Piedmont, CA

Urban Forest Inventory & Resource Analysis Summary Report

2023

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Urban Forest Inventory & Resource Analysis Summary Report

2023

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Executive Summary

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

In 2023, the City of Piedmont contracted with Davey Resource Group, Inc. (DRG) to conduct an inventory of all public trees. The tree inventory data was used 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 public tree resource. This report details the results of that analysis. It is important to note that this analysis does not consider private trees.

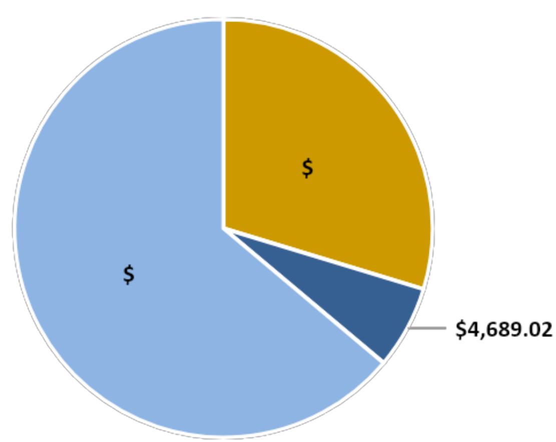
Structure

A structural analysis is the first step towards understanding the benefits provided by public trees as well as their management needs. Piedmont's public tree inventory includes 8,839 trees, 995 vacant sites and 211 stumps on streets and in parks. Considering species composition, diversity, and age distribution, the following information characterizes Piedmont's public tree inventory:

- 185 unique tree species were identified in the inventory.
- The top three most prevalent species are *Platanus x hybrida (*London planetree*,* 22.3%), *Liquidambar styraciflua* (sweetgum*,* 10.1%), and *Quercus acerifolia (*maple leaf oak*,* 8.4%).
- 47% of trees are 8 inches in diameter (DBH[1]) or less and 8.6% of trees are larger than 24 inches in diameter.
- 93% of trees are in fair condition or better.
- Public trees provide 394.5 canopy acres or 7.4% of all land cover.
- To date, Piedmont's trees are storing 3,296 tons of carbon.
- To replace Piedmont's 8,839 public trees with trees of equivalent size, species, and condition, would cost over $22.2 million.
- Approximately 83% of trees are at risk to pests and pathogens such as *Euwallacea nov.* sp. (polyphagous shot hole borer) and *Anoplophora glabripennis* (Asian longhorned beetle)
- Piedmont's public tree stocking level is nearly 88%.

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 provide a multitude of 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, carbon sequestration, and energy.



Annually, public trees provide quantifiable benefits to the community totaling $72,988. The average annual benefit per tree is $8.26. These benefits include:

[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).

- 3.8 tons of air pollution removed, improving air quality, and reducing adverse health incidents for a value of $46,626, an average of $5.27 per tree
- 127.1 tons of carbon directly sequestered, valued at $21,673, an average of $2.45 per tree
- 1,049,556 gallons of avoided stormwater runoff, valued at $4,689, an average of $0.53 per tree

Figure : Annual Benefits from the public tree Resource

Management & Investment

Annually, the City invests approximately $525,000 ($59.40/tree, $49.22/capita) to manage public trees. The quantifiable benefits from i-Tree *Eco* offset this investment by $72,988 for a net investment of $452,012. 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 Piedmont's 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 community 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 community 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 resilience and species diversity in new and replacement tree plantings to reduce reliance on *Platanus x hybrida* and *Liquidambar styricaflua*.
  - Discourage the planting of 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.
- 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 integrated pest management and 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), all available planting sites, track tree growth and condition, and consider adding distance and direction from buildings to calculate energy benefits.

Large shade tree provides habitat for Piedmont's wildlife

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Urban trees play an essential role in the community of Piedmont 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 public tree resource (Table 1, Figure 2). The public tree resource includes a mix of 185 unique species (Appendix C: Tables), with 11.9% native to California.

Table 1: Population Summary of Most Prevalent Species

	DBH Class (in.)											
Species	**0 - 4**	**4 - 6**	**6 - 12**	**12 - 18**	**18 - 24**	**24 - 30**	**30 - 36**	**36 - 42**	**42 - 48**	**48+**	**# of Trees**	**% of Pop.**
Platanus x hybrida	61	88	351	678	518	209	49	13	2	2	1,972	22.31
Liquidambar styraciflua	12	44	213	344	180	69	27	4	0	0	891	10.08
Quercus acerifolia	112	94	227	183	80	31	11	2	1	0	741	8.38
Pistacia chinensis	315	219	149	9	0	1	0	0	0	0	692	7.83
Sequoia sempervirens	55	38	117	121	87	53	33	27	9	10	549	6.21
Aesculus x carnea	111	96	126	63	13	1	0	0	0	0	410	4.64
Prunus cerasifera	196	109	46	2	0	0	0	0	0	0	353	3.99
Lagerstroemia	163	22	3	0	0	0	0	0	0	0	188	2.13
Acacia melanoxylon	61	20	56	27	13	2	0	0	0	0	179	2.03
Prunus serrulata	101	31	32	2	0	0	0	0	0	0	166	1.88
Magnolia grandiflora	13	9	55	39	8	1	1	0	0	0	126	1.43
Prunus ilicifolia	68	31	15	1	0	0	0	0	0	0	115	1.30
Calocedrus	2	7	37	39	17	4	4	1	2	0	113	1.28
Acer x freemanii	20	28	51	1	2	0	0	1	0	0	103	1.17
Umbellularia californica	23	26	39	4	5	1	2	0	0	3	103	1.17
Cinnamomum camphora	0	3	40	25	13	12	6	1	0	0	100	1.13
Cornus florida	97	0	1	0	0	0	0	0	0	0	98	1.11
Acacia dealbata	27	22	27	11	1	0	0	0	0	0	88	1.00
All Other Species	780	298	366	178	69	107	20	20	9	5	1,852	20.95
Total	**2,996**	**1,483**	**2,316**	**1,905**	**1,074**	**598**	**173**	**90**	**32**	**25**	**8,839**	**100%**

The species diversity in Piedmont's public tree resource matches the mean of 185 species reported from 18 California communities (Muller and Bornstein, 2010). Five species in the inventory are considered invasive according to California Invasive Species Advisory Committee, including *Eucalyptus globulus* (blue gum eucalyptus), *Melaleuca quinquenervia (*punk tree*), Schinus mole* (California peppertree), *Triadica sebifera* (Chinese tallowtree), and *Ailanthus altissima* (tree of heaven).

The most prevalent species are *Platanus x hybrida* (London planetree, 22.3%), *Liquidambar styraciflua* (sweetgum, 10.1%), *Quercus acerifolia* (maple leaf oak, 8.4%), *Pistacia chinensis* (Chinese pistache, 7.8%), and *Sequoia sempervirens* (coast redwood, 6.2%) (Table 1, Figure 2). These five species make up nearly 55% of the overall population. The 18 most prevalent species (representing >1% of the overall population) make up more than 79% of the overall population.

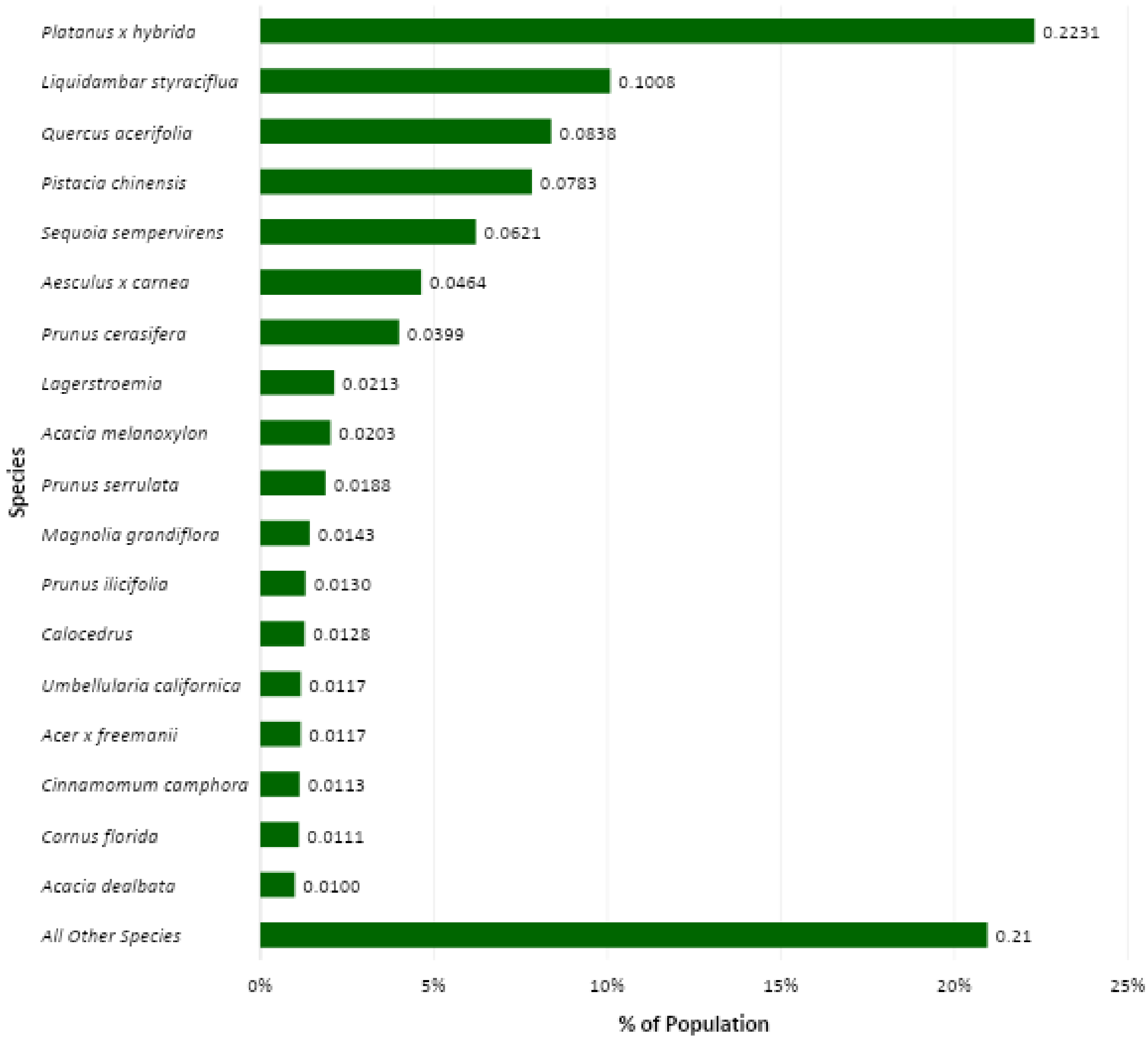


Figure 2: Species Diversity in Piedmont's public tree resource

Maintaining diversity in an urban forest 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 tree resource and the flow of benefits and costs over time. Catastrophic pathogens, such as mountain pine beetle (*Scolytus ventralis*), gypsy moth (*Lymantria dispar*), 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 Piedmont's public tree population, two species, *Platanus x hybrida* (London planetree) and *Liquidambar styraciflua* (sweetgum), exceed these widely accepted rules. In fact, *P. x hybrida* is exceeding the suggested percentage by more than 120%. 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 Piedmont's public tree resource, an importance value (IV) is derived for each of the most prevalent species. Importance values are particularly meaningful to urban forest 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 an urban forest. 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 Piedmont's public tree resource. These 18 species represent 79.1% of the overall population and 86% of the total leaf area for a combined importance value of 165 (82.5%). Of these, Piedmont relies most heavily on *Platanus x hybrida* (London planetree, IV=61.5), followed by *Liquidambar styraciflua* (sweetgum, IV=27.4), and *Quercus acerifolia* (maple leaf oak, IV=17.0). Together these three species represent 40.8% of the inventory and have a combined importance value of 106 (53.0% of the total). These few species are responsible for a significant share of overall benefits provided by the public tree resource. The importance values of *P. x hybrida* and *L. styraciflua* also highlight the potential for loss in leaf area due to a pest or pathogen or other threat affecting these two species. The loss of these two species alone would result in a reduction of nearly $38,700 (53.0%) in annual benefits to the community. To increase resilience in the resource and sustain benefits managers should reduce reliance on these two species in future plantings.

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. If a low importance value is the result of an immature population, the benefits (and importance value) from the species can be expected to increase over time as more trees mature. For example, *Aesculus x carnea* (red horse chestnut, IV=7.6) represents 4.6% of the resource and less than 3% of overall leaf area. In total, 41.4% of these medium-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. In contrast, *Lagerstroemia indica* (common crapemyrtle), which represents 2.1% of the overall resource and less than 1% of overall leaf area, currently has an importance value of 2.2. This species has a large percentage of the population under 8 inches in diameter (99.5%) and the importance value is not likely to increase over time due to its small-stature.

Some species are more significant contributors to the urban forest than population numbers would suggest. For example, *Eucalyptus citriodora* (lemonscented gum) represents less than 1% of the population and 4.7% of overall leaf area and has an importance value of 5.37 (Table 15). The age distribution of this small-stature species suggests that it is well established in Piedmont, with 100% of trees greater than 24 inches in diameter. This species has a broad canopy despite its overall size. As a result, these trees are greater contributors to canopy than other trees of a similar stature (e.g., *Pinus ponderosa*).

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

Species	% of Pop.	% Leaf Area	Importance Value (IV)	Importance Value %
Platanus x hybrida	22.31	39.21	61.52	30.76
Liquidambar styraciflua	10.08	17.32	27.40	13.70
Quercus acerifolia	8.38	8.64	17.02	8.51
Pistacia chinensis	7.83	1.18	9.01	4.50
Sequoia sempervirens	6.21	8.50	14.71	7.36
Aesculus x carnea	4.64	2.93	7.57	3.78
Prunus cerasifera	3.99	0.48	4.47	2.24
Lagerstroemia	2.13	0.11	2.24	1.12
Acacia melanoxylon	2.03	1.40	3.42	1.71
Prunus serrulata	1.88	0.22	2.10	1.05
Magnolia grandiflora	1.43	1.63	3.06	1.53
Prunus ilicifolia	1.30	0.17	1.47	0.73
Calocedrus	1.28	0.82	2.10	1.05
Acer x freemanii	1.17	0.90	2.07	1.04
Umbellularia californica	1.17	0.57	1.73	0.87
Cinnamomum camphora	1.13	1.42	2.55	1.27
Cornus florida	1.11	0.03	1.14	0.57
Acacia dealbata	1.00	0.45	1.45	0.72
All Other Species	20.95	14.01	34.96	17.50
Total	**100%**	**100%**	**200.00**	**100%**

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. Piedmont covers an area of 1,088 acres. i-Tree *Eco* estimates that public trees are providing 80.5 acres of canopy cover which accounts for 7.4% of total land area.

Stocking Level

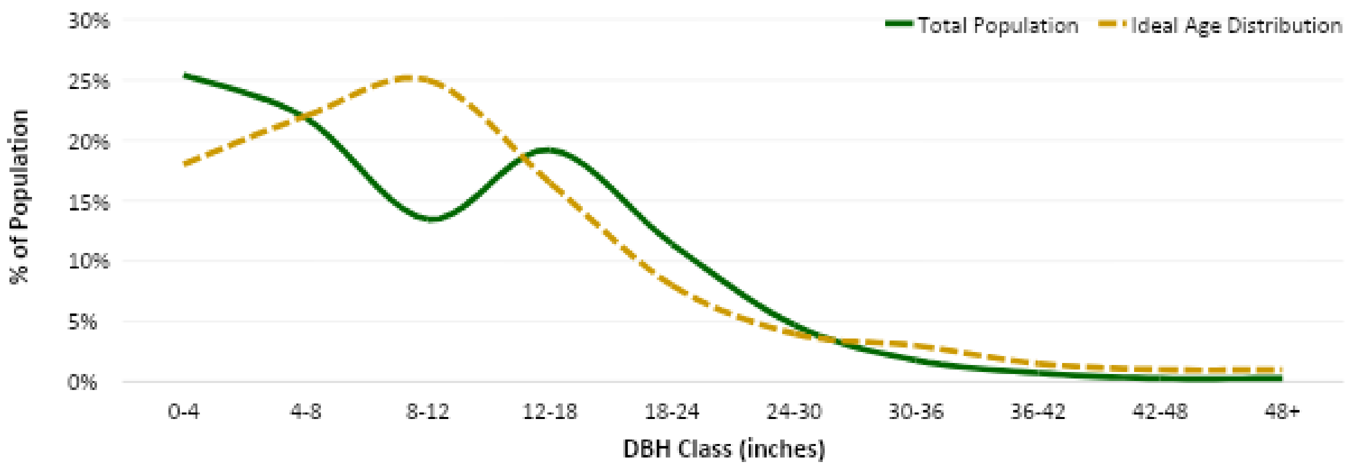
Currently, Piedmont's public tree resource has 995 vacant sites and 211 stumps which could support future tree plantings. Considering the tree inventory identified 8,839 existing trees and the 1,206 available planting sites, there are 10,045 total planting sites for public trees. As a result, the estimated stocking level for Piedmont's public tree resource is currently 88%.

