For example, *Lagerstroemia indica* (common crapemyrtle), which represents 6.2% of the overall resource and 0.8% of overall leaf area, currently has an importance value of 7.0. This species has a large percentage of the population under 8 inches in diameter (81.5%) and the importance value is not likely to increase over time due to its small stature. In contrast, *Quercus douglasii* (blue oak, IV=1.4) represents 1.2% of the resource and less than 1% of overall leaf area. In total, 89.5% of these large stature trees are currently under 8 inches in diameter. As these young trees mature and increase in canopy (leaf area), the importance value of this species is likely to increase significantly over time.

Some species are more significant contributors to the urban forest than population numbers would suggest. For example, *Pinus canariensis* (Canary Island pine) represents 1.8% of the population and 4.0% of overall leaf area and has an importance value of 5.9. This large-stature species is well-established in Davis, with 29.3% of trees greater than 24 inches in diameter. As a result, these trees provide significant benefits despite their representation in the population.

Table 2: Importance Value (IV) of Prevalent Species in Davis (Representing >1%)

Species	% of Pop.	% of Leaf Area	Importance Value (IV)
Platanus x acerifolia	7.75	11.30	19.10
Pistacia chinensis	6.57	3.50	10.10
Lagerstroemia indica	6.25	0.80	7.00
Quercus lobata	5.97	7.00	13.00
Sequoia sempervirens	4.95	6.60	11.60
Pyrus calleryana	4.84	3.40	8.20
Triadica sebifera	4.31	3.80	8.10
Celtis sinensis	3.35	6.10	9.40
Fraxinus holotricha	2.67	5.00	7.70
Vitex agnus-castus	2.56	2.40	5.00
Casuarina cunninghamiana	2.15	1.70	3.90
Pinus canariensis	1.84	4.00	5.90
Celtis australis	1.76	3.00	4.80
Ulmus parvifolia	1.71	0.90	2.60
Ginkgo biloba	1.65	0.60	2.30
Acer buergerianum	1.40	0.70	2.10
Koelreuteria paniculata	1.34	1.60	3.00
Pinus brutia	1.23	1.70	2.90
Gleditsia triacanthos	1.18	1.40	2.60
Quercus douglasii	1.18	0.20	1.40
Fraxinus velutina	1.15	1.90	3.10
Quercus suber	1.06	2.00	3.00
Fraxinus americana	1.04	0.50	1.60
Platanus racemosa	1.02	1.90	2.90
All other species	31.05	27.10	58.90
Total	**100%**	**100%**	**200**

Canopy Cover

The amount and distribution of leaf surface area is the driving force behind the urban forest's ability to produce benefits for the community (Clark et al, 1997). As canopy cover increases, so do the benefits afforded by leaf area. Davis covers an area of 10 square miles (6,400 acres). i-Tree *Eco* estimates that community trees are providing approximately 2.1 square miles (1,355 acres) of canopy cover which accounts for 4.9% of total land area.

Stocking Level

Currently, Davis' community tree resource has 407 available planting sites. Considering the tree inventory identified 30,692 existing trees and 407 available planting sites, there are 31,099 total planting sites for community trees. As a result, the estimated stocking level for the community tree resource is currently 98.7%.

Relative Age Distribution

Age distribution can be approximated by considering the DBH range of the overall inventory and of individual species. Trees with smaller diameters tend to be younger. It is important to note that palms do not increase in DBH over time and that height more accurately correlates to age.

The distribution of individual tree ages within a tree population influences present and future costs as well as the flow of benefits. An ideally aged population allows managers to allocate annual maintenance costs uniformly over many years and assures continuity in overall tree canopy coverage and associated benefits. A desirable distribution has a high proportion of young trees to offset establishment and age-related mortality as the percentage of older trees declines over time (Richards, 1982/83). This ideal, albeit uneven, distribution suggests a large fraction of trees (~40%) should be young, with a DBH less than eight inches, while only 10% should be in the large diameter classes (>24 inches DBH).

The age distribution of the community tree resource shows a well-established population. Nearly 36% of all trees are less than 8 inches in diameter and 9.8% are greater than 24 inches (Figure 3). The data indicates that a number of recent tree plantings have been directed towards both large and small statured trees.

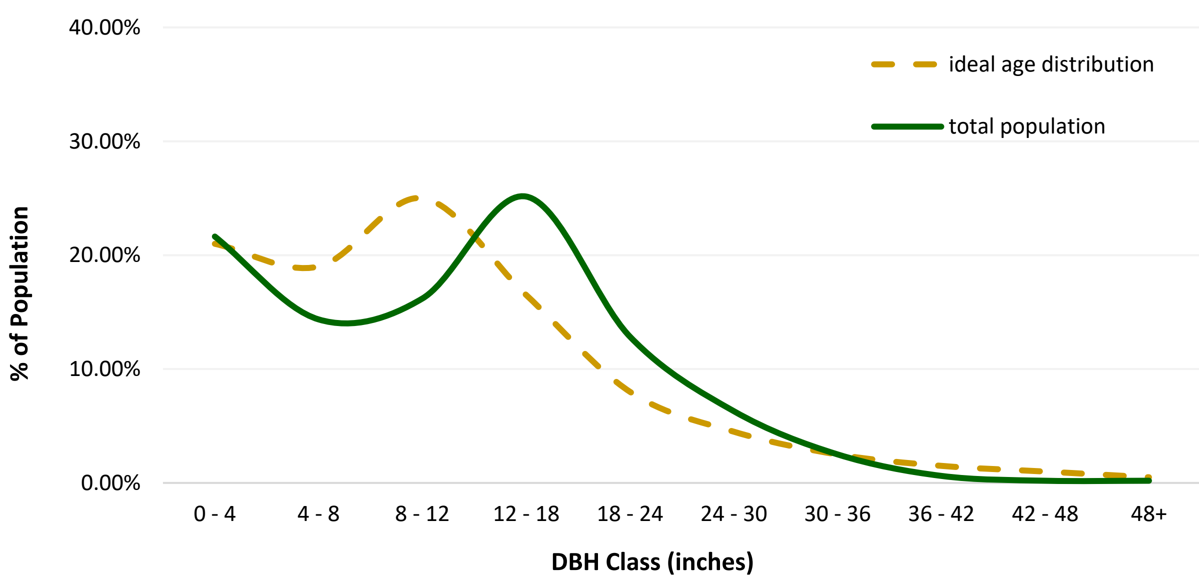


Figure 3: Community Tree Inventory Relative Age Distribution

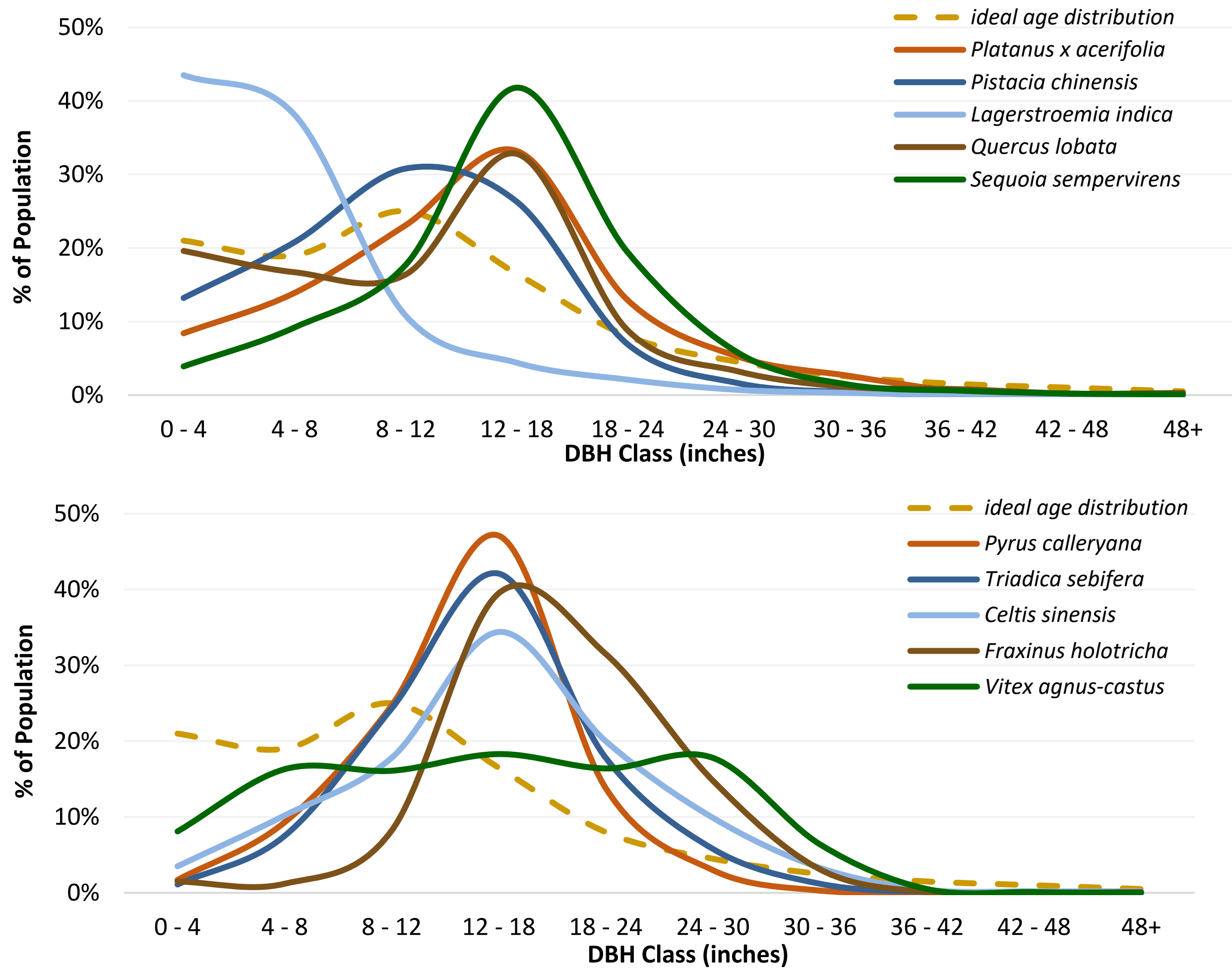


Figure 4: Relative Age Distribution of Davis' Top 10 Most Prevalent Species

Relative age distribution can also be evaluated for each individual species. The 10 most prevalent community tree species are compared against the ideal distribution in Figure 4. Similar to the overall distribution, the majority of the age distributions of the top 10 most prevalent species show well established populations, heavily represented by trees between 12 and 18 inches in diameter (e.g., *Platanus x acerifolia* [London planetree], *Quercus lobata* [California white oak] and *Sequoia sempervirens* [coast redwood]). *Pistacia chinensis* (Chinese pistache) has a nearly ideal age distribution.

The age distribution of *Vitex agnus-castus* (chaste tree) shows a significant portion of the population greater than 24 inches in diameter (24.8%). This species can be a small tree or shrub. The data indicates that most of the population is taking on a shrub form, based on the seemingly large diameter, which is likely a reflection of the method used to measure multi-stemmed individuals (e.g., sum of diameters of individual trunks). *Lagerstroemia indica* (common crapemyrtle) is a another small-statured species, therefore trees larger than 8 inches (18.3%) are likely mature. These species do not contribute much to the overall environmental benefits of the tree resource due to their smaller canopies.

Analysis of the age distribution of prevalent species can help resource managers to understand and foresee maintenance activities and budgetary needs. In addition to informing managers of the economics of prevalent species, managers can use the age distribution to determine trends in plantings and adopt strategies for species selection in the years to come.

Tree Condition & Relative Performance

Tree condition is an indication of how well trees are managed and how well they are performing in the region and in each site-specific environment (e.g., street, median, parking lot, etc.). Condition ratings can help managers anticipate maintenance and funding needs. In addition, tree condition is an important factor for the calculation of resource benefits. A condition rating of good assumes that a tree has no major structural problems, no significant mechanical damage, and may have only minor aesthetic, insect, disease, or structural problems, and is in good health. When trees are performing at their peak, as those rated as good or better, the benefits they provide are maximized.

Community trees in Davis are in overall fair or better condition (93.3%). Approximately 5.7% of trees are in poor condition and 1.0% are dead. (Figure 5).

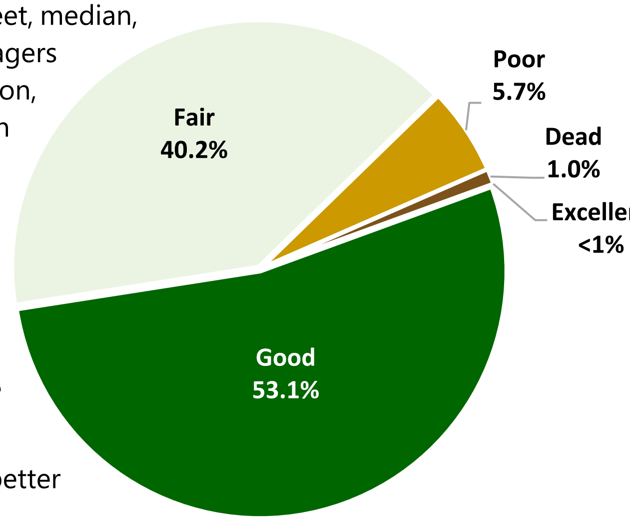


Figure 5: Tree Condition

Relative Performance Index

The relative performance index (RPI) is one way to further analyze the condition and suitability of a specific tree species. The RPI provides an urban forest manager with a detailed perspective on how different species perform compared to each other. The index compares the condition ratings of each tree species with the condition rating of every other tree species within the inventory. An RPI of 1.0 or better indicates that the species is performing as well or better than average. An RPI value below 1.0 indicates that the species is underperforming in comparison to the rest of the population.

Among Davis' 24 most prevalent tree species, 16 have an RPI of 1.0 or greater (Table 3). *Acer buergerianum* (Trident maple) has the highest RPI at 1.13. The most abundant species, *Platanus x acerifolia* (London planetree, 7.8%) has an RPI of 0.98, which is attributable to 52.2% of the species being in fair condition.

The RPI can be a useful tool for urban forest managers as an indicator of environmental suitability for species selection. If a community has been planting two or more new species, the RPI can be used to compare their relative performance. If the RPI indicates that one is performing relatively poorly, managers may decide to reduce or even stop planting that species and subsequently save money on both planting stock and replacement costs. For example, *Pinus canariensis* (Canary Island pine) has an RPI of 1.07 and *Pinus brutia* (Turkish pine) has an RPI of 0.88 (Table 3). The data indicates that both species are heavily represented by trees between 12 and 18 inches in diameter, and the data indicates that both species have been planted recently. However, the RPI indicates that *P. canariensis* is a more suitable species for Davis where a large-stature coniferous tree is preferred.

The RPI enables managers to look at the performance of long-standing species as well. Established species with an RPI of 1.00 or greater have performed well over time. These top performers should be retained, and planted, as a healthy proportion of the overall population. It is important to keep in mind that, because RPI is based on condition at the time of the inventory, it may not reflect cosmetic or nuisance issues, especially seasonal issues that are not threatening the health or structure of the trees.

Table 3: Relative Performance Index of Most Prevalent Species

Species	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Dead (%)	RPI	# of Trees	% of Pop.
Platanus x acerifolia	0.00	42.60	52.20	4.70	0.40	**0.98**	2,380	7.75
Pistacia chinensis	0.00	79.30	18.50	1.80	0.30	**1.09**	2,016	6.57
Lagerstroemia indica	0.00	59.00	36.20	4.60	0.20	**1.03**	1,918	6.25
Quercus lobata	0.00	46.00	49.40	3.90	0.60	**0.99**	1,833	5.97
Sequoia sempervirens	0.00	54.20	42.00	2.90	1.00	**1.01**	1,518	4.95
Pyrus calleryana	0.00	8.40	65.60	24.10	2.00	**0.81**	1,484	4.84
Triadica sebifera	0.00	54.50	42.10	3.10	0.40	**1.02**	1,322	4.31
Celtis sinensis	0.20	55.40	38.10	5.50	0.80	**1.01**	1,028	3.35
Fraxinus holotricha	0.00	31.40	60.10	8.10	0.40	**0.94**	818	2.67
Vitex agnus-castus	0.00	77.50	19.90	2.50	0.00	**1.09**	787	2.56
Casuarina cunninghamiana	0.00	71.60	26.80	1.20	0.50	**1.07**	661	2.15
Pinus canariensis	0.00	73.60	22.30	3.90	0.20	**1.07**	564	1.84
Celtis australis	0.00	83.20	14.80	1.50	0.60	**1.10**	541	1.76
Ulmus parvifolia	0.00	78.70	18.90	1.90	0.60	**1.09**	525	1.71
Ginkgo biloba	0.20	88.60	7.30	1.60	2.40	**1.10**	507	1.65
Acer buergerianum	0.00	90.30	9.00	0.50	0.20	**1.13**	431	1.40
Koelreuteria paniculata	0.20	66.50	27.70	5.10	0.50	**1.05**	412	1.34
Pinus brutia	0.00	12.90	78.40	7.90	0.80	**0.88**	379	1.23
Gleditsia triacanthos	0.00	19.60	71.10	9.40	0.00	**0.90**	363	1.18
Quercus douglasii	0.00	77.90	21.00	0.60	0.60	**1.09**	362	1.18
Fraxinus velutina	0.00	5.60	66.70	27.10	0.60	**0.80**	354	1.15
Quercus suber	0.00	68.90	26.20	3.70	1.20	**1.05**	325	1.06
Fraxinus americana	0.00	60.00	31.60	7.50	0.90	**1.02**	320	1.04
Platanus racemosa	0.00	27.20	66.10	5.80	1.00	**0.92**	313	1.02
All other species	0.00	0.88	0.84	0.14	0.06	**1.02**	9,531	31.05
Total	**<1.00%**	**53.10%**	**40.20%**	**5.70%**	**1.00%**	**1.00**	**30,692**	**100%**

An RPI value less than 1.00 may be indicative of a species that is not well-adapted to local conditions. Poorly adapted species are more likely to present increased safety and maintenance issues. Species with an RPI less than 1.00 should receive careful consideration before being selected for future planting choices. However, prior to selecting or deselecting trees based on RPI alone, managers should consider the age distribution of the species, among other factors. A species that has an RPI of less than 1.00 but has a significant number of trees in larger DBH classes, may simply be exhibiting signs of population senescence. For example, *Pinus brutia* (Turkish pine), has an RPI of 0.88. This species has a relatively large number of mature trees, with 35.4% larger than 24 inches in diameter. Although the RPI is below 1.00, it is likely an indication of the mature age distribution and small percentage of new plantings (only 2.5% of trees are below 8 inches in diameter), rather than poor performance. A complete table, with RPI values for all species, is included in Appendix C.

RPI is also helpful for identifying underused species that are demonstrating reliable performance. Species with an RPI value greater than 1.00 and an established age distribution may be indicating their suitability for the local environment. These species should receive consideration for additional planting (Table 4).

As an example, *Celtis australis* (European hackberry) has an RPI of 1.10 and an age distribution that is adequately represented by young to mature trees (27.9% are less than 8 inches in diameter and 24.4% are greater than 24 inches in diameter). The representation in the population and the age distribution combined support the high RPI. Alternatively, *Ulmus davidiana v. japonica* (Japanese elm) represents less than 1% of the population, has an RPI of 1.12, and is almost entirely represented by trees less than 8 inches in diameter (92.6%) and does not have any trees greater than 24 inches in diameter. Although expected to do well in Davis, the current age distribution cannot substantiate the high RPI as there are not enough mature trees, resulting in a lack of evidence for long-term performance.

Table 4: Species That May Be Underused (based on RPI and age distribution)

Species	RPI	% of Pop.
Conifer Evergreen Large		
Cedrus deodara	1.04	0.89
Pinus pinea	1.03	0.18
Broadleaf Evergreen Medium		
Acacia melanoxylon	1.04	0.13
Eucalyptus nicholii	1.02	0.02
Broadleaf Deciduous Large		
Gymnocladus dioica	1.12	0.57
Quercus macrocarpa	1.13	0.09
Broadleaf Deciduous Medium		
Melia azedarach	1.08	0.41
Broadleaf Deciduous Small		
Cercis canadensis	1.00	0.79

RPI is most relevant when there is a moderately high representation of the species. In other words, if there is a single individual that has a high RPI (greater than 1.00) but is the only representative of the species at the site, additional trial plantings of the species can help test the accuracy of the RPI. It is important to use RPI as one of many factors for species selection. Species that have historically experienced major issues in Davis should be avoided and species with a proven track record should be favored.

Replacement Value

The replacement value of the existing community tree resource is more than $91.5 million. Replacement value accounts for the historical investment in trees over their lifetime and is a way of describing the value of a tree population (and/or average value per tree) at a given time. In other words, the value of a tree is equal to the cost of replacing the tree in its current state (Cullen, 2002). There are several methods available for obtaining a fair and reasonable perception of a tree's value (Council of Tree and Landscape Appraisers, 2018; Watson, 2002). For this analysis, the replacement value reflects current population numbers and is based on the valuation procedures of the Council of Tree and Landscape Appraisers, which uses tree species, diameter, condition, and location information (Nowak et al 2002a; 2002b).

To replace all 30,692 community trees in Davis with trees of equivalent size and condition would cost over $91.5 million, an average of $2,983 per tree (Table 5). *Platanus x acerifolia* (London planetree) has the highest replacement value of approximately $8.1 million and accounts for the greatest proportion of the overall replacement value (8.9%). This is consistent with the species having the highest importance value in the inventory and having well established age distribution.

The replacement value for Davis' community tree resource reflects the vital importance of these assets to the community. With proper care and maintenance, the value will continue to increase over time. It is important to recognize that replacement values are separate and distinct from the value of annual benefits produced by this resource and in some instances the replacement value of a tree may be greater than or less than the benefits that a particular tree may provide.

