



*Street Tree Inventory
Report and Recommendations*

City of Grapevine, TX



May 2010



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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 2008, Texas Forest Service foresters, city of Grapevine staff and local Master Gardener and Master Naturalist volunteers conducted a sample tree inventory of 72 randomly selected street segments covering 18.6 miles (or 8.5% of the total street miles maintained by the city).

Results include:

- * Grapevine has approximately 9,797 public trees that occupy 43% of the sites available for street and median trees.
- * The population is dominated by crapemyrtle (20%) and post oak (18%).
- * Most trees are mid-sized with 36% of trees in the 7-12" diameter range and less than 2% of trees larger than 24" diameter.
- * Three-quarters of street trees are in good condition and 72% require only routine care.
- * An estimated 3,700 public trees and 3,200 private trees have limbs that encroach into clear zones above streets and sidewalks.
- * Street trees in Grapevine are valued at more than \$18 million.

Recommendations include:

- * Begin a program of pruning to train and shape young trees.
- * Favor trees other than crapemyrtle in street tree planting projects.
- * Develop a systematic program to prune for safety clearance over roads, sidewalks and traffic signals.
- * Develop an annual work plan for tree maintenance and planting.
- * Continue to hold an annual Arbor Day celebration and involve local groups.

City Description

Located in Tarrant County, Texas, the city of Grapevine sits 26 miles northeast of Fort Worth. It is bordered by the Dallas-Fort Worth International Airport to the south and east, Grapevine Lake to the north and the city of Southlake to the west.

Situated in the state's Cross Timbers ecoregion, Grapevine was settled in the mid 1800s when farmers and ranchers began converting the most productive bottomlands and native prairies to farms and rangeland. The move left pockets of native cross timbers vegetation, dominated by post oak trees.

The opening of the airport in 1974 spurred enormous growth in the city and nearby towns. Census figures for Grapevine show a pattern typical of cities nestled north of the airport: 2,821 in 1960, 7,023 in 1970, 11,801 in 1980, 29,202 in 1990 and 42,059 in 2000. By 2007, the population had reached 49,635, though the rate of growth now is slowing as the remaining vacant land in the city is developed.

Despite the population surge, Grapevine is a family-friendly community. Outdoor recreation opportunities abound at nearby Grapevine Lake, festivals are frequent and the historic downtown area gives the city a certain "small town" charm. It's close proximity to major employers in Fort Worth and Dallas also make commuting convenient. In 2007, the city was rated by CNNMoney.com as one of "America's Best Places to Live."

Current Tree Management

Tree management in Grapevine is guided by a professional forester (Joe Moore) within the Parks & Recreation Department. The department's duties include managing street trees, but such work is not always a top priority. Other duties include landscaping projects, holiday decorations, special events, maintenance and a variety of other tasks. There is no single person whose sole responsibility is tree care.

The department's annual tree budget is approximately \$150,000 (from the general fund), which includes a budget of \$110,000 for contract tree work. Pruning is conducted both on an emergency basis and through citizen requests and is performed in-house as well as by private contractors. About 10% of the wood waste generated from this activity is currently recycled, with 5% provided to the general public and 5% sold to outside vendors. Safety and technical training for city staff often is provided by the Texas Forest Service regional urban forester assigned to this area.