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 public tree resource shows an established population with a large number of young, recently planted trees. Nearly 50% of all trees are less than 8 inches in diameter and 7.8% are greater than 24 inches (Figure 3). The data indicates that a number of recent tree plantings have been directed towards small-statured trees.



hybrida (London planetree), the most prevalent species, are between 8 and 24 inches in diameter and more than 4% are greater than 24 inches, indicating an established population for this large-stature species (Figure 4). The data indicates that recent plantings have placed greater emphasis on small-statured trees, including *Lagerstroemia indica* (common crapemyrtle), *Prunus cerasifera* (cherry plum), and *Prunus serrulata* (Japanese flowering cherry), with 86.7%, 55.6%, and 60.8% of species represented by trees less than 4 inches in diameter, respectively.

Young trees require more frequent pruning to establish good structure, which if done properly can result in less maintenance as trees mature. In contrast, as trees reach the end of their useful lifespan, maintenance costs rise due to the need for more frequent inspections and eventual removal. Analysis of the age distribution of prevalent species can help resource managers to understand and foresee maintenance activities and budgetary needs.

Managers can use the age distribution to determine trends in plantings and adopt strategies for species selection in the years to come. For example, the current distribution suggests that *Sequoia sempervirens* (coast redwood) has not been frequently planted in recent years. Future tree planting should focus on underused desirable species and increasing diversity.

Appendix C: Tables

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

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.

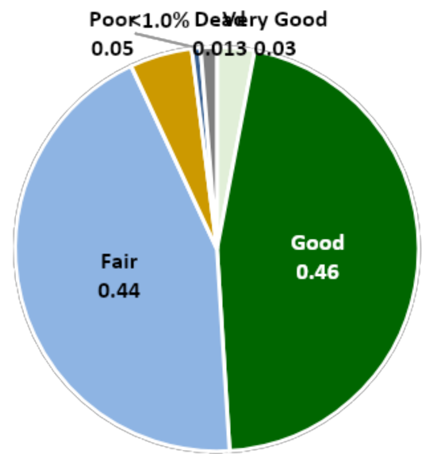


Figure : Tree Condition

Based on the inventory data (2018), public trees in Piedmont are in overall fair or better condition (93%). Approximately 5% of trees are in poor condition and 1.3% are dead (Figure 5).

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 Piedmont's 18 most prevalent tree species, 8 have an RPI of 1.0 or greater (Table 3). *Lagerstroemia* (common crapemyrtle.) has the highest RPI at 1.15. The most abundant species, *Platanus x hybrida* (London planetree, 22.3%) has an RPI of 0.99.

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, *Prunus cerasifera* (purple leaf plum) has an RPI of 0.92 and *Prunus serrulata* (Japanese flowering cherry) has an RPI of 1.14. The data indicates that both species have been favored in recent plantings and the RPI indicates that *P. serrulata* is a more suitable species for Piedmont where a small-statured 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	Very Good	Good	Fair	Poor	Critical	Dead	RPI	# of Trees	% of Pop.
Platanus x hybrida	2.70	36.50	56.90	3.70	0.20	0.00	**0.99**	1,972	22.31
Liquidambar styraciflua	1.80	57.90	36.90	3.40	0.00	0.00	**1.04**	891	10.08
Quercus acerifolia	0.50	33.20	58.60	6.60	0.30	0.80	**0.96**	741	8.38
Pistacia chinensis	5.10	77.90	15.80	0.70	0.40	0.10	**1.10**	692	7.83
Sequoia sempervirens	5.50	49.50	37.20	2.70	1.30	3.80	**1.00**	549	6.21
Aesculus x carnea	6.80	25.10	51.70	15.60	0.50	0.20	**0.95**	410	4.64
Prunus cerasifera	2.80	29.50	49.90	11.00	2.30	4.50	**0.92**	353	3.99
Lagerstroemia	10.60	87.80	1.60	0.00	0.00	0.00	**1.15**	188	2.13
Acacia melanoxylon	0.00	44.10	47.50	7.30	1.10	0.00	**0.99**	179	2.03
Prunus serrulata	8.40	52.40	35.50	2.40	0.60	0.60	**1.05**	166	1.88
Magnolia grandiflora	6.30	60.30	32.50	0.80	0.00	0.00	**1.07**	126	1.43
Prunus ilicifolia	0.00	26.10	67.00	2.60	0.90	3.50	**0.93**	115	1.30
Calocedrus decurrens	0.00	10.60	46.90	12.40	5.30	24.80	**0.71**	113	1.28
Acer x freemanii	19.40	66.00	13.60	1.00	0.00	0.00	**1.14**	103	1.17
Umbellularia californica	0.00	17.50	71.80	8.70	0.00	1.90	**0.91**	103	1.17
Cinnamomum camphora	0.00	46.00	47.00	6.00	1.00	0.00	**0.99**	100	1.13
Cornus florida	2.00	49.00	35.70	13.30	0.00	0.00	**1.00**	98	1.11
Acacia dealbata	0.00	27.30	60.20	12.50	0.00	0.00	**0.99**	88	1.00
All Other Species	8.30	22.11	20.15	20.17	32.57	33.07	**0.90**	1,852	20.95
Total	**3.00%**	**46.00%**	**44.00%**	**5.00%**	**0.70%**	**1.30%**	**1.00**	**8,839**	**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, *Calocedrus decurrens* (incense cedar), has an RPI of 0.71. This species has a relatively large number of mature trees, with nearly 10% of the population greater than 24 inches in diameter. 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. As an example, *Syzgium paniculatum* (Australian brush cherry) has an RPI of 1.04 and an age distribution that is adequately represented by young to mature trees (20% are less than 8 inches in diameter and 20% are greater than 24 inches in diameter). The representation in the population and the age distribution combined support the high RPI. Alternatively, *Eriobotrya japonica* (Japanese loquat) represents less than 1% of the population, has an RPI of 1.03, but is largely represented by trees less than 8 inches in diameter and does not have any trees greater than 24 inches in diameter. Although expected to do well in Piedmont, 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.

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 Piedmont should be avoided and species with a proven track record should be favored.

To replace all 8,839 public trees would cost more than $22 million

Resource Benefits

Public 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 Piedmont's public tree resource.

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 public tree resource provides quantifiable annual environmental benefits valued at approximately $72,988 (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})[2]

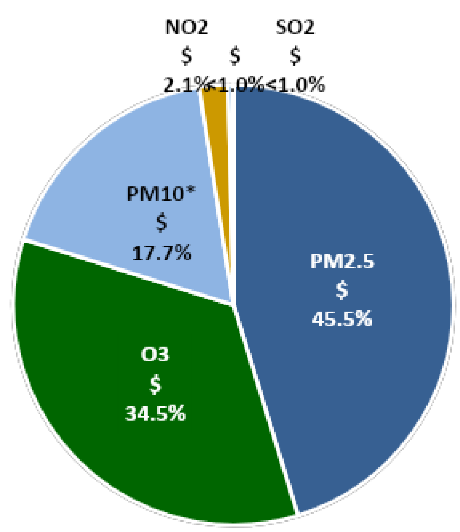


Figure : Annual Air Pollution Benefits

[2] $PM_{2.5}$ 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).

Table 5: Annual Air Pollution Removal Benefits

Air Pollutant	Annual Removal (lb.)	Annual Value ($)
$PM_{2.5}$	64	21,106
O_3	3,632	16,106
PM_{10}*	2,514	8,252
NO_2	1,186	980
CO	234	163
SO_2	55	18
Total	**7,685**	**$46,626**

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. Piedmont's public trees reduce adverse health effects associated with ozone by approximately 7 incidents annually, a value of $16,106. Ozone forms when nitrogen oxide from fuel combustion and volatile organic gasses 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).

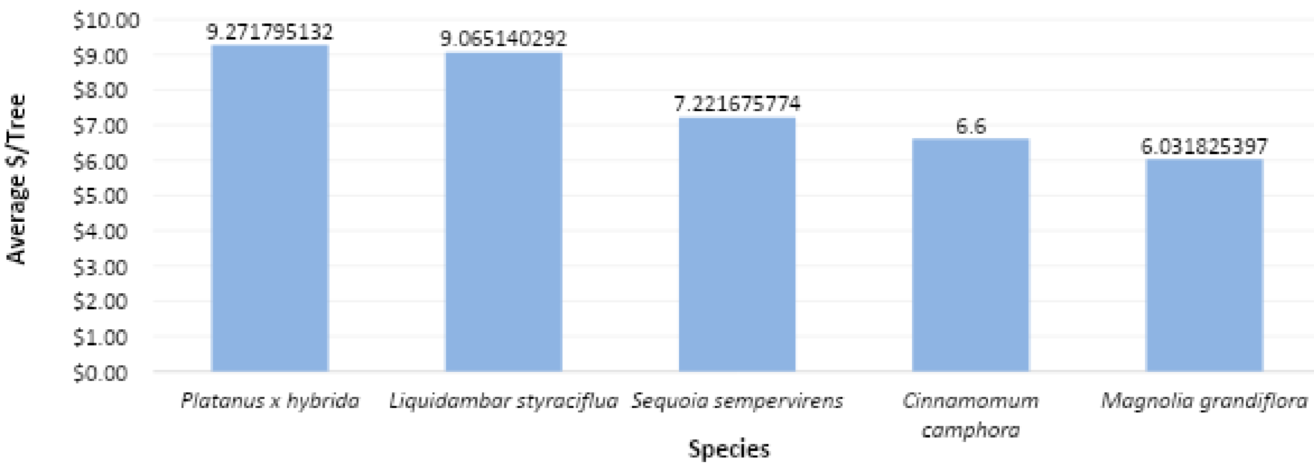
Table 6: Adverse Health Incidents Avoided Due to Changes in Pollutant Concentration Levels and Economic Values

	NO_2 Incidence (Reduction/yr.)	Value ($/yr.)	O_3 Incidence (Reduction/yr.)	Value ($/yr.)	$PM_{2.5}$ Incidence (Reduction/yr.)	Value ($/yr.)	SO_2 Incidence (Reduction/yr.)	Value ($/yr.)
Acute Bronchitis					0.00	0.24		
Acute Myocardial Infarction					0.00	48.98		
Acute Respiratory Symptoms	0.53	16.6	4.09	349.51	0.88	86	0.01	0.33
Asthma Exacerbation	7.75	651			1.05	85.61	0.09	7.2
Chronic Bronchitis					0.00	259.62		
Emergency Room Visits	0.01	2.28	0.00	1.17	0.00	0.69	0.00	0.14
Hospital Admissions	0.01	309.82	0.01	154.98			0.00	10.69
Hospital Admissions, Cardiovascular					0.00	11.49		
Hospital Admissions, Respiratory					0.00	10.8		
Lower Respiratory Symptoms					0.03	1.56		
Mortality			0.00	15,334.95	0.00	20,573.96		
School Loss Days			2.71	265.71				
Upper Respiratory Symptoms					0.03	1.18		
Work Loss Days					0.15	25.75		
Total	**8.30**	**$979.70**	**6.80**	**$16,106.32**	**2.147**	**$21,105.88**	**0.10**	**$18.37**

Deposition, Interception, & Avoided Pollutants

Each year, more than 7,685 pounds of nitrogen dioxide, carbon monoxide, sulfur dioxide, small particulate matter ($PM_{2.5}$ and PM_{10}), and ozone are intercepted or absorbed by public trees, for a total value of more than $46,626. As a population, *Platanus x hybrida* (London planetree) is the greatest contributor to pollutant deposition and interception accounting for 39.2% of the benefit. This is directly related to the species prevalence in the overall population and contributions to the overall leaf area (22.3%).

Trees produce oxygen during photosynthesis, and public trees in Piedmont produce an estimated 339 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.



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 Piedmont are estimated to emit 2.2 tons of volatile organic compounds (VOCs) (1.3 tons of isoprene and 0.9 tons 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 acerifolia* (maple leaf oak), accounting for approximately 33.7% of the overall emissions, largely due to species attributes. Regardless, the net air quality benefit of *Quercus acerifolia* 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 Piedmont's 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.

Table 7: Annual Air Quality Benefits by Most Prevalent Species

Species	# of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)
Platanus x hybrida	1,972	22.31	1.51	18,283.98
Liquidambar styraciflua	891	10.08	0.67	8,077.04
Quercus acerifolia	741	8.38	0.33	4,027.81
Pistacia chinensis	692	7.83	0.05	549.09
Sequoia sempervirens	549	6.21	0.33	3,964.70
Aesculus x carnea	410	4.64	0.11	1,365.02
Prunus cerasifera	353	3.99	0.02	222.93

Lagerstroemia	188	2.13	0.00	52.27
Acacia melanoxylon	179	2.03	0.05	651.88
Prunus serrulata	166	1.88	0.01	104.44
Magnolia grandiflora	126	1.43	0.06	760.01
Prunus ilicifolia	115	1.30	0.01	77.63
Calocedrus	113	1.28	0.03	384.58
Acer x freemanii	103	1.17	0.03	421.76
Umbellularia californica	103	1.17	0.02	265.02
Cinnamomum camphora	100	1.13	0.05	660.00
Cornus florida	98	1.11	0.00	13.16
Acacia dealbata	88	1.00	0.02	211.68
All Other Species	1,852	20.95	0.45	6,532.59
Total	**8,839**	**100%**	**3.75**	**$46,625.58**

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).

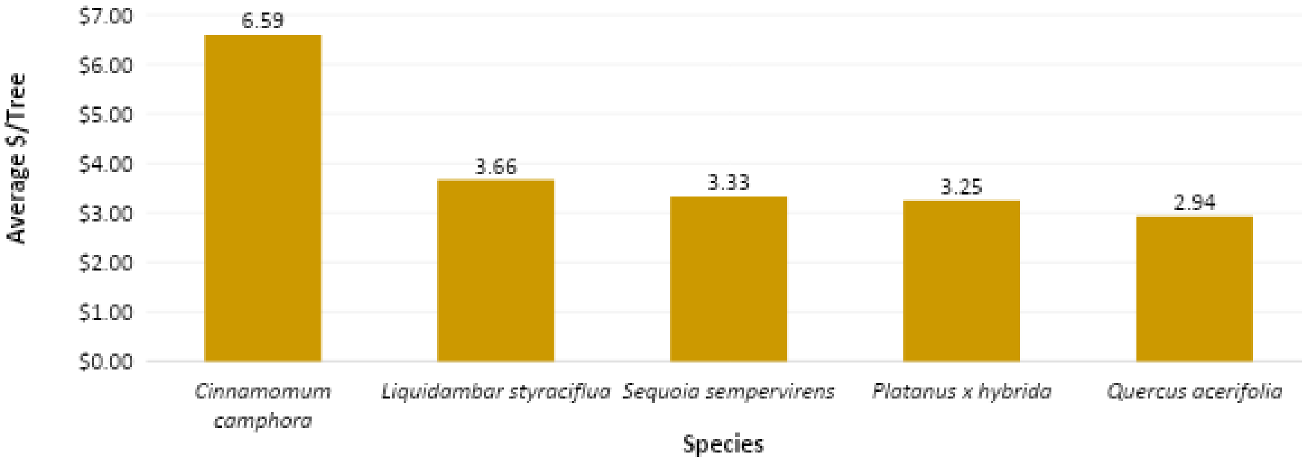
Urban trees reduce atmospheric CO_2 in two ways:

- 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, Piedmont's public trees are estimated to have stored 3,269 tons of carbon (CO_2) in woody and foliar biomass valued at nearly $562,000. Annually, the public tree resource directly sequesters an additional 127.1 tons of carbon valued at $21,700, with an average value of $2.45 per tree (Table 8). Among prevalent species, *Cinnamomum camphora* (camphor tree, $6.59/tree), *Liquidambar styraciflua* (sweetgum, $3.66/tree), and *Sequoia sempervirens* (coast redwood, $3.33/tree) provide the greatest annual per-tree benefits to atmospheric carbon removal, sequestering more than 84.1 tons of carbon annually (Figure 8). These three species account for 66.2% of overall carbon benefit and 48.1% of the overall population.