Table 5: Replacement Value for Most Prevalent Species

Species	Number of Trees	Replacement Value ($)	% of Replacement Value	% of Pop.
Platanus x acerifolia	2,380	8,143,297	8.90	7.75
Pistacia chinensis	2,016	4,495,144	4.91	6.57
Lagerstroemia indica	1,918	1,880,088	2.05	6.25
Quercus lobata	1,833	5,746,913	6.28	5.97
Sequoia sempervirens	1,518	6,110,424	6.67	4.95
Pyrus calleryana	1,484	3,564,743	3.89	4.84
Triadica sebifera	1,322	4,620,540	5.05	4.31
Celtis sinensis	1,028	4,078,906	4.46	3.35
Fraxinus holotricha	818	3,656,562	3.99	2.67
Vitex agnus-castus	787	3,651,017	3.99	2.56
Casuarina cunninghamiana	661	3,575,834	3.91	2.15
Pinus canariensis	564	3,870,910	4.23	1.84
Celtis australis	541	2,573,654	2.81	1.76
Ulmus parvifolia	525	847,016	0.93	1.71
Ginkgo biloba	507	508,968	0.56	1.65
Acer buergerianum	431	367,193	0.40	1.40
Koelreuteria paniculata	412	822,126	0.90	1.34
Pinus spp.	379	1,721,986	1.88	1.23
Gleditsia triacanthos	363	1,408,791	1.54	1.18
Quercus douglasii	362	156,517	0.17	1.18
Fraxinus velutina	354	2,321,000	2.54	1.15
Quercus suber	325	1,833,490	2.00	1.06
Fraxinus americana	320	421,963	0.46	1.04
Platanus racemosa	313	1,235,475	1.35	1.02
All other species	9,531	23,930,290	26.14	31.05
Total	**30,692**	**$91,542,848**	**100%**	**100%**

Resource Benefits

Community trees continuously mitigate the effects of urbanization and development and protect and enhance the quality of life within the community. The amount and distribution of leaf surface area is the driving force behind the ability of the urban forest to produce benefits for the community (Clark et al, 1997). Healthy trees are vigorous, often producing more leaf surface area each year.

The quantifiable benefits from the urban forest are based on the environmental functions trees perform. In addition to air quality benefits, trees slow down stormwater and remove pollutants, resulting in reduced stormwater management costs for municipalities. Tree growth sequesters carbon in woody stems and roots. The economic value of these ecosystem functions is calculated in terms of both volume and cost savings. It is important to note that this assessment does not fully account for all of the benefits trees provide. For example, i-Tree *Eco* requires information on the distance and aspect of individual trees from homes and other conditioned structures to calculate energy benefits. This information is currently unavailable for Davis' community tree resource. In addition, i-Tree *Eco* does not calculate benefit values for trees larger than 100 inches in diameter. Some trees in the inventory exceeded the maximum allowable diameter and were therefore assigned a default measurement of 100 inches in diameter to accommodate the analysis.

Annual environmental benefits tend to increase with an increase in the number and size of healthy trees (Nowak et al, 2002). Through proper management, urban forest values can be increased over time as trees mature and with improved longevity and as stocking levels are increased. Climate, pest, and weather events can cause values to decrease if the amount of healthy tree cover declines. Excluding energy benefits, the community tree resource provides quantifiable annual environmental benefits valued at approximately $213,857 (Appendix B).

Air Quality

Urban trees improve air quality in five fundamental ways:

- Absorption of gaseous pollutants such as ozone (O_3), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) through leaf surfaces
- Reduction of emissions from power generation by reducing energy consumption
- Increase of oxygen levels through photosynthesis
- Transpiration of water and shade provision, resulting in lower local air temperatures, thereby reducing ozone levels Interception of particulate matter ($PM_{2.5}$ and PM_{10})[3]

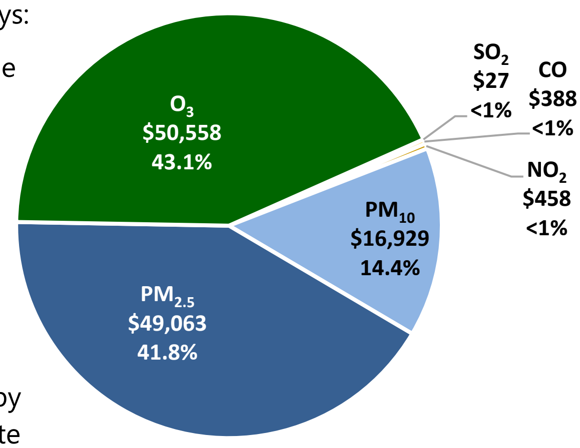


Figure 6: Annual Air Pollution Benefits

[3] $PM_{2.5}$ is particulate matter less than 2.5 microns (a subset of PM_{10}). These microscopic particles are significant air pollutants and are generally more impactful on human health than PM_{10} (i-Tree *Eco* User Manual, 2019).

Air pollutants are known to contribute adversely to human health. Trees decrease the amount of air pollutants in the atmosphere, which can reduce the incidence of numerous negative health effects (Table 6). Ozone is an air pollutant that is particularly harmful to human health. Davis' community trees reduce adverse health effects associated with ozone by approximately 22 incidents annually, a value of $50,558 Ozone forms when nitrogen oxide from fuel combustion and volatile organic gases from evaporated petroleum products react in the presence of sunshine. In the absence of cooling effects provided by trees, higher temperatures contribute to ozone formation. In addition to consequences to human health, short-term increases in ozone concentrations are statistically associated with increased tree mortality for 95 large US cities (Bell et al, 2004).

Table 6: Adverse Health Incidents Avoided Due to Changes in Pollutant Concentration Levels and Economic Values

	NO_2		O_3		$PM_{2.5}$		SO_2	
	Incidence (Reduction/yr.)	Value ($/yr.)	Incidence (Reduction/yr.)	Value ($/yr.)	Incidence (Reduction/yr.)	Value ($/yr.)	Incidence (Reduction/yr.)	Value ($/yr.)
Acute Bronchitis					0.00	$0.37		
Acute Myocardial Infarction					0.00	$115.88		
Acute Respiratory Symptoms	0.23	$7.27	17.73	$1,515.52	3.54	$346.75	0.02	$0.56
Asthma Exacerbation	3.45	$289.29			1.95	$158.66	0.15	$11.68
Chronic Bronchitis					0.00	$542.63		
Emergency Room Visits	0.00	$0.98	0.00	$1.83	0.00	$0.58	0.00	$0.22
Hospital Admissions	0.01	$160.41	0.01	$229.71			0.00	$14.23
Hospital Admissions, Cardiovascular					0.00	$19.31		
Hospital Admissions, Respiratory					0.00	$13.90		
Lower Respiratory Symptoms					0.05	$2.61		
Mortality			0.01	$48,353.95	0.01	$47,754.39		
School Loss Days			4.66	$457.29				
Upper Respiratory Symptoms					0.04	$1.82		
Work Loss Days					0.61	$105.77		
Total	**3.69**	**$457.95**	**22.40**	**$50,558.30**	**6.21**	**$49,062.67**	**0.17**	**$26.68**

Deposition, Interception, & Avoided Pollutants

Each year, 1,981.5 pounds of nitrogen dioxide, carbon monoxide, sulfur dioxide, small particulate matter ($PM_{2.5}$ and PM_{10}), and ozone are intercepted or absorbed by community trees, for a total value of $66,865 (7). As a population, *Platanus x acerifolia* (London planetree) is the greatest contributor to pollutant deposition and interception accounting for 11.3% of the benefit. This is directly related to the species prevalence in the overall population and contributions to the overall leaf area (11.3%).

Trees produce oxygen during photosynthesis, and community trees in Davis produce an estimated 1,124 tons of oxygen annually. Additionally, trees contribute to energy savings by reducing air pollutant emissions (NO_2, $PM_{2.5}$, SO_2, and VOCs) that result from energy production.

Table 7: Annual Air Pollution Removal Benefits

Air Pollutant	Annual Removal (lb.)	Annual Value ($)
O_3	13,947.53	$50,558
$PM_{2.5}$	267.05	$49,063
PM_{10}	4,993.11	$16,929
NO_2	860.47	$458
CO	538.56	$388
SO_2	252.37	$27
	1,918.45	**$66,865**

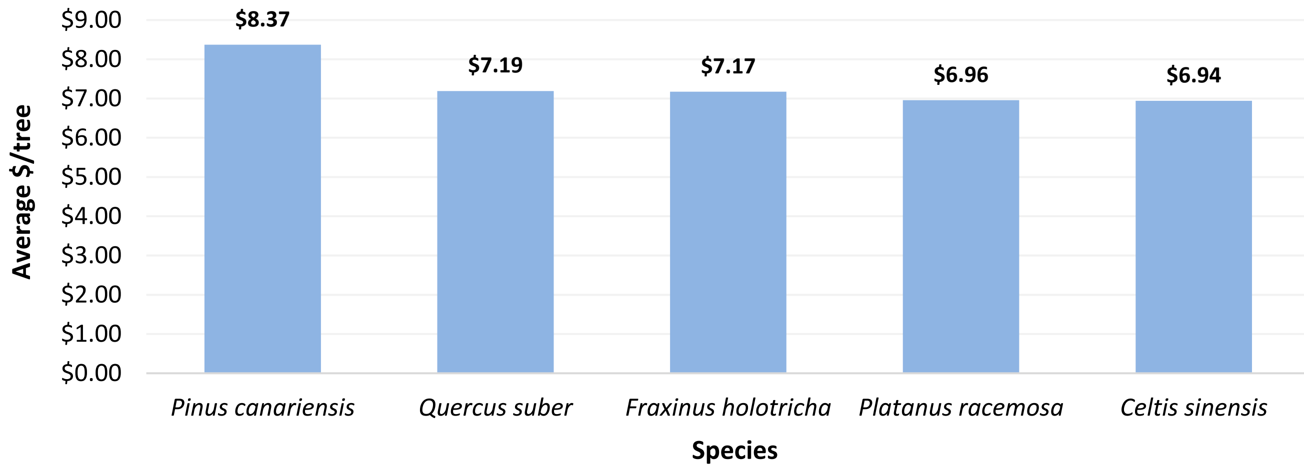


Figure 7: Top 5 Species for Air Pollution Removal Benefits

Table 8: Annual Air Quality Benefits by Most Prevalent Species

Species	Number of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)
Platanus x acerifolia	2,380	7.75	1.18	13,327
Pistacia chinensis	2,016	6.57	0.37	4,140
Lagerstroemia indica	1,918	6.25	0.08	99
Quercus lobata	1,833	5.97	0.73	8,233
Sequoia sempervirens	1,518	4.95	0.69	7,801
Pyrus calleryana	1,484	4.84	0.36	3,999
Triadica sebifera	1,322	4.31	0.40	4,510
Celtis sinensis	1,028	3.35	0.63	7,136
Fraxinus holotricha	818	2.67	0.52	5,868
Vitex agnus-castus	787	2.56	0.25	2,832
Casuarina cunninghamiana	661	2.15	0.18	2,002
Pinus canariensis	564	1.84	0.42	4,7212
Celtis australis	541	1.76	0.31	3,530
Ulmus parvifolia	525	1.71	0.10	1,082
Ginkgo biloba	507	1.65	0.07	754
Acer buergerianum	431	1.40	0.08	853
Koelreuteria paniculata	412	1.34	0.17	1,921
Pinus spp.	379	1.23	0.18	1,983
Gleditsia triacanthos	363	1.18	0.15	1,636
Quercus douglasii	362	1.18	0.02	249
Fraxinus velutina	354	1.15	0.20	2,253
Quercus suber	325	1.06	0.21	2,338
Fraxinus americana	320	1.04	0.05	597
Platanus racemosa	313	1.02	0.19	2,178
All other species	9,531	31.05	2.82	32,571
Total	**30,692**	**100%**	**10.43**	**$117,423**

While trees do a great deal to absorb air pollutants (especially ozone and particulate matter); they also negatively contribute to air pollution. Trees emit volatile organic compounds (VOCs), which also contribute to ozone and carbon monoxide formation. The i-Tree *Eco* analysis accounts for these VOC emissions in the air quality cumulative benefit. Trees in Davis are estimated to emit 27,594 pounds of volatile organic compounds (VOCs) (15,401 pounds of isoprene and 12,192 pounds of monoterpenes) annually. Emissions vary based on species characteristics (e.g., some genera such as oaks are high isoprene emitters) and amount of leaf biomass. The highest volume of VOC emissions is generated by *Quercus lobata* (California white oak), accounting for approximately 25.1% of the overall emissions, largely due to their size (7.0% of overall leaf area) and species attributes. Regardless, the net air quality benefit of *Quercus lobata* is positive.

Air quality impacts of trees are complex, and the i-Tree *Eco* software models these interactions to help urban forest managers evaluate the true impact of urban trees on the Davis' air quality. The cumulative and interactive effects of trees on climate, pollution removal, VOCs, and power plant emissions determine the net impact of trees on air pollution. Local urban forest management decisions also can help improve air quality by prioritizing tree species recognized for their ability to improve air quality and planting next to large traffic corridors.

Atmospheric Carbon Dioxide Reductions

As environmental awareness continues to increase, conversations around global warming and the effects of greenhouse gas (GHG) emissions are increasing. As energy from the sun (sunlight) strikes the Earth's surface it is reflected into space as infrared radiation (heat). GHGs absorb some of this infrared radiation and trap heat in the atmosphere, modifying the temperature of the Earth's surface. Many chemical compounds in the Earth's atmosphere act as GHGs, including carbon dioxide (CO_2), water vapor, and human-made (gases/aerosols). As GHGs increase, the amount of energy radiated back into space is reduced, and more heat is trapped in the atmosphere. An increase in the average temperature of the Earth may result in changes in weather, sea levels, and land-use patterns, commonly referred to as "climate change" (NASA, 2020).

Because urban trees use carbon as a building component for wood and foliar growth, they can help offset carbon emissions and should be recognized as a part of a community's solution for meeting carbon offset goals identified in climate action plans and other environmental policies. i-Tree tools can be used to estimate the GHG and carbon sequestration benefits of tree planting projects (California Air Resource Board, 2020).

Urban trees reduce atmospheric CO_2 in two ways:

- Directly, through growth and the sequestration of CO_2 in wood, foliar biomass, and soil
- Indirectly, by lowering the demand for heating and air conditioning, thereby reducing the emissions associated with electric power generation and natural gas consumption

To date, community trees are estimated to have stored 16,158 tons of carbon (CO_2) in woody and foliar biomass valued at nearly $2.8 million. Annually, the community tree resource directly sequesters an additional 421.5 tons of carbon valued at $71,882, with an average value of $2.00 per tree (Table 9). Among prevalent species, *Casuarina cunninghamiana* (river she-oak, $7.87/tree), *Triadica sebifera* (Chinese tallowtree, $5.24/tree), and *Gleditsia triacanthos* (honeylocust, $3.93/tree) provide the greatest annual per-tree benefits to atmospheric carbon removal, sequestering 13,562.3 tons of carbon annually (Figure 8). These three species account for 18.9% of overall carbon benefit and 7.6% of the overall population.

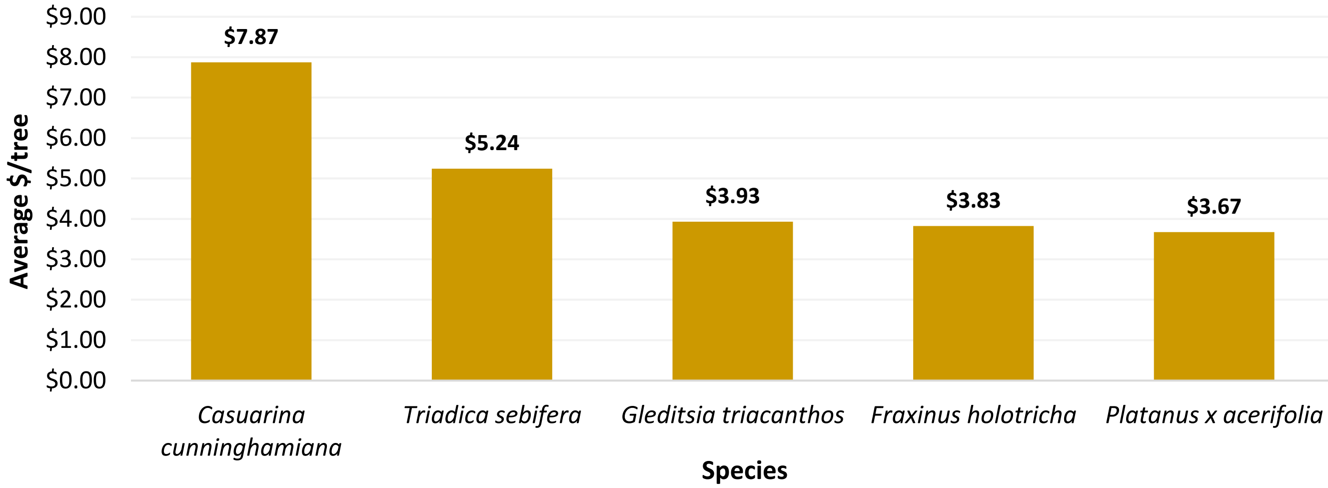


Figure 8: Top 5 Species for Carbon Benefits

Table 9: Annual Carbon Sequestration Benefits by Most Prevalent Species

Species	Number of Trees	% of Pop.	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Average $/tree	% of Annual Benefit
Platanus x acerifolia	2,380	7.75	51.27	8,744.03	3.67	12.16
Pistacia chinensis	2,016	6.57	16.54	2,820.84	1.40	3.92
Lagerstroemia indica	1,918	6.25	9.87	1,682.83	0.88	2.34
Quercus lobata	1,833	5.97	28.02	4,778.93	2.61	6.65
Sequoia sempervirens	1,518	4.95	21.13	3,603.16	2.37	5.01
Pyrus calleryana	1,484	4.84	24.73	4,217.58	2.84	5.87
Triadica sebifera	1,322	4.31	40.65	6,932.12	5.24	9.64
Celtis sinensis	1,028	3.35	3.28	559.13	0.54	0.78
Fraxinus holotricha	818	2.67	18.35	3,129.21	3.83	4.35
Vitex agnus-castus	787	2.56	4.52	771.33	0.98	1.07
Casuarina cunninghamiana	661	2.15	30.51	5,203.75	7.87	7.24
Pinus canariensis	564	1.84	9.80	1,671.14	2.96	2.32
Celtis australis	541	1.76	1.63	277.64	0.51	0.39
Ulmus parvifolia	525	1.71	7.61	1,298.44	2.47	1.81
Ginkgo biloba	507	1.65	0.89	152.03	0.30	0.21
Acer buergerianum	431	1.40	2.72	464.13	1.08	0.65
Koelreuteria paniculata	412	1.34	4.95	844.62	2.05	1.18
Pinus spp.	379	1.23	6.17	1,051.66	2.77	1.46
Gleditsia triacanthos	363	1.18	8.36	1,426.45	3.93	1.98
Quercus douglasii	362	1.18	0.65	110.83	0.31	0.15
Fraxinus velutina	354	1.15	5.42	923.86	2.61	1.29
Quercus suber	325	1.06	4.43	755.23	2.32	1.05
Fraxinus americana	320	1.04	2.26	385.45	1.20	0.54
Platanus racemosa	313	1.02	2.62	447.07	1.43	0.62
All other species	9,531	31.05	115.08	19,630.56	1.95	27.31
Total	**30,692**	**100%**	**421.46**	**$71,882.02**	**$2.00**	**100%**

Stormwater Runoff Reductions

Rainfall interception by trees reduces the amount of stormwater that enters collection and treatment facilities during large storm events (Figure 9). Trees intercept rainfall in their canopy, acting as mini reservoirs, controlling runoff at the source. Healthy urban trees reduce the amount of runoff and pollutant loading in receiving waters in three primary ways:

- Leaves and branch surfaces intercept and store rainfall, thereby reducing runoff volumes and delaying the onset of peak flows
- Root growth and decomposition increase the capacity and rate of soil infiltration by rainfall and reduce overland flow
- Tree canopies reduce soil erosion and surface flows by diminishing the impact of raindrops on bare soil

Davis’ community tree resource is estimated to contribute to the avoidance of more than 189 million gallons of stormwater runoff annually through the interception of precipitation on the leaves and bark of trees for an average of 6,160 gallons per tree (Table 10). The total value of this benefit is $24,552 annually, an average of $0.80 per tree.

Platanus x acerifolia (London planetree) provide 11.4% of the estimated total avoided runoff and provide the greatest per tree benefit of $1.174 (Figure 10). Their age distribution and stature allow them to provide a larger benefit in comparison to other species. In contrast, *Lagerstroemia indica* (common crapemyrtle), which represents 3.6% of the population, reduce less than 1% of the estimated total avoided runoff. This small stature species is limited in its ability to intercept stormwater. Characteristics that contribute to greater stormwater capture include large leaves, broad or dense canopies, and furrowed bark.

As trees grow, the benefits that they provide tend to grow as well. Some species provide more benefits than others, based on their architecture and leaf morphology. Other trees have characteristics that hinder their ability to be strong contributors to stormwater runoff reduction, possibly due to a tree having smaller leaves and thinner canopies.

