



*Street Tree Inventory
Report and Recommendations*

City of Cedar Park, TX



March 2007



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Credits

The Texas Sample Community Tree Inventory (TXSCTI) system and report was developed by the Texas Forest Service. It is adapted from the Street Tree Management Tool for Urban Forest Managers (STRATUM) computer model developed by researchers at the Center for Urban Forest Research, a research unit of the USDA Forest Service's Pacific Southwest Research Station. The statistical equations used to compute Standard Error values and percentages were specifically drawn from the STRATUM model, as published in the user's manual. For more information about STRATUM or the other i-Tree tools, go to www.itreetools.org.

Recommendations provided are the judgment of the Texas Forest Service forester(s) listed below, based on the data collected in cooperation with community staff or volunteers. Questions or comments should be directed to:

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Executive Summary

In September 2005, Texas Forest Service foresters and city of Cedar Park personnel conducted a sample tree inventory of 85 randomly selected street segments, covering 7.26 miles (roughly 5%) of the total street miles maintained by the city.

Results include:

- * Cedar Park has approximately 10,489 public trees that occupy 65% of the available planting sites.
- * The population is dominated by live oak (46%), cedar elm (10%), crapemyrtle (10%), post oak (6%), and Ashe juniper (5%).
- * Most trees are small, with almost 50% of trees in the 0-5" diameter class and less than 4% of trees larger than 20" diameter.
- * Two-thirds of street trees are in good condition and 65% require only routine care.
- * An estimated 2,200 public trees and 1,900 private trees have limbs that encroach into clear zones above streets and sidewalks.
- * Street trees in Cedar Park are valued at more than \$18 million.

Recommendations include:

- * Begin a program of pruning to train and shape young trees.
- * Favor shade trees other than live oak in street tree planting projects.
- * Locate and remove the estimated 42 trees that pose risk to persons or property.
- * Develop an annual work plan for tree maintenance and planting.
- * Conduct an annual Arbor Day celebration and involve local groups.
- * Craft a public tree care ordinance.

City Description

Cedar Park, Texas, is located approximately 17 miles northwest of downtown Austin, along the U.S. Highway 183 corridor. Incorporated in 1973, the city is now one of the fastest growing communities in the nation. From a 1990 U.S. Census population of 5,161, Cedar Park has grown dramatically in just one-and-one-half decades, mirroring the trend in other communities in the Austin metropolitan area. City leaders now estimate the population at more than 45,000.

Cedar Park is a convenient commuting distance to major employers in Austin and Round Rock (the home of Dell Computers), and has regionally affordable housing, both of which have spurred the city's growth. Outdoor recreational activities are in high demand among citizens, and concerns about community appearance consistently rank near the top of issues raised at meetings of city council. Cedar Park has been recognized as a Tree City USA in previous years.

Current Tree Management

City tree management is focused on park trees and the Director of the Parks and Recreation department, Mr. Curt Randa, serves as the city forester. Chapter 15 of the Cedar Park code of ordinances provides for the protection and mitigation of trees during commercial development projects on private property. The ordinance may be viewed online at www.ctspublish.com/cedarparklp/lpext.dll.

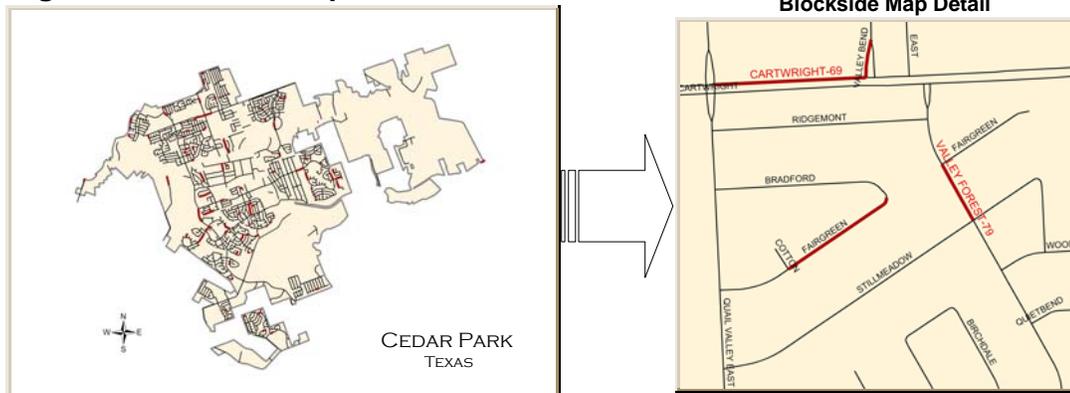
At this time there is no ordinance that defines responsibility or provides standards of care for public trees, nor does the city have a formal program for the planting and maintenance of street trees. However, street trees are occasionally planted by city crews or by individual homeowners, homeowner associations (HOAs), businesses and developers.

The Streets Division of the Public Works department is sometimes involved in emergency tree removal and maintenance. If the job requires specialized equipment or expertise, Streets Division staff will contact the city forester for assistance, and the Parks and Recreation department contracts out any jobs beyond their capabilities.

Inventory Methods

The Texas Sample Community Tree Inventory (TXSCTI) system is designed to provide city staff and community leaders with basic information about the street tree resource. Texas Forest Service (TFS) foresters identify and survey a 5-15% sample of street segments, or "blocksides" (see Figure 1 below), and collect data on the individual trees they find there. This sample is not a substitute for a complete inventory of street trees, but instead is designed to make basic short- and long-term recommendations for managing this important community asset.

Figure 1: Blockside Map



Field data collection is limited to relatively few measurements in order to speed up the process (see Appendix A for data collection form and definitions). Trees located within the public right-of-way (ROW) on both sides of a chosen blockside segment, or within a center median, are evaluated for species, trunk diameter, general condition, maintenance needs, and safety clearance. Private trees outside the ROW are evaluated solely for safety clearance. Blockside segments are also surveyed for available planting spaces, both within the ROW or median and within 30' of the roadway on private property. All estimates provided in this report represent public ROW and median trees combined, unless specifically identified otherwise.