Table 8: Annual Carbon Sequestration Benefits by Most Prevalent Species

Species	# of Trees	% of Pop.	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Average $/Tree	% of Annual Benefit
Platanus x hybrida	1,972	22.31	37.62	6,416.93	3.25	29.61



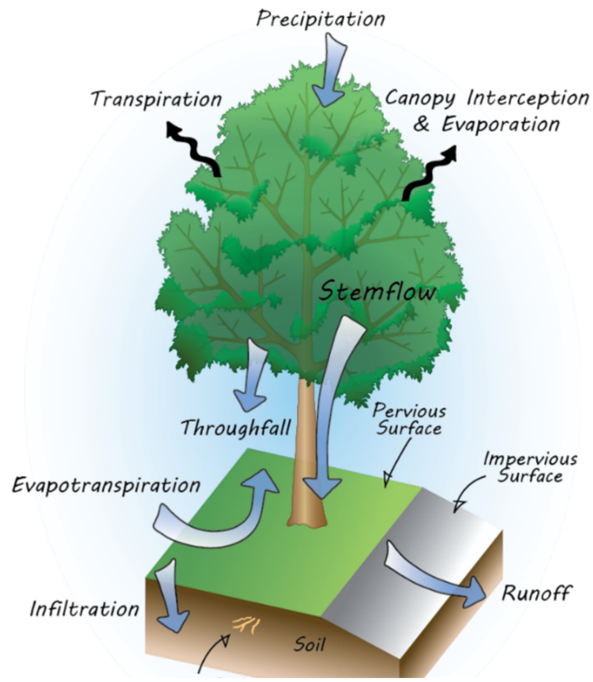
Acer x freemanii	103	1.17	1.54	263.37	2.56	1.22
Umbellularia californica	103	1.17	1.47	251.19	2.44	1.16
Cinnamomum camphora	100	1.13	3.87	659.45	6.59	3.04
Cornus florida	98	1.11	0.16	26.65	0.27	0.12
Acacia dealbata	88	1.00	0.22	37.53	0.43	0.17
All Other Species	1,852	20.95	20.86	3,553.65	1.92	16.40
Total	**8,839**	**100%**	**127.08**	**$21,673.10**	**$2.45**	**100%**

Figure 8: Top 5 Species for Carbon Benefits

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



Inc Figure How Trees Impact Stormwater

Piedmont's public tree resource is estimated to contribute to the avoidance of more than 524 thousand gallons of stormwater runoff annually through the interception of precipitation on the leaves and bark of trees for an average of 59.4 gallons per tree (Table 9). The total value of this benefit is $4,689 annually, an average of $0.53 per tree.

Platanus x hybrida (London planetree) provide 39.2% of the estimated total avoided runoff and provide the greatest per tree benefit of $0.93 (Table 10, Figure 10). Their age distribution and prevalence allow them to provide a larger benefit in comparison to other species. In contrast, *Prunus cerasifera* (cherry plum), which represents 4% of the population, reduce less than 0.5% 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 canopy.

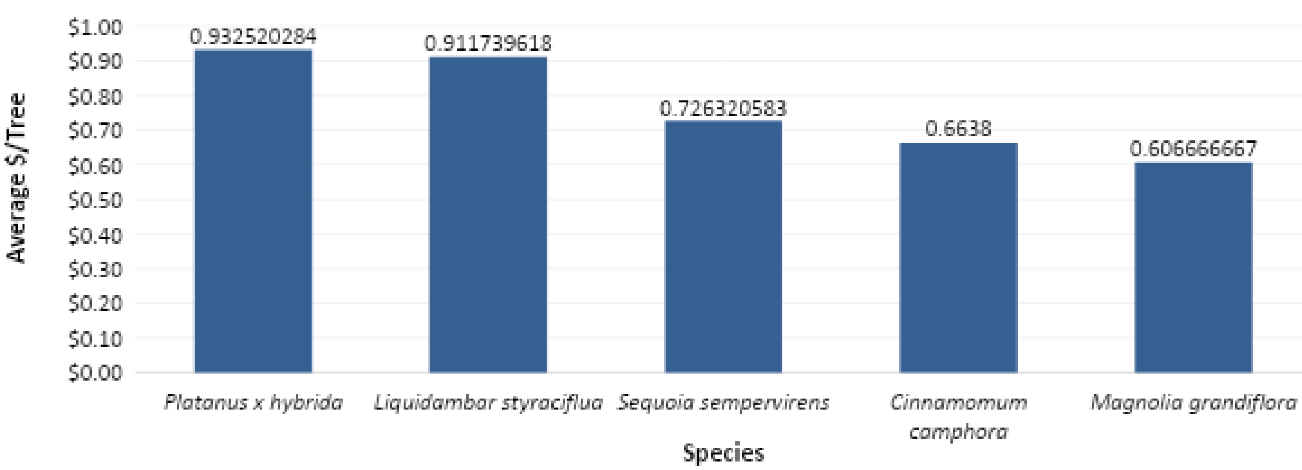


Table 9: Stormwater Benefits by Most Prevalent Tree Species

Species Name	# of Trees	Leaf Area (acres)	Potential ET[3] (gal./yr.)	Evaporation (gal./yr.)	Transpiration (gal./yr.)	Water Intercepted (gal./yr.)	Avoided Runoff (gal./yr.)	Avoided Runoff Value ($/yr.)	% of Benefit
Platanus x hybrida	1,972	154.71	16,306,551	1,053,650	6,408,564	1,071,485	205,789	1,838.93	39.22
Liquidambar styraciflua	891	68.34	7,203,495	465,455	2,831,013	473,334	90,908	812.36	17.32
Quercus acerifolia	741	34.08	3,592,198	232,110	1,411,753	236,039	45,334	405.10	8.64
Pistacia chinensis	692	4.65	489,709	31,643	192,458	32,178	6,180	55.23	1.18
Sequoia sempervirens	549	33.55	3,535,912	228,474	1,389,633	232,341	44,623	398.75	8.50
Aesculus x carnea	410	11.55	1,217,392	78,662	478,442	79,993	15,364	137.29	2.93
Prunus cerasifera	353	1.89	198,820	12,847	78,137	13,064	2,509	22.42	0.48
Lagerstroemia	188	0.44	46,616	3,012	18,320	3,063	588	5.26	0.11
Acacia melanoxylon	179	5.52	581,377	37,566	228,484	38,202	7,337	65.56	1.40
Prunus serrulata	166	0.88	93,145	6,019	36,607	6,120	1,176	10.50	0.22
Magnolia grandiflora	126	6.43	677,817	43,797	266,386	44,539	8,554	76.44	1.63
Prunus ilicifolia	115	0.66	69,234	4,474	27,209	4,549	874	7.81	0.17
Calocedrus	113	3.25	342,984	22,162	134,795	22,537	4,328	38.68	0.82
Acer x freemanii	103	3.57	376,146	24,305	147,827	24,716	4,747	42.42	0.90
Umbellularia californica	103	2.24	236,358	15,272	92,890	15,531	2,983	26.65	0.57
Cinnamomum camphora	100	5.58	588,620	38,034	231,331	38,678	7,428	66.38	1.42
Cornus florida	98	0.11	11,740	759	4,614	771	148	1.32	0.03
Acacia dealbata	88	1.79	188,784	12,198	74,193	12,405	2,382	21.29	0.45
All Other Species	1,852	55.26	5,826,070	376,452	2,289,677	382,824	73,525	657.95	14.93
Total	**8,839**	**395**	**41,582,968**	**2,686,890**	**16,342,334**	**2,732,370**	**524,778**	**4,689.34**	**100%**

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).

[3] Evapotranspiration (ET)

Electricity & Natural Gas Reductions

Energy reduction metrics are calculated using data on tree distance and direction from buildings. The annual energy reductions from Piedmont's public trees were not calculated because this data is not currently captured in the inventory database. However, trees in Piedmont 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 community 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).

i-Tree Design

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 public 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, Table 10), 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,

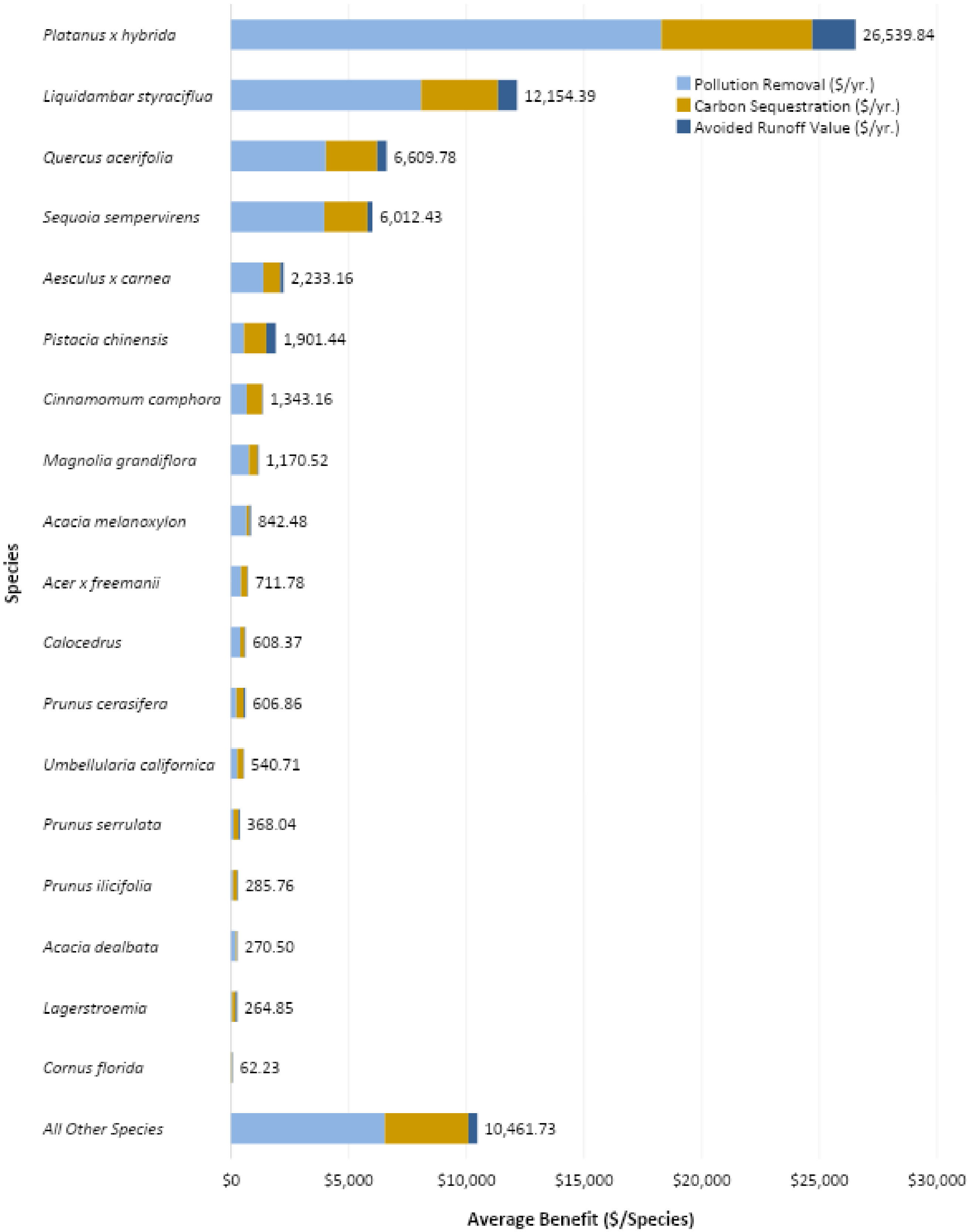

Platanus x hybrida
Liquidambar styraciflua
Quercus acerifolia
Sequoia sempervirens
Aesculus x carnea
Pistacia chinensis
Cinnamomum camphora
Magnolia grandiflora
Acacia melanoxylon
Acer x freemanii
Calocedrus
Prunus cerasifera
Umbellularia californica
Prunus serrulata
Prunus ilicifolia
Acacia dealbata
Lagerstroemia
Cornus florida
All Other Species
26,539.84
12,154.39
6,609.78
6,012.43
2,233.16
1,901.44
1,343.16
1,170.52
842.48
711.78
608.37
606.86
540.71
368.04
285.76
270.50
264.85
62.23
10,461.73
Pollution Removal ($/yr.)
Carbon Sequestration ($/yr.)
Avoided Runoff Value ($/yr.)
Species
$0
$5,000
$10,000
$15,000
$20,000
$25,000
$30,000
Average Benefit ($/Species)

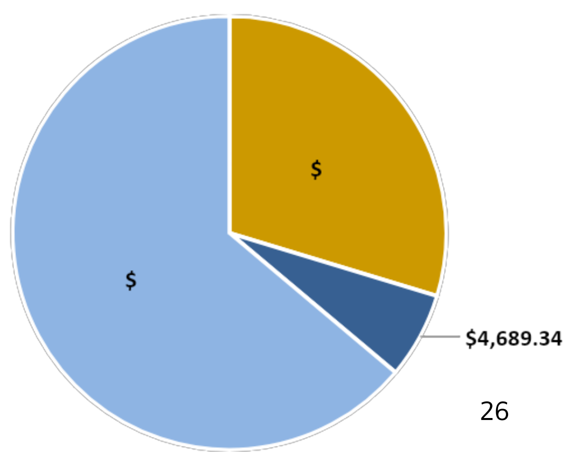
Figure 11: Summary of Annual Benefits for Most Prevalent Species

Table 10: Summary of Annual Benefits of Most Prevalent Species

Species	# of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gal./yr.)	Avoided Runoff Value ($/yr.)
Platanus x hybrida	1,972	22.31	1.51	18,283.98	37.62	6,416.93	205,789.13	1,838.93
Liquidambar styraciflua	891	10.08	0.67	8,077.04	19.14	3,264.99	90,908.31	812.36
Quercus acerifolia	741	8.38	0.33	4,027.81	12.76	2,176.87	45,333.64	405.10
Pistacia chinensis	692	7.83	0.05	549.09	5.59	953.60	44,623.31	398.75
Sequoia sempervirens	549	6.21	0.33	3,964.70	10.72	1,827.88	24,602.51	219.85
Aesculus x carnea	410	4.64	0.11	1,365.02	4.29	730.85	15,363.52	137.29
Prunus cerasifera	353	3.99	0.02	222.93	1.80	307.49	8,554.07	76.44
Lagerstroemia	188	2.13	0.00	52.27	0.86	146.20	7,428.40	66.38
Acacia melanoxylon	179	2.03	0.05	651.88	0.73	125.04	7,337.00	65.56
Prunus serrulata	166	1.88	0.01	104.44	1.22	208.37	6,180.14	55.23
Magnolia grandiflora	126	1.43	0.06	760.01	2.16	368.09	4,746.97	42.42
Prunus ilicifolia	115	1.30	0.01	77.63	0.99	169.45	4,328.47	38.68
Calocedrus	113	1.28	0.03	384.58	1.09	185.50	4,285.09	38.29
Acer x freemanii	103	1.17	0.03	421.76	1.54	263.37	2,982.85	26.65
Umbellularia californica	103	1.17	0.02	265.02	1.47	251.19	2,741.28	24.50
Cinnamomum camphora	100	1.13	0.05	660.00	3.87	659.45	2,653.52	23.71
Cornus florida	98	1.11	0.00	13.16	0.16	26.65	2,509.11	22.42
Acacia dealbata	88	1.00	0.02	211.68	0.22	37.53	2,382.47	21.29
All Other Species	1,852	20.95	0.45	6,532.59	20.86	3,553.65	42,028.41	375.49
Total	**8,839**	**100 %**	**3.75**	**$46,625.58**	**127.08**	**$21,673.10**	**1,049,556.41**	**$4,689.34**

Net Annual Benefits

Piedmont receives substantial benefits from their public tree resource; however, managers should understand and evaluate the investment required to preserve the public 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 public 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).