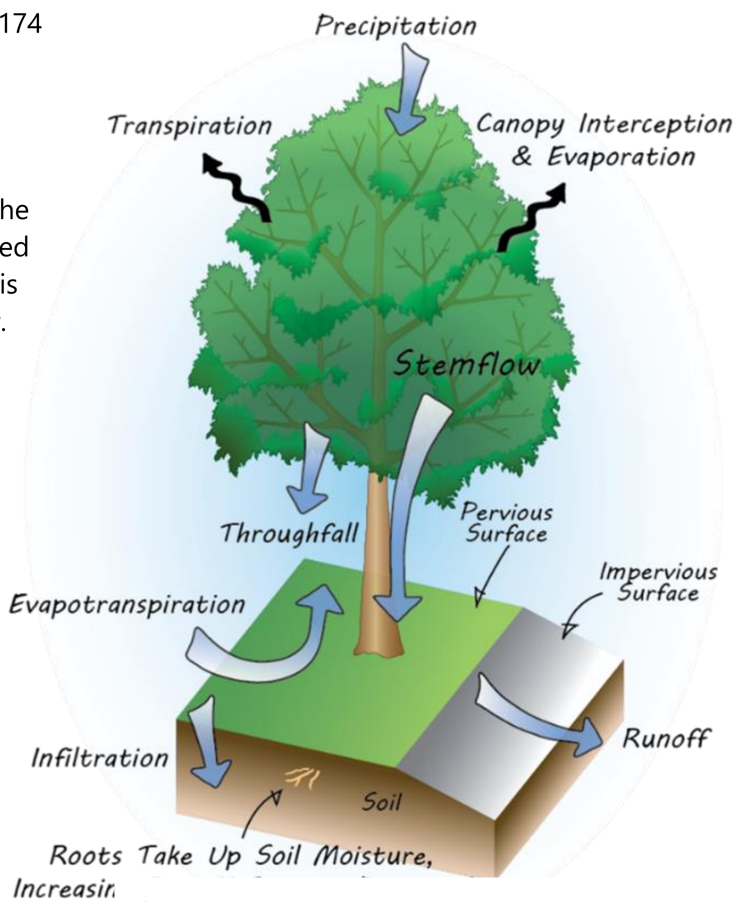


Figure 9: How Trees Impact Stormwater

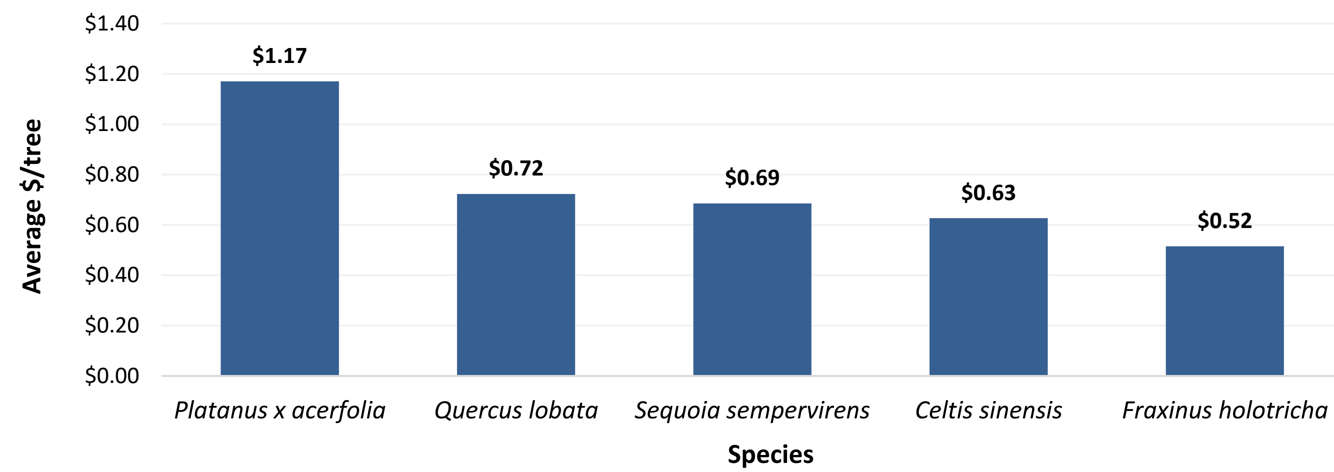


Figure 10: Top 5 Species for Stormwater Benefits

Table 10: Stormwater Benefits by Most Prevalent Tree Species

Species Name	Number of Trees	Leaf Area (acres)	Potential Evapotranspiration (gallons/yr.)	Evaporation (gallons/yr.)	Transpiration (gallons/yr.)	Water Intercepted (gallons/yr.)	Avoided Runoff (gallons/yr.)	Avoided Runoff Value ($)
Platanus x acerifolia	2,380	154	21,459,727	1,528,125	9,130,095	1,530,345	311,843	2,787
Pistacia chinensis	2,016	48	6,666,415	474,709	2,836,243	475,398	96,873	866
Lagerstroemia indica	1,918	10	1,462,912	104,172	622,400	104,324	21,258	190
Quercus lobata	1,833	95	13,256,693	943,996	5,640,094	945,367	192,640	1,721
Sequoia sempervirens	1,518	90	12,561,410	894,485	5,344,284	895,784	182,537	1,631
Pyrus calleryana	1,484	46	6,438,664	458,491	2,739,346	459,157	93,564	836
Triadica sebifera	1,322	52	7,262,083	517,126	3,089,671	517,877	105,529	943
Celtis sinensis	1,028	82	11,491,029	818,265	4,888,888	819,453	166,982	1,492
Fraxinus holotricha	818	68	9,448,929	672,849	4,020,071	673,826	137,307	1,227
Vitex agnus-castus	787	33	4,559,529	324,679	1,939,863	325,151	66,257	592
Casuarina cunninghamiana	661	23	3,224,194	229,592	1,371,742	229,925	46,853	419
Pinus canariensis	564	54	7,603,084	541,408	3,234,752	542,194	110,485	987
Celtis australis	541	41	5,684,398	404,780	2,418,442	405,368	82,603	738
Ulmus parvifolia	525	12	1,741,671	124,023	740,998	124,203	25,309	226
Ginkgo biloba	507	9	1,213,733	86,429	516,386	86,554	17,637	158
Acer buergerianum	431	10	1,374,084	97,847	584,607	97,989	19,968	178
Koelreuteria paniculata	412	22	3,092,627	220,223	1,315,766	220,543	44,941	402
Pinus brutia	379	23	3,193,385	227,398	1,358,634	227,728	46,405	415
Gleditsia triacanthos	363	19	2,633,956	187,561	1,120,623	187,834	38,275	342
Quercus douglasii	362	3	400,882	28,546	170,556	28,588	5,825	52
Fraxinus velutina	354	26	3,628,393	258,374	1,543,709	258,750	52,726	471
Quercus suber	325	27	3,763,907	268,024	1,601,364	268,413	54,695	489
Fraxinus americana	320	7	960,973	68,430	408,848	68,529	13,964	125
Platanus racemosa	313	25	3,507,740	249,783	1,492,377	250,145	50,973	455
All other species	9,531	376	52,446,214	3,734,641	22,313,374	3,740,066	762,125	6,810
Total	**30,692**	**1,355**	**189,076,631**	**13,463,956**	**80,443,132**	**13,483,511**	**2,747,575**	**$24,552.30**

Energy Savings

Trees modify climate and conserve energy in three principal ways:

- Shading reduces the amount of radiant energy absorbed and stored by hardscape surfaces, thereby reducing the heat island effect
- Transpiration converts moisture to water vapor, thereby cooling the air by using solar energy that would otherwise result in heating of the air
- Reduction of wind speed plus the movement of outside air into interior spaces, and conductive heat loss where thermal conductivity is relatively high (e.g., glass windows) (Simpson, 1998)

The heat island effect describes the increase in urban temperatures in relation to surrounding suburban and rural areas. Heat islands are associated with an increase in hardscape and impervious surfaces. Trees and other vegetation within an urbanized environment help reduce the heat island effect by lowering air temperatures 5°F (3°C) compared with outside the green space (Chandler, 1965). On a larger scale, temperature differences of more than 9°F (5°C) have been observed between city centers without adequate canopy coverage and more vegetated suburban areas (Akbari et al, 1997). The relative importance of these effects depends upon the size and configuration of trees and other landscape elements (McPherson, 1993). Tree spacing, crown spread, and vertical distribution of leaf area each influence the transport of warm air and pollutants along streets and out of urban canyons. Trees reduce conductive heat loss from buildings by reducing air movement into buildings and against conductive surfaces (e.g., glass, metal siding). Trees can reduce wind speed and the resulting air infiltration by up to 50%, translating into potential annual heating savings of 25% (Heisler, 1986).

Electricity & Natural Gas Reductions

Energy reduction metrics are calculated using data on tree distance and direction from buildings. The annual energy reductions from Davis' trees were not calculated because this data is not currently captured in the inventory database. However, trees in Davis contribute to electric and natural gas savings through shading and climate buffering effects.

Aesthetic, Property Value, & Socioeconomic Benefits

Trees provide beauty in the urban landscape, privacy and screening, improved human health, a sense of comfort and place, and habitat for urban wildlife. Research shows that trees promote better business by stimulating more frequent and extended shopping and a willingness to pay more for goods and parking (Wolf, 2007). In residential areas, the values of these benefits are captured as a percentage of the value of the property on which a tree stands. There is no current model for calculating the aesthetic benefits of an urban forest. Although, there are many indicators that suggest trees and tree canopy cover contribute significantly to quality of life and community well-being.

It is important to acknowledge that this assessment does not account for all the benefits provided by the tree resource. Some benefits are intangible and/or difficult to quantify, such as:

- Impacts on psychological and physical health and wellness
- Reduction in crime and violence
- Increases in tourism revenue
- Quality of life
- Wildlife habitat

- Socio-economic impacts
- Increases in property values
- Overall community well-being

Empirical evidence of these benefits does exist (Wolf, 2007; Kaplan and Kaplan, 1989; Ulrich, 1986), but there is limited knowledge about the physical processes at work and the complex nature of interactions make quantification imprecise. Tree growth and mortality rates are highly variable. A true and full accounting of benefits and investments must consider variability among sites (e.g., tree species, growing conditions, maintenance practices), as well as variability in tree growth. In other words, trees are worth far more than what one can ever quantify!

Calculating Tree Benefits

While all these tree benefits are provided by the urban forest, it can be useful to understand the contribution of just one tree. Individuals can calculate the benefits of individual trees to their property by using i-Tree *Design* (design.itreetools.org).

Calculate My Tree Benefits

Annual Benefits of Most Prevalent Species

It is important to keep in mind that a benefits analysis provides a snapshot of the community tree inventory as it exists today. The calculated benefits are based on the size and condition of existing trees. To provide greater context for the overall per tree and per species benefits of the most prevalent tree species (Figure 11 and Table 11), and to determine if these benefits are a true indicator of performance, the age distribution and stature of the species must also be considered (Table 1 and Figure 4).

The most prevalent tree species in Davis, *Platanus x acerifolia* (London planetree, 7.8%) is providing the greatest overall annual benefit, a value of $24,858, which is attributable to its prevalence in the population as well as species characteristics (Figure 11). The data indicates recent plantings of this large-statured, well-established species in the inventory, which is important because as this population ages, maintenance needs (and costs) may increase and per tree benefits will begin to level out.

Among other prevalent species, *Pinus canariensis* (Canary Island pine) provides $7,380 in annual benefits and the highest per tree benefit, an average of $13.09 per tree. In contrast, *Quercus douglasii* (blue oak) provides $411.85 in annual benefits and the lowest per tree benefit, an average of $1.14 per tree. As the majority (89.5%) of *Quercus douglasii* measure less than 8 inches in diameter, which for this large-statured species are not yet mature, the benefits that this large-statured species provides are likely to increase significantly over time as trees grow and mature.

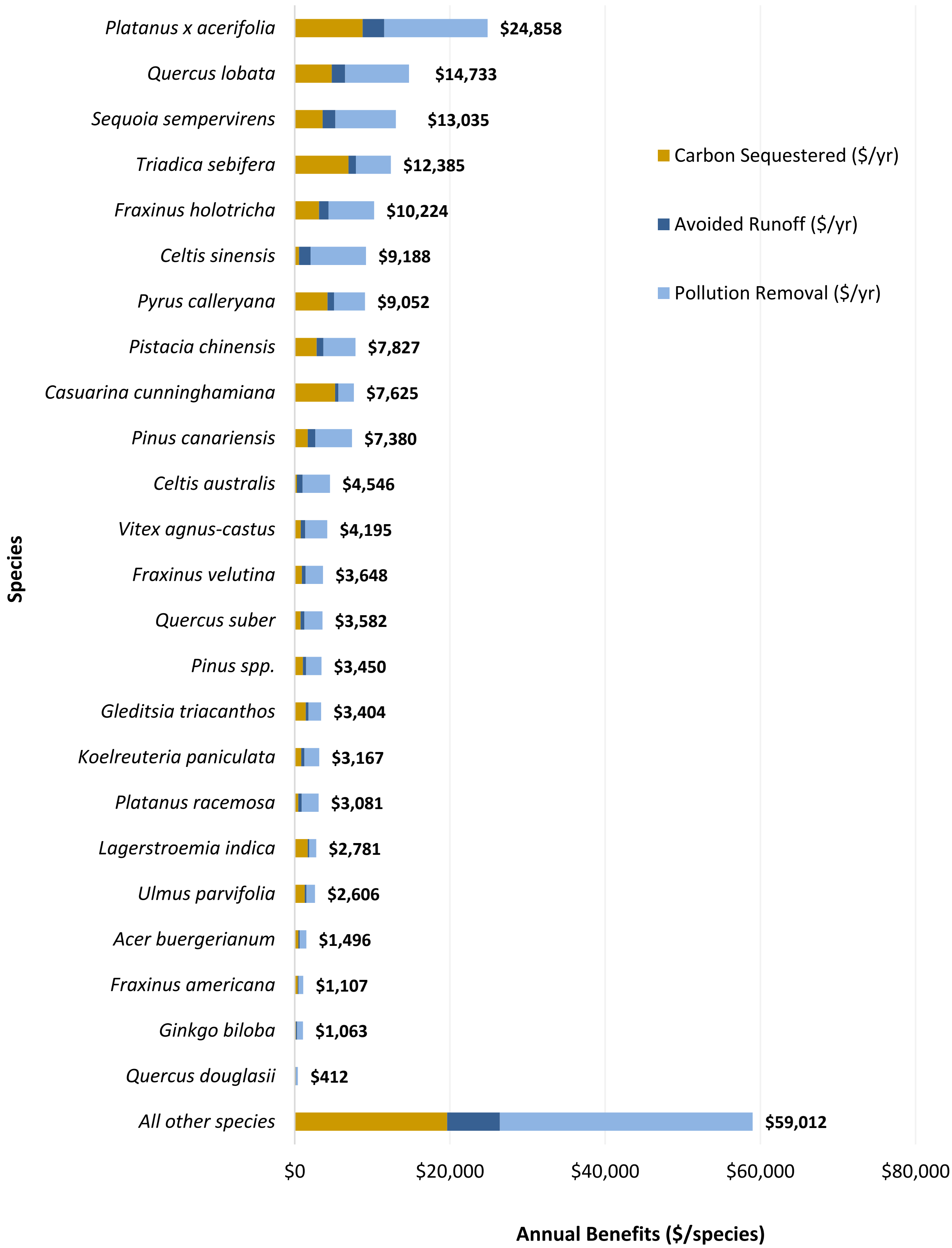


Figure 11: Summary of Annual Benefits for Most Prevalent Species

Table 11: Summary of Annual Benefits of Most Prevalent Species

Species	Number of Trees	% of Pop.	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gallon/yr.)	Avoided Runoff ($/yr.)	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)
Platanus x acerifolia	2,380	7.75	51.27	8,744	311,843	2,786.63	1.18	13,327
Pistacia chinensis	2,016	6.57	16.54	2,821	96,873	865.66	0.37	4,140
Lagerstroemia indica	1,918	6.25	9.87	1,683	21,258	189.96	0.08	909
Quercus lobata	1,833	5.97	28.02	4,779	192,640	1,721.43	0.73	8,233
Sequoia sempervirens	1,518	4.95	21.13	3,603	182,537	1,631.15	0.69	7,801
Pyrus calleryana	1,484	4.84	24.73	4,218	93,564	836.08	0.36	3,999
Triadica sebifera	1,322	4.31	40.65	6,932	105,529	943.01	0.40	4,510
Celtis sinensis	1,028	3.35	3.28	559	166,982	1,492.15	0.63	7,136
Fraxinus holotricha	818	2.67	18.35	3,129	137,307	1,226.98	0.52	5,868
Vitex agnus-castus	787	2.56	4.52	771	66,257	592.07	0.25	2,832
Casuarina cunninghamiana	661	2.15	30.51	5,204	46,853	418.67	0.18	2,002
Pinus canariensis	564	1.84	9.80	1,671	110,485	987.29	0.42	4,722
Celtis australis	541	1.76	1.63	278	82,603	738.14	0.31	3,530
Ulmus parvifolia	525	1.71	7.61	1,298	25,309	226.16	0.10	1,082
Ginkgo biloba	507	1.65	0.89	152	17,637	157.61	0.07	754
Acer buergerianum	431	1.40	2.72	464	19,968	178.43	0.08	853
Koelreuteria paniculata	412	1.34	4.95	845	44,941	401.59	0.17	1,921
Pinus spp.	379	1.23	6.17	1,052	46,405	414.67	0.18	1,983
Gleditsia triacanthos	363	1.18	8.36	1,426	38,275	342.03	0.15	1,636
Quercus douglasii	362	1.18	0.65	111	5,825	52.06	0.02	249
Fraxinus velutina	354	1.15	5.42	924	52,726	471.16	0.20	2,253
Quercus suber	325	1.06	4.43	755	54,695	488.76	0.21	2,338
Fraxinus americana	320	1.04	2.26	385	13,964	124.79	0.05	597
Platanus racemosa	313	1.02	2.62	447	50,973	455.49	0.19	2,178
All other species	9,531	31.05	115.08	19,631	762,125	6,810.33	2.82	32,571
Total	**30,692**	**100%**	**421.47**	**$71,882**	**2,747,575**	**$24,552.30**	**10.43**	**$117,423**

Net Annual Benefits

Davis receives substantial benefits from their community tree resource; however, managers should understand and evaluate the investment required to preserve the community tree resource along with the benefits that it provides. A limitation of the annual benefits summary is that i-Tree *Eco* does not fully account for all benefits provided by the community tree resource. Many of the documented environmental and socioeconomic benefits provided by trees are intangible and not able to be quantified using current methods (University of Washington, 2018; University of Illinois, 2018).

Davis' community tree resource has a beneficial effect on the environment, and annually contributes $213,857 in quantifiable benefits to the community (Figure 12). Individual components of the environmental benefits include improved air quality $117,423 (54.9%), carbon reduction of $71,882 (33.6%), and stormwater management for $24,552 (11.5%).

Annually, community trees provide a total benefit of $213,857, a value of $6.97 per tree and $3.09 per capita.

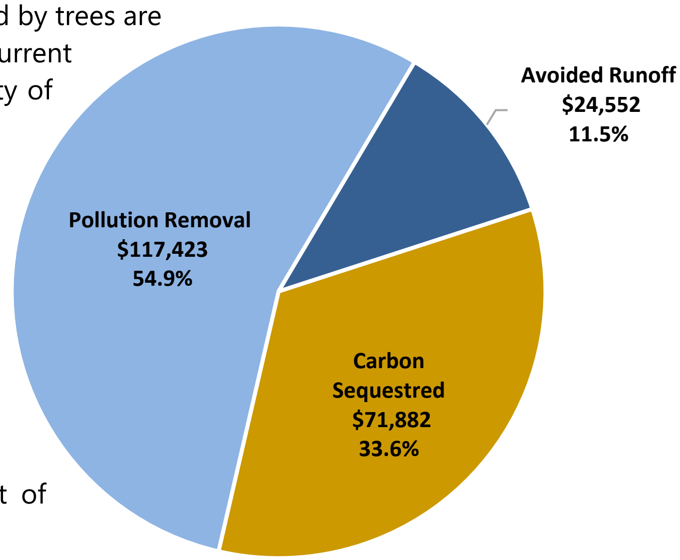


Figure 12: Annual Environmental Benefits

Annual Investment & Benefit Offset

Davis' urban forestry staff provided estimated investment costs. The total annual cost of managing the community tree resource in Davis is approximately $1.6 million. In total, 40.8% of the costs are attributed to annual pruning, 32.9% to tree removal, and 8.0% to purchasing and planting trees. The remaining 18% of costs are for program administration and claims. The quantifiable benefits from i-Tree *Eco* offset this investment by $213,857 (Table 12).

Table 12: Quantifiable Benefits and Investments

Benefits	Total ($)	$/tree	$/capita
Carbon Sequestration	71,882	2.34	1.04
Pollution Removal	117,423	3.83	1.69
Avoided Runoff	24,552	0.80	0.35
Total Benefits	**$213,857**	**$6.97**	**$3.09**

Investments	Total ($)	$/tree	$/capita
Purchasing Trees and Planting	127,061	4.14	1.83
Contract Pruning	643,235	20.96	9.28
Removal	519,604	16.93	7.50
Administration	255,711	8.33	3.69
Liability/Claims	32,284	1.05	0.47
Total Investments	**$1,577,895**	**$51.41**	**$22.77**

Pest and Pathogen Threats

Management of pests and disease organisms can be a challenge in any urban forest. In some cases, a pest or disease can result in significant tree damage or loss and/or be costly to manage. Involvement in the global economy, close proximity to major ports, and a highly mobile human population increase the risk of an invasive pest or pathogen introduction into Davis. To further investigate the risk of pests and pathogens, i-Tree *Eco* identifies the susceptibility of tree populations to 36 emerging and existing pests and pathogens in the United States (Appendix B). According to the analysis, 21,162 (69.0%) of Davis' trees are susceptible to the included pests and pathogens and the potential risk is estimated at nearly $65.0 million. The pests and pathogens identified as most relevant to Davis are included in Table 13. Anticipating and monitoring for these threats is an important part of urban forest management.

Among the pests of greatest concern for Davis' urban forest is the polyphagous shot hole borer. The polyphagous shot hole borer is involved in a disease called Fusarium dieback, which occurs when invasive beetles feed on fungi that they carry into heartwood tissues of the tree. Some of the introduced fungi are tree pathogens that disrupt the flow of water and nutrients. Staining and gummosis can be seen around beetle entry and exit wounds, and typically cankers have formed at these sites. The damage causes branch dieback, and over time can kill the tree (Eskalen, 2018). Within the United States, the polyphagous shot hole borer has been detected in southern California but has the potential to spread to the Central Valley as these beetles have a large host range consisting of more than 260 plant species and can colonize healthy or stressed trees. An estimated 46.5% of trees in Davis are at risk to polyphagous shot hole borer.

Defoliating moths, such as spongy moth (*Lymantria dispar*) and winter moth (*Operophtera brumata*), are not yet present in California, but they threaten a broad range of tree hosts present in Davis (22.3% and 15.2% of trees susceptible, respectively). During outbreaks, the feeding damage weakens the tree host, and renders it more vulnerable to other pests and diseases (Collins, 1996). The gypsy moth is known to feed on hundreds of species of trees and shrubs; oaks (*Quercus*) are one of their preferred hosts.

Davis is currently experiencing thousand cankers disease (TCD) in the walnut populations and Dutch elm disease in the elm trees populations. In, TCD, the walnut twig beetle (*Pityophthorus juglandis*) vectors the fungus *Geosmithia morbida*. As the walnut twig beetle tunnels into the cambium, cankers form in and around beetle galleries. When the beetles are abundant, cankers can girdle twigs or branches, stopping the flow of sugars through the phloem, and causing yellowing, wilting, and branch die back (Tisserat et al, 2009). Trees under stress usually die within three years of initial symptoms but sometimes the infection can persist for years with no external signs or symptoms. Control measures have not yet been identified, but sanitation practices to dispose of infected material is advised.

Dutch Elm Disease (DED) has devastated *Ulmus americana* (American elm) populations, which are some of the most important street trees in the twentieth century. Since first reported in the 1930s, it has killed over 50% of the native elm population in the United States (Forest Service, Northeastern Area State and Private Forestry, 2005). Less than 1% of Davis' tree inventory is susceptible to DED, largely because managers have planted elm species that exhibit some disease resistance.