The sampled trees provide the basis for statistical estimates for the entire street tree population. In general, sample sizes that produce a Standard Error (SE) value of 20% or less of the total tree estimate are considered sufficient for making basic judgments about the state of the street tree resource. Streets with center medians are included in the survey, with the length of these street segments increased as if the median were divided between the two sides of the street. Table 1 details the sampling results for this survey.

Table 1: Street Tree Sampling Results

| | |
|-------------------------------|---------------|
| Total Miles (# blocksides): | 153.48 (1724) |
| Miles Sampled (# blocksides): | 7.26 (85) |
| Sample Size: | 4.7% (4.9%) |
| Estimated Total Public Trees: | 10,489 |
| Standard Error (SE): | +/- 1,890 |
| Standard Error Percent: | 18.0% |

The report findings are divided into three sections: Street Tree Structure, Street Tree Care, and Street Tree Values. The TFS forester has provided professional insight into the data results, followed by a set of recommendations based on an understanding of the city's current program and the state of the street tree resource.

Street Tree Structure

The pattern of trees found in a community can be referred to as its structure. This includes the different tree species and their sizes, as well as the overall number of trees and how they fill the available space along city streets – what urban foresters call stocking. These key measures will guide the recommendations at the end of the report.

Stocking

In any city there are a certain number of miles of streets to maintain. A model residential street has trees planted along both sides of the right-of-way (ROW), often between the curb and sidewalk. Larger collector streets and boulevards may also have medians that are wide enough to support street trees. If all planting spaces are filled with trees of the largest size possible for the available growing space (termed "full stocking"), a typical U.S. city will have about 105 ROW trees per mile. This benchmark is equivalent to one tree every 50 feet, but takes into account visibility triangles at corners and lost planting spaces due to intersections, driveways, and other public infrastructure. Median spaces provide additional planting opportunities above that number, as do spaces on adjacent private property that can shade public sidewalks and ROWs. The estimates here did not take into account underground utility conflicts that would lower the potential number of planting sites.

Table 2 shows the current estimate of street trees in the community, as well as planting site criteria and opportunities, as found in the sample inventory.

Table 2: Street Tree Stocking

| | | |
|-----------------------------------|--------|---|
| Estimated No. ROW Trees: | 9,255 | <p>Planting Site Criteria</p> <p>Tree Size: Medium or large tree to be planted, if room; only small trees planted under powerlines.</p> <p>Location: Within public ROW and/or within 30' of ROW edge in private front yard. Tree lawn minimum 4' width.</p> <p>Distances: Overhead - 15' Hydrant, utility pole, street light - 10' Street intersection - 25' Driveway - 5' Other trees - 20-50'</p> |
| Estimated No. Median Trees: + | 1,234 | |
| Estimated Total No. Street Trees: | 10,489 | |
| Total Street Miles: | 153.48 | |
| Estimated Stocking (trees/mile): | 68.34 | |
| % Stocking: | 65% | |
| Median/ROW Planting Spaces: | 4,420 | |
| Private Yard Planting Spaces: + | 2,622 | |
| Total Planting Opportunities: | 7,042 | |

Key findings:

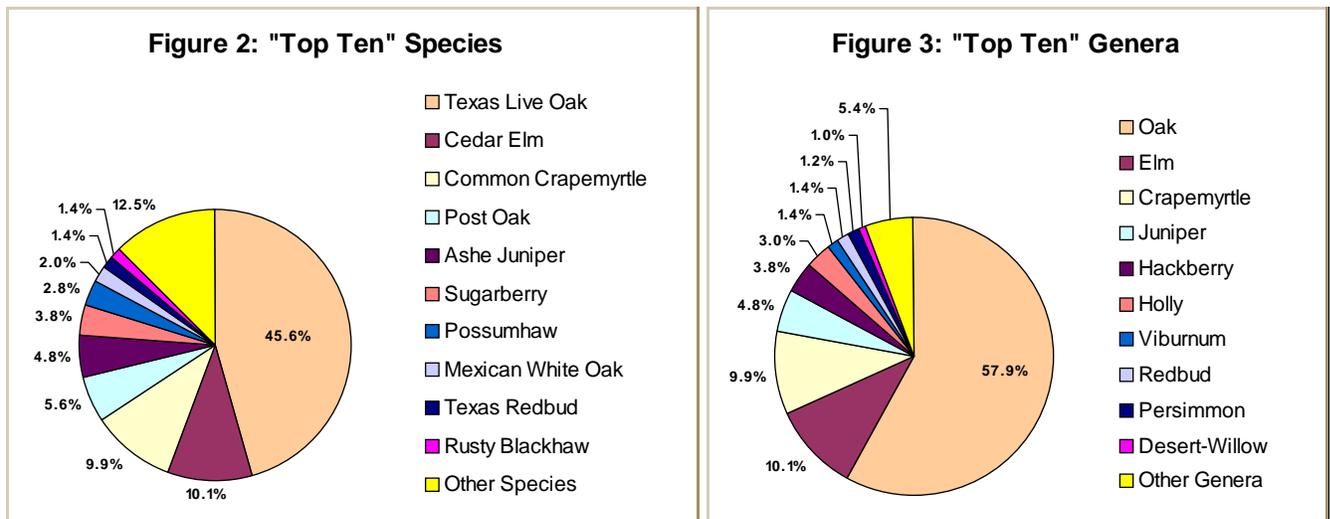
Cedar Park has an estimated street tree stocking level of 65%, but there are still ample opportunities for increasing street tree cover. To reach full stocking, the city would need to plant new trees in all of the estimated 4,400 planting spaces along medians and ROWs.

In addition, private homeowners have space in their front yards to plant another 2,600 trees within 30 feet of the curb. Since these owners provide tree maintenance, either individually or through their homeowner associations, Cedar Park can realize the added benefits of trees over streets and sidewalks without the associated increase in management costs.

Species

As a rule, urban foresters recommend having no more than 10% of the street tree population made up of any single species, and no more than 20% made up of any one tree genus (i.e. the oaks or elms). This can prevent the catastrophic loss of trees due to an outbreak of insects or disease, like the story of Dutch Elm disease in the Eastern U.S. or current outbreaks of Emerald Ash Borer in the Upper Midwest. Species diversity is one sign of a healthy tree resource.