Piedmont's public tree resource has a beneficial effect on the environment, and annually contributes $72,988 in quantifiable benefits to the community (Figure 12). Individual components of the environmental benefits include improved air quality $46,626 (63.9%), carbon reduction of $21,673 (29.7%), and stormwater management for $4,689 (6.4%).

Figure Annual Environmental Benefits

Annually, public trees provide a total benefit of $72,988, a value of $8.26 per tree and $6.48 per capita.

Annual Investment & Benefit Offset

Piedmont's urban forestry staff provided estimated investment costs. The total annual cost of managing the public tree resource in Piedmont is approximately $72,988. Based on budget information for 2023, in total, 42.4% of the costs are attributed to annual pruning, 33.3% to storm response, and 6.7% to purchasing and planting trees. The remaining 17.6% of costs are for contract services. The quantifiable benefits from i-Tree *Eco* offset this investment by $72,988. (Table 11).

Table 11: Quantifiable Benefits and Investments

Benefits	Total ($)	($)/tree	($)/capita
Pollution Removal	46,626	5.27	4.37
Gross Carbon Sequestration	21,673	2.45	2.03
Avoided Runoff	4,689	0.53	0.44
Total Benefits	**$72,988**	**$8.26**	**$6.84**

Investments	Total ($)	($)/tree	($)/capita
Street Tree Pruning	275,000	31.11	25.78
Storm Response	175,000	19.80	16.41
Contract Service	40,000	4.53	3.75
Street Tree Planting	35,000	3.96	3.28
Total Benefits	**$525,000**	**$59.40**	**$49.22**

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 Piedmont. To further investigate the risk of pests and pathogens, i-Tree *Eco* identifies the susceptibility of tree populations to 41 emerging and existing pests and pathogens in the United States (Appendix B). According to the analysis, 7,330 (82.9%) of Piedmont's public trees are susceptible to the included pests and pathogens and the potential risk is estimated at nearly $20.2 million. The pests and pathogens identified as most relevant to Piedmont are included in

Among the pests of greatest concern for Piedmont's community forest is the *Euwallacea nov. sp.* (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 55.2% of trees in Piedmont are at risk to polyphagous shot hole borer.

The Asian longhorned beetle (ALB, *Anoplophora glabripennis*) is an invasive insect that threatens many hardwood trees. Currently, California does not have any ALB infestations, but 32.7% of Piedmont's public trees are susceptible (45% of the total leaf area). Symptoms of infestations include flagging, or leaf yellowing, branch dieback, and weeping wounds. The feeding and tunneling damage caused by immature beetles blocks the flow of water and nutrients throughout the tree. The known preferred hosts include many hardwood trees such as (*Platanus spp*. (planetree), *Acer spp*. (maple), *Aesculus spp*. (buckeye), and *Ulmus spp*. (elm) (USDA APHIS, n.d.).

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 pests and pathogens as well as the tree symptoms that indicate infestation/infection
- Identify procedures and protocols that will be followed in the case of an introduced pests or pathogens
- 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

Table 12: Pest & Pathogen Threats to Piedmont

	# of Trees	Replacement Value ($)	Leaf Area (%)	Leaf Area (acres)

Pest Name	Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible	Susceptible	Not Susceptible
Euwallacea nov. sp.	4,875	3,964	13,253,735	8,978,566	67	32.7	266	129
Anoplophora glabripennis	2,891	5,948	8,304,939	13,927,362	45	55.4	176	218
Lycorma delicatula	2,630	6,209	8,018,493	14,213,808	42	58.3	165	230
Lymantria dispar	2,026	6,813	6,111,012	16,121,290	29	71.2	114	281
Phytophthora ramorum	985	7,854	4,087,755	18,144,546	12	87.9	48	347
Ceratocystis fagacearum	776	8,063	2,251,373	19,980,928	9	91.0	35	359
Tomicus piniperda	105	8,734	661,168	21,571,134	2	98.5	6	389
Choristoneura occidentalis	90	8,749	548,767	21,683,534	1	98.7	5	390
Heterobasidion irregulare/occidentale	89	8,750	541,976	21,690,326	1	98.8	5	390
Raffaelea lauricola	203	8,636	516,163	21,716,138	2	98.0	8	387
Leptographium wageneri	85	8,754	514,385	21,717,917	1	98.8	5	390
Leptographium wageneri var. pseudotsugae	85	8,754	514,385	21,717,917	1	98.8	5	390
Dendroctonus frontalis	34	8,805	346,430	21,885,871	1	99.3	3	392
Sirex noctilio	34	8,805	346,430	21,885,871	1	99.3	3	392
Acleris gloverana	72	8,767	317,405	21,914,896	1	99.2	3	391
Armillaria spp.	71	8,768	314,737	21,917,564	1	99.2	3	391
Dendroctonus pseudotsugae	71	8,768	314,737	21,917,564	1	99.2	3	391
Scolytus ventralis	71	8,768	314,737	21,917,564	1	99.2	3	391
Choristoneura fumiferana	71	8,768	314,737	21,917,564	1	99.2	3	391
Dendroctonus ponderosae	20	8,819	235,816	21,996,485	1	99.5	2	393
Operophtera brumata	149	8,690	234,319	21,997,982	2	98.5	6	389
Leptographium wageneri var. ponderosum	14	8,825	199,647	22,032,654	0	99.6	2	393
Dryocoetes confusus	13	8,826	197,861	22,034,441	0	99.6	2	393
Dendroctonus brevicomis	13	8,826	197,861	22,034,441	0	99.6	2	393
Euproctis chrysorrhoea	185	8,654	140,614	22,091,687	0	99.6	2	393
Malacosoma disstria	88	8,751	73,107	22,159,194	0	99.7	1	394
Choristoneura pinus	8	8,831	62,002	22,170,299	0	99.9	1	394
Choristoneura conflictana	69	8,770	58,887	22,173,414	0	99.7	1	393
Ophiostoma novo-ulmi	42	8,797	49,703	22,182,598	0	99.8	1	394
Agrilus auroguttatus	10	8,829	24,776	22,207,525	0	99.9	0	394
Phytophthora lateralis	9	8,830	24,265	22,208,036	0	99.9	0	394
Matsucoccus resinosae	1	8,838	24,047	22,208,254	0	100.0	0	394
Xyleborus monographus	18	8,821	20,651	22,211,651	0	99.9	1	394
Cronartium quercuum f. sp. Fusiforme	6	8,833	19,198	22,213,103	0	100.0	0	394
Discula destructiva	104	8,735	17,835	22,214,466	0	100.0	0	394
Phyllocnistis populiella	35	8,804	17,223	22,215,078	0	99.9	0	394
Agrilus planipennis	10	8,829	17,214	22,215,087	0	99.9	1	394
Geosmithia morbida	5	8,834	11,445	22,220,857	0	100.0	0	394
Sirococcus clavigignenti juglandacearum	2	8,837	9,846	22,222,455	0	100.0	0	394
Neonectria faginata	1	8,838	4,696	22,227,605	0	99.9	0	394
Adelges piceae	1	8,838	2,668	22,229,633	0	100.0	0	395
All Pests	**7,330**	**1,509**	**$20,134,954**	**$2,097,347**	**91%**	**9.2%**	**358**	**36**

Conclusion

This analysis describes the current structural characteristics of Piedmont's public 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. Piedmont's 8,839 public trees provide cumulative annual benefits worth $72,988.02, a value of $8.26 per tree and $6.48 per capita.

Industry standards suggest that no one tree species should represent more than 10% of the urban forest. Additionally, industry standards suggest no one genera should represent more than 20% of a population. Of Piedmont's public tree inventory, *Platanus x hybrida* (London planetree) 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 public tree resource.

Piedmont's public tree resource has an established population in fair or better condition with 185 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 regarding the management of the City's trees:

- 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 for all trees.
- Increase genus and species diversity in new and replacement tree plantings to reduce reliance on *Platanus x hybrida* and *Liquidambar stryraciflua*.
- Use new tree plantings to improve diversity, increase benefits, and support an ideal age distribution of public trees.
- Monitor species performance (e.g., health, structure, longevity, pests 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.
- Prioritize planting replacement trees for those trees that are removed and plant available vacant sites to increase the stocking level for optimal benefits.
- Plant large-stature species for greater benefits wherever space allows.
- Reduce the prevalence of these invasive species (e.g., *Acacia melanoxylon* and *Schinus molle*)
    - Monitor areas with existing stands of invasive species and implement weed management strategies where desired.
    - As mature trees of invasive species decline and are removed, replace with species that are not invasive and are more suitable to local conditions.
- 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.

Piedmont's public 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 public 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.

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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, $0.01 per gallon, 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 Piedmont (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 $171.00 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 $171.00 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 $1,397 per ton (carbon monoxide), $8,868 per ton (ozone), $1,652 per ton (nitrogen dioxide), $672 per ton (sulfur dioxide), $656,582 per ton (particulate matter less than 2.5 microns), and $6,565 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 13: Botanical and Common Names of Tree Species in Piedmont's public tree resource

Botanical Name	Common Name	# of Trees	% of Pop.
Platanus x hybrida	London planetree	1,972	22.31
Liquidambar styraciflua	Sweetgum	891	10.08
Quercus acerifolia	Maple leaf oak	741	8.38
Pistacia chinensis	Chinese pistache	692	7.83
Sequoia sempervirens	Coast redwood	549	6.21
Aesculus x carnea	Red horse chestnut	410	4.64
Prunus cerasifera	Cherry plum	353	3.99
Lagerstroemia	Common crapemyrtle	188	2.13
Acacia melanoxylon	Blackwood	179	2.03

Botanical Name	Common Name	# of Trees	% of Pop.
Prunus serrulata	Japanese flowering cherry	166	1.88
Magnolia grandiflora	Southern magnolia	126	1.43
Prunus ilicifolia	Hollyleaf cherry	115	1.30
Calocedrus	Incense Cedar spp	113	1.28
Acer x freemanii	Freeman maple	103	1.17
Umbellularia californica	California laurel	103	1.17
Cinnamomum camphora	Camphor tree	100	1.13
Cornus florida	Flowering dogwood	98	1.11
Acacia dealbata	Silver wattle	88	1.00
Ginkgo biloba	Ginkgo	83	0.94
Pyrus	Pear spp	75	0.85
Triadica sebifera	Chinese tallowtree	72	0.81
Pseudotsuga menziesii	Douglas fir	71	0.80
Acer palmatum	Japanese maple	63	0.71
Pittosporum undulatum	Victorian box	63	0.71
Eucalyptus citriodora	Lemonscented gum	60	0.68
Tilia cordata	Littleleaf linden	57	0.64
Pittosporum tobira	Japanese Pittosporum	52	0.59
Cercis canadensis v. texensis	Western redbud	51	0.58
Leptospermum laevigatum	Coastal Tea-tree	47	0.53
Ligustrum lucidum	Glossy privet	40	0.45
Ulmus	Elm spp	38	0.43
Acer rubrum	Red maple	37	0.42
Aesculus californica	California buckeye	36	0.41
Arbutus unedo	Strawberry tree	36	0.41
Camellia japonica	Camellia	33	0.37
Prunus	Plum spp	33	0.37
Rhododendron	Rhododendron spp	30	0.34
Pyrus calleryana	Callery pear	29	0.33
Crataegus	Hawthorn spp	27	0.31
Robinia pseudoacacia	Black locust	27	0.31
Prunus laurocerasus	Cherry laurel	26	0.29
Cedrus deodara	Deodar cedar	25	0.28
Unknown tree	Hardwood	25	0.28
Acer macrophyllum	Bigleaf maple	24	0.27
Acacia confusa	Small Philippine acacia	23	0.26
Betula pendula	European white birch	23	0.26
Heteromeles arbutifolia	Toyon	23	0.26
Malus	Apple spp	22	0.25
Tristaniopsis laurina	Water gum	22	0.25
Cotoneaster buxifolius	Box-leaf cotoneaster	21	0.24
Cercis canadensis	Eastern redbud	20	0.23
Olea europaea	Olive	20	0.23
Cordyline australis	Giant dracaena	19	0.21

Botanical Name	Common Name	# of Trees	% of Pop.
Laurus nobilis	Bay laurel	19	0.21
Sphaeropteris	Sphaeropteris spp	18	0.20
Casuarina equisetifolia	Australian pine	15	0.17
Populus fremontii	Fremont cottonwood	15	0.17
Eriobotrya japonica	Loquat tree	13	0.15
Pinus ponderosa	Ponderosa pine	13	0.15
Cupressus macrocarpa	Monterey cypress	11	0.12
Quercus lobata	California white oak	11	0.12
Acer	Maple spp	10	0.11
Betula nigra	River birch	10	0.11
Ceratonia siliqua	Carob	10	0.11
Melaleuca quinquenervia	Punk tree	10	0.11
Phoenix canariensis	Canary island date palm	10	0.11
Aesculus hippocastanum	Horse chestnut	9	0.10
Ligustrum japonicum	Japanese privet	9	0.10
Thuja occidentalis	Northern white cedar	9	0.10
Magnolia	Magnolia spp	8	0.09
Pyracantha coccinea	Fire thorn	8	0.09
Acer saccharinum	Silver maple	7	0.08
Fraxinus angustifolia	Narrow-leafed ash	7	0.08
Pieris japonica	Japanese pieris	7	0.08
Pinus radiata	Monterey pine	7	0.08
Ceanothus thyrsiflorus	Blue blossom	6	0.07
Cornus kousa	Kousa dogwood	6	0.07
Ligustrum	Privet spp	6	0.07
Malus sylvestris	European crabapple	6	0.07
Pinus sylvestris	Scots pine	6	0.07
Quercus virginiana	Live oak	6	0.07
Acer glabrum	Rocky Mountain maple	5	0.06
Citrus	Citrus spp	5	0.06
Ilex aquifolium	English holly	5	0.06
Metasequoia glyptostroboides	Dawn redwood	5	0.06
Morus alba	White mulberry	5	0.06
Nyssa sylvatica	Black tupelo	5	0.06
Phoenix dactylifera	Date palm	5	0.06
Pinus	Pine spp	5	0.06
Quercus	Oak spp	5	0.06
Quercus chrysolepis	Canyon live oak	5	0.06
Quercus kelloggii	California black oak	5	0.06
Syzygium paniculatum	Brush cherry	5	0.06
Ilex	Holly spp	4	0.05
Juniperus	Juniper spp	4	0.05
Juniperus communis	Common juniper	4	0.05

Botanical Name	Common Name	# of Trees	% of Pop.
Prunus domestica	Common plum	4	0.05
Ternstroemia gymnanthera	Japanese ternstroemia	4	0.05
Ulmus americana	American elm	4	0.05
Yucca	Yucca spp	4	0.05
Zelkova serrata	Japanese zelkova	4	0.05
Acer buergerianum	Trident maple	3	0.03
Bambusa	Bamboo spp	3	0.03
Cupressus arizonica	Arizona cypress	3	0.03
Cycas revoluta	Sago palm	3	0.03
Eucalyptus	Gum spp	3	0.03
Eucalyptus ficifolia	Redflower gum	3	0.03
Eucalyptus polyanthemos	Silver dollar eucalyptus	3	0.03
Fraxinus uhdei	Shamel ash	3	0.03
Juglans hindsii	Hind walnut	3	0.03
Lonicera	Honeysuckle spp	3	0.03
Magnolia acuminata	Cucumber tree	3	0.03
Plumeria	Plumeria spp	3	0.03
Rhus lanceolata	Prairie sumac	3	0.03
Sequoiadendron giganteum	Giant sequoia	3	0.03
Tristaniopsis	Tristaniopsis spp	3	0.03
Acer saccharum	Sugar maple	2	0.02
Celtis sinensis	Chinese hackberry	2	0.02
Chionanthus retusus	Chinese fringe tree	2	0.02
Dichotomanthes tristaniicarpa	Dichotomanthes spp	2	0.02
Eucalyptus camaldulensis	Red gum eucalyptus	2	0.02
Gleditsia triacanthos	Honeylocust	2	0.02
Grevillea robusta	Silk oak	2	0.02
Juglans nigra	Black walnut	2	0.02
Juniperus virginiana	Eastern red cedar	2	0.02
Berberis bealei	Leatherleaf mahonia	2	0.02
Malus prunifolia	Plumleaf crabapple	2	0.02
Philodendron bipinnatifidum	Tree philodendron	2	0.02
Pittosporum rhombifolia	Queensland Pittosporum	2	0.02
Populus nigra	Black poplar	2	0.02
Prunus avium	Sweet cherry	2	0.02
Prunus persica	Peach	2	0.02
Rhaphiolepis indica	Indian hawthorn	2	0.02
Syringa	Lilac spp	2	0.02
Taxus	Yew spp	2	0.02
Tabebuia	Trumpet-tree spp	2	0.02
Trachycarpus fortunei	Windmill palm	2	0.02
Abies	Fir spp	1	0.01
Acer campbellii ssp. wilsonii	Wilson's Maple	1	0.01