Table 13: Pest & Pathogen Threats to Davis

		Number of Trees		Structural Value ($)		Leaf Area (%)		Leaf Area (ac)	
		Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible
aspen leafminer	*Phyllocnistis populiella*	162	30,530	306,416	91,236,432	0.30	99.70	4.30	1,350.50
Asian longhorned beetle	*Anoplophora glabripennis*	2,661	28,031	3,307,601	88,235,247	4.50	95.50	60.90	1,293.90
butternut canker	*Ophiognomonia clavigignenti-juglandacearum*	14	30,678	105,619	91,437,229	0.10	99.90	1.20	1,353.50
Dutch elm disease	*Ophiostoma ulmi*	177	30,515	303,734	91,239,114	0.30	99.70	4.30	1,350.50
emerald ash borer	*Agrilus planipennis*	2,022	28,670	8,396,883	83,145,965	9.90	90.10	133.50	1,221.20
fusiform rust	*Cronartium quercuum*	23	30,669	50,330	91,492,518	0.10	99.90	0.90	1,353.90
goldspotted oak borer	*Agrilus auroguttatus*	244	30,448	837,411	90,705,437	1.20	98.80	15.90	1,338.90
large aspen tortrix	*Choristoneura conflictana*	209	30,483	375,582	91,167,266	0.40	99.60	5.80	1,349.00
laurel wilt	*Xyleborus glabratus and Raffaellea lauricola*	42	30,650	138,529	91,404,319	0.20	99.80	2.00	1,352.70
mountain pine beetle	*Dendroctonus ponderosae*	15	30,677	61,313	91,481,535	0.10	99.90	0.80	1,354.00
oak wilt	*Ceratocystis fagacearum*	4,202	26,490	11,829,292	79,713,556	14.30	85.70	194.40	1,160.40
pine shoot beetle	*Tomicus piniperda*	1,293	29,399	8,121,462	83,421,386	7.60	92.40	103.20	1,251.60
polyphagous shot hole borer	*Euwallacea sp. and Fusarium euwallaceae*	14,258	16,434	41,726,417	49,816,431	43.60	56.40	590.50	764.30
spongy moth	*Lymantria dispar*	6,841	23,851	17,433,314	74,109,534	20.00	80.00	270.60	1,084.20
spruce beetle	*Dendroctonus rufipennis*	4	30,688	5,369	91,537,479	0.00	100.00	0.10	1,354.70
spruce budworm	*Choristoneura fumiferana*	4	30,688	5,369	91,537,479	0.00	100.00	0.10	1,354.70
sudden oak death	*Phytophthora ramorum*	2,414	28,278	8,554,718	82,988,130	9.90	90.10	133.70	1,221.10
southern pine beetle	*Dendroctonus frontalis*	1,297	29,395	8,126,831	83,416,017	7.60	92.40	103.20	1,251.60
sirex wood wasp	*Sirex noctilio*	1,293	29,399	8,121,462	83,421,386	7.60	92.40	103.20	1,251.60
thousand cankers disease	*Geosmithia morbida and Pityophthorus juglandis*	215	30,477	1,140,480	90,402,368	1.10	98.90	15.00	1,339.80
winter moth	*Operophtera brumata*	4,679	26,013	12,317,111	79,225,737	14.40	85.60	194.50	1,160.30
western pine beetle	*Dendroctonus brevicomi*	2	30,690	4,380	91,538,468	0.00	100.00	0.00	1,354.70
western spruce budworm	*Choristoneura occidentalis*	18	30,674	63,432	91,479,416	0.10	99.90	0.80	1,354.00
All Pests		**21,162**	**9,530**	**$64,987,241**	**$26,555,607**	**69.50**	**30.50**	**941.40**	**413.40**

Pest Management

Although managers cannot foresee when a pest or pathogen may be introduced to the urban forest, being aware of potential threats is the first step in a preparedness program. Following Integrated Pest Management (IPM) protocol and best management practices when preparing for and addressing pest and diseases can help to minimize their economic, health, and environmental consequences (Wiseman and Raupp, 2016). Some management practices include:

- Obtain current information on emergent pests and pathogens
- Increase understanding of the biology of the pest and pathogen as well as the tree symptoms that indicate infestation/infection
- Identify procedures and protocols that will be followed in the case of an introduced pest or pathogen
- Complete training and licensing in the case of pesticide or fungicide use
- Plant tree species that are resistant or tolerant to identified pest and pathogen threats
- Choose healthy, vigorous nursery stock
- Diversify plantings at the genus level, as many pests threaten several species within a genus
- Prevent the movement of felled tree materials that may be harboring pests or pathogens such as untreated logs, firewood, and woodchips

Maintaining a diverse community tree resource is important in integrated pest management.

Conclusion

This analysis describes the current structural characteristics of Davis' community tree resource, using established numerical modeling and statistical methods to provide a general accounting of the benefits. The analysis provides a "snapshot" of this resource at its current population, structure, and condition. Trees are providing quantifiable impacts on air quality, reduction in atmospheric CO_2, stormwater runoff, and aesthetic benefits. Davis' 30,692 community trees provide cumulative annual benefits worth $213,857, a value of $667 per tree and $3.09 per capita.

Industry standards suggest that no one tree species should represent more than 10% of the urban forest. As of 2022, no species in Davis violate this rule. Additionally, industry standards suggest no one genera should represent more than 20% of a population. Of Davis' community tree inventory, no genus violates this rule. The rule provides a baseline for greater genetic diversity, therefore future new and replacement tree plantings should continue to focus on increasing the diversity of the community tree resource.

Davis' community tree resource has an established population in fair or better condition with 207 distinct species. The City should continue to focus resources on preserving existing and mature trees to promote health, strong structure, and tree longevity. Structural and training pruning for young trees will maximize the value of this resource, reduce long-term maintenance costs, reduce risk, and ensure that as trees mature, they provide the greatest possible benefits over time.

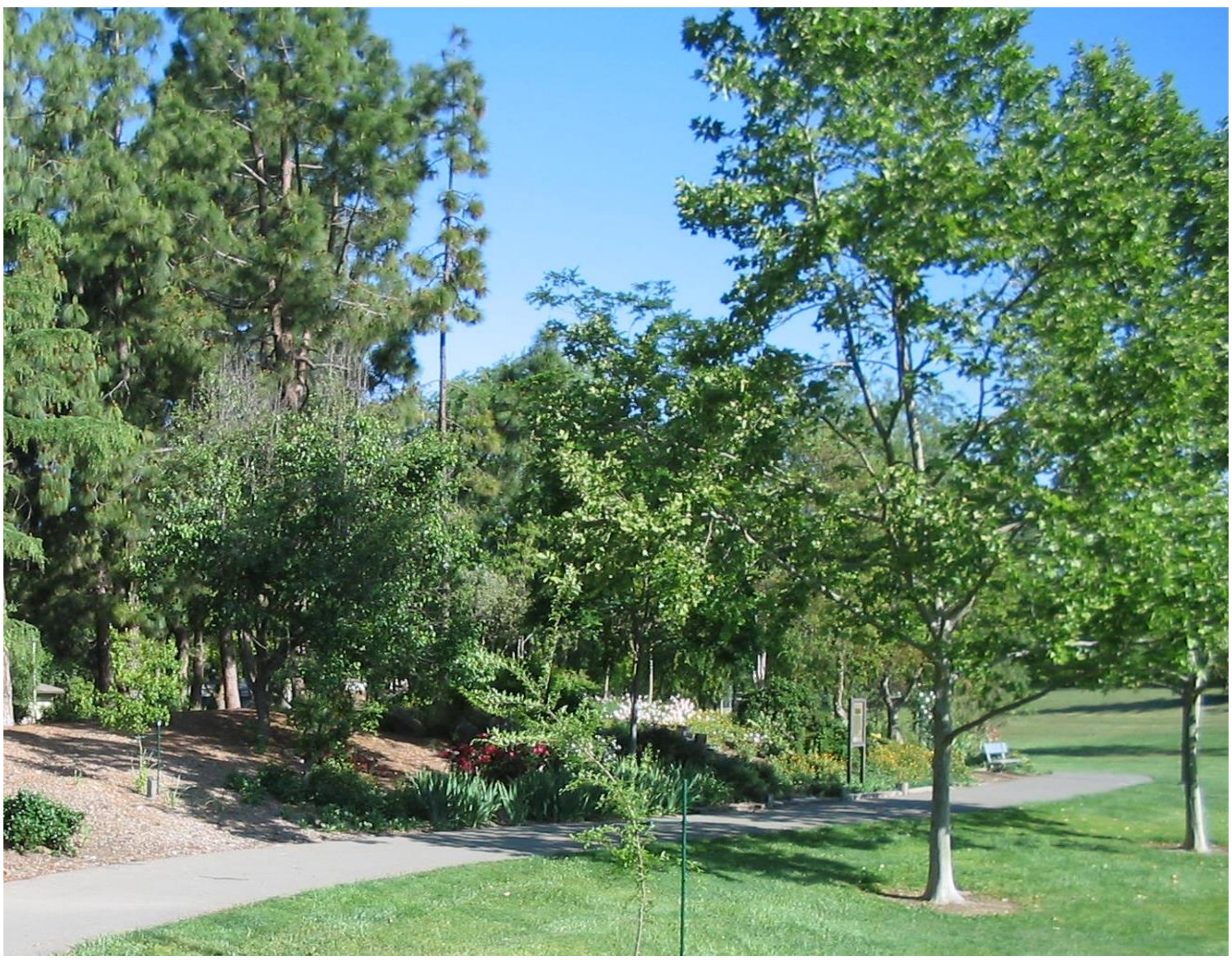
Based on this resource analysis, DRG recommends the following:

- Protect existing trees and regularly inspect trees to identify and mitigate structural and age-related defects.
- Provide structural pruning for young trees and a routine pruning cycle for all trees.
- Monitor species performance (e.g., health, structure, longevity, pest and disease resistance) and increase resilience in the urban forest by planting species that perform best in local and regional conditions, including introducing new species that indicate promising traits.
- Maintain the benefits of key species by continuing to include them in new tree plantings.
- Plant tree species with consideration for species performance and increasing resilience in the urban forest.
    - Discontinue planting species that are classified as invasive (e.g., *Triadica sebifera* [Chinese tallowtree], *Schinus molle* [California peppertree], *Ailanthus altissima* [tree of heaven], and *Eucalyptus globulus* [blue gum]).
- Increase genus and species diversity in new and replacement tree plantings to reduce reliance on over-represented species. While no species represent more than 10% of the overall population, increasing diversity in the tree resource can provide additional benefits.
- Prioritize planting replacement trees for those trees that are removed.
- Consider successional planting of important species, as supported by relative performance index (RPI) and the relative age distribution (e.g., *Celtis sinensis* [Chinese hackberry]).
- Use available planting sites to improve diversity, increase benefits, and support an ideal age distribution of community trees.
- Plant large-stature species for greater benefits wherever space allows.
- Follow best management practices when monitoring for and dealing with pests and diseases.

- Maintain and update the inventory database to include new tree plantings, removals, as well as changes in diameter, condition for new trees.
  - Consider adding information on distance and orientation to nearest structure/building so that energy benefits can be calculated in future analyses.

Urban forest managers can better anticipate future trends with an understanding of the composition and structure of the tree population. Managers can also anticipate challenges and devise plans to increase benefits. Performance data from this analysis can be used to make determinations regarding species selection, distribution, and maintenance policies. Documenting current structure is necessary for establishing goals and performance objectives and can serve as a benchmark for measuring future success.

Davis' community trees are of vital importance to the environmental, social, and economic well-being of the community. Inventory data can be used to plan a proactive and forward-looking approach to the care of community trees. Updates should continue to be incorporated into the inventory as regular maintenance is performed, including information on the diameter and condition of existing trees. Current and complete inventory data will help staff to track maintenance activities and tree health more efficiently and will provide a strong basis for making informed management decisions. A continued commitment to planting, maintaining, and preserving these trees will support the health and welfare of the City and the community at large.



Trees are of vital importance to the environmental, social, and economic well-being of the community.

Appendix A: References

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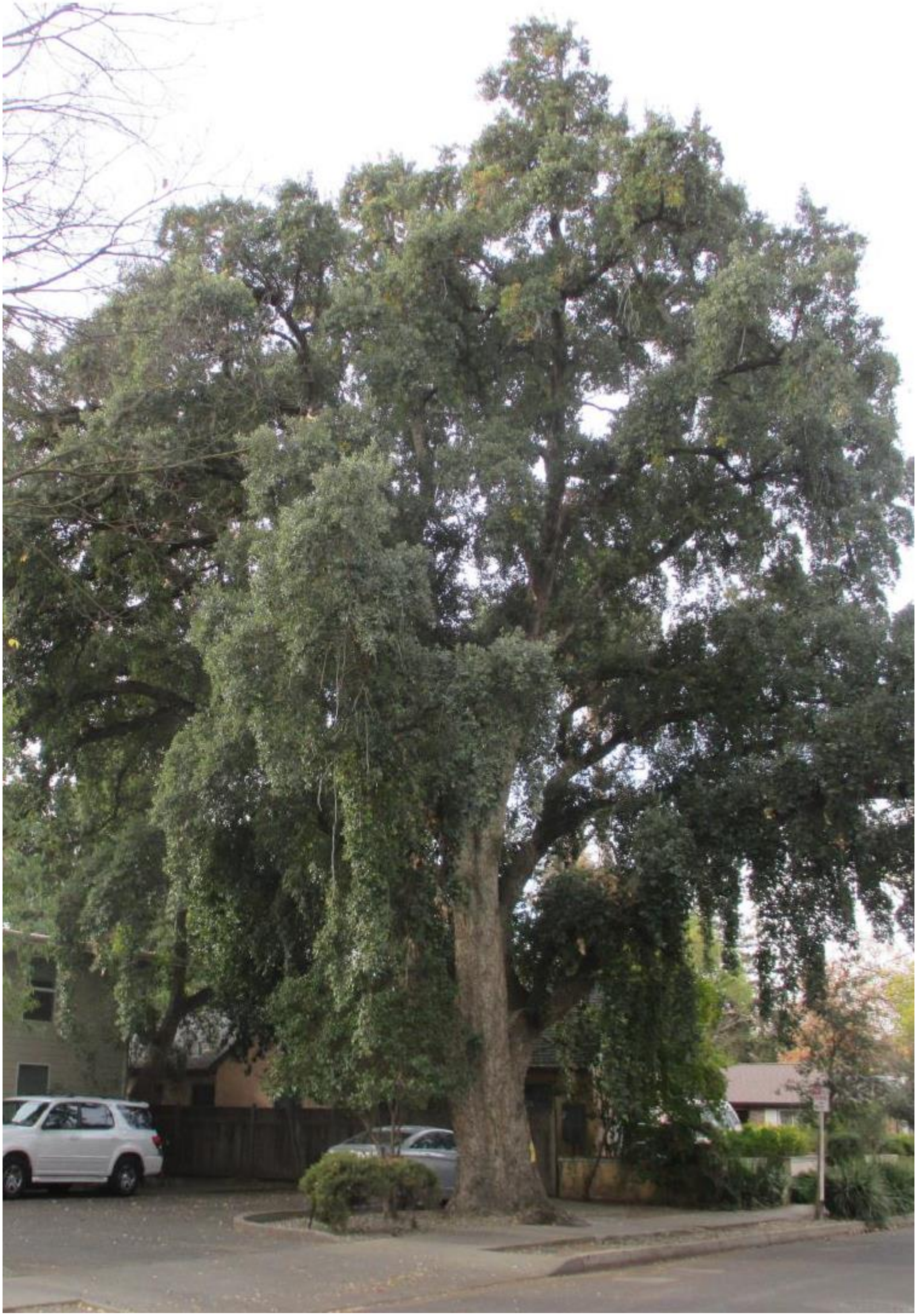

Davis' community tree resource includes a mix of 207 distinct species.

Appendix B: Methods

i-Tree *Eco* Model and Field Measurements

All field data was collected during the leaf-on season to properly assess tree canopies. The i-Tree *Eco* model uses inventory data, local hourly air pollution, and meteorological data to quantify the urban forest and its structure and benefits (Nowak & Crane, 2000), including:

- Urban forest structure (e.g., genus composition, tree health, leaf area, etc.).
- Amount of pollution removed hourly by the urban forest, and its associated percent air quality improvement throughout a year. Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter (<2.5 microns).
- Total carbon stored and net carbon annually sequestered by the urban forest.
- Structural value of the forest as a replacement cost.
- Potential impact of infestations by pests or pathogen.

Definitions and Calculations

Avoided surface water runoff value is calculated based on rainfall interception by vegetation, specifically the difference between annual runoff with and without vegetation. Although tree leaves, branches, and bark may intercept precipitation and thus mitigate surface runoff, only the precipitation intercepted by leaves is accounted for in this analysis. The U.S. value of avoided runoff, \$0.067 per ft^3, is based on the U.S. Forest Service's Community Tree Guide Series (McPherson et al, 1999-2010; Peper et al, 2009; 2010; Vargas et al, 2007a-2008).

Carbon dioxide emissions from automobile assumed six pounds of carbon per gallon of gasoline if energy costs of refinement and transportation are included (Graham et al, 1992).

Carbon emissions were calculated based on the total city carbon emissions from the 2010 US per capita carbon emissions (Carbon Dioxide Information Analysis Center, 2010) This value was multiplied by the population of Davis (69,295) to estimate total city carbon emissions.

Carbon sequestration is removal of carbon from the air by plants. Carbon storage and carbon sequestration values are calculated based on \$170.55 per short ton (EPA, 2015; Interagency Working Group on Social Cost of Carbon, 2015).

Carbon storage is the amount of carbon bound up in the above-ground and below-ground parts of woody vegetation. Carbon storage and carbon sequestration values are calculated based on \$170.55 per ton (EPA, 2015; Interagency Working Group on Social Cost of Carbon, 2015).

Diameter at Breast Height (DBH) is the diameter of the tree measured 4’5” above grade.

Household emissions average is based on average electricity kWh usage, natural gas Btu usage, fuel oil Btu usage, kerosene Btu usage, LPG Btu usage, and wood Btu usage per household in 2009 (EIA, 2013; EIA, 2014), CO_2, SO_2, and NO_3 power plant emission per KwH (Leonardo Academy, 2011), CO emission per kWh assumes 1/3 of one percent of C emissions is CO (EIA, 2014), PM_{10} emission per kWh (Layton 2004), CO_2, NO_3, SO_2, and CO emission per Btu for natural gas, propane and butane (average used to represent LPG), Fuel #4 and #6 (average used to represent fuel oil and kerosene) (Leonardo Academy, 2011), CO_2 emissions per Btu of wood (EIA, 2014), CO, NO_3 and SO_2 emission per Btu based on total emissions and wood burning (tons) from (British Columbia Ministry, 2005; Georgia Forestry Commission, 2009).

Leaf area was estimated using measurements of crown dimensions and percentage of crown canopy missing.

Monetary values ($) are reported in US dollars throughout the report.

Ozone (O_3) is an air pollutant that is harmful to human health. Ozone forms when nitrogen oxide from fuel combustion and volatile organic gases from evaporated petroleum products react in the presence of sunshine. In the absence of cooling effects provided by trees, higher temperatures contribute to ozone (O_3) formation.

Passenger automobile emissions assumed 0.72 pounds of carbon per driven mile (U.S. Environmental Protection Agency, 2010) multiplied by the average miles driven per vehicle in 2011 (Federal Highway Administration, 2013).

Pollution removal is calculated based on the prices of $1,442.52 per ton (carbon monoxide), $7,249.79 per ton (ozone), $1,064.41 per ton (nitrogen dioxide), $211.43 per ton (sulfur dioxide), $367,444.76 per ton (particulate matter less than 2.5 microns), and $6,780.92 per ton (particulate matter less than 10 microns) (Nowak et al., 2014).

Potential pest impacts were estimated based on tree inventory information from the study area combined with i-Tree *Eco* pest range maps. The input data included species, DBH, total height, height to crown base, crown width, percent canopy missing, and crown dieback. In the model, potential pest risk is based on pest range maps and the known pest host species that are likely to experience mortality.

Pest range maps for 2012 from the Forest Health Technology Enterprise Team (FHTET) (Forest Health Technology Enterprise Team, 2014) were used to determine the proximity of each pest to Yolo County For the county, it was established whether the insect/disease occurs within the county, is within 250 miles of the county edge, is between 250 and 750 miles away, or is greater than 750 miles away. FHTET did not have pest range maps for Dutch elm disease and chestnut blight. The range of these pests was based on known occurrence and the host range, respectively (Eastern Forest Environmental Threat Assessment Center; Worrall 2007). Due to the dates of some of these resources, pests may have encroached closer to the tree resource in recent years.

Replacement value is based on the physical resource itself (e.g., the cost of having to replace a tree with a similar tree). Structural values were based on valuation procedures of the Council of Tree and Landscape Appraisers, which uses tree species, diameter, condition, and location information (Nowak et al 2002a; 2002b).

Ton is equivalent to a U.S. short ton, or 2,000 pounds.