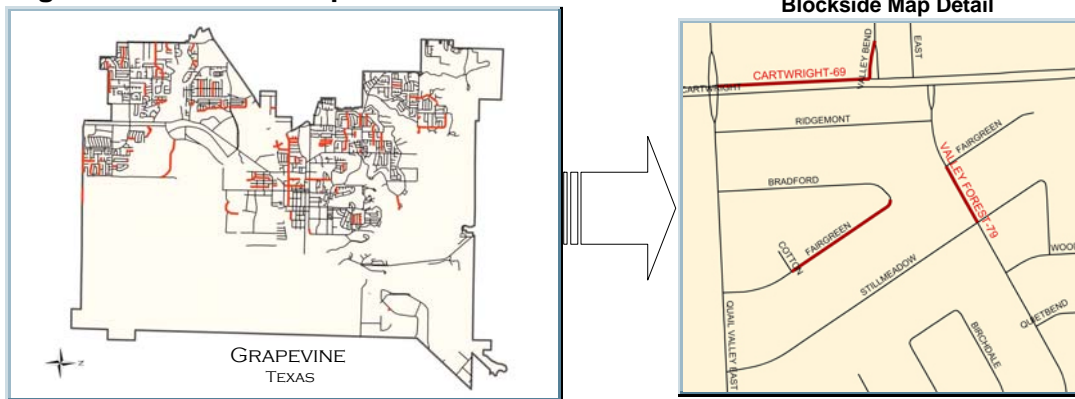
Grapevine has a tree preservation ordinance for properties undergoing new development and it generates mitigation fees used to fund replanting projects. In addition, the city's landscaping ordinance requires the planting of new trees. The city's Tree Sharing program and the Living Legacy program also provide mechanisms to plant new trees. In 2004, the city planted 1,125 trees, and this increased to 3,175 by 2006.

Keep Grapevine Beautiful is a key partner in various tree planting activities and is particularly supportive of the annual Arbor Day observance. This event is a critical component for maintaining the National Arbor Day Foundation's Tree City USA designation, which Grapevine first received in 1986, making it one of the earliest recipients of this award in Texas.

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, as well as those 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 also are surveyed for available planting spaces, both within the ROW and median as well as within 30 feet of the roadway on private property, since private trees in this zone also provide public benefits. 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):	218.55 (729)
Miles Sampled (# blocksides):	18.56 (72)
Sample Size:	8.5% (9.9%)
Estimated Total Public Trees:	9,797
Standard Error (SE): +/-	1,251
Standard Error Percent:	12.8%

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, which is what urban foresters call stocking. These key measures will guide the recommendations at the end of the report.

Stocking

Every city has a designated amount of street miles to maintain. A model residential street has trees planted along both sides of the ROW, often between the curb and sidewalk. Larger collector streets and boulevards also may have medians that are wide enough to support street trees. If all planting spaces are filled with the largest trees 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, 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:	7,932	<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: +	1,865	
Estimated Total No. Street Trees:	9,797	
Total Street Miles:	218.55	
Estimated Stocking (trees/mile):	44.83	
% Stocking:	43%	
Median/ROW Planting Spaces:	21,290	
Private Yard Planting Spaces: +	10,139	
Total Planting Opportunities:	31,429	

Key findings:

Grapevine has an estimated street tree stocking level of 43%, which leaves ample opportunities for increasing street tree cover. To reach full stocking, the city would need to plant new trees in many of the estimated 21,000 planting spaces available along medians and ROWs. To reach just 80% of full stocking within the next five years, the city would need to plant more than 8,500 trees as well as replace all trees removed during that period.

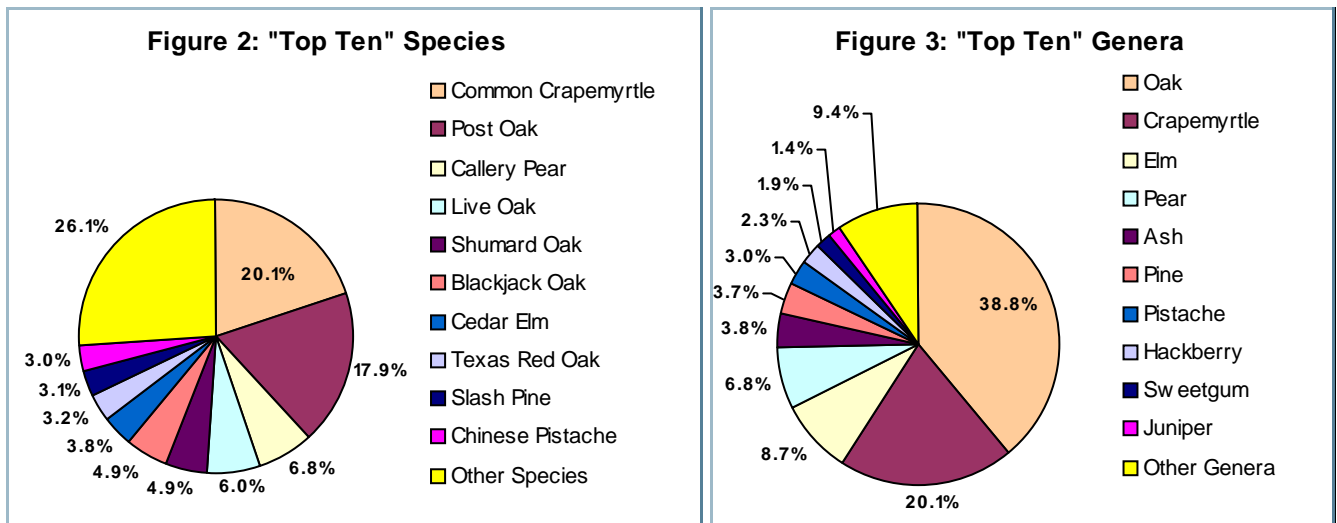
In addition, private homeowners have space in their front yards to plant another 10,000 trees within 30 feet of the curb. Since these owners provide tree maintenance, either individually or through their homeowner associations, Grapevine can realize the added benefits of trees over streets and sidewalks without the associated increase in management costs.