Botanical Name	Common Name	# of Trees	% of Pop.
Acer circinatum	Vine maple	1	0.01
Acer negundo	Boxelder	1	0.01
Acca sellowiana	Feijoa	1	0.01
Ailanthus altissima	Tree of heaven	1	0.01
Arbutus menziesii	Pacific madrone	1	0.01
Baccharis pilularis	Dwarf chaparral broom	1	0.01
Bougainvillea spectabilis	Great bougainvillea	1	0.01
Brahea	Palm(brahea) spp	1	0.01
Callistemon	Bottlebrush spp	1	0.01
Catalpa	Catalpa spp	1	0.01
Callistemon citrinus	Crimson bottlebrush	1	0.01
Citrus aurantifolia	Key Lime	1	0.01
Cryptomeria japonica	Japanese red cedar	1	0.01
Crataegus laevigata	Smooth hawthorn	1	0.01
Cussonia spicata	Cabbage Tree	1	0.01
Diospyros kaki	Japanese persimmon	1	0.01
Eucalyptus globulus	Blue gum eucalyptus	1	0.01
Eucalyptus robusta	Beakpod euclayptus	1	0.01
Fagus sylvatica	European beech	1	0.01
Ficus	Fig spp	1	0.01
Ficus carica	Common fig	1	0.01
Gleditsia aquatica	Water locust	1	0.01
Jacaranda mimosifolia	Blue jacaranda	1	0.01
Magnolia x soulangeana	Saucer magnolia	1	0.01
Melia azedarach	Chinaberry	1	0.01
Melaleuca leucadendra	White paperbark	1	0.01
Morus	Mulberry spp	1	0.01
Phoenix roebelenii	Pygmy date palm	1	0.01
Photinia serrulata	Photinia	1	0.01
Pinus contorta	Lodgepole pine	1	0.01
Pittosporum crassifolium	Stiffleaf cheesewood	1	0.01
Pinus resinosa	Red pine	1	0.01
Pinus rigida	Pitch pine	1	0.01
Prunus angustifolia	Chickasaw plum	1	0.01
Prunus serotina	Black cherry	1	0.01
Prunus virginiana	Common chokecherry	1	0.01
Pyrus communis	Common pear	1	0.01
Quercus palustris	Pin oak	1	0.01
Quercus phellos	Willow oak	1	0.01
Quercus rubra	Northern red oak	1	0.01
Rhizophora mangle	Mangrove	1	0.01
Salix discolor	Pussy willow	1	0.01
Salix nigra	Black willow	1	0.01
Schinus molle	California peppertree	1	0.01

Botanical Name	Common Name	# of Trees	% of Pop.
Platycladus orientalis	Oriental arborvitae	1	0.01
Washingtonia robusta	Mexican fan palm	1	0.01
Total		**8,839**	**100%**

Table 14: Population Summary for All Species

Species	DBH Class (in.) 0 - 4	4 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48	48+	# of Trees	% of Pop.
Platanus x hybrida	61	88	351	678	518	209	49	13	2	2	1,972	22.31
Liquidambar styraciflua	12	44	213	344	180	69	27	4	0	0	891	10.08
Quercus acerifolia	112	94	227	183	80	31	11	2	1	0	741	8.38
Pistacia chinensis	315	219	149	9	0	1	0	0	0	0	692	7.83
Sequoia sempervirens	55	38	117	121	87	53	33	27	9	10	549	6.21
Aesculus x carnea	111	96	126	63	13	1	0	0	0	0	410	4.64
Prunus cerasifera	196	109	46	2	0	0	0	0	0	0	353	3.99
Lagerstroemia	163	22	3	0	0	0	0	0	0	0	188	2.13
Acacia melanoxylon	61	20	56	27	13	2	0	0	0	0	179	2.03
Prunus serrulata	101	31	32	2	0	0	0	0	0	0	166	1.88
Magnolia grandiflora	13	9	55	39	8	1	1	0	0	0	126	1.43
Prunus ilicifolia	68	31	15	1	0	0	0	0	0	0	115	1.30
Calocedrus	2	7	37	39	17	4	4	1	2	0	113	1.28
Acer x freemanii	20	28	51	1	2	0	0	1	0	0	103	1.17
Umbellularia californica	23	26	39	4	5	1	2	0	0	3	103	1.17
Cinnamomum camphora	0	3	40	25	13	12	6	1	0	0	100	1.13
Cornus florida	97	0	1	0	0	0	0	0	0	0	98	1.11
Acacia dealbata	27	22	27	11	1	0	0	0	0	0	88	1.00
Ginkgo biloba	41	18	20	4	0	0	0	0	0	0	83	0.94
Pyrus	38	32	5	0	0	0	0	0	0	0	75	0.85
Triadica sebifera	11	17	39	5	0	0	0	0	0	0	72	0.81
Pseudotsuga menziesii	2	0	12	31	11	5	7	2	1	0	71	0.80
Acer palmatum	35	24	4	0	0	0	0	0	0	0	63	0.71
Pittosporum undulatum	24	15	16	5	3	0	0	0	0	0	63	0.71
Eucalyptus citriodora	0	1	0	2	7	2	2	1	1	4	60	0.24
Tilia cordata	6	8	28	9	4	2	0	0	0	0	57	0.64
Pittosporum tobira	42	5	4	1	0	0	0	0	0	0	52	0.59
Cercis canadensis v. texensis	31	17	3	0	0	0	0	0	0	0	51	0.58
Leptospermum laevigatum	30	4	9	4	0	0	0	0	0	0	47	0.53
Ligustrum lucidum	17	12	10	1	0	0	0	0	0	0	40	0.45
Ulmus	25	5	2	1	2	2	1	0	0	0	38	0.43
Acer rubrum	26	5	2	4	0	0	0	0	0	0	37	0.42
Aesculus californica	16	13	4	2	1	0	0	0	0	0	36	0.41
Arbutus unedo	28	8	0	0	0	0	0	0	0	0	36	0.41
Camellia japonica	33	0	0	0	0	0	0	0	0	0	33	0.37
Prunus	23	4	4	2	0	0	0	0	0	0	33	0.37
Rhododendron	27	3	0	0	0	0	0	0	0	0	30	0.34
Pyrus calleryana	3	8	17	1	0	0	0	0	0	0	29	0.33

Species	0 - 4	4 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48	48+	# of Trees	% of Pop.
	DBH Class (in.)											
Crataegus	1	0	0	0	0	0	0	0	0	0	27	0.01
Robinia pseudoacacia	10	9	5	3	0	0	0	0	0	0	27	0.31
Prunus laurocerasus	19	5	2	0	0	0	0	0	0	0	26	0.29
Cedrus deodara	1	0	6	13	4	1	0	0	0	0	25	0.28
Unknown tree	11	3	9	1	1	0	0	0	0	0	25	0.28
Acer macrophyllum	4	2	9	7	0	1	1	0	0	0	24	0.27
Acacia confusa	16	0	3	2	2	0	0	0	0	0	23	0.26
Betula pendula	8	1	8	5	1	0	0	0	0	0	23	0.26
Heteromeles arbutifolia	17	4	2	0	0	0	0	0	0	0	23	0.26
Malus	15	5	2	0	0	0	0	0	0	0	22	0.25
Tristaniopsis laurina	0	5	16	1	0	0	0	0	0	0	22	0.25
Cotoneaster buxifolius	1	0	0	0	0	0	0	0	0	0	21	0.01
Cercis canadensis	12	8	0	0	0	0	0	0	0	0	20	0.23
Olea europaea	9	2	9	0	0	0	0	0	0	0	20	0.23
Cordyline australis	18	1	0	0	0	0	0	0	0	0	19	0.21
Laurus nobilis	13	4	2	0	0	0	0	0	0	0	19	0.21
Sphaeropteris	0	0	15	3	0	0	0	0	0	0	18	0.20
Casuarina equisetifolia	1	5	4	4	0	0	1	0	0	0	15	0.17
Populus fremontii	0	0	1	3	8	2	0	1	0	0	15	0.17
Eriobotrya japonica	1	0	0	0	0	0	0	0	0	0	13	0.02
Pinus ponderosa	0	1	1	1	0	1	2	4	3	0	13	0.15
Cupressus macrocarpa	0	0	1	1	0	0	0	0	0	0	11	0.03
Quercus lobata	3	1	4	2	0	1	0	0	0	0	11	0.12
Acer	6	0	3	1	0	0	0	0	0	0	10	0.11
Betula nigra	0	5	5	0	0	0	0	0	0	0	10	0.11
Ceratonia siliqua	0	0	3	4	3	0	0	0	0	0	10	0.11
Melaleuca quinquenervia	0	0	1	5	4	0	0	0	0	0	10	0.11
Phoenix canariensis	5	1	0	1	0	0	3	0	0	0	10	0.11
Aesculus hippocastanum	6	2	0	1	0	0	0	0	0	0	9	0.10
Ligustrum japonicum	8	1	0	0	0	0	0	0	0	0	9	0.10
Thuja occidentalis	8	0	0	0	0	0	0	0	0	1	9	0.10
Magnolia	4	3	1	0	0	0	0	0	0	0	8	0.09
Pyracantha coccinea	8	0	0	0	0	0	0	0	0	0	8	0.09
Acer saccharinum	0	1	1	2	1	2	0	0	0	0	7	0.08
Fraxinus angustifolia	0	0	1	6	0	0	0	0	0	0	7	0.08
Pieris japonica	6	1	0	0	0	0	0	0	0	0	7	0.08
Pinus radiata	0	0	0	1	3	0	2	0	1	0	7	0.08
Ceanothus thyrsiflorus	3	3	0	0	0	0	0	0	0	0	6	0.07
Cornus kousa	4	1	1	0	0	0	0	0	0	0	6	0.07
Ligustrum	5	0	1	0	0	0	0	0	0	0	6	0.07

Species	DBH Class (in.) 0 - 4	4 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48	48+	# of Trees	% of Pop.
Malus sylvestris	4	0	2	0	0	0	0	0	0	0	6	0.07
Pinus sylvestris	3	0	1	0	0	1	0	0	1	0	6	0.07
Quercus virginiana	1	0	2	3	0	0	0	0	0	0	6	0.07
Acer glabrum	1	0	4	0	0	0	0	0	0	0	5	0.06
Citrus	5	0	0	0	0	0	0	0	0	0	5	0.06
Ilex aquifolium	2	2	0	1	0	0	0	0	0	0	5	0.06
Metasequoia glyptostroboides	0	0	0	1	4	0	0	0	0	0	5	0.06
Morus alba	0	0	5	0	0	0	0	0	0	0	5	0.06
Nyssa sylvatica	3	2	0	0	0	0	0	0	0	0	5	0.06
Phoenix dactylifera	1	0	0	0	2	1	0	1	0	0	5	0.06
Pinus	1	1	2	0	0	1	0	0	0	0	5	0.06
Quercus	2	0	1	2	0	0	0	0	0	0	5	0.06
Quercus chrysolepis	0	0	4	1	0	0	0	0	0	0	5	0.06
Quercus kelloggii	0	0	1	3	1	0	0	0	0	0	5	0.06
Syzygium paniculatum	1	0	0	2	1	1	0	0	0	0	5	0.06
Ilex	2	0	2	0	0	0	0	0	0	0	4	0.05
Juniperus	2	0	2	0	0	0	0	0	0	0	4	0.05
Juniperus communis	0	3	1	0	0	0	0	0	0	0	4	0.05
Prunus domestica	0	0	3	1	0	0	0	0	0	0	4	0.05
Ternstroemia gymnanthera	3	1	0	0	0	0	0	0	0	0	4	0.05
Ulmus americana	0	0	1	3	0	0	0	0	0	0	4	0.05
Yucca	1	0	2	1	0	0	0	0	0	0	4	0.05
Zelkova serrata	0	0	0	4	0	0	0	0	0	0	4	0.05
Acer buergerianum	1	0	1	0	0	1	0	0	0	0	3	0.03
Bambusa	3	0	0	0	0	0	0	0	0	0	3	0.03
Cupressus arizonica	0	1	0	0	0	0	0	0	0	0	3	0.01
Cycas revoluta	0	0	0	0	0	0	0	0	0	0	3	0.01
Eucalyptus	0	0	0	0	0	60	0	0	0	0	3	0.68
Eucalyptus ficifolia	0	0	0	0	0	18	0	9	0	0	3	0.31
Eucalyptus polyanthemos	0	0	0	1	1	1	0	0	0	0	3	0.03
Fraxinus uhdei	0	2	0	1	0	0	0	0	0	0	3	0.03
Juglans hindsii	2	1	0	0	0	0	0	0	0	0	3	0.03
Lonicera	3	0	0	0	0	0	0	0	0	0	3	0.03
Magnolia acuminata	3	0	0	0	0	0	0	0	0	0	3	0.03
Plumeria	0	0	2	0	0	1	0	0	0	0	3	0.03
Rhus lanceolata	0	0	3	0	0	0	0	0	0	0	3	0.03
Sequoiadendron giganteum	0	0	0	0	1	1	0	0	1	0	3	0.03
Tristaniopsis	1	1	1	0	0	0	0	0	0	0	3	0.03
Acer saccharum	1	0	1	0	0	0	0	0	0	0	2	0.02

Species	DBH Class (in.) 0 - 4	4 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48	48+	# of Trees	% of Pop.
Auranticarpa rhombifolia	0	0	2	0	0	0	0	0	0	0	2	0.02
Berberis bealei	1	0	1	0	0	0	0	0	0	0	2	0.02
Celtis sinensis	0	0	2	0	0	0	0	0	0	0	2	0.02
Chionanthus retusus	1	1	0	0	0	0	0	0	0	0	2	0.02
Dichotomanthes tristaniicarpa	13	0	0	0	0	0	0	0	0	0	2	0.15
Eucalyptus camaldulensis	0	0	0	3	0	0	0	0	0	0	2	0.03
Gleditsia triacanthos	0	0	1	1	0	0	0	0	0	0	2	0.02
Grevillea robusta	0	0	0	1	1	0	0	0	0	0	2	0.02
Juglans nigra	0	0	0	1	0	1	0	0	0	0	2	0.02
Juniperus virginiana	1	1	0	0	0	0	0	0	0	0	2	0.02
Malus prunifolia	1	0	1	0	0	0	0	0	0	0	2	0.02
Philodendron bipinnatifidum	1	1	0	0	0	0	0	0	0	0	2	0.02
Populus nigra	0	0	2	0	0	0	0	0	0	0	2	0.02
Prunus avium	1	0	1	0	0	0	0	0	0	0	2	0.02
Prunus persica	2	0	0	0	0	0	0	0	0	0	2	0.02
Rhaphiolepis indica	2	0	0	0	0	0	0	0	0	0	2	0.02
Syringa	2	0	0	0	0	0	0	0	0	0	2	0.02
Tabebuia	2	0	0	0	0	0	0	0	0	0	2	0.02
Taxus	0	1	1	0	0	0	0	0	0	0	2	0.02
Trachycarpus fortunei	0	0	0	2	0	0	0	0	0	0	2	0.02
Abies	0	0	1	0	0	0	0	0	0	0	1	0.01
Acca sellowiana	1	0	0	0	0	0	0	0	0	0	1	0.01
Acer campbellii ssp. wilsonii	1	0	0	0	0	0	0	0	0	0	1	0.01
Acer circinatum	1	0	0	0	0	0	0	0	0	0	1	0.01
Acer negundo	1	0	0	0	0	0	0	0	0	0	1	0.01
Ailanthus altissima	1	0	0	0	0	0	0	0	0	0	1	0.01
Arbutus menziesii	1	0	0	0	0	0	0	0	0	0	1	0.01
Baccharis pilularis	1	0	0	0	0	0	0	0	0	0	1	0.01
Bougainvillea spectabilis	1	0	0	0	0	0	0	0	0	0	1	0.01
Brahea	1	0	0	0	0	0	0	0	0	0	1	0.01
Callistemon	1	0	0	0	0	0	0	0	0	0	1	0.01
Callistemon citrinus	1	0	0	0	0	0	0	0	0	0	1	0.01
Catalpa	0	0	0	0	0	0	0	1	0	0	1	0.01
Citrus aurantifolia	1	0	0	0	0	0	0	0	0	0	1	0.01
Crataegus laevigata	0	0	3	0	0	0	0	0	0	0	1	0.03
Cryptomeria japonica	0	0	11	0	0	0	0	0	0	0	1	0.12
Cussonia spicata	2	0	0	0	0	0	0	0	0	0	1	0.02
Diospyros kaki	3	0	0	0	0	0	0	0	0	0	1	0.03