Appendix C: Tables

Table 14: Botanical and Common Names of Tree Species in Davis' Community tree Resource

Botanical Name	Common Name	# of Trees	% of Pop.
Platanus x acerifolia	London planetree	2,380	7.75
Pistacia chinensis	Chinese pistache	2,016	6.57
Lagerstroemia indica	common crapemyrtle	1,918	6.25
Quercus lobata	California white oak	1,833	5.97
Sequoia sempervirens	coast redwood	1,518	4.95
Pyrus calleryana	Callery pear	1,484	4.84
Triadica sebifera	Chinese tallowtree	1,322	4.31
Celtis sinensis	Chinese hackberry	1,028	3.35
Fraxinus holotricha	Moraine ash	818	2.67
Vitex agnus-castus	chaste tree	787	2.56
Casuarina cunninghamiana	river she-oak	661	2.15
Pinus canariensis	Canary Island pine	564	1.84
Celtis australis	European hackberry	541	1.76
Ulmus parvifolia	Chinese elm	525	1.71
Ginkgo biloba	ginkgo	507	1.65
Acer buergerianum	Trident maple	431	1.40
Koelreuteria paniculata	goldenrain tree	412	1.34
Pinus brutia	Turkish pine	379	1.23
Gleditsia triacanthos	honeylocust	363	1.18
Quercus douglasii	blue oak	362	1.18
Fraxinus velutina	velvet ash	354	1.15
Quercus suber	cork oak	325	1.06
Fraxinus americana	white ash	320	1.04
Platanus racemosa	California sycamore	313	1.02
Koelreuteria bipinnata	Chinese flame tree	305	0.99
Quercus virginiana	live oak	278	0.91
Cedrus deodara	deodar cedar	274	0.89
Acer rubrum	red maple	258	0.84
Cercis canadensis	eastern redbud	244	0.79
Quercus agrifolia	coastal live oak	236	0.77
Ulmus davidiana v. japonica	Japanese elm	232	0.76
Olea europaea	olive	226	0.74
Celtis occidentalis	northern hackberry	222	0.72
Fraxinus uhdei	Shamel ash	214	0.70
Zelkova serrata	Japanese zelkova	212	0.69
Juglans hindsii	hind walnut	201	0.65
Laurus nobilis	bay laurel	198	0.65
Malus spp.	apple species	192	0.63
Quercus wislizeni	interior live oak	189	0.62
Prunus cerasifera	cherry plum	188	0.61

Botanical Name	Common Name	# of Trees	% of Pop.
Arbutus unedo	strawberry tree	187	0.61
Liriodendron tulipifera	tulip tree	187	0.61
Quercus rubra	northern red oak	183	0.60
Eucalyptus sideroxylon	Mugga ironbark	178	0.58
Acer x freemanii	Freeman maple	177	0.58
Gymnocladus dioica	Kentucky coffee tree	176	0.57
Morus alba	white mulberry	172	0.56
Fraxinus angustifolia ssp. Oxycarpa	Caucasian ash	169	0.55
Magnolia grandiflora	southern magnolia	160	0.52
Pinus halepensis	Aleppo pine	157	0.51
Quercus buckleyi	Buckley oak	153	0.50
Quercus ilex	holly oak	152	0.50
Pistacia spp.	pistache species	152	0.50
Ulmus spp.	elm species	145	0.47
Quercus canbyi	Chisos oak	143	0.47
Melia azedarach	Chinaberry	125	0.41
Fraxinus spp.	ash species	124	0.40
Prunus spp.	plum species	122	0.40
x Chitalpa tashkentensis	chitalpa	113	0.37
Tilia cordata	littleleaf linden	95	0.31
Sophora japonica	necklacepod	90	0.29
Quercus shumardii	Shumard oak	86	0.28
Populus fremontii	Fremont cottonwood	85	0.28
Acer platanoides	Norway maple	84	0.27
Pinus spp.	pine species	82	0.27
Robinia pseudoacacia	black locust	82	0.27
Quercus coccinea	scarlet oak	80	0.26
Ligustrum lucidum	glossy privet	78	0.25
Chilopsis linearis	desert-willow	77	0.25
Quercus robur	English oak	77	0.25
Prunus serrulata	Japanese flowering cherry	73	0.24
Searsia lancea	African sumac	66	0.22
Carpinus betulus	European hornbeam	64	0.21
Juglans regia	English walnut	63	0.21
Cupressus arizonica	Arizona cypress	59	0.19
Maclura pomifera	Osage orange	56	0.18
Pinus pinea	Italian stone pine	55	0.18
Populus nigra v. italica	Lombardy poplar	52	0.17
Ostrya virginiana	eastern hophornbeam	52	0.17
Chionanthus retusus	Chinese fringe tree	44	0.14
Schinus molle	California peppertree	44	0.14
Acer campestre	hedge maple	43	0.14
Acacia melanoxylon	blackwood	41	0.13

Botanical Name	Common Name	# of Trees	% of Pop.
Salix spp.	willow species	40	0.13
Pinus nigra	Austrian pine	38	0.12
Eucalyptus camaldulensis	red gum eucalyptus	36	0.12
Liquidambar styraciflua	sweetgum	33	0.11
Calocedrus decurrens	incense cedar	31	0.10
Acer saccharinum	silver maple	31	0.10
Aesculus californica	California buckeye	31	0.10
Albizia julibrissin	Persian silk tree	30	0.10
Quercus macrocarpa	bur oak	29	0.09
Chamaecyparis	false cypress spp.	29	0.09
Geijera parviflora	Australian willow	27	0.09
Robinia spp.	robinia species	26	0.08
Umbellularia californica	California laurel	26	0.08
Chilopsis spp.	desert willow species	25	0.08
Platanus occidentalis	American sycamore	24	0.08
Fraxinus ornus	flowering ash	23	0.07
Prunus dulcis	sweet almond	23	0.07
Quercus spp.	oak species	23	0.07
Tilia tomentosa	silver linden	22	0.07
Quercus frainetto	Hungarian oak	21	0.07
Betula pendula	European white birch	21	0.07
Pinus thunbergii	Japanese black pine	20	0.07
Casuarina stricta	she-oak	19	0.06
Parrotia persica	Persian ironwood	19	0.06
Tilia americana	American basswood	18	0.06
Ulmus americana	American elm	18	0.06
Eucalyptus polyanthemos	silver dollar eucalyptus	17	0.06
Ficus spp.	fig species	17	0.06
Platanus orientalis	Oriental planetree	17	0.06
Cinnamomum camphora	camphor tree	16	0.05
Taxodium distichum	bald cypress	16	0.05
Prunus persica	peach	15	0.05
Tilia x euchlora	Crimean linden	15	0.05
Prosopis chilensis	Chilean mesquite	15	0.05
Catalpa speciosa	northern catalpa	15	0.05
Ceratonia siliqua	carob	14	0.05
Juglans nigra	black walnut	14	0.05
Acer palmatum	Japanese maple	14	0.05
Maytenus boaria	mayten	13	0.04
Pinus sylvestris	Scots pine	13	0.04
Paulownia tomentosa	royal paulownia	12	0.04
Tristaniopsis spp.	tristaniopsis species	12	0.04
Quercus cerris	European turkey oak	11	0.04

Botanical Name	Common Name	# of Trees	% of Pop.
Acer negundo	boxelder	11	0.04
Alnus cordata	Italian alder	11	0.04
Cedrus atlantica	atlas cedar	11	0.04
Afrocarpus gracilior	fern pine	11	0.04
Quercus palustris	pin oak	10	0.03
Alnus rhombifolia	white alder	10	0.03
Eriobotrya japonica	loquat tree	10	0.03
Acer truncatum x platanoides	sunset maple	9	0.03
Eucalyptus melliodora	yellow box	9	0.03
Prunus Kanzan	Kanzan cherry	9	0.03
Pterocarya stenoptera	Chinese wingnut	9	0.03
Punica spp.	pomegranate species	9	0.03
Quercus laurifolia	laurel oak	9	0.03
Ulmus procera	English elm	9	0.03
Magnolia x soulangeana	saucer magnolia	8	0.03
Melaleuca linariifolia	cajeput tree	8	0.03
Crataegus spp.	hawthorn species	7	0.02
Eucalyptus spp.	gum species	7	0.02
Ailanthus altissima	tree of heaven	7	0.02
Quercus chrysolepis	canyon live oak	7	0.02
Acer pseudoplatanus	sycamore maple	6	0.02
Eucalyptus nicholii	willow-leaved gimlet	6	0.02
Quercus muehlenbergii	chinkapin oak	6	0.02
Salix babylonica	Babylon weeping willow	6	0.02
Betula nigra	river birch	5	0.02
Carpinus caroliniana	American hornbeam	5	0.02
Quercus imbricaria	shingle oak	5	0.02
Xylosma spp.	xylosma species	5	0.02
Picea pungens	blue spruce	4	0.01
Cupressus sempervirens	Italian cypress	4	0.01
Thuja plicata	western red cedar	4	0.01
Ulmus pumila	Siberian elm	4	0.01
Magnoliopsida	Unknown species	4	0.01
Lagerstroemia subcostata	Chinese crapemyrtle	4	0.01
Myrtuss spp.	myrtus species	4	0.01
Parkinsonia aculeata	Jerusalem thorn	3	0.01
Metasequoia glyptostroboides	dawn redwood	3	0.01
Juglans spp.	walnut species	3	0.01
Eucalyptus globulus	blue gum eucalyptus	3	0.01
Brachychiton populneus	kurrajong	3	0.01
Acer griseum	paperbark maple	3	0.01
Pinus radiata	Monterey pine	3	0.01
Quercus castaneifolia	chestnut-leaved oak	2	0.01

Botanical Name	Common Name	# of Trees	% of Pop.
Photinia spp.	chokeberry species	2	0.01
Quercus nigra	water oak	2	0.01
Washingtonia filifera	California palm	2	0.01
Prunus x yedoensis	Yoshino flowering cherry	2	0.01
Prunus lyonii	Catalina cherry	2	0.01
Prunus armeniaca	apricot	2	0.01
Pinus coulteri	Coulter pine	2	0.01
Crataegus phaenopyrum	Washington hawthorn	2	0.01
Corymbia maculata	spotted gum	2	0.01
Citrus spp.	citrus species	2	0.01
Citrus limon	lemon	2	0.01
Callistemon spp.	bottlebrush sprvird	2	0.01
Acer saccharum	Sugar maple	2	0.01
Acer spp.	maple species	2	0.01
Quercus phellos	willow oak	2	0.01
Koelreuteria elegans	flamegold	2	0.01
Thuja spp.	red cedar species	1	0.00
Persea spp.	bay species	1	0.00
Pistacia vera	pistachio	1	0.00
Prunus subhirtella	Higan cherry	1	0.00
Prunus x blireiana	Blireiana plum	1	0.00
Pyrus betulifolia	birchleaf pear	1	0.00
Ostrya carpinifolia	Hop hornbeam	1	0.00
Tetradium spp.	tetradium species	1	0.00
Firmiana simplex	Chinese parasoltree	1	0.00
Ulmus x hollandica	Dutch elm	1	0.00
Quercus engelmannii	Engelmann oak	1	0.00
Nyssa sylvatica	black tupelo	1	0.00
Magnolia virginiana	sweetbay	1	0.00
Malus x arnoldiana	Arnold's apple	1	0.00
Juniperus virginiana	eastern red cedar	1	0.00
Elaeocarpus decipiens	Japanese blueberry tree	1	0.00
Cercidiphyllum japonicum	katsura tree	1	0.00
Carya illinoinensis	pecan	1	0.00
Brachychiton acerifolius	Illwarra flame tree	1	0.00
Acer macrophyllum	bigleaf maple	1	0.00
Washingtonia spp.	palm species	1	0.00
Larix occidentalis	western larch	1	0.00
Total		**30,692**	**100%**

Table 15: Population Summary for All Species

Species	DBH Class (inches)								# of Trees	% of Pop.
	0 - 4	4 - 8	8 - 12	12 - 18	18 - 24	24 - 30	30 - 36	>36		
Platanus x acerifolia	201	332	550	791	308	124	62	12	2,380	7.75
Pistacia chinensis	266	419	621	530	139	32	8	0	2,016	6.57
Lagerstroemia indica	834	731	207	84	40	13	6	2	1,918	6.25
Quercus lobata	359	306	301	601	161	59	20	25	1,833	5.97
Sequoia sempervirens	59	140	269	635	294	87	21	14	1,518	4.95
Pyrus calleryana	25	138	367	699	205	44	4	2	1,484	4.84
Triadica sebifera	15	99	321	557	235	77	16	3	1,322	4.31
Celtis sinensis	36	105	183	354	206	102	34	8	1,028	3.35
Fraxinus holotricha	12	10	67	323	258	121	25	2	818	2.67
Vitex agnus-castus	64	128	127	144	129	140	50	5	787	2.56
Casuarina cunninghamiana	8	47	62	189	205	103	34	13	661	2.15
Pinus canariensis	7	20	36	139	197	110	47	8	564	1.84
Celtis australis	121	27	48	109	104	76	42	14	541	1.76
Ulmus parvifolia	237	114	77	64	22	10	0	1	525	1.71
Ginkgo biloba	392	36	10	27	33	8	1	0	507	1.65
Acer buergerianum	243	84	52	48	4	0	0	0	431	1.40
Koelreuteria paniculata	26	97	165	100	20	3	1	0	412	1.34
Pinus brutia	32	23	42	69	78	78	42	14	379	1.23
Gleditsia triacanthos	6	26	32	126	130	39	3	1	363	1.18
Quercus douglasii	280	44	22	15	1	0	0	0	362	1.18
Fraxinus velutina	5	3	4	26	91	130	89	6	354	1.15
Quercus suber	71	39	39	69	43	32	19	13	325	1.06
Fraxinus americana	188	54	17	38	18	4	0	1	320	1.04
Platanus racemosa	1	29	59	128	79	11	4	2	313	1.02
Koelreuteria bipinnata	243	15	10	21	12	4	0	0	305	0.99
Quercus virginiana	33	38	40	118	46	2	0	1	278	0.91
Cedrus deodara	32	17	31	99	46	33	12	4	274	0.89
Acer rubrum	213	29	11	4	1	0	0	0	258	0.84
Cercis canadensis	146	28	24	19	10	16	1	0	244	0.79
Quercus agrifolia	45	39	39	78	22	8	4	1	236	0.77
Ulmus davidiana v japonica	182	33	13	3	1	0	0	0	232	0.76
Olea europaea	20	32	27	67	43	19	13	5	226	0.74
Celtis occidentalis	41	48	40	65	19	5	1	3	222	0.72
Fraxinus uhdei	10	11	16	67	60	32	15	3	214	0.70
Zelkova serrata	156	28	10	8	3	7	0	0	212	0.69
Juglans hindsii	6	20	16	32	26	29	22	50	201	0.65
Laurus nobilis	25	73	48	36	5	4	3	4	198	0.65
Malus spp.	77	62	45	7	0	1	0	0	192	0.63
Quercus wislizeni	13	45	33	58	24	13	3	0	189	0.62
Prunus cerasifera	27	36	106	17	0	0	1	1	188	0.61
Arbutus unedo	33	66	56	17	11	4	0	0	187	0.61
Liriodendron tulipifera	11	32	70	66	7	1	0	0	187	0.61
Quercus rubra	160	10	12	1	0	0	0	0	183	0.60

Species	DBH Class (inches) 0 - 4	4 - 8	8 - 12	12 - 18	18 - 24	24 - 30	30 - 36	>36	# of Trees	% of Pop.
Eucalyptus sideroxylon	1	2	15	68	60	23	8	1	178	0.58
Acer x freemanii	108	43	12	12	2	0	0	0	177	0.58
Gymnocladus dioica	132	6	4	10	18	5	1	0	176	0.57
Morus alba	5	3	15	47	44	28	24	6	172	0.56
Fraxinus angustifolia ssp. Oxycarpa	9	12	30	65	39	13	1	0	169	0.55
Magnolia grandiflora	20	61	31	44	4	0	0	0	160	0.52
Pinus halepensis	6	8	13	27	22	26	35	20	157	0.51
Quercus buckleyi	145	7	1	0	0	0	0	0	153	0.50
Pistacia spp.	151	0	0	1	0	0	0	0	152	0.50
Quercus ilex	22	20	16	28	41	23	1	1	152	0.50
Ulmus spp.	117	9	2	4	5	0	4	4	145	0.47
Quercus canbyi	143	0	0	0	0	0	0	0	143	0.47
Melia azedarach	6	8	16	31	31	18	14	1	125	0.41
Fraxinus spp.	14	32	27	31	14	5	1	0	124	0.40
Prunus spp.	9	50	26	23	7	5	1	1	122	0.40
x Chitalpa tashkentensis	73	28	9	2	1	0	0	0	113	0.37
Tilia cordata	12	18	36	23	4	2	0	0	95	0.31
Sophora japonica	4	0	1	10	49	25	1	0	90	0.29
Quercus shumardii	66	6	10	3	0	0	1	0	86	0.28
Populus fremontii	4	14	10	24	15	10	5	3	85	0.28
Acer platanoides	8	64	11	1	0	0	0	0	84	0.27
Pinus spp.	0	2	3	41	22	12	2	0	82	0.27
Robinia pseudoacacia	4	21	23	26	4	2	2	0	82	0.27
Quercus coccinea	42	11	14	10	1	2	0	0	80	0.26
Ligustrum lucidum	3	15	10	41	6	1	0	2	78	0.25
Chilopsis linearis	69	4	2	1	0	1	0	0	77	0.25
Quercus robur	62	4	2	7	2	0	0	0	77	0.25
Prunus serrulata	18	23	23	8	0	1	0	0	73	0.24
Searsia lancea	1	0	5	11	28	19	1	1	66	0.22
Carpinus betulus	16	2	12	27	7	0	0	0	64	0.21
Juglans regia	2	3	3	39	7	5	3	1	63	0.21
Cupressus arizonica	8	9	12	23	7	0	0	0	59	0.19
Maclura pomifera	56	0	0	0	0	0	0	0	56	0.18
Pinus pinea	0	1	1	5	6	28	10	4	55	0.18
Ostrya virginiana	2	27	17	4	1	1	0	0	52	0.17
Populus nigra v. italica	0	9	12	27	3	0	0	1	52	0.17
Chionanthus retusus	43	0	1	0	0	0	0	0	44	0.14
Schinus molle	0	3	8	14	11	8	0	0	44	0.14
Acer campestre	0	3	9	29	1	1	0	0	43	0.14
Acacia melanoxylon	4	0	5	16	9	6	1	0	41	0.13
Salix spp.	0	0	8	18	9	3	0	2	40	0.13
Pinus nigra	0	7	26	5	0	0	0	0	38	0.12
Eucalyptus camaldulensis	2	1	2	12	2	8	5	4	36	0.12

	DBH Class (inches)									
Species	0 - 4	4 - 8	8 - 12	12 - 18	18 - 24	24 - 30	30 - 36	>36	# of Trees	% of Pop.
Liquidambar styraciflua	0	1	4	22	5	1	0	0	33	0.11
Acer saccharinum	1	4	3	7	7	6	2	1	31	0.10
Aesculus californica	10	14	2	4	1	0	0	0	31	0.10
Calocedrus decurrens	4	7	2	4	4	7	1	2	31	0.10
Albizia julibrissin	4	1	1	18	6	0	0	0	30	0.10
Chamaecyparis	1	7	5	8	5	3	0	0	29	0.09
Quercus macrocarpa	8	6	2	2	5	4	2	0	29	0.09
Geijera parviflora	0	8	8	6	1	2	1	1	27	0.09
Robinia spp.	1	4	11	7	2	0	0	1	26	0.08
Umbellularia californica	0	3	2	12	8	0	1	0	26	0.08
Chilopsis spp.	25	0	0	0	0	0	0	0	25	0.08
Platanus occidentalis	3	1	4	5	6	3	2	0	24	0.08
Fraxinus ornus	0	2	3	10	7	1	0	0	23	0.07
Prunus dulcis	7	6	4	3	2	1	0	0	23	0.07
Quercus spp.	8	3	1	9	1	1	0	0	23	0.07
Tilia tomentosa	13	8	1	0	0	0	0	0	22	0.07
Betula pendula	4	6	8	2	1	0	0	0	21	0.07
Quercus frainetto	17	2	2	0	0	0	0	0	21	0.07
Pinus thunbergii	0	1	8	9	2	0	0	0	20	0.07
Casuarina stricta	0	0	0	0	4	7	4	4	19	0.06
Parrotia persica	19	0	0	0	0	0	0	0	19	0.06
Tilia americana	3	2	5	4	3	0	1	0	18	0.06
Ulmus americana	5	0	0	0	1	2	5	5	18	0.06
Eucalyptus polyanthemos	0	1	3	3	2	4	3	1	17	0.06
Ficus spp.	4	2	3	5	2	0	1	0	17	0.06
Platanus orientalis	3	0	3	9	2	0	0	0	17	0.06
Cinnamomum camphora	0	4	7	1	2	1	1	0	16	0.05
Taxodium distichum	16	0	0	0	0	0	0	0	16	0.05
Catalpa speciosa	0	2	6	5	1	1	0	0	15	0.05
Prosopis chilensis	15	0	0	0	0	0	0	0	15	0.05
Prunus persica	3	3	1	7	1	0	0	0	15	0.05
Tilia x euchlora	0	0	4	11	0	0	0	0	15	0.05
Acer palmatum	10	4	0	0	0	0	0	0	14	0.05
Ceratonia siliqua	1	1	1	1	2	6	1	1	14	0.05
Juglans nigra	1	1	0	3	2	0	1	6	14	0.05
Maytenus boaria	2	0	1	4	3	1	1	1	13	0.04
Pinus sylvestris	1	1	2	4	2	3	0	0	13	0.04
Paulownia tomentosa	2	1	2	3	4	0	0	0	12	0.04
Tristaniopsis spp.	9	2	1	0	0	0	0	0	12	0.04
Acer negundo	3	4	2	0	2	0	0	0	11	0.04
Afrocarpus gracilior	0	2	8	1	0	0	0	0	11	0.04
Alnus cordata	0	0	4	6	1	0	0	0	11	0.04
Cedrus atlantica	1	1	3	3	2	1	0	0	11	0.04
Quercus cerris	1	0	0	2	3	2	3	0	11	0.04