Figures 2 and 3 show the most common species and genera, respectively, found in the sample inventory. The top ten species or genera are shown (could be more if categories tie for tenth place), plus a category combining the remaining species or genera. A complete list of species encountered during the inventory are listed in Appendix B.



Key findings:

The population of street trees in Cedar Park is dominated by just a few species, mostly reflecting the natural surroundings of the area. Texas live oak (46%), cedar elm (10%), crapemyrtle (10%), post oak (6%), Ashe juniper (commonly called "cedar") (5%), and sugarberry (4%) combine to account for 80% of ROW and median trees. Of the six, only crapemyrtle represents an introduced species planted for ornamental purposes. And though live oaks fare well in this area and are popular to plant, the risk to this major portion of the population from oak wilt disease is very significant.

In fact, because live oaks are so prevalent today, it may be impossible to achieve a model distribution in the future. Cedar Park would have to plant more than 46,000 trees of other species to achieve the recommended 10% level for live oaks – many more trees than there are spaces to plant them! On the other hand, it may not be wise to completely avoid planting live oaks; this species is well adapted to the climate and performs well in difficult urban settings. But as a rule it would be good to begin to favor other medium and large-statured species when designing street tree planting projects, especially those resistant to oak wilt.

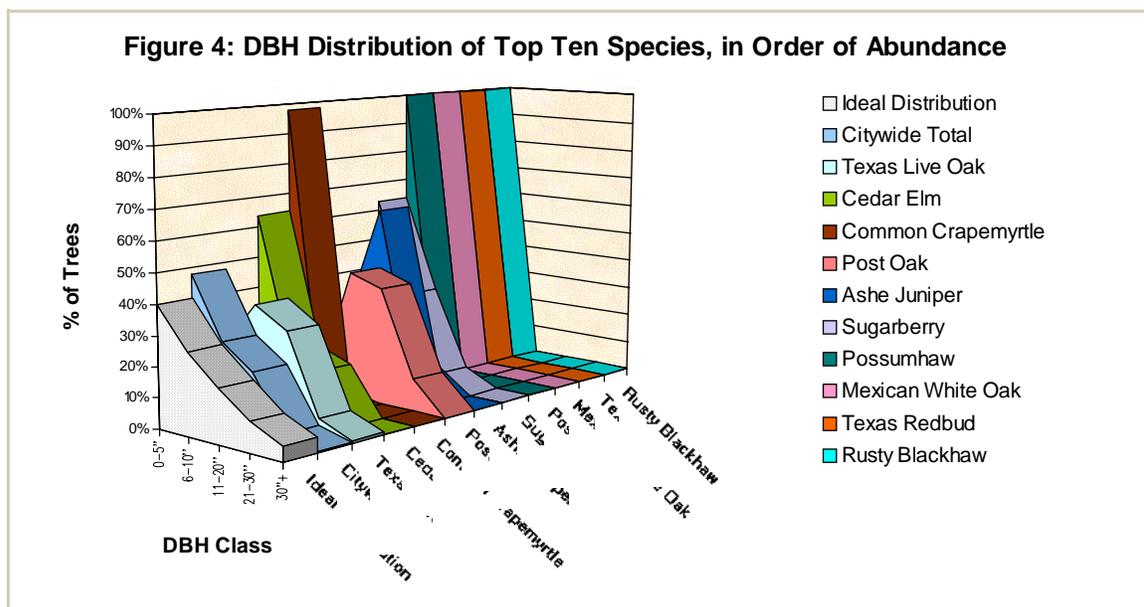
The diversity of new plantings, though, is encouraging. Appendix B shows a number of species discovered in the survey that are native or well-adapted to the area, and only small numbers of less-desirable species such as Arizona ash, chinaberry, and silver maple.

Size

Tree diameter is measured at a point on the trunk located 4.5 feet off the ground, also called diameter at breast height (DBH). This sample inventory assigned each tree to one of five size classes, as detailed in Appendix B (palms are assigned to a class by feet of clear trunk height). The ten most prevalent species are displayed as a graph in Figure 4 (below).

The distribution of street trees by size mirrors its age structure, since older trees are usually larger than young trees. Species composition can also influence the size class distribution, since small-statured species will never grow into the larger classes. Taking into account mortality rates that are higher for trees when they are young, a balanced size distribution for a species will have more trees in the smaller size classes and fewer in the large size classes. For example, the City of Davis, CA set an overall goal of having 40% young trees (<6" DBH), 30% maturing (6-12" DBH), 20% mature (12-24" DBH), and 10% old trees (>24" DBH).

This survey considers medium (25-50' tall) and large (>50' tall) species mature when they reach the 11-20" DBH class. A reasonable target distribution would then be: 40% young trees (0-5" DBH), 27% maturing (6-10" DBH), 18% mature (11-20" DBH), and 15% old (>20" DBH).



Key findings:

The citywide size distribution of street trees reflects the rapid development of Cedar Park in recent years, with almost 50% of all trees in the 0-5" DBH class and less than 4% of trees larger than 20" DBH (Figure 4). This distribution also reflects some of the species choices for streetscapes, since small-statured species like crapemyrtle, possumhaw, redbud, Texas persimmon, prairie sumac, mescalbean, and rusty blackhaw rarely grow into a larger class. One addition to the species mix of the community became obvious in our survey: Mexican white oak (aka Monterrey oak). This species is relatively new to the nursery industry, but represents the eighth most prevalent species encountered.

Some of the distributions for individual species offer additional insight (see Appendix B for detail). In particular, live oak, post oak, and Ashe juniper represent tree species present when roads were built into the native landscape. They survived the construction and are now some of the larger trees found in our survey. But damage to trunk or roots during construction can start the decay process that leads to structural failure many years later. Trees in the larger size classes should be inspected periodically for structural soundness as part of the overall management program.