Species	DBH Class (in.) 0 - 4	4 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48	48+	# of Trees	% of Pop.
Eucalyptus globulus	0	0	0	0	0	0	0	1	0	0	1	0.01
Eucalyptus robusta	0	0	0	0	1	0	0	0	0	0	1	0.01
Fagus sylvatica	0	0	0	1	0	0	0	0	0	0	1	0.01
Ficus	0	1	0	0	0	0	0	0	0	0	1	0.01
Ficus carica	1	0	0	0	0	0	0	0	0	0	1	0.01
Gleditsia aquatica	0	0	0	1	0	0	0	0	0	0	1	0.01
Jacaranda mimosifolia	0	1	0	0	0	0	0	0	0	0	1	0.01
Magnolia x soulangeana	1	0	0	0	0	0	0	0	0	0	1	0.01
Melaleuca leucadendra	1	0	0	0	0	0	0	0	0	0	1	0.01
Melia azedarach	0	1	0	0	0	0	0	0	0	0	1	0.01
Morus	0	0	0	1	0	0	0	0	0	0	1	0.01
Phoenix roebelenii	0	1	0	0	0	0	0	0	0	0	1	0.01
Photinia serrulata	1	0	0	0	0	0	0	0	0	0	1	0.01
Pinus contorta	0	0	1	0	0	0	0	0	0	0	1	0.01
Pinus resinosa	0	0	0	0	0	0	0	0	1	0	1	0.01
Pinus rigida	0	0	0	0	0	1	0	0	0	0	1	0.01
Pittosporum crassifolium	0	0	0	1	0	0	0	0	0	0	1	0.01
Platycladus orientalis	0	1	0	0	0	0	0	0	0	0	1	0.01
Prunus angustifolia	1	0	0	0	0	0	0	0	0	0	1	0.01
Prunus serotina	0	0	1	0	0	0	0	0	0	0	1	0.01
Prunus virginiana	1	0	0	0	0	0	0	0	0	0	1	0.01
Pyrus communis	1	0	0	0	0	0	0	0	0	0	1	0.01
Quercus palustris	0	0	0	0	0	0	1	0	0	0	1	0.01
Quercus phellos	0	0	1	0	0	0	0	0	0	0	1	0.01
Quercus rubra	0	1	0	0	0	0	0	0	0	0	1	0.01
Rhizophora mangle	1	0	0	0	0	0	0	0	0	0	1	0.01
Salix discolor	0	1	0	0	0	0	0	0	0	0	1	0.01
Salix nigra	0	0	0	1	0	0	0	0	0	0	1	0.01
Schinus molle	0	0	0	1	0	0	0	0	0	0	1	0.01
Washingtonia robusta	0	0	0	0	1	0	0	0	0	0	1	0.01
Total	**2,216**	**1,185**	**1,950**	**1,727**	**1,005**	**491**	**153**	**69**	**23**	**20**	**8,839**	**100%**

Table 15: Importance Value (IV) for All Tree Species

Species	% of Pop.	% Leaf Area	Importance Value (IV)
Platanus x hybrida	22.31	39.21	61.52
Liquidambar styraciflua	10.08	17.32	27.40
Quercus acerifolia	8.38	8.64	17.02
Pistacia chinensis	7.83	1.18	9.01
Sequoia sempervirens	6.21	8.50	14.71
Aesculus x carnea	4.64	2.93	7.57
Prunus cerasifera	3.99	0.48	4.47
Lagerstroemia	2.13	0.11	2.24
Acacia melanoxylon	2.03	1.40	3.42
Prunus serrulata	1.88	0.22	2.10
Magnolia grandiflora	1.43	1.63	3.06
Prunus ilicifolia	1.30	0.17	1.47
Calocedrus	1.28	0.82	2.10
Acer x freemanii	1.17	0.90	2.07
Umbellularia californica	1.17	0.57	1.73
Cinnamomum camphora	1.13	1.42	2.55
Cornus florida	1.11	0.03	1.14
Acacia dealbata	1.00	0.45	1.45
All Other Species	20.95	14.01	34.96
Ginkgo biloba	0.94	0.25	1.19
Pyrus	0.85	0.12	0.97
Triadica sebifera	0.81	0.24	1.06
Pseudotsuga menziesii	0.80	0.82	1.62
Acer palmatum	0.71	0.07	0.78
Pittosporum undulatum	0.71	0.18	0.89
Eucalyptus citriodora	0.68	4.69	5.37
Tilia cordata	0.64	0.51	1.15
Pittosporum tobira	0.59	0.06	0.65
Cercis canadensis v. texensis	0.58	0.04	0.62
Leptospermum laevigatum	0.53	0.15	0.68
Ligustrum lucidum	0.45	0.12	0.57
Ulmus	0.43	0.18	0.61
Acer rubrum	0.42	0.13	0.55
Aesculus californica	0.41	0.19	0.59
Arbutus unedo	0.41	0.05	0.46
Camellia japonica	0.37	0.01	0.38
Prunus	0.37	0.05	0.42
Rhododendron	0.34	0.03	0.37
Pyrus calleryana	0.33	0.11	0.44

Species	% of Pop.	% Leaf Area	Importance Value (IV)
Crataegus	0.31	0.04	0.34
Robinia pseudoacacia	0.31	0.07	0.38
Prunus laurocerasus	0.29	0.04	0.34
Cedrus deodara	0.28	0.19	0.48
Unknown tree	0.28		0.28
Acer macrophyllum	0.27	0.24	0.51
Acacia confusa	0.26	0.09	0.36
Betula pendula	0.26	0.22	0.48
Heteromeles arbutifolia	0.26	0.02	0.28
Malus	0.25	0.02	0.27
Tristaniopsis laurina	0.25	0.17	0.42
Cotoneaster buxifolius	0.24	<.01	0.24
Cercis canadensis	0.23	0.02	0.24
Olea europaea	0.23	0.11	0.34
Cordyline australis	0.21	<.01	0.21
Laurus nobilis	0.21	0.02	0.24
Sphaeropteris	0.20	0.23	0.43
Casuarina equisetifolia	0.17	0.04	0.21
Populus fremontii	0.17	0.52	0.69
Eriobotrya japonica	0.15	0.01	0.16
Pinus ponderosa	0.15	0.38	0.52
Cupressus macrocarpa	0.12	0.07	0.20
Quercus lobata	0.12	0.07	0.20
Acer	0.11	0.04	0.16
Betula nigra	0.11	0.03	0.14
Ceratonia siliqua	0.11	0.15	0.26
Melaleuca quinquenervia	0.11	0.27	0.38
Phoenix canariensis	0.11	0.02	0.13
Aesculus hippocastanum	0.10	0.03	0.13
Ligustrum japonicum	0.10	0.01	0.11
Thuja occidentalis	0.10	0.07	0.17
Magnolia	0.09	0.02	0.11
Pyracantha coccinea	0.09	<.01	0.09
Acer saccharinum	0.08	0.10	0.18
Fraxinus angustifolia	0.08	0.12	0.20
Pieris japonica	0.08	<.01	0.08
Pinus radiata	0.08	0.14	0.22
Ceanothus thyrsiflorus	0.07	<.01	0.07
Cornus kousa	0.07	<.01	0.07
Ligustrum	0.07	<.01	0.07
Malus sylvestris	0.07	0.01	0.08
Pinus sylvestris	0.07	0.09	0.15
Quercus virginiana	0.07	0.03	0.10

Species	% of Pop.	% Leaf Area	Importance Value (IV)
Acer glabrum	0.06	0.02	0.07
Citrus	0.06	<.01	0.06
Ilex aquifolium	0.06	0.01	0.07
Metasequoia glyptostroboides	0.06	0.15	0.20
Morus alba	0.06	0.05	0.11
Nyssa sylvatica	0.06	<.01	0.06
Phoenix dactylifera	0.06	0.02	0.07
Pinus	0.06	0.01	0.07
Quercus	0.06	0.02	0.08
Quercus chrysolepis	0.06	0.05	0.10
Quercus kelloggii	0.06	0.04	0.10
Syzygium paniculatum	0.06	0.16	0.22
Ilex	0.05	0.01	0.06
Juniperus	0.05	<.01	0.05
Juniperus communis	0.05	<.01	0.05
Prunus domestica	0.05	0.02	0.07
Ternstroemia gymnanthera	0.05	<.01	0.05
Ulmus americana	0.05	0.07	0.11
Yucca	0.05	0.02	0.06
Zelkova serrata	0.05	0.09	0.13
Acer buergerianum	0.03	0.06	0.09
Bambusa	0.03	<0.1	0.03
Cupressus arizonica	0.03	0.01	0.05
Cycas revoluta	0.03	0.03	0.07
Eucalyptus	0.03	0.14	0.17
Eucalyptus ficifolia	0.03	0.28	0.31
Eucalyptus polyanthemos	0.03	0.18	0.22
Fraxinus uhdei	0.03	0.01	0.05
Juglans hindsii	0.03	<.01	0.03
Lonicera	0.03	<.01	0.03
Magnolia acuminata	0.03	<.01	0.03
Plumeria	0.03	0.01	0.05
Rhus lanceolata	0.03	0.01	0.05
Sequoiadendron giganteum	0.03	0.06	0.10
Tristaniopsis	0.03	<.01	0.03
Acer saccharum	0.02	0.01	0.03
Pittosporum rhombifolia	0.02	0.02	0.04
Berberis bealei	0.02	0.02	0.04
Celtis sinensis	0.02	0.02	0.04
Chionanthus retusus	0.02	<.01	0.02
Dichotomanthes tristaniicarpa	0.02	<.01	0.02
Eucalyptus camaldulensis	0.02	0.02	0.04
Gleditsia triacanthos	0.02	0.02	0.04

Species	% of Pop.	% Leaf Area	Importance Value (IV)
Grevillea robusta	0.02	0.02	0.04
Juglans nigra	0.02	0.03	0.06
Juniperus virginiana	0.02	<.01	0.02
Malus prunifolia	0.02	<.01	0.02
Philodendron bipinnatifidum	0.02	<.01	0.02
Populus nigra	0.02	0.02	0.04
Prunus avium	0.02	<.01	0.02
Prunus persica	0.02	<.01	0.02
Rhaphiolepis indica	0.02	<.01	0.02
Syringa	0.02	<.01	0.02
Tabebuia	0.02	<.01	0.02
Taxus	0.02	<.01	0.02
Trachycarpus fortunei	0.02	<.01	0.02
Abies	0.01	<.01	0.01
Acca sellowiana	0.01	<.01	0.01
Acer campbellii ssp. wilsonii	0.01	<0.1	0.01
Acer circinatum	0.01	<.01	0.01
Acer negundo	0.01	<0.1	0.01
Ailanthus altissima	0.01	<.01	0.01
Arbutus menziesii	0.01	<.01	0.01
Baccharis pilularis	0.01	<.01	0.01
Bougainvillea spectabilis	0.01	<.01	0.01
Brahea	0.01	<0.1	0.01
Callistemon	0.01	<.01	0.01
Callistemon citrinus	0.01	<.01	0.01
Catalpa	0.01	0.03	0.04
Citrus aurantifolia	0.01	<0.1	0.01
Crataegus laevigata	0.01	<.01	0.01
Cryptomeria japonica	0.01	0.01	0.02
Cussonia spicata	0.01	<.01	0.01
Diospyros kaki	0.01	<.01	0.01
Eucalyptus globulus	0.01	0.10	0.12
Eucalyptus robusta	0.01	0.03	0.04
Fagus sylvatica	0.01	0.05	0.06
Ficus	0.01	<.01	0.01
Ficus carica	0.01	<.01	0.01
Gleditsia aquatica	0.01	<.01	0.01
Jacaranda mimosifolia	0.01	<.01	0.01
Magnolia x soulangeana	0.01	<.01	0.01
Melaleuca leucadendra	0.01	<.01	0.01
Melia azedarach	0.01	<.01	0.01
Morus	0.01	0.02	0.03
Phoenix roebelenii	0.01	<0.1	0.01

Species	% of Pop.	% Leaf Area	Importance Value (IV)
Photinia serrulata	0.01	<.01	0.01
Pinus contorta	0.01	<.01	0.01
Pinus resinosa	0.01	0.03	0.04
Pinus rigida	0.01	0.03	0.04
Pittosporum crassifolium	0.01	0.01	0.02
Platycladus orientalis	0.01	<.01	0.01
Prunus angustifolia	0.01	<.01	0.01
Prunus serotina	0.01	<.01	0.01
Prunus virginiana	0.01	<.01	0.01
Pyrus communis	0.01	<.01	0.01
Quercus palustris	0.01	0.09	0.10
Quercus phellos	0.01	<.01	0.01
Quercus rubra	0.01	<.01	0.01
Rhizophora mangle	0.01	<0.1	0.01
Salix discolor	0.01	<.01	0.01
Salix nigra	0.01	0.01	0.02
Schinus molle	0.01	<.01	0.01
Washingtonia robusta	0.01	<.01	0.01
Total	**100%**	**100%**	**200**

Table 16: Condition and RPI for All Tree Species

Species	Very Good	Good	Fair	Poor	Critica l	Dead	RPI	# of Trees	% of Pop.
Platanus x hybrida	2.70	36.50	56.90	3.70	0.20	0.00	**0.99**	1,972	22.31
Liquidambar styraciflua	1.80	57.90	36.90	3.40	0.00	0.00	**1.04**	891	10.08
Quercus acerifolia	0.50	33.20	58.60	6.60	0.30	0.80	**0.96**	741	8.38
Pistacia chinensis	5.10	77.90	15.80	0.70	0.40	0.10	**1.10**	692	7.83
Sequoia sempervirens	5.50	49.50	37.20	2.70	1.30	3.80	**1.00**	549	6.21
Aesculus x carnea	6.80	25.10	51.70	15.60	0.50	0.20	**0.95**	410	4.64
Prunus cerasifera	2.80	29.50	49.90	11.00	2.30	4.50	**0.92**	353	3.99
Lagerstroemia	10.60	87.80	1.60	0.00	0.00	0.00	**1.15**	188	2.13
Acacia melanoxylon	0.00	44.10	47.50	7.30	1.10	0.00	**0.99**	179	2.03
Prunus serrulata	8.40	52.40	35.50	2.40	0.60	0.60	**1.05**	166	1.88
Magnolia grandiflora	6.30	60.30	32.50	0.80	0.00	0.00	**1.07**	126	1.43
Prunus ilicifolia	0.00	26.10	67.00	2.60	0.90	3.50	**0.93**	115	1.30
Calocedrus	0.00	10.60	46.90	12.40	5.30	24.80	**0.71**	113	1.28
Acer x freemanii	19.40	66.00	13.60	1.00	0.00	0.00	**1.14**	103	1.17
Umbellularia californica	0.00	17.50	71.80	8.70	0.00	1.90	**0.91**	103	1.17
Cinnamomum camphora	0.00	46.00	47.00	6.00	1.00	0.00	**0.99**	100	1.13
Cornus florida	2.00	49.00	35.70	13.30	0.00	0.00	**1.00**	98	1.11
Acacia dealbata	0.00	27.30	60.20	12.50	0.00	0.00	**0.99**	88	1.00
All Other Species	8.30	22.11	20.15	20.17	32.57	33.07	**1.00**	1,852	20.95
Ginkgo biloba	4.80	54.20	37.30	3.60	0.00	0.00	**1.04**	83	0.94