Species	DBH Class (inches) 0 - 4	4 - 8	8 - 12	12 - 18	18 - 24	24 - 30	30 - 36	>36	# of Trees	% of Pop.
Alnus rhombifolia	1	3	0	4	2	0	0	0	10	0.03
Eriobotrya japonica	3	3	3	1	0	0	0	0	10	0.03
Quercus palustris	5	4	1	0	0	0	0	0	10	0.03
Acer truncatum x platanoides	2	4	0	3	0	0	0	0	9	0.03
Eucalyptus melliodora	0	0	1	1	0	5	2	0	9	0.03
Prunus Kanzan	6	1	1	1	0	0	0	0	9	0.03
Pterocarya stenoptera	0	2	0	1	4	0	0	2	9	0.03
Punica spp.	1	1	3	2	2	0	0	0	9	0.03
Quercus laurifolia	0	1	4	4	0	0	0	0	9	0.03
Ulmus procera	0	0	0	1	2	0	2	4	9	0.03
Magnolia x soulangeana	4	0	3	1	0	0	0	0	8	0.03
Melaleuca linariifolia	0	1	0	2	4	1	0	0	8	0.03
Ailanthus altissima	1	1	1	1	2	0	1	0	7	0.02
Crataegus spp.	2	3	0	2	0	0	0	0	7	0.02
Eucalyptus spp.	0	0	0	1	1	2	0	3	7	0.02
Quercus chrysolepis	7	0	0	0	0	0	0	0	7	0.02
Acer pseudoplatanus	1	0	1	4	0	0	0	0	6	0.02
Eucalyptus nicholii	0	0	1	2	0	1	2	0	6	0.02
Quercus muehlenbergii	5	0	0	1	0	0	0	0	6	0.02
Salix babylonica	0	0	0	0	0	1	5	0	6	0.02
Betula nigra	3	1	1	0	0	0	0	0	5	0.02
Carpinus caroliniana	2	3	0	0	0	0	0	0	5	0.02
Quercus imbricaria	5	0	0	0	0	0	0	0	5	0.02
Xylosma spp.	0	4	1	0	0	0	0	0	5	0.02
Cupressus sempervirens	0	0	2	2	0	0	0	0	4	0.01
Lagerstroemia subcostata	4	0	0	0	0	0	0	0	4	0.01
Magnoliopsida	4	0	0	0	0	0	0	0	4	0.01
Myrtuss pp.	0	0	2	0	0	2	0	0	4	0.01
Picea pungens	1	1	1	1	0	0	0	0	4	0.01
Thuja plicata	0	0	0	3	0	1	0	0	4	0.01
Ulmus pumila	0	0	0	0	0	0	1	3	4	0.01
Acer griseum	2	1	0	0	0	0	0	0	3	0.01
Brachychiton populneus	0	0	1	1	1	0	0	0	3	0.01
Eucalyptus globulus	0	0	0	1	0	1	1	0	3	0.01
Juglans spp.	0	1	0	1	0	0	0	1	3	0.01
Metasequoia glyptostroboides	3	0	0	0	0	0	0	0	3	0.01
Parkinsonia aculeata	3	0	0	0	0	0	0	0	3	0.01
Pinus radiata	0	0	1	0	1	1	0	0	3	0.01
Acer spp.	0	0	0	2	0	0	0	0	2	0.01
Acer saccharum	0	0	1	1	0	0	0	0	2	0.01
Callistemon spp.	2	0	0	0	0	0	0	0	2	0.01
Citrus spp.	0	0	0	1	1	0	0	0	2	0.01
Citrus limon	0	2	0	0	0	0	0	0	2	0.01

Species	DBH Class (inches) 0 - 4	4 - 8	8 - 12	12 - 18	18 - 24	24 - 30	30 - 36	>36	# of Trees	% of Pop.
Corymbia maculata	0	1	0	0	0	0	1	0	2	0.01
Crataegus phaenopyrum	2	0	0	0	0	0	0	0	2	0.01
Koelreuteria elegans	1	1	0	0	0	0	0	0	2	0.01
Photinia spp.	0	1	1	0	0	0	0	0	2	0.01
Pinus coulteri	0	0	0	2	0	0	0	0	2	0.01
Prunus armeniaca	0	1	1	0	0	0	0	0	2	0.01
Prunus lyonii	1	0	1	0	0	0	0	0	2	0.01
Prunus x yedoensis	2	0	0	0	0	0	0	0	2	0.01
Quercus castaneifolia	2	0	0	0	0	0	0	0	2	0.01
Quercus nigra	1	0	0	1	0	0	0	0	2	0.01
Quercus phellos	1	0	0	0	0	0	0	1	2	0.01
Washingtonia filifera	2	0	0	0	0	0	0	0	2	0.01
Acer macrophyllum	1	0	0	0	0	0	0	0	1	0.00
Brachychiton acerifolius	1	0	0	0	0	0	0	0	1	0.00
Carya illinoinensis	0	0	1	0	0	0	0	0	1	0.00
Cercidiphyllum japonicum	1	0	0	0	0	0	0	0	1	0.00
Elaeocarpus decipiens	1	0	0	0	0	0	0	0	1	0.00
Firmiana simplex	0	0	0	1	0	0	0	0	1	0.00
Juniperus virginiana	0	0	1	0	0	0	0	0	1	0.00
Larix occidentalis	0	1	0	0	0	0	0	0	1	0.00
Magnolia virginiana	0	0	1	0	0	0	0	0	1	0.00
Malus x arnoldiana	0	0	1	0	0	0	0	0	1	0.00
Nyssa sylvatica	1	0	0	0	0	0	0	0	1	0.00
Ostrya carpinifolia	1	0	0	0	0	0	0	0	1	0.00
Persea spp.	1	0	0	0	0	0	0	0	1	0.00
Pistacia vera	0	0	0	1	0	0	0	0	1	0.00
Prunus subhirtella	0	0	0	0	0	1	0	0	1	0.00
Prunus x blireiana	0	0	0	1	0	0	0	0	1	0.00
Pyrus betulifolia	0	1	0	0	0	0	0	0	1	0.00
Quercus engelmannii	0	0	0	1	0	0	0	0	1	0.00
Tetradium spp.	0	0	0	0	1	0	0	0	1	0.00
Thuja spp.	0	0	0	0	0	0	0	1	1	0.00
Ulmus x hollandica	0	0	0	0	0	0	0	1	1	0.00
Washingtonia spp.	0	0	0	1	0	0	0	0	1	0.00

Table 16: Importance Value (IV) for All Tree Species

Species	% of Pop.	% of Leaf Area	Importance Value (IV)
Platanus x acerifolia	7.75	11.30	19.10
Pistacia chinensis	6.57	3.50	10.10
Lagerstroemia indica	6.25	0.80	7.00
Quercus lobata	5.97	7.00	13.00
Sequoia sempervirens	4.95	6.60	11.60
Pyrus calleryana	4.84	3.40	8.20
Triadica sebifera	4.31	3.80	8.10
Celtis sinensis	3.35	6.10	9.40
Fraxinus holotricha	2.67	5.00	7.70
Vitex agnus-castus	2.56	2.40	5.00
Casuarina cunninghamiana	2.15	1.70	3.90
Pinus canariensis	1.84	4.00	5.90
Celtis australis	1.76	3.00	4.80
Ulmus parvifolia	1.71	0.90	2.60
Ginkgo biloba	1.65	0.60	2.30
Acer buergerianum	1.40	0.70	2.10
Koelreuteria paniculata	1.34	1.60	3.00
Pinus brutia	1.23	1.70	2.90
Gleditsia triacanthos	1.18	1.40	2.60
Quercus douglasii	1.18	0.20	1.40
Fraxinus velutina	1.15	1.90	3.10
Quercus suber	1.06	2.00	3.00
Fraxinus americana	1.04	0.50	1.60
Platanus racemosa	1.02	1.90	2.90
Koelreuteria bipinnata	0.99	0.30	1.30
Quercus virginiana	0.91	1.10	2.00
Cedrus deodara	0.89	0.90	1.80
Acer rubrum	0.84	0.10	1.00
Cercis canadensis	0.79	0.30	1.10
Quercus agrifolia	0.77	1.20	1.90
Ulmus davidiana v. japonica	0.76	0.10	0.90
Olea europaea	0.74	1.00	1.70
Celtis occidentalis	0.72	0.90	1.60
Fraxinus uhdei	0.70	1.10	1.80
Zelkova serrata	0.69	0.20	0.90
Juglans hindsii	0.65	1.00	1.70
Laurus nobilis	0.65	0.40	1.10
Malus spp.	0.63	0.10	0.70
Quercus wislizeni	0.62	0.80	1.50
Prunus cerasifera	0.61	0.30	0.90
Arbutus unedo	0.61	0.30	0.90
Liriodendron tulipifera	0.61	0.80	1.40

Species	% of Pop.	% of Leaf Area	Importance Value (IV)
Quercus rubra	0.60	0.10	0.70
Eucalyptus sideroxylon	0.58	1.50	2.10
Acer x freemanii	0.58	0.30	0.80
Gymnocladus dioica	0.57	0.20	0.80
Morus alba	0.56	0.80	1.40
Fraxinus angustifolia ssp. Oxycarpa	0.55	0.90	1.40
Magnolia grandiflora	0.52	0.30	0.90
Pinus halepensis	0.51	1.00	1.60
Quercus buckleyi	0.50	0.00	0.50
Pistacia spp.	0.50	0.00	0.50
Quercus ilex	0.50	1.20	1.70
Ulmus spp.	0.47	0.10	0.60
Quercus canbyi	0.47	0.00	0.50
Melia azedarach	0.41	0.60	1.00
Fraxinus spp.	0.40	0.40	0.80
Prunus spp.	0.40	0.20	0.60
x Chitalpa tashkentensis	0.37	0.00	0.40
Tilia cordata	0.31	0.30	0.60
Sophora japonica	0.29	0.40	0.70
Quercus shumardii	0.28	0.10	0.40
Populus fremontii	0.28	0.40	0.60
Acer platanoides	0.27	0.10	0.30
Pinus spp.	0.27	0.30	0.60
Robinia pseudoacacia	0.27	0.20	0.40
Quercus coccinea	0.26	0.20	0.40
Ligustrum lucidum	0.25	0.30	0.60
Chilopsis linearis	0.25	0.00	0.30
Quercus robur	0.25	0.10	0.30
Prunus serrulata	0.24	0.10	0.30
Searsia lancea	0.22	0.20	0.40
Carpinus betulus	0.21	0.30	0.50
Juglans regia	0.21	0.30	0.50
Cupressus arizonica	0.19	0.10	0.30
Maclura pomifera	0.18	0.00	0.20
Pinus pinea	0.18	0.40	0.60
Ostrya virginiana	0.17	0.10	0.30
Populus nigra v. italica	0.17	0.20	0.30
Chionanthus retusus	0.14	0.00	0.10
Schinus molle	0.14	0.10	0.30
Acer campestre	0.14	0.20	0.40
Acacia melanoxylon	0.13	0.30	0.40
Salix spp.	0.13	0.10	0.30
Pinus nigra	0.12	0.00	0.20

Species	% of Pop.	% of Leaf Area	Importance Value (IV)
Eucalyptus camaldulensis	0.12	0.60	0.70
Liquidambar styraciflua	0.11	0.20	0.30
Acer saccharinum	0.10	0.20	0.30
Aesculus californica	0.10	0.10	0.20
Calocedrus decurrens	0.10	0.10	0.20
Albizia julibrissin	0.10	0.10	0.20
Chamaecyparis	0.09	0.10	0.20
Quercus macrocarpa	0.09	0.20	0.30
Geijera parviflora	0.09	0.00	0.10
Robinia spp.	0.08	0.10	0.20
Umbellularia californica	0.08	0.10	0.20
Chilopsis spp.	0.08	0.00	0.10
Platanus occidentalis	0.08	0.20	0.30
Fraxinus ornus	0.07	0.10	0.20
Prunus dulcis	0.07	0.00	0.10
Quercus spp.	0.07	0.10	0.10
Tilia tomentosa	0.07	0.00	0.10
Betula pendula	0.07	0.00	0.10
Quercus frainetto	0.07	0.00	0.10
Pinus thunbergii	0.07	0.10	0.10
Casuarina stricta	0.06	0.10	0.10
Parrotia persica	0.06	0.00	0.10
Tilia americana	0.06	0.10	0.10
Ulmus americana	0.06	0.10	0.20
Eucalyptus polyanthemos	0.06	0.20	0.30
Ficus spp.	0.06	0.00	0.10
Platanus orientalis	0.06	0.10	0.10
Cinnamomum camphora	0.05	0.00	0.10
Taxodium distichum	0.05	0.00	0.10
Catalpa speciosa	0.05	0.00	0.10
Prosopis chilensis	0.05	0.00	0.00
Prunus persica	0.05	0.00	0.10
Tilia x euchlora	0.05	0.10	0.10
Acer palmatum	0.05	0.00	0.00
Ceratonia siliqua	0.05	0.10	0.10
Juglans nigra	0.05	0.10	0.10
Maytenus boaria	0.04	0.00	0.10
Pinus sylvestris	0.04	0.10	0.10
Paulownia tomentosa	0.04	0.00	0.10
Tristaniopsis spp.	0.04	0.00	0.00
Acer negundo	0.04	0.00	0.10
Afrocarpus gracilior	0.04	0.00	0.10
Alnus cordata	0.04	0.10	0.10

Species	% of Pop.	% of Leaf Area	Importance Value (IV)
Cedrus atlantica	0.04	0.00	0.10
Quercus cerris	0.04	0.10	0.10
Alnus rhombifolia	0.03	0.00	0.10
Eriobotrya japonica	0.03	0.00	0.00
Quercus palustris	0.03	0.00	0.00
Acer truncatum x platanoides	0.03	0.00	0.10
Eucalyptus melliodora	0.03	0.10	0.20
Prunus Kanzan	0.03	0.00	0.00
Pterocarya stenoptera	0.03	0.00	0.10
Punica spp.	0.03	0.00	0.10
Quercus laurifolia	0.03	0.00	0.10
Ulmus procera	0.03	0.00	0.10
Magnolia x soulangeana	0.03	0.00	0.00
Melaleuca linariifolia	0.03	0.00	0.10
Ailanthus altissima	0.02	0.00	0.00
Crataegus spp.	0.02	0.00	0.00
Eucalyptus spp.	0.02	0.10	0.20
Quercus chrysolepis	0.02	0.00	0.00
Acer pseudoplatanus	0.02	0.00	0.00
Eucalyptus nicholii	0.02	0.10	0.10
Quercus muehlenbergii	0.02	0.00	0.00
Salix babylonica	0.02	0.00	0.10
Betula nigra	0.02	0.00	0.00
Carpinus caroliniana	0.02	0.00	0.00
Quercus imbricaria	0.02	0.00	0.00
Xylosma spp.	0.02	0.00	0.00
Cupressus sempervirens	0.01	0.00	0.00
Lagerstroemia subcostata	0.01	0.00	0.00
Magnoliopsida	0.01	0.00	0.00
Myrtuss pp.	0.01	0.00	0.10
Picea pungens	0.01	0.00	0.00
Thuja plicata	0.01	0.00	0.00
Ulmus pumila	0.01	0.00	0.00
Acer griseum	0.01	0.00	0.00
Brachychiton populneus	0.01	0.00	0.00
Eucalyptus globulus	0.01	0.00	0.10
Juglans spp.	0.01	0.00	0.00
Metasequoia glyptostroboides	0.01	0.00	0.00
Parkinsonia aculeata	0.01	0.00	0.00
Pinus radiata	0.01	0.00	0.00
Acer spp.	0.01	0.00	0.00
Acer saccharum	0.01	0.00	0.00
Callistemon spp.	0.01	0.00	0.00

Species	% of Pop.	% of Leaf Area	Importance Value (IV)
Citrus spp.	0.01	0.00	0.00
Citrus limon	0.01	0.00	0.00
Corymbia maculata	0.01	0.00	0.00
Crataegus phaenopyrum	0.01	0.00	0.00
Koelreuteria elegans	0.01	0.00	0.00
Photinia spp.	0.01	0.00	0.00
Pinus coulteri	0.01	0.00	0.00
Prunus armeniaca	0.01	0.00	0.00
Prunus lyonii	0.01	0.00	0.00
Prunus x yedoensis	0.01	0.00	0.00
Quercus castaneifolia	0.01	0.00	0.00
Quercus nigra	0.01	0.00	0.00
Quercus phellos	0.01	0.00	0.00
Washingtonia filifera	0.01	0.00	0.00
Acer macrophyllum	0.00	0.00	0.00
Brachychiton acerifolius	0.00	0.00	0.00
Carya illinoinensis	0.00	0.00	0.00
Cercidiphyllum japonicum	0.00	0.00	0.00
Elaeocarpus decipiens	0.00	0.00	0.00
Firmiana simplex	0.00	0.00	0.00
Juniperus virginiana	0.00	0.00	0.00
Larix occidentalis	0.00	0.00	0.00
Magnolia virginiana	0.00	0.00	0.00
Malus x arnoldiana	0.00	0.00	0.00
Nyssa sylvatica	0.00	0.00	0.00
Ostrya carpinifolia	0.00	0.00	0.00
Persea spp.	0.00	0.00	0.00
Pistacia vera	0.00	0.00	0.00
Prunus subhirtella	0.00	0.00	0.00
Prunus x blireiana	0.00	0.00	0.00
Pyrus betulifolia	0.00	0.00	0.00
Quercus engelmannii	0.00	0.00	0.00
Tetradium spp.	0.00	0.00	0.00
Thuja spp.	0.00	0.00	0.00
Ulmus x hollandica	0.00	0.00	0.00
Washingtonia spp.	0.00	0.00	0.00

Table 17: Condition and RPI for All Tree Species

Species	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Dead (%)	RPI	Number of Trees	% of Pop.
Platanus x acerifolia	0.00	42.60	52.20	4.70	0.40	**0.98**	2,380	7.75
Pistacia chinensis	0.00	79.30	18.50	1.80	0.30	**1.09**	2,016	6.57
Lagerstroemia indica	0.00	59.00	36.20	4.60	0.20	**1.03**	1,918	6.25
Quercus lobata	0.00	46.00	49.40	3.90	0.60	**0.99**	1,833	5.97
Sequoia sempervirens	0.00	54.20	42.00	2.90	1.00	**1.01**	1,518	4.95
Pyrus calleryana	0.00	8.40	65.60	24.10	2.00	**0.81**	1,484	4.84
Triadica sebifera	0.00	54.50	42.10	3.10	0.40	**1.02**	1,322	4.31
Celtis sinensis	0.20	55.40	38.10	5.50	0.80	**1.01**	1,028	3.35
Fraxinus holotricha	0.00	31.40	60.10	8.10	0.40	**0.94**	818	2.67
Vitex agnus-castus	0.00	77.50	19.90	2.50	0.00	**1.09**	787	2.56
Casuarina cunninghamiana	0.00	71.60	26.80	1.20	0.50	**1.07**	661	2.15
Pinus canariensis	0.00	73.60	22.30	3.90	0.20	**1.07**	564	1.84
Celtis australis	0.00	83.20	14.80	1.50	0.60	**1.10**	541	1.76
Ulmus parvifolia	0.00	78.70	18.90	1.90	0.60	**1.09**	525	1.71
Ginkgo biloba	0.20	88.60	7.30	1.60	2.40	**1.10**	507	1.65
Acer buergerianum	0.00	90.30	9.00	0.50	0.20	**1.13**	431	1.40
Koelreuteria paniculata	0.20	66.50	27.70	5.10	0.50	**1.05**	412	1.34
Pinus brutia	0.00	12.90	78.40	7.90	0.80	**0.88**	379	1.23
Gleditsia triacanthos	0.00	19.60	71.10	9.40	0.00	**0.90**	363	1.18
Quercus douglasii	0.00	77.90	21.00	0.60	0.60	**1.09**	362	1.18
Fraxinus velutina	0.00	5.60	66.70	27.10	0.60	**0.80**	354	1.15
Quercus suber	0.00	68.90	26.20	3.70	1.20	**1.05**	325	1.06
Fraxinus americana	0.00	60.00	31.60	7.50	0.90	**1.02**	320	1.04
Platanus racemosa	0.00	27.20	66.10	5.80	1.00	**0.92**	313	1.02
Koelreuteria bipinnata	0.00	79.00	18.70	2.00	0.30	**1.09**	305	0.99
Quercus virginiana	0.00	75.50	20.50	4.00	0.00	**1.08**	278	0.91
Cedrus deodara	0.70	63.10	32.80	2.60	0.70	**1.04**	274	0.89
Acer rubrum	0.00	88.80	7.80	1.90	1.60	**1.11**	258	0.84
Cercis canadensis	0.00	51.60	42.60	4.50	1.20	**1.00**	244	0.79
Quercus agrifolia	0.00	59.30	37.30	1.70	1.70	**1.02**	236	0.77
Ulmus davidiana v. japonica	0.00	87.90	11.60	0.40	0.00	**1.12**	232	0.76
Olea europaea	0.00	15.50	81.90	2.70	0.00	**0.91**	226	0.74
Celtis occidentalis	0.00	27.00	66.70	5.90	0.50	**0.93**	222	0.72
Fraxinus uhdei	0.00	34.10	55.10	10.30	0.50	**0.94**	214	0.70
Zelkova serrata	0.00	86.80	7.50	5.70	0.00	**1.11**	212	0.69
Juglans hindsii	0.00	9.50	52.70	27.40	10.40	**0.73**	201	0.65
Laurus nobilis	0.00	24.20	70.70	4.50	0.50	**0.92**	198	0.65
Malus spp.	0.00	32.80	57.30	5.20	4.70	**0.91**	192	0.63
Quercus wislizeni	0.00	38.10	54.00	7.90	0.00	**0.96**	189	0.62
Prunus cerasifera	0.00	19.70	75.50	2.10	2.70	**0.90**	188	0.61
Arbutus unedo	0.00	40.10	54.00	3.20	2.70	**0.95**	187	0.61

Species	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Dead (%)	RPI	Number of Trees	% of Pop.
Liriodendron tulipifera	0.00	51.90	35.80	9.60	2.70	**0.97**	187	0.61
Quercus rubra	0.00	79.20	15.30	1.60	3.80	**1.06**	183	0.60
Eucalyptus sideroxylon	0.00	5.10	91.60	3.40	0.00	**0.88**	178	0.58
Acer x freemanii	0.60	80.80	15.30	2.80	0.60	**1.09**	177	0.58
Gymnocladus dioica	0.00	88.10	10.20	1.10	0.60	**1.12**	176	0.57
Morus alba	0.00	20.90	69.80	9.30	0.00	**0.90**	172	0.56
Fraxinus angustifolia ssp. Oxycarpa	0.00	32.50	55.00	12.40	0.00	**0.93**	169	0.55
Magnolia grandiflora	0.00	23.10	61.90	15.00	0.00	**0.89**	160	0.52
Pinus halepensis	0.00	48.40	45.20	5.70	0.60	**0.99**	157	0.51
Quercus buckleyi	0.00	98.70	1.30	0.00	0.00	**1.16**	153	0.50
Pistacia spp.	0.00	99.30	0.70	0.00	0.00	**1.16**	152	0.50
Quercus ilex	0.00	71.70	25.00	1.30	2.00	**1.06**	152	0.50
Ulmus spp.	0.00	84.80	11.00	4.10	0.00	**1.11**	145	0.47
Quercus canbyi	0.00	100.00	0.00	0.00	0.00	**1.16**	143	0.47
Melia azedarach	0.00	74.40	24.80	0.80	0.00	**1.08**	125	0.41
Fraxinus spp.	0.00	19.40	79.00	1.60	0.00	**0.92**	124	0.40
Prunus spp.	0.00	4.10	63.90	25.40	6.60	**0.75**	122	0.40
x Chitalpa tashkentensis	0.00	52.20	38.10	6.20	3.50	**0.97**	113	0.37
Tilia cordata	0.00	55.80	38.90	5.30	0.00	**1.02**	95	0.31
Sophora japonica	0.00	13.30	86.70	0.00	0.00	**0.91**	90	0.29
Quercus shumardii	0.00	68.60	24.40	2.30	4.70	**1.02**	86	0.28
Populus fremontii	0.00	16.50	68.20	7.10	8.20	**0.83**	85	0.28
Acer platanoides	0.00	27.40	51.20	14.30	7.10	**0.85**	84	0.27
Pinus spp.	0.00	23.20	50.00	26.80	0.00	**0.86**	82	0.27
Robinia pseudoacacia	0.00	14.60	75.60	6.10	3.70	**0.86**	82	0.27
Quercus coccinea	0.00	67.50	25.00	3.80	3.80	**1.02**	80	0.26
Ligustrum lucidum	0.00	12.80	84.60	2.60	0.00	**0.90**	78	0.25
Chilopsis linearis	0.00	93.50	6.50	0.00	0.00	**1.14**	77	0.25
Quercus robur	0.00	79.20	18.20	1.30	1.30	**1.09**	77	0.25
Prunus serrulata	0.00	50.70	39.70	1.40	8.20	**0.94**	73	0.24
Searsia lancea	0.00	12.10	84.80	0.00	3.00	**0.88**	66	0.22
Carpinus betulus	0.00	76.60	17.20	4.70	1.60	**1.07**	64	0.21
Juglans regia	0.00	4.80	69.80	17.50	7.90	**0.76**	63	0.21
Cupressus arizonica	0.00	37.30	37.30	22.00	3.40	**0.89**	59	0.19
Maclura pomifera	0.00	100.00	0.00	0.00	0.00	**1.16**	56	0.18
Pinus pinea	0.00	54.50	45.50	0.00	0.00	**1.03**	55	0.18
Ostrya virginiana	0.00	0.00	100.00	0.00	0.00	**0.87**	52	0.17
Populus nigra v. italica	0.00	0.00	100.00	0.00	0.00	**0.87**	52	0.17
Chionanthus retusus	0.00	81.80	18.20	0.00	0.00	**1.11**	44	0.14
Schinus molle	0.00	15.90	84.10	0.00	0.00	**0.92**	44	0.14
Acer campestre	0.00	60.50	37.20	2.30	0.00	**1.04**	43	0.14
Acacia melanoxylon	0.00	61.00	36.60	2.40	0.00	**1.04**	41	0.13