However, filling many of the planting sites on ROWs and medians will be challenging. Planting strips or "tree lawns" between the curb and sidewalk that are less than four feet wide can prevent the planting of shade trees along new streets. Utility easements also may occupy the spaces normally reserved for street trees.

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 during an outbreak of insects or disease – like the stories of Dutch Elm disease in the Eastern U.S. or 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 10th place), plus a category combining the remaining species or genera. A complete list of species encountered during the inventory is listed in Appendix B.



Key findings:

The population of street trees in Grapevine is dominated by four species: crapemyrtle (20%), post oak (18%), callery pear (7%) and live oak (6%). These four species combine to account for over 50% of ROW and median trees. Only post oak represents the pre-development forest into which city streets have been constructed; the others were planted as new streets and subdivisions were built. Not counting the two most common trees – crapemyrtle and post oak – Grapevine has a diverse species distribution with no other species approaching the recommended 10% limit. The remaining street tree population is much more diverse and includes 48 additional species encountered during our survey.

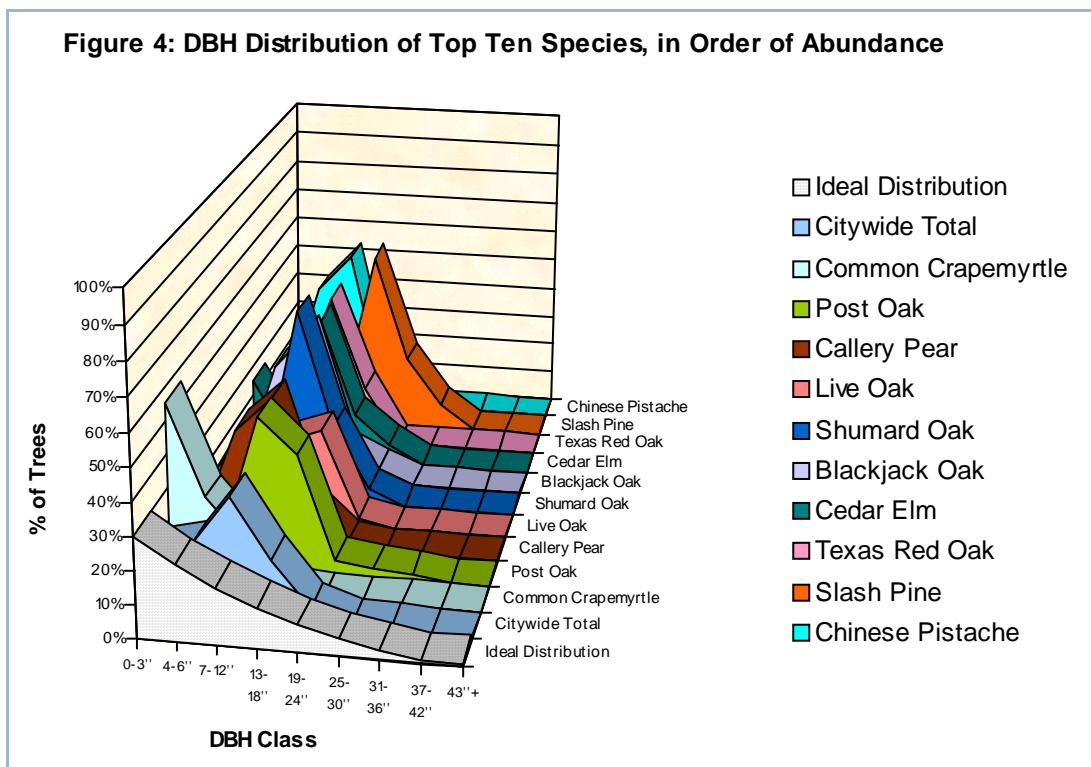
One challenge in Grapevine will be to increase diversity within the 'small tree' category. Right now, just two species dominate the landscape, but adding accent trees such as Mexican plum, Eve's-necklace, possumhaw, yaupon holly and Texas redbud can provide seasonal interest and color beyond crapemyrtles and flowering pears.