Species	Very Good	Good	Fair	Poor	Critical	Dead	RPI	# of Trees	% of Pop.
Pyrus	0.00	98.70	1.30	0.00	0.00	0.00	**1.13**	75	0.85
Triadica sebifera	0.00	75.00	19.40	5.60	0.00	0.00	**1.06**	72	0.81
Pseudotsuga menziesii	0.00	31.00	47.90	7.00	11.30	2.80	**0.89**	71	0.80
Acer palmatum	1.60	61.90	34.90	1.60	0.00	0.00	**1.05**	63	0.71
Pittosporum undulatum	0.00	12.70	68.30	15.90	3.20	0.00	**0.88**	63	0.71
Eucalyptus	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	60	0.68
Tilia cordata	0.00	47.40	47.40	5.30	0.00	0.00	**1.00**	57	0.64
Pittosporum tobira	0.00	44.20	51.90	3.80	0.00	0.00	**1.00**	52	0.59
Cercis canadensis v. texensis	0.00	3.90	78.40	9.80	5.90	2.00	**0.85**	51	0.58
Leptospermum laevigatum	0.00	66.00	31.90	2.10	0.00	0.00	**1.05**	47	0.53
Ligustrum lucidum	0.00	30.00	70.00	0.00	0.00	0.00	**0.97**	40	0.45
Ulmus	0.00	31.60	65.80	2.60	0.00	0.00	**0.97**	38	0.43
Acer rubrum	0.00	75.70	21.60	2.70	0.00	0.00	**1.07**	37	0.42
Aesculus californica	0.00	55.60	44.40	0.00	0.00	0.00	**1.03**	36	0.41
Arbutus unedo	5.60	63.90	27.80	0.00	0.00	2.80	**1.06**	36	0.41
Camellia japonica	0.00	87.90	12.10	0.00	0.00	0.00	**1.10**	33	0.37
Prunus	0.00	33.30	39.40	18.20	6.10	3.00	**0.89**	33	0.37
Rhododendron	0.00	36.70	56.70	6.70	0.00	0.00	**0.97**	30	0.34
Pyrus calleryana	0.00	62.10	24.10	13.80	0.00	0.00	**1.01**	29	0.33
Eucalyptus ficifolia	0.00	66.70	33.30	0.00	0.00	0.00	**1.06**	27	0.31
Robinia pseudoacacia	0.00	22.20	59.30	14.80	0.00	3.70	**0.90**	27	0.31
Prunus laurocerasus	0.00	76.90	23.10	0.00	0.00	0.00	**1.08**	26	0.29
Cedrus deodara	0.00	44.00	16.00	12.00	4.00	24.00	**0.80**	25	0.28
Unknown tree	0.00	0.00	0.00	0.00	0.00	100.00	**0.23**	25	0.28
Acer macrophyllum	0.00	16.70	54.20	25.00	4.20	0.00	**0.99**	24	0.27
Acacia confusa	0.00	34.80	60.90	4.30	0.00	0.00	**0.99**	23	0.26
Betula pendula	0.00	43.50	56.50	0.00	0.00	0.00	**1.00**	23	0.26
Heteromeles arbutifolia	0.00	8.70	91.30	0.00	0.00	0.00	**0.93**	23	0.26
Malus	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	22	0.25
Tristaniopsis laurina	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	22	0.25
Eucalyptus citriodora	0.00	41.70	58.30	0.00	0.00	0.00	**1.00**	21	0.24
Cercis canadensis	0.00	45.00	55.00	0.00	0.00	0.00	**1.01**	20	0.23
Olea europaea	0.00	70.00	30.00	0.00	0.00	0.00	**1.06**	20	0.23
Cordyline australis	0.00	89.50	10.50	0.00	0.00	0.00	**1.11**	19	0.21
Laurus nobilis	15.80	21.10	57.90	5.30	0.00	0.00	**1.01**	19	0.21
Sphaeropteris	11.10	83.30	5.60	0.00	0.00	0.00	**1.14**	18	0.20
Casuarina equisetifolia	0.00	6.70	86.70	6.70	0.00	0.00	**0.91**	15	0.17
Populus fremontii	0.00	80.00	20.00	0.00	0.00	0.00	**1.09**	15	0.17
Dichotomanthes tristaniicarpa	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	13	0.15
Pinus ponderosa	0.00	61.50	23.10	15.40	0.00	0.00	**1.01**	13	0.15

Species	Very Good	Good	Fair	Poor	Critical	Dead	RPI	# of Trees	% of Pop.
Cryptomeria japonica	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	11	0.12
Quercus lobata	0.00	18.20	45.50	36.40	0.00	0.00	**0.87**	11	0.12
Acer	0.00	40.00	50.00	10.00	0.00	0.00	**0.99**	10	0.11
Betula nigra	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	10	0.11
Ceratonia siliqua	0.00	70.00	30.00	0.00	0.00	0.00	**1.06**	10	0.11
Melaleuca quinquenervia	0.00	90.00	10.00	0.00	0.00	0.00	**1.11**	10	0.11
Phoenix canariensis	0.00	40.00	60.00	0.00	0.00	0.00	**1.00**	10	0.11
Aesculus hippocastanum	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	9	0.10
Ligustrum japonicum	0.00	55.60	44.40	0.00	0.00	0.00	**1.03**	9	0.10
Thuja occidentalis	0.00	44.40	55.60	0.00	0.00	0.00	**1.01**	9	0.10
Magnolia	0.00	62.50	37.50	0.00	0.00	0.00	**1.05**	8	0.09
Pyracantha coccinea	0.00	62.50	37.50	0.00	0.00	0.00	**1.05**	8	0.09
Acer saccharinum	0.00	14.30	85.70	0.00	0.00	0.00	**0.94**	7	0.08
Fraxinus angustifolia	0.00	28.60	42.90	28.60	0.00	0.00	**0.91**	7	0.08
Pieris japonica	0.00	57.10	42.90	0.00	0.00	0.00	**1.03**	7	0.08
Pinus radiata	0.00	57.10	28.60	14.30	0.00	0.00	**1.00**	7	0.08
Ceanothus thyrsiflorus	16.70	66.70	16.70	0.00	0.00	0.00	**1.13**	6	0.07
Cornus kousa	0.00	66.70	33.30	0.00	0.00	0.00	**1.06**	6	0.07
Ligustrum	50.00	16.70	33.30	0.00	0.00	0.00	**1.17**	6	0.07
Malus sylvestris	16.70	83.30	0.00	0.00	0.00	0.00	**1.17**	6	0.07
Pinus sylvestris	0.00	83.30	16.70	0.00	0.00	0.00	**1.09**	6	0.07
Quercus virginiana	0.00	0.00	83.30	16.70	0.00	0.00	**0.87**	6	0.07
Acer glabrum	0.00	100.00	0.00	0.00	0.00	0.00	**0.99**	5	0.06
Citrus	0.00	80.00	20.00	0.00	0.00	0.00	**1.09**	5	0.06
Ilex aquifolium	0.00	60.00	20.00	0.00	20.00	0.00	**0.95**	5	0.06
Metasequoia glyptostroboides	40.00	60.00	0.00	0.00	0.00	0.00	**1.22**	5	0.06
Morus alba	0.00	80.00	20.00	0.00	0.00	0.00	**1.09**	5	0.06
Nyssa sylvatica	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	5	0.06
Phoenix dactylifera	0.00	80.00	20.00	0.00	0.00	0.00	**1.09**	5	0.06
Pinus	0.00	40.00	20.00	0.00	20.00	20.00	**0.77**	5	0.06
Quercus	0.00	40.00	20.00	40.00	0.00	0.00	**0.91**	5	0.06
Quercus chrysolepis	0.00	20.00	60.00	20.00	0.00	0.00	**0.91**	5	0.06
Quercus kelloggii	0.00	0.00	60.00	40.00	0.00	0.00	**0.82**	5	0.06
Syzygium paniculatum	0.00	60.00	40.00	0.00	0.00	0.00	**1.04**	5	0.06
Ilex	0.00	75.00	25.00	0.00	0.00	0.00	**1.08**	4	0.05
Juniperus	0.00	75.00	25.00	0.00	0.00	0.00	**1.08**	4	0.05
Juniperus communis	0.00	50.00	0.00	50.00	0.00	0.00	**0.91**	4	0.05

Species	Very Good	Good	Fair	Poor	Critical	Dead	RPI	# of Trees	% of Pop.
Prunus domestica	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	4	0.05
Ternstroemia gymnanthera	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	4	0.05
Ulmus americana	25.00	50.00	25.00	0.00	0.00	0.00	**1.13**	4	0.05
Yucca	0.00	75.00	25.00	0.00	0.00	0.00	**1.08**	4	0.05
Zelkova serrata	0.00	75.00	25.00	0.00	0.00	0.00	**0.99**	4	0.05
Acer buergerianum	0.00	66.70	33.30	0.00	0.00	0.00	**0.99**	3	0.03
Bambusa	0.00	66.70	33.30	0.00	0.00	0.00	**1.06**	3	0.03
Crataegus laevigata	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	3	0.03
Cupressus macrocarpa	0.00	63.60	36.40	0.00	0.00	0.00	**1.05**	3	0.03
Diospyros kaki	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	3	0.03
Eucalyptus camaldulensis	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	3	0.03
Eucalyptus polyanthemos	0.00	66.70	33.30	0.00	0.00	0.00	**1.06**	3	0.03
Fraxinus uhdei	0.00	33.30	33.30	33.30	0.00	0.00	**0.90**	3	0.03
Juglans hindsii	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	3	0.03
Lonicera	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	3	0.03
Magnolia acuminata	33.30	33.30	33.30	0.00	0.00	0.00	**1.13**	3	0.03
Plumeria	0.00	0.00	66.70	33.30	0.00	0.00	**0.83**	3	0.03
Rhus lanceolata	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	3	0.03
Sequoiadendron giganteum	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	3	0.03
Tristaniopsis	0.00	66.70	33.30	0.00	0.00	0.00	**1.06**	3	0.03
Acer saccharum	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	2	0.02
Pittosporum rhombifolia	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	2	0.02
Berberis bealei	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	2	0.02
Celtis sinensis	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	2	0.02
Chionanthus retusus	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	2	0.02
Cussonia spicata	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	2	0.02
Eriobotrya japonica	0.00	53.80	46.20	0.00	0.00	0.00	**1.03**	2	0.02
Gleditsia triacanthos	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	2	0.02
Grevillea robusta	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	2	0.02
Juglans nigra	0.00	0.00	50.00	50.00	0.00	0.00	**0.79**	2	0.02
Juniperus virginiana	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	2	0.02

Species	Very Good	Good	Fair	Poor	Critical	Dead	RPI	# of Trees	% of Pop.
Malus prunifolia	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	2	0.02
Philodendron bipinnatifidum	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	2	0.02
Populus nigra	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	2	0.02
Prunus avium	0.00	100.00		0.00	0.00	0.00	**1.13**	2	0.02
Prunus persica	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	2	0.02
Rhaphiolepis indica	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	2	0.02
Syringa	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	2	0.02
Tabebuia	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	2	0.02
Taxus	0.00	0.00	50.00	50.00	0.00	0.00	**0.79**	2	0.02
Trachycarpus fortunei	0.00	50.00	50.00	0.00	0.00	0.00	**1.02**	2	0.02
Abies	0.00	100.00	0.00	0.00	0.00	0.00	**0.99**	1	0.01
Acca sellowiana	0.00	100.00	0.00	0.00	0.00	0.00	**0.99**	1	0.01
Acer campbellii ssp. wilsonii	0.00	100.00	0.00	0.00	0.00	0.00	**0.99**	1	0.01
Acer circinatum	0.00	0.00	100.00	0.00	0.00	0.00	**0.99**	1	0.01
Acer negundo	0.00	100.00	0.00	0.00	0.00	0.00	**0.99**	1	0.01
Ailanthus altissima	0.00	0.00	0.00	100.00	0.00	0.00	**0.68**	1	0.01
Arbutus menziesii	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Baccharis pilularis	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Bougainvillea spectabilis	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Brahea	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Callistemon	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Callistemon citrinus	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Catalpa	0.00		100.00	0.00	0.00	0.00	**0.91**	1	0.01
Citrus aurantifolia	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Cotoneaster buxifolius	0.00	19.00	71.40	4.80	4.80	0.00	**0.92**	1	0.01
Crataegus	0.00	37.00	51.90	7.40	3.70	0.00	**0.96**	1	0.01

Species	Very Good	Good	Fair	Poor	Critical	Dead	RPI	# of Trees	% of Pop.
Cupressus arizonica	0.00	66.70	33.30	0.00	0.00	0.00	**1.06**	1	0.01
Cycas revoluta	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Eucalyptus globulus	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Eucalyptus robusta	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Fagus sylvatica	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Ficus	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Ficus carica	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Gleditsia aquatica	0.00	0.00	0.00	0.00	100.00	0.00	**0.45**	1	0.01
Jacaranda mimosifolia	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Magnolia x soulangeana	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Melaleuca leucadendra	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Melia azedarach	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Morus	100.00	0.00	0.00	0.00	0.00	0.00	**1.36**	1	0.01
Phoenix roebelenii	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Photinia serrulata	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Pinus contorta	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Pinus resinosa	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Pinus rigida	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Pittosporum crassifolium	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Platycladus orientalis	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Prunus angustifolia	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Prunus serotina	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Prunus virginiana	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Pyrus communis	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01

Species	Very Good	Good	Fair	Poor	Critical	Dead	RPI	# of Trees	% of Pop.
Quercus palustris	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Quercus phellos	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Quercus rubra	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Rhizophora mangle	0.00	0.00	0.00	100.00	0.00	0.00	**0.68**	1	0.01
Salix discolor	0.00	0.00	0.00	100.00	0.00	0.00	**0.68**	1	0.01
Salix nigra	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Schinus molle	0.00	0.00	100.00	0.00	0.00	0.00	**0.91**	1	0.01
Washingtonia robusta	0.00	100.00	0.00	0.00	0.00	0.00	**1.13**	1	0.01
Total	**3.00**	**46.00**	**44.00**	**5.00**	**0.70**	**1.30**	**1.00**	**8,839**	**100%**

Table 17: Annual Benefits for All Species

Species	# of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gal./yr.)	Avoided Runoff Value ($/yr.)
Platanus x hybrida	1,972	22.31	1.51	18,283.98	37.62	6,416.93	205,789.13	1,838.93
Liquidambar styraciflua	891	10.08	0.67	8,077.04	19.14	3,264.99	90,908.31	812.36
Quercus acerifolia	741	8.38	0.33	4,027.81	12.76	2,176.87	45,333.64	405.10
Pistacia chinensis	692	7.83	0.05	549.09	5.59	953.60	44,623.31	398.75
Sequoia sempervirens	549	6.21	0.33	3,964.70	10.72	1,827.88	24,602.51	219.85
Aesculus x carnea	410	4.64	0.11	1,365.02	4.29	730.85	15,363.52	137.29
Prunus cerasifera	353	3.99	0.02	222.93	1.80	307.49	8,554.07	76.44
Lagerstroemia	188	2.13	0.00	52.27	0.86	146.20	7,428.40	66.38
Acacia melanoxylon	179	2.03	0.05	651.88	0.73	125.04	7,337.00	65.56
Prunus serrulata	166	1.88	0.01	104.44	1.22	208.37	6,180.14	55.23
Magnolia grandiflora	126	1.43	0.06	760.01	2.16	368.09	4,746.97	42.42
Prunus ilicifolia	115	1.30	0.01	77.63	0.99	169.45	4,328.47	38.68
Calocedrus	113	1.28	0.03	384.58	1.09	185.50	4,285.09	38.29
Acer x freemanii	103	1.17	0.03	421.76	1.54	263.37	2,982.85	26.65
Umbellularia californica	103	1.17	0.02	265.02	1.47	251.19	2,741.28	24.50
Cinnamomum camphora	100	1.13	0.05	660.00	3.87	659.45	2,653.52	23.71
Cornus florida	98	1.11	0.00	13.16	0.16	26.65	2,509.11	22.42
Acacia dealbata	88	1.00	0.02	211.68	0.22	37.53	2,382.47	21.29
All Other Species	1,852	20.95	0.45	6,532.59	20.86	3,553.65	42,028.41	375.49
Ginkgo biloba	83	0.94	0.01	114.95	0.15	25.36	1,979.60	17.69