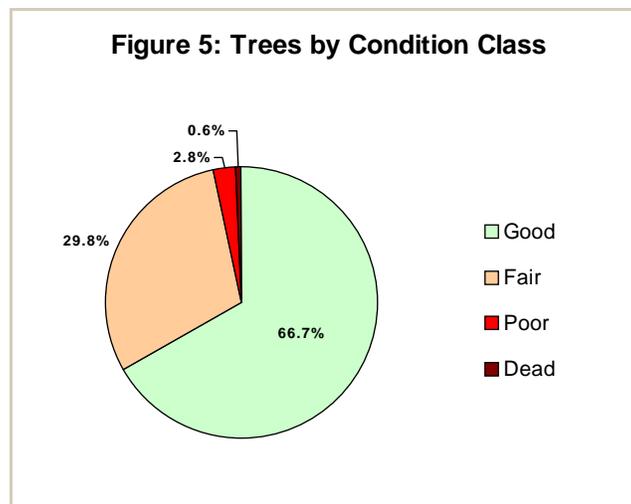
Street Tree Care

The care and maintenance practices – or lack thereof – that cities perform on their street trees will determine the condition of the resource as well as its future needs. This sample inventory evaluated trees for their overall condition, maintenance needs, and safety clearance.

Condition

Sampled trees were briefly observed and assigned to one of four condition classes: good, fair, poor, or dead (see Appendix A for condition class descriptions). This evaluation was designed to capture a general assessment of the tree, but did not rate each portion of the tree such as leaves, twigs, branches, trunk, and roots.

Figure 5 shows the distribution of street trees by condition class, as found in the sample inventory.



Key findings:

The majority of street trees in Cedar Park are well cared for, with two-thirds (67%) in good condition. If proper maintenance continues, these trees can remain in good health and produce increasing economic and environmental benefits to the community for years to come.

But 30% of street trees are only in fair condition. These are trees that can usually be restored to full health with appropriate treatment, but much depends on the reason for the classification. Trees in this category may be larger specimens that survived the original road construction and have the scars to prove it. Injuries to the trunk, branches, or root systems would be reasons to rate a tree as fair instead of good. Or, these trees could be new plantings that have not received proper care or sufficient water during recent drought conditions.

A relatively small number of trees rated poor (2.8%) in the survey. Some of these trees could move up one level to the fair classification if timely maintenance is conducted. Without maintenance, they will likely continue to decline and will need to be removed at some point. Removal costs are almost always higher than maintenance costs.

Very few dead trees were discovered in the sample. All dead trees should be located and removed.

Maintenance

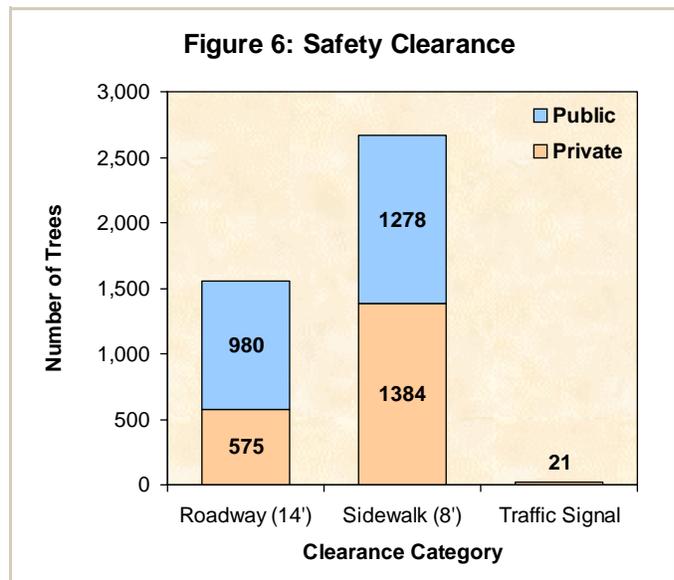
Tree maintenance is the primary responsibility of the street tree manager. A prudent maintenance program will remove or repair trees that pose risk to the public, as well as improve tree health and reduce future maintenance costs. This sample inventory evaluated ROW and median trees and assigned each to a maintenance category, as shown in Table 3 (below).

Table 3: Maintenance Needs

| Treatment | Description | Estimate | Percent |
|---------------------|---|----------|---------|
| Prune-Immediate | Large broken or dead branches present possible safety risk to persons or property. Pruning should be accomplished as soon as resources are available. | 148 | 1.4% |
| Prune-High Priority | Broken branches or deadwood, but no apparent immediate safety risk to persons or property. Prune as soon as resources are available. | 275 | 2.6% |
| Prune-Routine | Routine, ongoing pruning should be scheduled on a cycle of five to seven years to remove dead, dying, or diseased branches. | 6,873 | 65.5% |
| Prune-Training | Recent plantings require pruning of root and trunk suckers; dead, crossing, diseased, or weak branches; and to develop a strong central leader and scaffold limbs. | 3,066 | 29.2% |
| Remove-Immediate | Trees should be removed ASAP because their condition and proximity to active-use areas could pose risk to persons or property. | 42 | 0.4% |
| Remove | Low priority removals should be scheduled when resources are available and after high-priority removals. Trees are generally located away from facilities and areas of use. | 85 | 0.8% |

Clearance

One important aspect of a tree maintenance program is to create safe clearance for the public and emergency vehicles over streets and sidewalks, and for visibility of traffic signs and signals. In these situations, even though a tree may be located on the adjacent private property, it is the city's responsibility to insure that the required pruning is performed – either by the owner or the city. Figure 6 shows the estimated number of trees that require pruning to meet the appropriate clearance standard.



Key findings:

Because Cedar Park has a lot of small trees – either because of the species chosen or because they were recently planted – training pruning is required for more than 3,000 trees (29%). This type of pruning shapes and directs the growth of young trees, helps reduce future maintenance costs, and allows each tree to reach its potential. Training is the single best maintenance investment a city can make.

An estimated 42 street trees in the city need to be removed immediately, and another 148 require immediate pruning. The offending sample trees were reported to city officials as soon as they were discovered and may have already been pruned or removed. An additional 85 trees need removal and an estimated 275 trees require priority pruning over the next year.

Safety clearance over sidewalks (8') and streets (14') is another area of concern. While our estimates show very few trees (21) obstruct street signs or signals, an estimated 2,200 public trees and 1,900 private trees have limbs that encroach into these safety zones above streets and sidewalks. Safety clearance work provides an excellent reason to develop a routine maintenance schedule for all street trees.