Species	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Dead (%)	RPI	Number of Trees	% of Pop.
Salix spp.	0.00	2.50	50.00	47.50	0.00	**0.74**	40	0.13
Pinus nigra	0.00	7.90	84.20	7.90	0.00	**0.87**	38	0.12
Eucalyptus camaldulensis	0.00	22.20	72.20	5.60	0.00	**0.92**	36	0.12
Liquidambar styraciflua	0.00	30.30	63.60	3.00	3.00	**0.92**	33	0.11
Acer saccharinum	0.00	38.70	48.40	9.70	3.20	**0.93**	31	0.10
Aesculus californica	0.00	71.00	25.80	0.00	3.20	**1.05**	31	0.10
Calocedrus decurrens	0.00	41.90	41.90	16.10	0.00	**0.95**	31	0.10
Albizia julibrissin	0.00	30.00	50.00	20.00	0.00	**0.90**	30	0.10
Chamaecyparis	0.00	20.70	55.20	24.10	0.00	**0.86**	29	0.09
Quercus macrocarpa	0.00	89.70	10.30	0.00	0.00	**1.13**	29	0.09
Geijera parviflora	0.00	18.50	81.50	0.00	0.00	**0.92**	27	0.09
Robinia spp.	0.00	19.20	65.40	15.40	0.00	**0.88**	26	0.08
Umbellularia californica	0.00	34.60	50.00	15.40	0.00	**0.93**	26	0.08
Chilopsis spp.	0.00	100.00	0.00	0.00	0.00	**1.16**	25	0.08
Platanus occidentalis	0.00	29.20	66.70	4.20	0.00	**0.94**	24	0.08
Fraxinus ornus	0.00	47.80	43.50	8.70	0.00	**0.98**	23	0.07
Prunus dulcis	0.00	8.70	73.90	13.00	4.30	**0.82**	23	0.07
Quercus spp.	0.00	47.80	43.50	0.00	8.70	**0.93**	23	0.07
Tilia tomentosa	0.00	81.80	13.60	4.50	0.00	**1.10**	22	0.07
Betula pendula	0.00	9.50	61.90	23.80	4.80	**0.79**	21	0.07
Quercus frainetto	0.00	100.00	0.00	0.00	0.00	**1.16**	21	0.07
Pinus thunbergii	0.00	35.00	35.00	30.00	0.00	**0.89**	20	0.07
Casuarina stricta	0.00	68.40	31.60	0.00	0.00	**1.07**	19	0.06
Parrotia persica	0.00	78.90	21.10	0.00	0.00	**1.10**	19	0.06
Tilia americana	0.00	77.80	22.20	0.00	0.00	**1.10**	18	0.06
Ulmus americana	0.00	50.00	33.30	16.70	0.00	**0.97**	18	0.06
Eucalyptus polyanthemos	0.00	5.90	94.10	0.00	0.00	**0.89**	17	0.06
Ficus spp.	0.00	29.40	41.20	17.60	11.80	**0.80**	17	0.06
Platanus orientalis	0.00	52.90	47.10	0.00	0.00	**1.02**	17	0.06
Cinnamomum camphora	0.00	6.30	75.00	12.50	6.30	**0.80**	16	0.05
Taxodium distichum	0.00	56.30	37.50	6.30	0.00	**1.02**	16	0.05
Catalpa speciosa	0.00	13.30	80.00	6.70	0.00	**0.89**	15	0.05
Prosopis chilensis	0.00	80.00	20.00	0.00	0.00	**1.10**	15	0.05
Prunus persica	0.00	20.00	80.00	0.00	0.00	**0.93**	15	0.05
Tilia x euchlora	0.00	80.00	20.00	0.00	0.00	**1.10**	15	0.05
Acer palmatum	0.00	78.60	7.10	7.10	7.10	**1.02**	14	0.05
Ceratonia siliqua	0.00	28.60	71.40	0.00	0.00	**0.95**	14	0.05
Juglans nigra	0.00	35.70	21.40	35.70	7.10	**0.81**	14	0.05
Maytenus boaria	0.00	30.80	38.50	30.80	0.00	**0.87**	13	0.04
Pinus sylvestris	0.00	53.80	7.70	7.70	30.80	**0.74**	13	0.04
Paulownia tomentosa	0.00	0.00	50.00	50.00	0.00	**0.73**	12	0.04
Tristaniopsis spp.	0.00	0.00	100.00	0.00	0.00	**0.87**	12	0.04
Acer negundo	0.00	9.10	45.50	18.20	27.30	**0.61**	11	0.04

Species	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Dead (%)	RPI	Number of Trees	% of Pop.
Afrocarpus gracilior	0.00	90.90	9.10	0.00	0.00	**1.13**	11	0.04
Alnus cordata	0.00	45.50	54.50	0.00	0.00	**1.00**	11	0.04
Cedrus atlantica	0.00	54.50	36.40	9.10	0.00	**1.00**	11	0.04
Quercus cerris	0.00	72.70	27.30	0.00	0.00	**1.08**	11	0.04
Alnus rhombifolia	0.00	10.00	50.00	20.00	20.00	**0.67**	10	0.03
Eriobotrya japonica	0.00	60.00	40.00	0.00	0.00	**1.04**	10	0.03
Quercus palustris	0.00	80.00	20.00	0.00	0.00	**1.10**	10	0.03
Acer truncatum x platanoides	0.00	44.40	55.60	0.00	0.00	**1.00**	9	0.03
Eucalyptus melliodora	0.00	33.30	33.30	11.10	22.20	**0.74**	9	0.03
Prunus Kanzan	0.00	66.70	33.30	0.00	0.00	**1.06**	9	0.03
Pterocarya stenoptera	0.00	22.20	66.70	11.10	0.00	**0.90**	9	0.03
Punica spp.	0.00	0.00	100.00	0.00	0.00	**0.87**	9	0.03
Quercus laurifolia	0.00	77.80	22.20	0.00	0.00	**1.10**	9	0.03
Ulmus procera	0.00	11.10	66.70	22.20	0.00	**0.84**	9	0.03
Magnolia x soulangeana	0.00	62.50	25.00	12.50	0.00	**1.02**	8	0.03
Melaleuca linariifolia	0.00	12.50	12.50	75.00	0.00	**0.69**	8	0.03
Ailanthus altissima	0.00	14.30	71.40	14.30	0.00	**0.87**	7	0.02
Crataegus spp.	0.00	42.90	14.30	42.90	0.00	**0.87**	7	0.02
Eucalyptus spp.	0.00	14.30	57.10	14.30	14.30	**0.75**	7	0.02
Quercus chrysolepis	0.00	57.10	0.00	0.00	42.90	**0.66**	7	0.02
Acer pseudoplatanus	0.00	66.70	16.70	0.00	16.70	**0.92**	6	0.02
Eucalyptus nicholii	0.00	50.00	50.00	0.00	0.00	**1.02**	6	0.02
Quercus muehlenbergii	0.00	83.30	16.70	0.00	0.00	**1.11**	6	0.02
Salix babylonica	0.00	16.70	66.70	16.70	0.00	**0.87**	6	0.02
Betula nigra	0.00	40.00	20.00	20.00	20.00	**0.75**	5	0.02
Carpinus caroliniana	0.00	80.00	20.00	0.00	0.00	**1.10**	5	0.02
Quercus imbricaria	0.00	100.00	0.00	0.00	0.00	**1.16**	5	0.02
Xylosma spp.	0.00	60.00	20.00	20.00	0.00	**0.99**	5	0.02
Cupressus sempervirens	0.00	25.00	75.00	0.00	0.00	**0.94**	4	0.01
Lagerstroemia subcostata	0.00	75.00	25.00	0.00	0.00	**1.09**	4	0.01
Magnoliopsida	0.00	75.00	0.00	0.00	25.00	**0.87**	4	0.01
Myrtuss pp.	0.00	25.00	75.00	0.00	0.00	**0.94**	4	0.01
Picea pungens	0.00	25.00	75.00	0.00	0.00	**0.94**	4	0.01
Thuja plicata	0.00	0.00	75.00	25.00	0.00	**0.8**	4	0.01
Ulmus pumila	0.00	0.00	50.00	50.00	0.00	**0.73**	4	0.01
Acer griseum	0.00	100.00	0.00	0.00	0.00	**1.16**	3	0.01
Brachychiton populneus	0.00	66.70	33.30	0.00	0.00	**1.06**	3	0.01
Eucalyptus globulus	0.00	66.70	0.00	33.30	0.00	**0.97**	3	0.01
Juglans spp.	0.00	33.30	33.30	33.30	0.00	**0.87**	3	0.01
Metasequoia glyptostroboides	0.00	100.00	0.00	0.00	0.00	**1.16**	3	0.01
Parkinsonia aculeata	0.00	100.00	0.00	0.00	0.00	**1.16**	3	0.01
Pinus radiata	0.00	33.30	66.70	0.00	0.00	**0.97**	3	0.01

Species	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Dead (%)	RPI	Number of Trees	% of Pop.
Acer spp.	0.00	0.00	100.00	0.00	0.00	**0.87**	2	0.01
Acer saccharum	0.00	100.00	0.00	0.00	0.00	**1.16**	2	0.01
Callistemon spp.	0.00	50.00	50.00	0.00	0.00	**1.02**	2	0.01
Citrus spp.	0.00	0.00	100.00	0.00	0.00	**0.87**	2	0.01
Citrus limon	0.00	50.00	50.00	0.00	0.00	**1.02**	2	0.01
Corymbia maculata	0.00	0.00	50.00	50.00	0.00	**0.73**	2	0.01
Crataegus phaenopyrum	0.00	50.00	50.00	0.00	0.00	**1.02**	2	0.01
Koelreuteria elegans	0.00	100.00	0.00	0.00	0.00	**1.16**	2	0.01
Photinia spp.	0.00	0.00	50.00	0.00	50.00	**0.44**	2	0.01
Pinus coulteri	0.00	0.00	50.00	50.00	0.00	**0.73**	2	0.01
Prunus armeniaca	0.00	0.00	100.00	0.00	0.00	**0.87**	2	0.01
Prunus lyonii	0.00	50.00	50.00	0.00	0.00	**1.02**	2	0.01
Prunus x yedoensis	0.00	50.00	50.00	0.00	0.00	**1.02**	2	0.01
Quercus castaneifolia	0.00	100.00	0.00	0.00	0.00	**1.16**	2	0.01
Quercus nigra	0.00	0.00	100.00	0.00	0.00	**0.87**	2	0.01
Quercus phellos	0.00	0.00	50.00	50.00	0.00	**0.73**	2	0.01
Washingtonia filifera	0.00	100.00	0.00	0.00	0.00	**1.16**	2	0.01
Acer macrophyllum	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Brachychiton acerifolius	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Carya illinoinensis	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Cercidiphyllum japonicum	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Elaeocarpus decipiens	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Firmiana simplex	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Juniperus virginiana	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Larix occidentalis	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Magnolia virginiana	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Malus x arnoldiana	0.00	0.00	0.00	0.00	100.00	**0**	1	0.00
Nyssa sylvatica	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Ostrya carpinifolia	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Persea spp.	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Pistacia vera	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Prunus subhirtella	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Prunus x blireiana	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Pyrus betulifolia	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Quercus engelmannii	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00
Tetradium spp.	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Thuja spp.	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Ulmus x hollandica	0.00	0.00	100.00	0.00	0.00	**0.87**	1	0.00
Washingtonia spp.	0.00	100.00	0.00	0.00	0.00	**1.16**	1	0.00

Table 18: Annual Benefits for All Species

Species	Number of Trees	% of Pop.	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gallon/yr.)	Avoided Runoff ($/yr.)	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)
Platanus x acerifolia	2,380	7.75	51.27	8,744.03	311,842.98	2,786.63	1.18	13,327.21
Pistacia chinensis	2,016	6.57	16.54	2,820.84	96,873.33	865.66	0.37	4,140.07
Lagerstroemia indica	1,918	6.25	9.87	1,682.83	21,258.37	189.96	0.08	908.52
Quercus lobata	1,833	5.97	28.02	4,778.93	192,640.22	1,721.43	0.73	8,232.85
Sequoia sempervirens	1,518	4.95	21.13	3,603.16	182,536.66	1,631.15	0.69	7,801.06
Pyrus calleryana	1,484	4.84	24.73	4,217.58	93,563.73	836.08	0.36	3,998.63
Triadica sebifera	1,322	4.31	40.65	6,932.12	105,529.27	943.01	0.40	4,510.00
Celtis sinensis	1,028	3.35	3.28	559.13	166,982.41	1,492.15	0.63	7,136.32
Fraxinus holotricha	818	2.67	18.35	3,129.21	137,307.49	1,226.98	0.52	5,868.10
Vitex agnus-castus	787	2.56	4.52	771.33	66,256.99	592.07	0.25	2,831.62
Casuarina cunninghamiana	661	2.15	30.51	5,203.75	46,852.52	418.67	0.18	2,002.33
Pinus canariensis	564	1.84	9.80	1,671.14	110,484.59	987.29	0.42	4,721.77
Celtis australis	541	1.76	1.63	277.64	82,603.12	738.14	0.31	3,530.20
Ulmus parvifolia	525	1.71	7.61	1,298.44	25,309.14	226.16	0.10	1,081.64
Ginkgo biloba	507	1.65	0.89	152.03	17,637.42	157.61	0.07	753.77
Acer buergerianum	431	1.40	2.72	464.13	19,967.53	178.43	0.08	853.35
Koelreuteria paniculata	412	1.34	4.95	844.62	44,940.65	401.59	0.17	1,920.63
Pinus spp.	379	1.23	6.17	1,051.66	46,404.81	414.67	0.18	1,983.20
Gleditsia triacanthos	363	1.18	8.36	1,426.45	38,275.43	342.03	0.15	1,635.78
Quercus douglasii	362	1.18	0.65	110.83	5,825.45	52.06	0.02	248.96
Fraxinus velutina	354	1.15	5.42	923.86	52,726.15	471.16	0.20	2,253.35
Quercus suber	325	1.06	4.43	755.23	54,695.39	488.76	0.21	2,337.51
Fraxinus americana	320	1.04	2.26	385.45	13,964.41	124.79	0.05	596.80
Platanus racemosa	313	1.02	2.62	447.07	50,972.86	455.49	0.19	2,178.43
Koelreuteria bipinnata	305	0.99	0.73	124.46	8,335.02	74.48	0.03	356.21
Quercus virginiana	278	0.91	7.45	1,270.65	28,912.73	258.36	0.11	1,235.64
Cedrus deodara	274	0.89	5.56	948.64	25,687.43	229.54	0.10	1,097.80
Acer rubrum	258	0.84	1.08	184.18	3,106.44	27.76	0.01	132.76
Cercis canadensis	244	0.79	0.53	90.67	7,125.79	63.68	0.03	304.53
Quercus agrifolia	236	0.77	3.35	572.07	31,999.64	285.95	0.12	1,367.57
Ulmus davidiana v. japonica	232	0.76	1.05	179.84	3,207.57	28.66	0.01	137.08
Olea europaea	226	0.74	2.81	479.89	26,542.68	237.18	0.10	1,134.35
Celtis occidentalis	222	0.72	0.48	82.70	23,704.65	211.82	0.09	1,013.06
Fraxinus uhdei	214	0.70	4.45	759.39	29,569.67	264.23	0.11	1,263.72
Zelkova serrata	212	0.69	0.60	101.54	6,597.74	58.96	0.03	281.97
Juglans hindsii	201	0.65	5.19	885.71	27,836.74	248.75	0.11	1,189.66
Laurus nobilis	198	0.65	3.61	615.42	11,394.40	101.82	0.04	486.96
Malus spp.	192	0.63	1.11	189.81	2,432.22	21.73	0.01	103.95
Quercus wislizeni	189	0.62	2.88	490.52	22,964.37	205.21	0.09	981.43
Prunus cerasifera	188	0.61	1.82	310.81	8,957.85	80.05	0.03	382.83
Arbutus unedo	187	0.61	1.16	197.81	8,934.88	79.84	0.03	381.85
Liriodendron tulipifera	187	0.61	2.74	467.11	22,426.97	200.41	0.09	958.46

Species	Number of Trees	% of Pop.	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gallon/yr.)	Avoided Runoff ($/yr.)	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)
Quercus rubra	183	0.60	0.36	61.18	2,459.74	21.98	0.01	105.12
Eucalyptus sideroxylon	178	0.58	1.46	248.32	40,520.63	362.09	0.15	1,731.73
Acer x freemanii	177	0.58	2.50	426.10	6,937.51	61.99	0.03	296.49
Gymnocladus dioica	176	0.57	1.71	292.45	6,399.06	57.18	0.02	273.48
Morus alba	172	0.56	2.27	386.57	22,328.83	199.53	0.08	954.27
Fraxinus angustifolia ssp. Oxycarpa	169	0.55	6.38	1,088.70	23,377.30	208.90	0.09	999.07
Magnolia grandiflora	160	0.52	1.39	236.76	9,031.91	80.71	0.03	386.00
Pinus halepensis	157	0.51	3.01	512.75	28,690.86	256.38	0.11	1,226.16
Quercus buckleyi	153	0.50	0.35	58.93	702.35	6.28	0.00	30.02
Pistacia spp.	152	0.50	0.11	19.36	400.66	3.58	0.00	17.12
Quercus ilex	152	0.50	4.21	717.90	32,154.57	287.33	0.12	1,374.19
Ulmus spp.	145	0.47	1.27	217.15	3,137.40	28.04	0.01	134.08
Quercus canbyi	143	0.47	0.24	41.56	355.40	3.18	0.00	15.19
Melia azedarach	125	0.41	3.71	633.27	16,478.61	147.25	0.06	704.25
Fraxinus spp.	124	0.40	2.41	411.20	10,310.63	92.14	0.04	440.64
Prunus spp.	122	0.40	0.96	163.92	5,377.52	48.05	0.02	229.82
x Chitalpa tashkentensis	113	0.37	0.48	81.51	1,171.08	10.46	0.00	50.05
Tilia cordata	95	0.31	0.98	166.73	7,461.37	66.67	0.03	318.88
Sophora japonica	90	0.29	0.15	26.04	12,134.75	108.44	0.05	518.60
Quercus shumardii	86	0.28	0.41	70.19	2,428.40	21.70	0.01	103.78
Populus fremontii	85	0.28	2.15	366.64	10,145.01	90.66	0.04	433.57
Acer platanoides	84	0.27	0.66	113.09	1,465.21	13.09	0.01	62.62
Pinus brutia	82	0.27	2.44	416.85	9,066.99	81.02	0.03	387.49
Robinia pseudoacacia	82	0.27	1.13	192.57	4,613.69	41.23	0.02	197.18
Quercus coccinea	80	0.26	0.83	142.01	4,212.51	37.64	0.02	180.03
Ligustrum lucidum	78	0.25	1.06	180.25	8,580.38	76.67	0.03	366.70
Chilopsis linearis	77	0.25	0.09	15.45	683.27	6.11	0.00	29.20
Quercus robur	77	0.25	0.46	78.76	2,231.66	19.94	0.01	95.37
Prunus serrulata	73	0.24	0.68	115.37	2,153.72	19.25	0.01	92.04
Searsia lancea	66	0.22	0.11	19.52	4,341.39	38.79	0.02	185.54
Carpinus betulus	64	0.21	0.54	91.68	6,984.04	62.41	0.03	298.48
Juglans regia	63	0.21	1.02	173.24	7,329.19	65.49	0.03	313.23
Cupressus arizonica	59	0.19	1.49	253.34	1,940.15	17.34	0.01	82.92
Maclura pomifera	56	0.18	0.03	4.79	104.28	0.93	0.00	4.46
Pinus pinea	55	0.18	1.42	242.81	11,508.48	102.84	0.04	491.84
Ostrya virginiana	52	0.17	0.27	45.48	2,756.95	24.64	0.01	117.82
Populus nigra v. italica	52	0.17	1.61	273.78	4,392.19	39.25	0.02	187.71
Chionanthus retusus	44	0.14	0.07	12.13	169.58	1.52	0.00	7.25
Schinus molle	44	0.14	0.16	26.48	3,241.61	28.97	0.01	138.54
Acer campestre	43	0.14	0.36	61.10	6,826.65	61.00	0.03	291.75
Acacia melanoxylon	41	0.13	0.84	143.26	7,321.71	65.43	0.03	312.91
Salix spp.	40	0.13	1.41	240.18	3,371.02	30.12	0.01	144.07
Pinus nigra	38	0.12	0.19	32.36	1,063.36	9.50	0.00	45.45