Though already above the recommended percentage (20%) for a street tree population, it may not be wise to completely avoid planting more oaks. This genus includes several well-adapted species that perform well in urban settings. A good strategy to ensure a long-lived, shady tree canopy would be to replace existing post oaks that inevitably will die with chinkapin oak, Shumard oak and perhaps Lacey oak.

Size

Tree diameter – also called diameter at breast height (DBH) – is measured on the trunk, 4.5 feet off the ground. This sample inventory assigned each tree to one of nine size classes as detailed in Appendix B (palms are assigned to a class by feet of clear trunk height). The 10 most prevalent species are displayed as a graph in Figure 4 (below).

The distribution of street trees by size is a good indicator of tree age, since large trees are usually older than small trees. But species composition also can influence the size class distribution because small-statured species will never grow into the larger classes. Taking into account mortality rates, which 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 larger size classes. This survey report sets a target distribution of 30% young trees (0-3" DBH), 40% maturing trees (4-12" DBH), 20% mature trees (13-24" DBH), and 10% old trees (>24" DBH).



Key findings:

The citywide size distribution of street trees reflects the changing landscape brought about by the growth of Grapevine over the years. Native species such as post oak still dominate the 'mature' size category, while small-statured ornamental trees like crapemyrtle dominate the 'young' category (Figure 4). A wave of tree planting a decade or two ago combined with a subsequent dropoff in recent plantings might partially explain the relatively low numbers in the smallest size class.

The distributions for individual species offer additional insight (see Appendix B for detail). For instance, slash pine was commonly planted in the Metroplex 20 years ago but has fallen out of favor more recently, leading to a distribution of mostly mature trees. The curve for callery pear (sometimes referred to as 'Bradford' pear) shows that fewer numbers of this species are being planted now. The curve also shows that the trees are approaching the end of their natural life span, thus making them more susceptible to damage from storm events during the coming years.

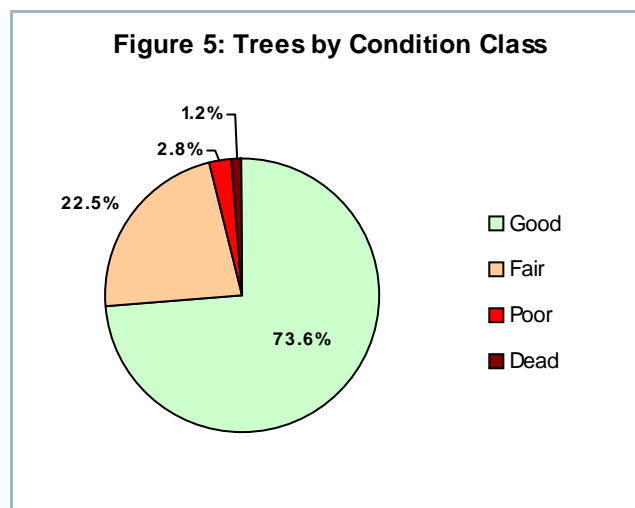
Street Tree Care

The care and maintenance practices for street trees – or lack thereof – 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 an overall assessment of the tree, including its health and structural soundness. It did not rate each individual part 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 survey.