Street Tree Values

Developing a management program for street trees requires community funding. But public trees also deliver valuable benefits to a community, and in recent years many of these have been quantified. These include the value of air and water pollution reductions, stormwater and energy savings, carbon sequestration, and even deferred medical costs. The aesthetic benefits of street trees are often harder to quantify – but just as important if you ask most citizens. Current research aims to quantify the health benefits to pedestrians from direct solar shading, the economic benefits from increased shopping activity in business districts, and reduced street repair costs. In fact, public trees are the only portion of a city's infrastructure that can increase in value over time because healthy trees grow each year and increase the benefits they provide. When the full benefits of trees are considered, investing in a tree maintenance program can actually deliver a positive return to a city.

Tree Replacement Value

The accepted method for quantifying the value of trees was developed by the Council of Tree and Landscape Appraisers, published as the "Guide for Plant Appraisal–9th Edition (2000)." This method combines tree ratings in four categories (species, condition, size, and location) to calculate the cost of replacing a given tree in the event it is damaged or destroyed. The location rating is an average of three factors: site, contribution, and placement. This sample inventory used a conservative location rating of 70%, recorded DBH class values and condition ratings, and published species ratings and regional replacement costs ("Texas Supplement and Species Approximation, 2003") to arrive at the estimated street tree value shown in Table 4. A complete list of replacement values, by species, is shown in Appendix C.

Table 4: Tree Replacement Values

| | |
|------------------------|--------------|
| Estimated No. Trees: | 10,489 |
| Estimated Total Value: | \$18,524,801 |
| Average Tree Value: | \$1,766 ea. |

Key findings:

Street trees in Cedar Park have a landscape value totalling more than \$18 million, for an average of about \$1,760 each. Considering the number of small trees that will continue to grow over time, city leaders can expect increasing value from street trees for many years.

Appendix C illustrates the value of large trees. Even a tree with a low species rating like eastern cottonwood has a high average value of \$8,500 each because the average DBH is 25 inches. Conversely, crapemyrtles represent 10% of the population, but because the average size is so small (3.2" DBH), they represent only 1.2% of the value of street trees (just \$217/tree). Unfortunately, this species simply won't grow much beyond this average DBH, meaning its value contribution won't increase either.

The real star in terms of value, though, is Texas live oak. We estimate that live oaks make up 46% of all trees, they have the highest species rating possible (100%), and their average DBH is under 12 inches, which represents a tree just beginning to mature. Given sufficient time and care, these trees can easily grow to over 20" DBH, with the largest ones exceeding 30" DBH. In fact, it was the only species in our sample with a tree over 30" DBH. Not only does live oak represent 70% of the current value of street trees, this species will undoubtedly become even more valuable to the community over time, easily justifying the management expenses required to keep them maintained and oak wilt free.

Recommendations

The purpose of this report is to provide city leaders with a snapshot of the current structure, maintenance needs, and replacement value of the street tree population. Below are the short- and long-term recommendations from the Texas Forest Service that the city can use to craft a plan for managing street trees into the future.

Short-Term (1-3 years)

Planting: develop a strategy to plant new trees annually

With as many as 4,400 public tree planting sites, a formal streetscape program should be implemented and budgeted to plant trees in appropriate locations along streets and medians. Even a small program will insure that some new trees are added each year to replace trees that die and must be removed. A second option would be to focus on the 2,600 planting sites on private property, within 30' of the curb. This sort of NeighborWoods program could bring together civic groups, HOAs, and businesses to distribute trees to citizens to plant in their front yards.

One way to support either program would be to revamp the existing city nursery to produce a broader range of species for planting along streets and in parks. Even a modest budget could allow the city to produce hundreds of low-cost trees each year, using a broader mix of species. Whether grown in-house or purchased from commercial nurseries, other species to consider include Lacey oak, chinkapin oak, baldcypress, Mexican sycamore, bigtooth maple, Eve's-necklace, and Mexican plum. At this time, we recommend planting no more live oaks on streets and medians.

Maintenance: lower the risk to the public from trees

In beginning to manage the risk from street trees, the first priority should be to locate and remove the estimated 42 trees that pose risk to persons or property. This is a relatively small number, so it may be more effective to first educate other city departments (public works, fire, police) how to identify and report a risky tree.

From our survey, more than one in five public trees requires pruning for safety clearance over streets and sidewalks, so the second priority should be to develop a systematic pruning cycle to visit each neighborhood on a 5-7 year cycle. Based on our estimates, tree managers would need to visit between 1,000 and 1,500 trees per year to conduct routine safety pruning on existing trees over 5" DBH. This systematic approach will keep these trees healthy and allow city staff to notify the owners of the estimated 2,000 trees on private property that also have clearance problems. Consider using a contract workforce for this maintenance program.

The resources of city staff can best be used by concentrating on training pruning of young trees (5" DBH or less). An estimated 3,000 trees require this maintenance investment, which will prevent poor branching and will greatly reduce future maintenance costs. Young tree training pruning requires few specialized tools and is easily taught to staff members. Other basic maintenance practices such as watering, mulching, and fertilizing can also improve young tree health and survival.

All tree work should conform to the latest ANSI A-300 (Standard Practices for Tree, Shrub and Woody Plant Maintenance), ANSI Z-133 (Safety Standards), and the latest Tree Pruning Guidelines from the International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA), and should be directed by ISA Certified Arborists.

Short-Term Recommendations, cont'd

Policy: review ordinances, standards, and training

Craft a public tree care ordinance that clarifies the role of city departments in caring for street trees. A public tree care ordinance is one of the four required standards for becoming a Tree City USA. The ordinance can also set standards for locating new plantings and can define the role for individuals, groups, and businesses in planting trees in the public ROW.

Develop a system for tree maintenance and planting and keep track of your progress. Such annual accomplishment reports can also be used to qualify for Tree City USA. A complete management plan covering the next three to five years would help guide work into the future and help set budget levels to accomplish your goals.