Species	Number of Trees	% of Pop.	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gallon/yr.)	Avoided Runoff ($/yr.)	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)
Eucalyptus camaldulensis	36	0.12	0.27	45.75	15,278.44	136.53	0.06	652.95
Liquidambar styraciflua	33	0.11	0.46	78.64	4,268.68	38.15	0.02	182.43
Acer saccharinum	31	0.10	0.72	123.28	5,101.34	45.59	0.02	218.02
Aesculus californica	31	0.10	0.25	43.37	2,147.66	19.19	0.01	91.78
Calocedrus decurrens	31	0.10	0.24	41.27	2,952.49	26.38	0.01	126.18
Albizia julibrissin	30	0.10	0.14	24.54	2,999.84	26.81	0.01	128.20
Chamaecyparis	29	0.09	0.73	124.50	1,774.98	15.86	0.01	75.86
Quercus macrocarpa	29	0.09	0.46	78.16	5,251.85	46.93	0.02	224.45
Geijera parviflora	27	0.09	0.36	61.80	963.34	8.61	0.00	41.17
Robinia spp.	26	0.08	0.41	70.56	1,807.74	16.15	0.01	77.26
Umbellularia californica	26	0.08	0.75	128.38	3,051.30	27.27	0.01	130.40
Chilopsis spp.	25	0.08	0.03	4.33	41.89	0.37	0.00	1.79
Platanus occidentalis	24	0.08	0.41	70.44	5,027.43	44.93	0.02	214.86
Fraxinus ornus	23	0.07	0.16	27.44	3,581.37	32.00	0.01	153.06
Prunus dulcis	23	0.07	0.16	28.12	832.96	7.44	0.00	35.60
Quercus spp.	23	0.07	0.27	45.53	1,791.96	16.01	0.01	76.58
Tilia tomentosa	22	0.07	0.05	8.50	446.21	3.99	0.00	19.07
Betula pendula	21	0.07	0.22	37.76	972.17	8.69	0.00	41.55
Quercus frainetto	21	0.07	0.13	21.68	469.10	4.19	0.00	20.05
Pinus thunbergii	20	0.07	0.20	33.46	1,585.20	14.17	0.01	67.75
Casuarina stricta	19	0.06	1.45	248.00	1,685.51	15.06	0.01	72.03
Parrotia persica	19	0.06	0.01	1.33	48.92	0.44	0.00	2.09
Tilia americana	18	0.06	0.19	32.04	2,386.81	21.33	0.01	102.01
Ulmus americana	18	0.06	0.61	104.39	3,217.22	28.75	0.01	137.49
Eucalyptus polyanthemos	17	0.06	0.11	18.33	5,895.25	52.68	0.02	251.95
Ficus spp.	17	0.06	0.30	50.72	1,107.79	9.90	0.00	47.34
Platanus orientalis	17	0.06	0.21	35.42	2,158.50	19.29	0.01	92.25
Cinnamomum camphora	16	0.05	0.33	56.66	1,093.20	9.77	0.00	46.72
Taxodium distichum	16	0.05	0.01	1.69	19.97	0.18	0.00	0.85
Catalpa speciosa	15	0.05	0.13	22.19	1,125.82	10.06	0.00	48.11
Prosopis chilensis	15	0.05	0.01	2.26	14.51	0.13	0.00	0.62
Prunus persica	15	0.05	0.17	29.61	967.83	8.65	0.00	41.36
Tilia x euchlora	15	0.05	0.50	85.94	2,044.58	18.27	0.01	87.38
Acer palmatum	14	0.05	0.02	2.78	63.06	0.56	0.00	2.70
Ceratonia siliqua	14	0.05	0.02	3.69	1,948.45	17.41	0.01	83.27
Juglans nigra	14	0.05	0.26	44.47	2,520.64	22.52	0.01	107.72
Maytenus boaria	13	0.04	0.25	41.83	1,263.39	11.29	0.00	53.99
Pinus sylvestris	13	0.04	0.17	28.58	1,518.02	13.56	0.01	64.87
Paulownia tomentosa	12	0.04	0.07	12.31	594.40	5.31	0.00	25.40
Tristaniopsis spp.	12	0.04	0.01	1.17	88.57	0.79	0.00	3.79
Acer negundo	11	0.04	0.08	13.68	402.00	3.59	0.00	17.18
Afrocarpus gracilior	11	0.04	0.07	11.98	771.32	6.89	0.00	32.96
Alnus cordata	11	0.04	0.12	20.99	1,432.07	12.80	0.01	61.20

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Cedrus atlantica	11	0.04	0.13	22.75	637.34	5.70	0.00	27.24
Quercus cerris	11	0.04	0.32	54.00	3,127.16	27.94	0.01	133.64
Alnus rhombifolia	10	0.03	0.06	10.92	539.64	4.82	0.00	23.06
Eriobotrya japonica	10	0.03	0.09	15.89	271.84	2.43	0.00	11.62
Quercus palustris	10	0.03	0.08	14.10	294.73	2.63	0.00	12.60
Acer truncatum x platanoides	9	0.03	0.18	29.95	669.73	5.98	0.00	28.62
Eucalyptus melliodora	9	0.03	0.11	18.65	3,910.67	34.95	0.01	167.13
Prunus Kanzan	9	0.03	0.08	12.80	263.09	2.35	0.00	11.24
Pterocarya stenoptera	9	0.03	0.13	21.94	1,322.71	11.82	0.01	56.53
Punica spp.	9	0.03	0.08	14.01	627.99	5.61	0.00	26.84
Quercus laurifolia	9	0.03	0.19	31.85	1,112.95	9.95	0.00	47.56
Ulmus procera	9	0.03	0.33	56.61	1,353.75	12.10	0.01	57.86
Magnolia x soulangeana	8	0.03	0.04	6.25	252.69	2.26	0.00	10.80
Melaleuca linariifolia	8	0.03	0.01	0.86	741.99	6.63	0.00	31.71
Ailanthus altissima	7	0.02	0.14	24.46	532.09	4.75	0.00	22.74
Crataegus spp.	7	0.02	0.04	7.19	175.04	1.56	0.00	7.48
Eucalyptus spp.	7	0.02	0.03	4.32	4,030.43	36.02	0.02	172.25
Quercus chrysolepis	7	0.02	-	0.25	9.13	0.08	0.00	0.39
Acer pseudoplatanus	6	0.02	0.10	16.83	836.47	7.47	0.00	35.75
Eucalyptus nicholii	6	0.02	0.05	8.06	2,188.13	19.55	0.01	93.51
Quercus muehlenbergii	6	0.02	0.04	7.09	166.59	1.49	0.00	7.12
Salix babylonica	6	0.02	0.27	46.12	1,270.19	11.35	0.00	54.28
Betula nigra	5	0.02	0.02	2.56	61.64	0.55	0.00	2.63
Carpinus caroliniana	5	0.02	0.02	2.92	141.98	1.27	0.00	6.07
Quercus imbricaria	5	0.02	0.01	1.45	8.68	0.08	0.00	0.37
Xylosma spp.	5	0.02	0.05	9.23	146.24	1.31	0.00	6.25
Cupressus sempervirens	4	0.01	0.03	5.38	205.49	1.84	0.00	8.78
Lagerstroemia subcostata	4	0.01	-	0.73	7.63	0.07	0.00	0.33
Magnoliopsida	4	0.01	-	0.57	5.54	0.05	0.00	0.24
Myrtuss pp.	4	0.01	0.01	1.25	1,256.13	11.22	0.00	53.68
Picea pungens	4	0.01	0.02	2.75	115.80	1.03	0.00	4.95
Thuja plicata	4	0.01	0.01	1.84	386.22	3.45	0.00	16.51
Ulmus pumila	4	0.01	0.20	33.75	660.16	5.90	0.00	28.21
Acer griseum	3	0.01	0.01	2.37	52.14	0.47	0.00	2.23
Brachychiton populneus	3	0.01	0.05	7.86	283.59	2.53	0.00	12.12
Eucalyptus globulus	3	0.01	0.03	4.52	1,292.93	11.55	0.00	55.26
Juglans spp.	3	0.01	0.06	10.51	264.81	2.37	0.00	11.32
Metasequoia glyptostroboides	3	0.01	-	0.23	3.29	0.03	0.00	0.14
Parkinsonia aculeata	3	0.01	0.01	0.86	12.34	0.11	0.00	0.53
Pinus radiata	3	0.01	0.05	9.35	397.29	3.55	0.00	16.98
Acer spp.	2	0.01	0.06	9.40	202.12	1.81	0.00	8.64
Acer saccharum	2	0.01	0.04	6.13	353.45	3.16	0.00	15.10

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Callistemon spp.	2	0.01	-	0.11	6.21	0.06	0.00	0.27
Citrus spp.	2	0.01	0.01	1.00	129.04	1.15	0.00	5.52
Citrus limon	2	0.01	0.02	3.57	19.67	0.18	0.00	0.84
Corymbia maculata	2	0.01	0.01	2.14	503.36	4.50	0.00	21.51
Crataegus phaenopyrum	2	0.01	-	0.66	5.76	0.05	0.00	0.25
Koelreuteria elegans	2	0.01	0.01	2.34	69.27	0.62	0.00	2.96
Photinia spp.	2	0.01	0.01	2.55	26.56	0.24	0.00	1.14
Pinus coulteri	2	0.01	0.02	3.76	84.75	0.76	0.00	3.62
Prunus armeniaca	2	0.01	0.02	3.54	39.35	0.35	0.00	1.68
Prunus lyonii	2	0.01	0.03	4.46	58.27	0.52	0.00	2.49
Prunus x yedoensis	2	0.01	0.01	0.86	11.22	0.10	0.00	0.48
Quercus castaneifolia	2	0.01	0.01	2.11	28.28	0.25	0.00	1.21
Quercus nigra	2	0.01	0.02	3.66	113.18	1.01	0.00	4.84
Quercus phellos	2	0.01	0.06	10.29	579.07	5.17	0.00	24.75
Washingtonia spp.	2	0.01	-	0.81	58.87	0.53	0.00	2.52
Acer macrophyllum	1	0.00	-	0.26	2.84	0.03	0.00	0.12
Brachychiton acerifolius	1	0.00	-	0.08	2.17	0.02	0.00	0.09
Carya illinoinensis	1	0.00	0.01	1.36	88.87	0.79	0.00	3.80
Cercidiphyllum japonicum	1	0.00	-	0.05	3.44	0.03	0.00	0.15
Elaeocarpus decipiens	1	0.00	-	0.21	2.99	0.03	0.00	0.13
Firmiana simplex	1	0.00	0.01	1.79	50.42	0.45	0.00	2.15
Juniperus virginiana	1	0.00	0.01	1.06	55.13	0.49	0.00	2.36
Larix occidentalis	1	0.00	0.01	0.93	19.30	0.17	0.00	0.83
Magnolia virginiana	1	0.00	0.01	2.53	105.55	0.94	0.00	4.51
Malus x arnoldiana	1	0.00	-	-	-	-	0.00	-
Nyssa sylvatica	1	0.00	-	0.07	0.75	0.01	0.00	0.03
Ostrya carpinifolia	1	0.00	-	0.30	5.61	0.05	0.00	0.24
Persea spp.	1	0.00	-	0.33	4.26	0.04	0.00	0.18
Pistacia vera	1	0.00	0.01	1.54	35.31	0.32	0.00	1.51
Prunus subhirtella	1	0.00	-	0.27	152.23	1.36	0.00	6.51
Prunus x blireiana	1	0.00	0.02	2.67	72.49	0.65	0.00	3.10
Pyrus betulifolia	1	0.00	0.01	1.29	16.16	0.14	0.00	0.69
Quercus engelmannii	1	0.00	0.02	3.61	188.96	1.69	0.00	8.08
Tetradium spp.	1	0.00	-	0.19	48.85	0.44	0.00	2.09
Thuja spp.	1	0.00	0.06	10.39	267.50	2.39	0.00	11.43
Ulmus x hollandica	1	0.00	-	0.57	263.91	2.36	0.00	11.28
Washingtonia filifera	1	0.00	-	0.12	0.97	0.01	0.00	0.04

TO: City of Davis

FROM: Davey Resource Group, Inc.

DATE: September 2, 2022

SUBJECT: Summary of Challenges and Opportunities Identified by Collaborators

1. Staffing and funding
   - Understaffed, moving toward previous staffing levels which supported a 3 person in-house crew
   - Defining the right balance between in-house versus contracted work
   - Funding levels do not support the level of tree care the community desires
   - Additional and alternative funding options
   - Equipment is successfully shared across departments (Parks and PW)
   - Equipment is not adequate to respond to work needs
   - Lack of arborist internship program
   - Desire for enhanced staff capacity to provide structure and collaboration with community non-profits
   - Cost of liabilities
2. Contract management
   - Figuring out the optimal amount of work conducted in-house versus via contractors
   - Reviewing and updating the current contract for tree work
   - Contractor oversight
   - Not all tree work is meeting community expectations
   - The City needs one point of contact with the contractor
3. Right tree, right place
   - Trees blocking signage and infrastructure (e.g., business and road signage, park attributes)

- Planting park trees farther from the sidewalks so there is less need for root pruning
- Davis has diverse soil types that impact tree success
- There is a desire for increased shade in particular areas (specifically where people are: bus stops, streets, bike paths and pedestrian corridors, adjacent to buildings, and in parks)
- Appropriate snag retention

4. Public tree care
    - Unattended work orders
        - Lack of communication, response, and follow through
    - Parks and Public Works use different asset inventory systems, which can make cross departmental communication difficult
    - Coordination with park and tree maintenance to avoid conflicts
    - Inadequate pruning and inspection cycle (should be more frequent)
        - Public safety concerns
    - Inadequate clearance for double decker buses
    - Stump removal does not always occur quickly
    - Stumps commonly sucker creating maintenance challenges
    - There is a desire for more street trees to enhance the aesthetics
    - Adjacent property owner responsibilities and follow through for maintenance of the rights-of-way, especially watering
        - Education on watering needs
        - Education on watering during drought
    - There is a successful leaf litter program
    - There has been successful habitat restoration in open space areas
    - Maintenance impacts on wildlife
    - Structural pruning of young trees to reduce costs for larger, higher priority pruning
5. Watering during establishment
    - Adjacent property owner responsibilities and follow through
    - Identifying collaborations to help expand the city's supplemental watering program
6. Climate change

- Installing landscaping that does not compete with trees for water
- Drought tolerant species
- Species and genus diversity, even at the neighborhood level
- Lack of wildfire fuel policies as they relate to trees and firebreak locations
- Concern over future water security

7. Age/succession of the urban forest
    - Davis is losing tree canopy
    - The urban forest is aging
    - Some neighborhoods have a large amount of mature trees of the same species/monocultures
    - Tree Davis is working with some neighborhoods interested in long-term plan for the succession and replacement of the tree populations
    - Phased removals of aging/declining trees coupled with shadow planting
8. Tree planting
    - Adequate planting space/soil volume
        - The downtown has limited space for tree planting
        - Parking lots have limited space for tree planting
    - Tree plantings are not occurring in-house (contractors and Tree Davis)
    - Seedling quality and species availability
    - Moving toward greater species diversity at the neighborhood level
    - Desire for incentives for tree planting on private property
9. Parking lot shade goals
    - Canopy goals have been hard to implement
    - Parking lot planting locations are stressful and many of the trees struggle
    - Parking lots should not be a great priority for tree planting, rather greenspaces and other areas of town should be priorities (places people spend more time)
    - Soil volume requirements and tree standards of growth are not monitored/enforced
    - Update the shade ordinance to be more achievable

        - Standard designs for parking lots
    - Creating spaces in parking lots that are conducive to tree planting
10. Integrating trees and solar
    - Trees have been removed in parking lots to accommodate solar installations and in these instances, there has been community discontent
    - There are several “camps” in Davis, one for trees and one for solar, and the situation is viewed as a conflict
    - Davis is experimenting with cool roadway materials for parking lots that do not absorb as much heat
11. Development
    - Tension when developing infill sites
    - There is a need to consider trees earlier in the development process
        - Ensure planter strips are large enough to accommodate trees
    - Projects to widen the sidewalk take space away from the planter strip/trees
    - Developers are willing to work with the city and follow requests
    - Designs that consider existing trees
    - Designs that allow for more soil volume/air and water infiltration (e.g., permeable pavements, chokers, stormwater catchment swales/planting areas, suspended pavements)
        - Standards for use of structural cells for sidewalks of a certain size
    - Root barriers have been used in the past to avoid infrastructure conflicts but other, more tree friendly options are available
12. Mitigation
    - Mitigation requirements could be stronger
        - Appropriately valuing trees that must be removed
        - Appropriate consequences for non-compliance
13. Tree protection (construction/development) - verification and enforcement
    - Currently, when Municipal Code is broken, the penalty is a misdemeanor which the city attorney does not typically pursue
    - Tree protection plan is not listed in the *Design Review Information Checklist*

- Site visits do not include checking for tree protection
  - No documentation to indicate they have acknowledged the requirements for tree protection
- Site plan/landscape plan reviews used to go to the city arborist
- City arborist used to inspect after site plan implementation
- Tree verification post installation does not occur to ensure mitigation plantings survive
- Educational materials on tree protection are not provided during the permitting process
- Ordinance loop hole for single family homes, where those that understand the ordinance get out of tree protection
- Indicate all trees on the site and adjacent to the site that may be affected by construction activities
- Complimentary arborists reports
- Tree protection plan is not listed in the design review information checklist
- Tree inspections do not occur during the construction/development process
- Landscape plans are not publicly available
- No arborist fees in land development agreement

14. Private tree care
    - There are a lot of rental properties with absentee landlords, as a result the trees on the property are not getting taken care of or watered during drought
    - Communicating clear actions that will help grow/maintain canopy
    - Expanding sustainability and resiliency guidelines for UC Davis students to off-campus housing
    - Increased areas of impervious surfaces in residential areas to accommodate more space for parking
15. Equitable distribution of canopy and urban forest resources
    - Some areas don't have as much access to green space
    - Financing greenspace projects where opportunities exist
    - Some areas have a lot of hardscape

- Newer neighborhoods have lower canopy cover when compared to established neighborhoods
- Some neighborhoods have the capability to be more influential/vocal and these may not be the areas with tree canopy/equity challenges
- There is not a lot of public understanding/recognition that Davis has equity problems
- Identifying and solving problems at the neighborhood level
- Non-profit involvement in creating a more equitable urban forest
- It can be hard to reach minority populations and communities where English is not the primary language
- Including indigenous and scientific ecological methods

16. Follow through on community vision (credibility)
    - Overcommitted, which has resulted in previous staff being unresponsive
    - Public expects a rapid response tree crew
    - City should be more able to interface with the public instead of responding to emergencies
    - 2002 Community Forest Management Plan (CFMP) has not been followed
    - The city successfully gets messaging out to the community around trees, there is room for improvement (i.e., city has a wide net across the geographic community but may be missing smaller enclaves)
17. Timeline for Urban Forest Management Plan (UFMP) development
    - Lost credibility with lack of implementation of the 2002 CFMP
    - Concern about the short timeline
    - Community engagement limitations
    - The online format will allow for continual updates
        - Communicating the vision for continual updates to the community
18. Private tree maintenance
    - Approved design
    - Maintaining trees after the construction phase and replacing them when they die

- Trees at many rental properties do not get the care they need, there are many absentee landowners
- Watering during drought

19. Climate change
    - Adapting to hotter/drier/windier landscape
    - Many trees have died as they were not watered during drought
    - A significant amount of residential landscaping has shifted from irrigated lawn to xeriscape, this change is stressful to mature trees
    - Most trees are watered with sprinklers in parks
    - Reclaimed water is not used
    - Irrigation retrofits
    - Not all medians have irrigation
    - Many of the most important species to Davis are susceptible to emerging pests and pathogens and/or are not drought tolerant
    - Proactive management in areas of Davis with trees that have the highest risk of failure due to climate change and the associated stressors
20. Maintaining master tree list/climate ready species
    - Davis organizations/institutions have been leaders in climate ready species research
        - US Forest Service studies on species suitability started ~20 years ago
        - Tree Davis is wrapping up the community canopy project this year and have planted nearly 1,000 research backed climate ready tree species
        - The Arboretum is leading a research project on testing trees from Texas for potential use in our local urban forest
    - Climate ready trees are difficult to source
    - The optimal balance of non-native, native, and near-native species
    - Concern there may not be many options for large stature, climate ready species
21. Davis loves trees
    - Trees are important in relation to other infrastructure

- The community wants transparency and wants to be involved
- The community has high expectations
- Engaged and active volunteer base
- Great appreciation for the many large and historic trees

22. Streamlining local government processes
    - Removals go to Tree Commission for deliberation, even when they are violating Code for "damaging infrastructure"
    - Many differing opinions make it so decisions are stalled and local government cannot move forward
        - This can result in costly damage to city infrastructure
    - Fees to cover staff time resulting from appeals to Tree Commission decisions
    - Landscape plans do not include signage then there are visibility issues with tree placement
    - Emphasize referencing policies and specifications in the Municipal Code to avoid frequent updates
23. UFMP congruence with guiding documents
    - Downtown plan does not consider trees, nor ways to modify planter sites to be more conducive to trees (it does include trees in the vision through graphic illustrations)
    - There is an opportunity to reiterate specific goals and objectives from the Climate Action & Adaptation Plan (CAAP) in the UFMP
    - A detailed inventory and tree plan for downtown
    - Goals will change within the 40 year UFMP planning horizon
    - Water management and creek restoration plans
24. Accessibility of information
    - Engage collaborators regularly (e.g., ad hoc advisory committee)
    - Some community members are not aware of the tree removal requirements
    - Some community members are not aware of the requirements to maintain/replant trees planted as part of landscape plans
    - There is a desire for informational videos that residents can watch at their leisure

- There is a desire for hands on events that also foster urban forestry learning opportunities
- There is a desire for more information/education about tree planting location and how it relates to energy saving benefits
- Flowcharts for tree modification and tree removal process
- Increased public signage with messaging about trees

25. Partnerships/collaborations
    - Continuing or growing current partnerships with local non-profits
    - More engagement with local schools, the university, and arboretum
        - Explore opportunities to create clear partnerships with schools (e.g., field days, presentations, programming, school yard greening)
26. More robust information about the public tree inventory and the urban forest
    - Quantifying habitat value and energy savings of trees
    - Inventory private trees
    - Expanding the inventory to include more information about the site conditions (e.g., irrigation, planter space)