Species	# of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gal./yr.)	Avoided Runoff Value ($/yr.)
Pyrus	75	0.85	0.00	56.79	0.47	79.51	1,453.66	12.99
Triadica sebifera	72	0.81	0.01	113.74	0.94	159.49	1,422.07	12.71
Pseudotsuga menziesii	71	0.80	0.03	380.72	0.77	130.71	1,293.77	11.56
Acer palmatum	63	0.71	0.00	32.75	0.18	30.82	1,280.11	11.44
Pittosporum undulatum	63	0.71	0.01	84.06	0.50	85.57	1,271.13	11.36
Eucalyptus	60	0.68	0.01	64.65	0.00	0.17	1,184.77	10.59
Tilia cordata	57	0.64	0.02	235.76	0.73	123.66	1,175.50	10.50
Pittosporum tobira	52	0.59	0.00	28.53	0.14	24.63	1,170.83	10.46
Cercis canadensis v. texensis	51	0.58	0.00	18.98	0.19	32.87	1,021.54	9.13
Leptospermum laevigatum	47	0.53	0.01	69.14	0.64	109.76	980.30	8.76
Ligustrum lucidum	40	0.45	0.00	55.74	0.22	37.83	957.91	8.56
Ulmus	38	0.43	0.01	81.69	0.36	61.34	946.05	8.45
Acer rubrum	37	0.42	0.00	59.56	0.38	64.55	919.44	8.22
Aesculus californica	36	0.41	0.01	87.10	0.16	26.54	882.82	7.89
Arbutus unedo	36	0.41	0.00	23.99	0.11	18.62	873.74	7.81
Camellia japonica	33	0.37	0.00	5.42	0.06	10.50	842.12	7.53
Prunus	33	0.37	0.00	23.22	0.19	31.72	778.23	6.95
Rhododendron	30	0.34	0.00	12.57	0.08	13.49	776.73	6.94
Pyrus calleryana	29	0.33	0.00	51.14	0.31	52.96	765.41	6.84
Eucalyptus ficifolia	27	0.31	0.01	129.16	0.07	12.07	750.27	6.70
Robinia pseudoacacia	27	0.31	0.00	33.17	0.25	42.30	727.65	6.50
Prunus laurocerasus	26	0.29	0.00	19.41	0.23	38.49	670.35	5.99
Cedrus deodara	25	0.28	0.01	90.76	0.44	75.75	639.21	5.71
Unknown tree	25	0.28	0.00	0.00	0.00	0.00	627.70	5.61
Acer macrophyllum	24	0.27	0.01	112.94	0.39	65.91	627.32	5.61
Acacia confusa	23	0.26	0.00	44.25	0.06	9.99	588.29	5.26
Betula pendula	23	0.26	0.01	104.03	0.43	72.64	585.84	5.24
Heteromeles arbutifolia	23	0.26	0.00	7.59	0.13	22.98	575.53	5.14
Malus	22	0.25	0.00	9.17	0.10	16.77	546.60	4.88
Tristaniopsis laurina	22	0.25	0.01	78.44	0.36	62.06	504.96	4.51
Eucalyptus citriodora	21	0.24	0.18	2,185.89	0.20	33.97	498.06	4.45
Cercis canadensis	20	0.23	0.00	8.21	0.06	9.88	488.97	4.37
Olea europaea	20	0.23	0.00	52.05	0.14	23.25	452.82	4.05
Cordyline australis	19	0.21	0.00	3.60	0.05	8.25	449.02	4.01
Laurus nobilis	19	0.21	0.00	11.50	0.13	22.45	383.76	3.43
Sphaeropteris	18	0.20	0.01	105.26	0.54	91.40	376.11	3.36
Casuarina equisetifolia	15	0.17	0.00	19.93	0.42	72.36	373.31	3.34
Populus fremontii	15	0.17	0.02	243.56	0.83	140.80	368.56	3.29
Dichotomanthes tristaniicarpa	13	0.15	0.00	0.31	0.00	0.13	364.30	3.26

Species	# of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gal./yr.)	Avoided Runoff Value ($/yr.)
Pinus ponderosa	13	0.15	0.01	175.88	0.35	59.33	342.88	3.06
Cryptomeria japonica	11	0.12	0.00	5.18	0.12	20.88	332.96	2.98
Quercus lobata	11	0.12	0.00	34.10	0.15	25.64	321.13	2.87
Acer	10	0.11	0.00	19.78	0.07	12.62	293.55	2.62
Betula nigra	10	0.11	0.00	14.74	0.09	15.33	277.92	2.48
Ceratonia siliqua	10	0.11	0.01	68.01	0.09	15.23	270.04	2.41
Melaleuca quinquenervia	10	0.11	0.01	126.35	0.43	72.72	261.29	2.33
Phoenix canariensis	10	0.11	0.00	8.50	0.01	2.16	256.60	2.29
Aesculus hippocastanum	9	0.10	0.00	12.15	0.05	8.03	251.06	2.24
Ligustrum japonicum	9	0.10	0.00	4.78	0.03	5.54	234.52	2.10
Thuja occidentalis	9	0.10	0.00	30.46	0.01	1.53	224.29	2.00
Magnolia	8	0.09	0.00	7.90	0.05	7.92	222.68	1.99
Pyracantha coccinea	8	0.09	0.00	2.11	0.03	5.93	218.50	1.95
Acer saccharinum	7	0.08	0.00	44.86	0.18	30.84	213.60	1.91
Fraxinus angustifolia	7	0.08	0.00	55.77	0.11	18.46	193.19	1.73
Pieris japonica	7	0.08	0.00	4.06	0.04	6.31	180.25	1.61
Pinus radiata	7	0.08	0.01	66.66	0.21	35.91	178.43	1.59
Ceanothus thyrsiflorus	6	0.07	0.00	2.05	0.04	6.32	166.29	1.49
Cornus kousa	6	0.07	0.00	3.05	0.02	3.29	165.92	1.48
Ligustrum	6	0.07	0.00	3.26	0.02	3.25	159.85	1.43
Malus sylvestris	6	0.07	0.00	4.58	0.04	7.52	151.28	1.35
Pinus sylvestris	6	0.07	0.00	40.23	0.09	15.32	148.15	1.32
Quercus virginiana	6	0.07	0.00	13.44	0.13	22.50	144.51	1.29
Acer glabrum	5	0.06	0.00	8.49	0.06	9.66	141.53	1.26
Citrus	5	0.06	0.00	1.87	0.03	4.31	137.45	1.23
Ilex aquifolium	5	0.06	0.00	5.80	0.03	4.54	136.70	1.22
Metasequoia glyptostroboides	5	0.06	0.01	69.01	0.11	18.71	129.41	1.16
Morus alba	5	0.06	0.00	22.80	0.11	18.17	120.59	1.08
Nyssa sylvatica	5	0.06	0.00	3.82	0.02	4.11	119.39	1.07
Phoenix dactylifera	5	0.06	0.00	8.07	0.01	2.22	116.57	1.04
Pinus	5	0.06	0.00	6.07	0.02	3.11	112.91	1.01
Quercus	5	0.06	0.00	9.64	0.05	9.09	108.50	0.97
Quercus chrysolepis	5	0.06	0.00	22.31	0.06	11.00	105.20	0.94
Quercus kelloggii	5	0.06	0.00	20.84	0.04	7.27	103.18	0.92
Syzygium paniculatum	5	0.06	0.01	74.82	0.03	5.38	101.81	0.91
Ilex	4	0.05	0.00	5.96	0.03	5.95	95.67	0.85
Juniperus	4	0.05	0.00	4.13	0.03	4.61	95.59	0.85
Juniperus communis	4	0.05	0.00	3.01	0.02	2.84	93.38	0.83
Prunus domestica	4	0.05	0.00	10.71	0.07	11.78	92.42	0.83
Ternstroemia gymnanthera	4	0.05	0.00	1.84	0.03	5.25	91.99	0.82

Species	# of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gal./yr.)	Avoided Runoff Value ($/yr.)
Ulmus americana	4	0.05	0.00	32.37	0.10	17.77	90.78	0.81
Yucca	4	0.05	0.00	8.17	0.04	6.65	88.89	0.79
Zelkova serrata	4	0.05	0.00	39.90	0.05	8.99	88.69	0.79
Acer buergerianum	3	0.03	0.00	26.08	0.03	5.40	85.41	0.76
Bambusa	3	0.03	0.00	0.14	0.00	0.42	85.08	0.76
Crataegus laevigata	3	0.03	0.00	0.83	0.07	11.31	70.56	0.63
Cupressus macrocarpa	3	0.03	0.00	33.42	0.01	2.11	68.84	0.62
Diospyros kaki	3	0.03	0.00	0.15	0.04	7.04	68.32	0.61
Eucalyptus camaldulensis	3	0.03	0.00	9.05	0.06	10.87	67.05	0.60
Eucalyptus polyanthemos	3	0.03	0.01	85.11	0.31	52.96	65.33	0.58
Fraxinus uhdei	3	0.03	0.00	5.69	0.03	4.82	64.03	0.57
Juglans hindsii	3	0.03	0.00	1.24	0.01	1.51	61.49	0.55
Lonicera	3	0.03	0.00	1.05	0.02	3.61	61.49	0.55
Magnolia acuminata	3	0.03	0.00	1.54	0.01	1.76	60.96	0.54
Plumeria	3	0.03	0.00	5.46	0.02	4.21	60.62	0.54
Rhus lanceolata	3	0.03	0.00	5.46	0.04	6.18	59.98	0.54
Sequoiadendron giganteum	3	0.03	0.00	29.58	0.08	13.52	58.28	0.52
Tristaniopsis	3	0.03	0.00	2.51	0.03	4.68	53.75	0.48
Acer saccharum	2	0.02	0.00	4.76	0.01	2.18	53.57	0.48
Pittosporum rhombifolia	2	0.02	0.00	8.30	0.05	7.73	51.50	0.46
Berberis bealei	2	0.02	0.00	7.56	0.03	5.37	46.48	0.42
Celtis sinensis	2	0.02	0.00	10.03	0.01	1.08	45.74	0.41
Chionanthus retusus	2	0.02	0.00	2.74	0.02	2.66	43.74	0.39
Cussonia spicata	2	0.02	0.00	0.43	0.04	6.22	43.02	0.38
Eriobotrya japonica	2	0.02	0.00	6.27	0.00	0.63	40.57	0.36
Gleditsia triacanthos	2	0.02	0.00	9.35	0.05	7.84	38.60	0.34
Grevillea robusta	2	0.02	0.00	10.36	0.07	11.76	38.57	0.34
Juglans nigra	2	0.02	0.00	16.01	0.09	15.32	38.08	0.34
Juniperus virginiana	2	0.02	0.00	0.71	0.00	0.69	36.72	0.33
Malus prunifolia	2	0.02	0.00	1.25	0.01	2.04	34.34	0.31
Philodendron bipinnatifidum	2	0.02	0.00	0.79	0.00	0.53	33.83	0.30
Populus nigra	2	0.02	0.00	7.88	0.03	5.79	32.73	0.29
Prunus avium	2	0.02	0.00	3.89	0.03	4.28	30.89	0.28
Prunus persica	2	0.02	0.00	0.32	0.01	1.04	28.28	0.25
Rhaphiolepis indica	2	0.02	0.00	0.50	0.01	1.75	27.70	0.25
Syringa	2	0.02	0.00	0.16	0.00	0.37	24.38	0.22
Tabebuia	2	0.02	0.00	0.23	0.00	0.59	23.77	0.21
Taxus	2	0.02	0.00	1.35	0.01	1.78	23.10	0.21
Trachycarpus fortunei	2	0.02	0.00	1.80	0.00	0.64	21.14	0.19

Species	# of Trees	% of Pop.	Pollution Removal (ton/yr.)	Pollution Removal ($/yr.)	Carbon Sequestration (ton/yr.)	Carbon Sequestration ($/yr.)	Avoided Runoff (gal./yr.)	Avoided Runoff Value ($/yr.)
Abies	1	0.01	0.00	3.43	0.01	1.89	21.03	0.19
Acca sellowiana	1	0.01	0.00	0.62	0.01	0.89	20.67	0.18
Acer campbellii ssp. wilsonii	1	0.01	0.00	0.12	0.00	0.18	20.25	0.18
Acer circinatum	1	0.01	0.00	0.22	0.00	0.30	20.15	0.18
Acer negundo	1	0.01	0.00	0.14	0.00	0.20	17.39	0.16
Ailanthus altissima	1	0.01	0.00	0.16	0.00	0.56	16.99	0.15
Arbutus menziesii	1	0.01	0.00	0.25	0.00	0.47	15.18	0.14
Baccharis pilularis	1	0.01	0.00	0.30	0.00	0.66	15.08	0.13
Bougainvillea spectabilis	1	0.01	0.00	0.24	0.00	0.61	14.05	0.13
Brahea	1	0.01	0.00	0.05	0.00	0.15	13.98	0.12
Callistemon	1	0.01	0.00	0.65	0.01	1.35	11.81	0.11
Callistemon citrinus	1	0.01	0.00	0.65	0.01	1.29	10.99	0.10
Catalpa	1	0.01	0.00	14.77	0.00	0.22	9.35	0.08
Citrus aurantifolia	1	0.01	0.00	0.13	0.00	0.22	8.87	0.08
Cotoneaster buxifolius	1	0.01	0.00	3.38	4.13	703.61	8.02	0.07
Crataegus	1	0.01	0.00	17.16	0.01	1.28	7.60	0.07
Cupressus arizonica	1	0.01	0.00	5.33	0.01	2.06	7.34	0.07
Cycas revoluta	1	0.01	0.00	15.85	0.14	23.20	7.34	0.07
Eucalyptus globulus	1	0.01	0.00	48.56	0.13	21.34	6.97	0.06
Eucalyptus robusta	1	0.01	0.00	12.84	0.05	7.75	5.64	0.05
Fagus sylvatica	1	0.01	0.00	24.69	0.03	4.78	4.89	0.04
Ficus	1	0.01	0.00	0.98	0.01	1.01	4.18	0.04
Ficus carica	1	0.01	0.00	0.23	0.00	0.40	3.95	0.04
Gleditsia aquatica	1	0.01	0.00	0.35	0.01	1.24	3.69	0.03
Jacaranda mimosifolia	1	0.01	0.00	1.51	0.01	1.56	3.60	0.03
Magnolia x soulangeana	1	0.01	0.00	0.18	0.00	0.26	3.53	0.03
Melaleuca leucadendra	1	0.01	0.00	0.23	0.01	0.94	3.51	0.03
Melia azedarach	1	0.01	0.00	1.79	0.01	1.73	3.35	0.03
Morus	1	0.01	0.00	10.61	0.02	3.60	2.85	0.03
Phoenix roebelenii	1	0.01	0.00	0.15	0.00	0.08	2.67	0.02
Photinia serrulata	1	0.01	0.00	0.21	0.00	0.56	2.61	0.02
Pinus contorta	1	0.01	0.00	2.91	0.01	1.43	2.57	0.02
Pinus resinosa	1	0.01	0.00	14.20	0.06	9.59	2.56	0.02
Pinus rigida	1	0.01	0.00	12.21	0.05	8.82	2.44	0.02
Pittosporum crassifolium	1	0.01	0.00	6.12	0.02	3.97	2.43	0.02
Platycladus orientalis	1	0.01	0.00	0.68	0.01	1.28	2.38	0.02
Prunus angustifolia	1	0.01	0.00	0.33	0.00	0.84	2.03	0.02
Prunus serotina	1	0.01	0.00	2.17	0.02	2.64	1.82	0.02
Prunus virginiana	1	0.01	0.00	0.37	0.01	1.11	1.82	0.02
Pyrus communis	1	0.01	0.00	0.22	0.00	0.47	1.67	0.01

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Quercus palustris	1	0.01	0.00	43.44	0.07	11.73	1.65	0.01
Quercus phellos	1	0.01	0.00	1.34	0.01	1.42	1.63	0.01
Quercus rubra	1	0.01	0.00	2.46	0.01	1.37	1.62	0.01
Rhizophora mangle	1	0.01	0.00	0.09	0.00	0.25	1.45	0.01
Salix discolor	1	0.01	0.00	0.31	0.00	0.72	1.40	0.01
Salix nigra	1	0.01	0.00	5.39	0.02	3.78	1.03	0.01
Schinus molle	1	0.01	0.00	1.88	0.02	2.95	0.54	0.00
Washingtonia robusta	1	0.01	0.00	3.43	0.00	0.66	0.00	0.00
Total	**8,839**	**100%**	**3.75**	**$46,625.58**	**127.08**	**$21,673.10**	**1,049,556.41**	**$4,689.42**