Conduct a basic tree care workshop to train city personnel from all applicable departments on proper tree maintenance practices. Texas Forest Service regional foresters can help schedule training classes, workshops, and other educational opportunities.

Community Support: get the public involved

In writing the public tree care ordinance, consider creating a citizen tree board. Many public tree ordinances establish such boards to build support for a tree management program and help set priorities for tree planting and care throughout the city.

Continue to conduct an annual Arbor Day celebration, and involve citizen groups to help plan the event. This is often one of the defined tasks for a citizen tree board, but Arbor Day can involve other community organizations such as the local Garden Club or even a new group such as Keep Cedar Park Beautiful or Trees for Cedar Park. These organizations can be great partners that support and advocate for tree issues in the community, and can help you regain Tree City USA status. This award program of the National Arbor Day Foundation and the State Foresters recognizes communities that invest in and manage public trees. Your Texas Forest Service forester can support a recognition ceremony at city council meetings or on Arbor Day.

Look to the private sector for additional support. Through your non-profit partners, many local businesses are often willing to donate towards activities that have such a strong public benefit as planting and caring for trees.

Long-Term Recommendations

Develop a Street Tree Master Plan to guide annual work plans and provide long-range budget forecasting. This can be an important tool in communicating with city leaders on the need for an ongoing maintenance budget. This plan will identify street tree priorities, goals and objectives and can help integrate street trees as part of the public infrastructure. To fund the plan, create a "green infrastructure" provision for capital improvement projects to create a dedicated income stream for planting new trees on all city construction projects.

Conduct a 100% inventory of street trees, which will allow for more efficient management and maintenance of the community's urban forest. Such an inventory can then be used to conduct a more thorough analysis of the city's trees, through models like the U.S. Forest Service's STRATUM or UFORE, or American Forests' CityGreen. These tools can calculate the ecosystem benefit of trees from processes such as pollution mitigation, stormwater runoff prevention, energy savings and other values that trees provide to a community.

Appendix A–Part 1: Sample Blockside Data Sheet

Blockside #: _____ ROW Width (ft.): _____ Date: _____ Crew: _____

Street: _____ From: _____ To: _____

| Tree # | Median/ Private Tree? | Species/ Code | DBH Class | | | | | Condition Class/Rating | | | | | Maintenance | | | | | Clearance Issues | | | | |
|--------|-----------------------------|------------------|-----------|------|-------|-------|-----|---------------------------|---|---|---|---|-------------|----|----|----|--------|---------------------|-----|---|---|-----|
| | | | 0-5 | 6-10 | 11-20 | 21-30 | 30+ | E | G | F | P | D | Prune | | | | Remove | | TS* | R | S | N/A |
| | | | | | | | | | | | | | PI* | PH | PR | PT | RI* | R | | | | |
| 1 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 2 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 3 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 4 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 5 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 6 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 7 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 8 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 9 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 10 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 11 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 12 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 13 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 14 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 15 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 16 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 17 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 18 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 19 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 20 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 21 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 22 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 23 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 24 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |
| 25 | M PVT | | 1 | 2 | 3 | 4 | 5 | E | G | F | P | D | PI* | PH | PR | PT | RI* | R | TS* | R | S | NA |

| | | |
|------------------------|-----------------------------|--|
| *Special Notes* | Address/Intersection | Number of Planting Sites per Block: |
| | | In Public ROW: _____ |
| | | In Private Yard: _____ (<30' from ROW) |

Blockside Sheet 1 of _____

Appendix A–Part 2: Data Sheet Definitions

Tree Inventory Information: TXSCTI

Blockside Number: Blockside = street name from street name to street name. 5% random sample has been mapped with ROW width and Blockside numbers assigned before the survey begins.

Tree #: Tree number is just to help you keep track of where you are since this is a sample inventory. Start at a block end. All trees are counted in ROW for residences, businesses, parks and other maintained areas. Only survey trees over 5 inches in fencerows or wild areas. If you have more than 25 trees, use a sheet with blank tree number column and fill in 26, 27, 28... and fill in "Blockside Sheet ____ of ____" at bottom of survey sheet.

Median Tree: The survey is taken by driving up one side of the block and down the other. Circle 'M' if tree is a tree in a center median strip.

Private Tree: Circle if tree is on private property and has 'Clearance Issues' - don't record DBH Class, Condition Rating or Maintenance for this tree.

Species Code: From list. Write name in if not on list.

DBH Class: 1 (0-5), 2 (6-10), 3 (11-20), 4 (21-30), 5 (31+). If forked, take diameter below fork. If multi-stemmed at the ground, sum diameters of stems and divide by number of stems.

Condition Class: Condition addresses the current state of the tree's health, structural soundness, shape, and growth rate. Discoloration, decay, dieback, decreased internodal length, and/or disfigured or dead stems or roots are symptoms of poor condition. Determine the overall health and condition of a tree by analyzing root characteristics, trunk and branch structure, canopy, twigs, buds, foliage, and any presence of disease and pest pathogens. Classify and record the condition of each tree in one of the following categories adapted from the rating system established by the International Society of Arboriculture:

Excellent: Trees in this class are judged to be exceptional trees possessing the best qualities of their species. They have excellent form and very minor maintenance problems. There are virtually no dead branches, deformities, or nutritional problems. These trees are in an acceptable location and can be expected to achieve a full mature shape and life expectancy.

Good: Trees in this class are judged to be desirable and with proper maintenance can be returned to an excellent classification. They may be interfering with utility lines, planted in an overcrowded location, or have minor insect, pathogen, or nutritional deficiencies.

Fair: Most trees in this category have some or all of the following problems: large dead limbs with as much as one-half of the tree already dead, large cavities in the trunk, major deformities, girdling roots, obvious insect, pathogen, or nutritional problems. Immediate maintenance and proper care may be able to save the tree.

Poor: Trees in this group are in a very degraded condition with irreversible problems. They have over 50% dead branches, drastic deformities, and severe insect, pathogen, or nutritional problems. They will have to be removed soon.

Dead: Trees in this category are either already dead or in such very poor condition that removal is required. These trees have over 90% dead branches and have completely succumbed to either insects, pathogens, or nutritional deficiencies. It is important to conduct the installation tree inventory after spring growth has begun. This ensures that a dormant tree is not misidentified as dead.