Key findings:

The majority of street trees in Grapevine are well cared for, with almost three-quarters (74%) in good condition. If proper maintenance continues, these trees can remain in good health and produce increasing economic and environmental benefits for years to come.

But 23% of street trees are only in fair condition. These are trees that usually can 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 impacts of road construction and have the scars to prove it. Injuries to the trunk, branches or root systems could cause a tree to be rated as fair instead of good. Or, these trees could be new plantings that have not received proper care or sufficient water.

A small number of trees were rated poor (3%) 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 (1%) were discovered, which is a sign of an effective monitoring and removal program. All dead trees should be located and removed each year.

Maintenance

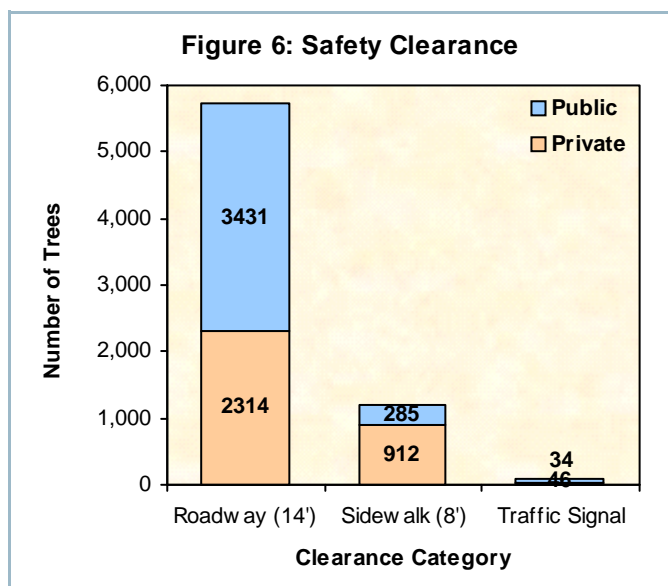
Tree maintenance is the primary responsibility of the street tree manager. A prudent manager will schedule the removal or repair of trees that pose a risk to the public, as well as improve tree health and reduce future maintenance costs. This sample inventory evaluated ROW and median trees and assigned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

Table 3: Maintenance Needs

Treatment	Description	Estimate	Percent
Prune-Immediate	Dangerous broken branches and/or large deadwood. Presents safety risk to persons or property. Pruning should be accomplished as soon as resources are available.	12	0.1%
Prune-High Priority	Broken branches or deadwood, but no apparent immediate safety risk to persons or property. Prune as soon as resources are available.	224	2.3%
Prune-Routine	Routine, ongoing pruning should be scheduled on a cycle of five to seven years to remove dead, dying or diseased branches.	7,018	71.6%
Prune-Training	Recent plantings require pruning that develops a strong central leader and scaffold limbs, while eliminating trunk sprouts and dead, crossing, diseased or weak branches.	1,861	19.0%
Remove-Immediate	Trees should be removed ASAP because their condition and proximity to active-use areas pose an apparent risk to persons or property.	35	0.4%

Clearance

One important aspect of a tree maintenance program is to create a safe clearance over streets and sidewalks and ensure the visibility of traffic signs and signals for the public as well as emergency vehicles. Even though a tree may be located on adjacent private property, it is the city's responsibility to ensure that necessary 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 distance standard.



Key findings:

Because Grapevine has quite a number of small trees along its streets, training pruning is required for more than 1,850 trees (19%). 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 35 street trees in the city need to be removed immediately; another 12 trees require immediate pruning. These trees were reported to city officials as soon as they were discovered and may have been already treated.

Safety clearance over sidewalks (8') and streets (14') is one area of concern. While our estimates show that some 80 trees obstruct street signs or signals, an estimated 3,700 public trees and 3,200 private trees have limbs that encroach into the 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 undoubtedly carries the burden of cost. But these trees also deliver valuable returns to a community, and in recent years many of these values have been quantified. Street trees stabilize neighborhoods and add value to adjacent real estate, thus improving the property tax base. They reduce air and water pollution, increase the energy efficiency of nearby buildings, sequester carbon and can even lower medical costs. The aesthetic benefits of street trees are harder to quantify, but they are just as important if you ask most citizens. New research aims to quantify the health benefits for 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. Investing in a tree maintenance program can actually deliver a positive return to a city when the full benefits of trees are considered.