Maintenance:

PI*: Prune Immediate Priority. Requires immediate pruning – record under special notes at bottom of page. Trees in the immediate pruning category present possible safety risks to persons or property. Trees in this category are characterized by broken branches and large deadwood. Pruning should be accomplished as soon as resources are available.

PH: Prune High Priority. Trees requiring high priority pruning should be attended to as quickly as scheduling will allow. These trees, like the immediate priority pruning category, have broken branches and areas of deadwood. The dead areas, however, do not present an apparent immediate safety risk to persons or property.

PR: Prune Routine Priority. All other trees except young and recent plantings fall into the routine pruning category. They require removal of dead, dying, diseased, or obviously weak and heavy branches and deadwood. Routine, ongoing pruning should be scheduled and programmed to ensure all tree pruning is accomplished on a minimum cycle of five to seven years. It is important to remember that low priority problems can become high priority if they are not maintained for an extended period of time.

PT: Prune Train. The final maintenance category is training pruning. Trees in this category are generally young, recent plantings. Minimum maintenance includes trimming root and trunk suckers, deadwood, crossing, diseased, or weak branches, and staking improvement or removal. Trees in this category need to be scheduled for maintenance and not neglected. Generally, young trees should be pruned to reflect their species' natural growth pattern or to a single leader or a strong central leader to promote the development of strong scaffold limbs.

RI*: Removal Immediate Priority. Record under special notes at bottom of page. Trees categorized as high priority removals should be removed as soon as possible based on their lower condition class and proximity to active use areas or structures.

R: Removal-low priority. Low priority removals should be scheduled and accomplished when resources are available after high priority removals have been accomplished. These trees are generally located away from population areas and facilities.

Clearance Issues: Note if it is a private tree by circling PVT.

***TS: Traffic Signal.** Record under special notes at bottom of page. Circle if tree is blocking traffic control device such as a sign or light.

R: Road Clearance. Limb(s) is less than 14' over the curb or roadway.

S: Sidewalk Clearance. Limb(s) is less than 8' over a sidewalk and other hardscapes (for parks and other public facilities besides streets).

N/A: No Clearance Issues.

Planting: (Medium to large trees to be planted if room. If power lines, only small trees to be planted)

Planting Site: Note number of spaces in Public ROW and within 30' of ROW in Private Front Yard
Curb or Road Edge: need a 4-foot tree lawn to plant a tree.

Distances From:

Utilities – underground (5'), overhead (15'), Hydrants, utility poles, and light posts (10'), Intersections (from corners) (25')
Driveways (5'), Other trees: 20-40'

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Appendix B: List of Species Sampled and the Distribution of Each by DBH Class

| Common Name | Scientific Name | Distribution by DBH Class | | | | | Tree Count | Percent of Total | Running % |
|-----------------------|--|---------------------------|------|-------|-------|-----|------------|------------------|-----------|
| | | 0-5 | 6-10 | 11-20 | 21-30 | 30+ | | | |
| Texas Live Oak | <i>Quercus fusiformis</i> | 24% | 38% | 31% | 5% | 1% | 226 | 45.6% | 45.6% |
| Cedar Elm | <i>Ulmus crassifolia</i> | 64% | 20% | 16% | | | 50 | 10.1% | 55.6% |
| Common Crapemyrtle | <i>Lagerstroemia indica</i> | 98% | 2% | | | | 49 | 9.9% | 65.5% |
| Post Oak | <i>Quercus stellata</i> | 7% | 43% | 39% | 11% | | 28 | 5.6% | 71.2% |
| Ashe Juniper | <i>Juniperus ashei</i> | 29% | 63% | 8% | | | 24 | 4.8% | 76.0% |
| Sugarberry | <i>Celtis laevigata</i> | 63% | 32% | 5% | | | 19 | 3.8% | 79.8% |
| Possumhaw | <i>Ilex decidua</i> | 100% | | | | | 14 | 2.8% | 82.7% |
| Mexican White Oak | <i>Quercus polymorpha</i> | 100% | | | | | 10 | 2.0% | 84.7% |
| Texas Redbud | <i>Cercis canadensis var. texensis</i> | 100% | | | | | 7 | 1.4% | 86.1% |
| Rusty Blackhaw | <i>Viburnum rufidulum</i> | 100% | | | | | 7 | 1.4% | 87.5% |
| Texas Persimmon | <i>Diospyros texana</i> | 100% | | | | | 6 | 1.2% | 88.7% |
| Desert-Willow | <i>Chilopsis linearis</i> | 100% | | | | | 5 | 1.0% | 89.7% |
| Shumard Oak | <i>Quercus shumardii</i> | 100% | | | | | 5 | 1.0% | 90.7% |
| Texas Red Oak | <i>Quercus buckleyi</i> | 75% | 25% | | | | 4 | 0.8% | 91.5% |
| Blackjack Oak | <i>Quercus marilandica</i> | | 25% | 75% | | | 4 | 0.8% | 92.3% |
| Bigelow Oak | <i>Quercus sinuata var. breviloba</i> | 50% | 25% | 25% | | | 4 | 0.8% | 93.1% |
| Callery Pear | <i>Pyrus calleryana</i> | 67% | | 33% | | | 3 | 0.6% | 93.8% |
| Bur Oak | <i>Quercus macrocarpa</i> | 100% | | | | | 3 | 0.6% | 94.4% |
| Mescalbean | <i>Sophora secundiflora</i> | 100% | | | | | 3 | 0.6% | 95.0% |
| Silver Maple | <i>Acer saccharinum</i> | | | 100% | | | 2 | 0.4% | 95.4% |
| Chittamwood | <i>Bumelia lanuginosa</i> | 100% | | | | | 2 | 0.4% | 95.8% |
| Pecan | <i>Carya illinoensis</i> | | 100% | | | | 2 | 0.4% | 96.2% |
| Chinaberry | <i>Melia azedarach</i> | | 50% | 50% | | | 2 | 0.4% | 96.6% |
| American Sycamore | <i>Platanus occidentalis</i> | 100% | | | | | 2 | 0.4% | 97.0% |
| Chinkapin Oak | <i>Quercus muehlenbergii</i> | 100% | | | | | 2 | 0.4% | 97.4% |
| Prairie Sumac | <i>Rhus lanceolata</i> | 100% | | | | | 2 | 0.4% | 97.8% |
| Mexican Buckeye | <i>Ungrandia speciosa</i> | 100% | | | | | 2 | 0.4% | 98.2% |
| Chaste Tree | <i>Vitex agnus-castus</i> | 100% | | | | | 2 | 0.4% | 98.6% |
| Arizona Ash | <i>Fraxinus velutina</i> | | 100% | | | | 1 | 0.2% | 98.8% |
| Yaupon | <i>Ilex vomitoria</i> | 100% | | | | | 1 | 0.2% | 99.0% |
| Chinese Pistache | <i>Pistacia chinensis</i> | 100% | | | | | 1 | 0.2% | 99.2% |
| Eastern Cottonwood | <i>Populus deltoides</i> | | | | 100% | | 1 | 0.2% | 99.4% |
| Carolina Laurelcherry | <i>Prunus caroliniana</i> | | 100% | | | | 1 | 0.2% | 99.6% |
| Durand Oak | <i>Quercus durandii</i> | | 100% | | | | 1 | 0.2% | 99.8% |
| Baldcypress | <i>Taxodium distichum</i> | 100% | | | | | 1 | 0.2% | 100.0% |