Tree Replacement Value

One 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% and recorded DBH class values and condition ratings, as well as 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:	9,797
Estimated Total Value:	\$18,399,374
Average Tree Value:	\$1,878 ea.

Key findings:

Street trees in Grapevine have a landscape value totalling more than \$18 million, which is an average of \$1,878 per tree. Considering the number of healthy trees that will continue to grow over time, city leaders can expect increasing value from street trees for many years to come.

Appendix C illustrates the value of large trees. Even a tree with a low species rating such as pecan has a high average value (\$6,382/tree) because the average DBH is over 20 inches. Conversely, crapemyrtles represent 20% of the total street tree population, but because the average size is so small (4.8" DBH) they represent less than 5% of total value (\$439/tree). Unfortunately, this species simply won't grow much beyond this average DBH, meaning its value contribution won't increase much either.

And it's no surprise that post oak is the most valuable species in Grapevine, since the city is situated within the Cross Timbers ecological region where post oaks are the dominant species. In fact, post oak represents 18% of all street trees, but accounts for 29% of total tree value due to the large average size. However, construction activity, drought and disease – particularly hypoxylon canker – often impact this species very hard during the summer months. Making plans for removing and replacing these trees as they decline and die will be an important part of a long-range management plan for street trees.

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 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 21,000 public tree planting sites available, some sort of formal streetscape program should be implemented and budgeted to plant trees in appropriate locations along streets and medians. Even a small program will ensure that some new trees are added each year to replace those that die and must be removed. A second option would be to focus on the 10,000 planting sites on private property, within 30 feet of the curb. This sort of "NeighborWoods" program could bring together civic groups, homeowners associations and businesses to distribute trees that citizens can plant in their front yards.

Whether grown in-house or purchased from commercial nurseries, species to consider planting along streets include live oak, chinkapin oak, Mexican white oak, baldcypress, cedar elm, thornless honeylocust, bigtooth maple, Eve's-necklace, Texas redbud, Mexican plum and yaupon holly. At this time, we recommend limiting the planting of crapemyrtles since they already represent the most common street tree in the city.

Maintenance: lower the risk to the public from trees

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

From our survey, more than one-third of all public street trees require pruning for safety clearance over roads and sidewalks, so the second priority should be to develop a systematic plan to visit each neighborhood on a regular cycle. Based on our estimates, tree crews would need to visit between 1,000 and 1,400 trees per year to conduct routine safety pruning on existing trees larger than 6" DBH. This systematic approach will keep these trees healthy and allow city staff to notify the owners of the estimated 3,200 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 (less than 6" DBH). An estimated 1,861 trees require this maintenance investment, which will prevent poor branching and greatly reduce future maintenance costs. Young tree training pruning requires few specialized tools and can be easily taught to staff members or volunteers. Other basic maintenance practices such as watering, mulching and fertilizing also can improve young tree health and survival.

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

Short-Term Recommendations, cont'd

Policy: review ordinances, standards and training

Review local tree ordinances to clarify the role of city departments in caring for street trees. A public tree care ordinance is one of the four required standards for maintaining Tree City USA status. The ordinance also can set standards for locating new plantings and define the role individuals, groups and businesses will play when 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 be used to support your Tree City USA recertification application each year. 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. The Texas Forest Service urban forester assigned to your region can help schedule training classes, workshops and other educational opportunities.

Community Support: get the public involved

Use the already well-established Tree City USA framework to build support for your tree management program and consider applying for a Growth Award to gain recognition for new initiatives. Continue to sponsor an energetic Arbor Day celebration and involve citizens in planning the event. Arbor Day also can provide opportunities to involve Keep Grapevine Beautiful and other community organizations. These groups can be great partners that support and advocate for tree issues in the community. Your Texas Forest Service regional urban 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 often are willing to donate towards activities with a strong public benefit such as planting and caring for trees. In this era of increasing awareness on issues like global climate change, many companies are looking for opportunities to invest in local communities.