Total Number of Public Trees Sampled: 496

Total Number of Species Sampled: 35

Appendix C: Tree Replacement Values, by Species

*Values are calculated for each tree in the sample using its recorded condition class rating, an average DBH for its assigned class, an average location rating of 70%, and the Austin/Central Texas 'Basic Price' (\$62 per square-inch) for a 3-inch caliper specimen, installed and guaranteed for one year. Values for palm species are calculated using an average height in 'brown trunk feet' (BTF) and a Basic Price for that species. Species ratings for species marked with # were determined by the regional forester.

| Tree Species | Species Rating # | Average DBH/BTF | Estimated No. Trees | Average Tree Value* | Total Value | Percent |
|--------------------------|------------------|-----------------|---------------------|------------------------|---------------------|---------|
| Texas Live Oak | 85% | 11.8" | 4,779 | \$2,706.70 | \$12,935,489 | 69.8% |
| Post Oak | 80% | 13.5" | 592 | \$3,864.02 | \$2,287,871 | 12.4% |
| Cedar Elm | 78% | 7.4" | 1,057 | \$980.65 | \$1,036,852 | 5.6% |
| Ashe Juniper | 87% | 7.8" | 508 | \$1,177.80 | \$597,746 | 3.2% |
| Sugarberry | 65% | 6.1" | 402 | \$565.33 | \$227,137 | 1.2% |
| Common Crapemyrtle | 80% | 3.2" | 1,036 | \$216.82 | \$224,661 | 1.2% |
| Blackjack Oak | 67% | 13.6" | 85 | \$2,347.72 | \$198,583 | 1.1% |
| Eastern Cottonwood | 67% | 25" | 21 | \$8,564.18 | \$181,101 | 1.0% |
| Bigelow Oak | 70% | 8.8" | 85 | \$1,443.55 | \$122,103 | 0.7% |
| Silver Maple | 45% | 15" | 42 | \$2,760.99 | \$116,769 | 0.6% |
| Chinaberry | 53% | 12" | 42 | \$1,972.78 | \$83,434 | 0.5% |
| # Possumhaw | 90% | 3" | 296 | \$220.88 | \$65,391 | 0.4% |
| Callery Pear | 60% | 9" | 63 | \$1,018.50 | \$64,612 | 0.3% |
| Pecan | 68% | 8" | 42 | \$1,186.75 | \$50,191 | 0.3% |
| Mexican White Oak | 80% | 3" | 211 | \$186.52 | \$39,443 | 0.2% |
| Texas Red Oak | 65% | 4.8" | 85 | \$403.24 | \$34,108 | 0.2% |
| Durand Oak | 80% | 8" | 21 | \$1,396.17 | \$29,524 | 0.2% |
| # Rusty Blackhaw | 80% | 3" | 148 | \$196.34 | \$29,063 | 0.2% |
| Texas Persimmon | 93% | 3" | 127 | \$218.73 | \$27,752 | 0.1% |
| # Carolina Laurelcherry | 70% | 8" | 21 | \$1,221.65 | \$25,833 | 0.1% |
| Desert-Willow | 86% | 3" | 106 | \$211.06 | \$22,316 | 0.1% |
| Arizona Ash | 71% | 8" | 21 | \$929.33 | \$19,652 | 0.1% |
| Texas Redbud | 45% | 3" | 148 | \$102.55 | \$15,180 | 0.1% |
| Shumard Oak | 80% | 3" | 106 | \$127.62 | \$13,493 | 0.1% |
| Bur Oak | 86% | 3" | 63 | \$211.06 | \$13,389 | 0.1% |
| Mescalbean | 73% | 3" | 63 | \$179.16 | \$11,366 | 0.1% |
| # Prairie Sumac | 80% | 3" | 42 | \$196.34 | \$8,304 | 0.0% |
| Chittamwood | 78% | 3" | 42 | \$191.43 | \$8,096 | 0.0% |
| # Mexican Buckeye | 70% | 3" | 42 | \$171.79 | \$7,265 | 0.0% |
| # Chaste Tree | 80% | 3" | 42 | \$147.25 | \$6,228 | 0.0% |
| Chinkapin Oak | 80% | 3" | 42 | \$122.71 | \$5,190 | 0.0% |
| # Yaupon | 100% | 3" | 21 | \$245.42 | \$5,190 | 0.0% |
| Chinese Pistache | 86% | 3" | 21 | \$211.06 | \$4,463 | 0.0% |
| American Sycamore | 60% | 3" | 42 | \$92.04 | \$3,892 | 0.0% |
| Baldcypress | 80% | 3" | 21 | \$147.25 | \$3,114 | 0.0% |
| Estimated Totals: | | | 10,485 | Avg: \$1,767 ea | \$18,524,801 | |