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 to city leaders the need for an ongoing maintenance budget. This plan will identify street tree priorities, goals and objectives, and it can help integrate street trees into city infrastructure. As part of the plan, consider a "green infrastructure" fund (1-2%) to pay for new trees on all city capital improvement projects. Other possibilities for diversifying program funding include stormwater or transportation fees, utility bill "check off" programs, or even energy efficiency grants provided by your local electric utility.

Conduct a 100% inventory of street trees, which will allow for more efficient management and maintenance of this important part of the community's urban forest. Such an inventory then can be used to conduct a more thorough analysis of the city's trees with help from the i-Streets or i-Eco tools (provided by the U.S. Forest Service) or CityGreen (provided by American Forests). These tools can calculate the ecosystem benefits trees provide 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				Maintenance					Clearance Issues			
			0-3	4-6	7-12	13-18	19-24	25-30	31-36	37-42	43+	Class/Rating				Prune			Remove		TS*	R	S	N/A		
												G	F	P	D	PI*	PH	PR	PT	RI*					R	
1	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
2	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
3	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
4	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
5	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
6	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
7	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
8	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
9	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
10	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
11	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
12	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
13	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
14	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
15	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
16	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
17	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
18	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
19	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
20	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
21	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
22	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
23	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
24	M PVT		1	2	3	4	5	6	7	8	9	G	F	P	D	PI*	PH	PR	PT	RI*	R	TS*	R	S	NA	
25	M PVT		1	2	3	4	5	6	7	8	9	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 Median or ROW: _____

Private Yards (<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. The survey is taken by walking or driving up one side of the block and down the other. All trees are counted in ROW and medians (if applicable) for residences, businesses, parks and other maintained areas. Only survey trees over 6 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: Circle 'M' if tree is in a center median strip. Mark map to indicate the total length of the median on the blockside.

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

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

DBH Class: Measure or estimate DBH and assign to one of the following classes: 1 (0-3), 2 (4-6), 3 (7-12), 4 (13-18), 5 (19-24), 6 (25-30), 7 (31-36), 8 (37-42), 9 (43+). If forked, take diameter at narrowest point below fork. If multi-stemmed (i.e. crape myrtles), average the diameters of stems over 1" at DBH. For palm species, assign to class based on feet of clear trunk height (from ground to base of live crown).

Condition Class: Condition addresses the current state of the tree's health, structural soundness, shape, and growth rate. Rate 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:

Good: Trees in this class are judged to be desirable and with regular maintenance can retain this classification. They have few signs of physical damage, decay, disease or insect damage, or deadwood in the crown, limbs or trunk, although they may be interfering with utility lines or are planted in an overcrowded location.

Fair: Trees in this category have visible signs of stress, including one or more of the following: thinning canopy or small leaves; premature fall coloration; limited insect or disease infestation; structural faults or poor form; mechanical stem damage, including evidence of past 'topping'; deadwood >2" in the crown, limbs or trunk.

Poor: Trees in this group are in a general state of decline, exhibiting major disease or insect damage, physical defects, over 50% of the crown has deadwood or other serious defects, or bark may be beginning to peel. Priority pruning is likely required (i.e., large dead wood is present that could cause significant harm or damage).

Dead: Trees in this category are either already dead or in such very poor condition that removal is warranted. These trees have over 90% dead branches and have completely succumbed to insects, pathogens, or nutritional deficiencies. Little or no live foliage is visible during the growing season.

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 (or other hardscapes for parks and public facilities besides streets).

N/A: No Clearance Issues.

Planting Sites: Medium or large trees to be planted if room. Under power lines, only small trees to be planted. Minimum 4-foot tree lawn needed to plant a tree. Record the number of planting spaces in Public ROW or Median. Also record number of planting spaces in Private Front Yards within 30' of ROW edge.

Distances From:

Utilities – overhead (15'); Hydrants, utility poles, and light posts (10'); Intersections (measured from corner) (25'); Driveways (5'); Other trees: 20-50'

TFS January 2007 PDS

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

Common Name (Scientific Name)	Distribution by DBH Class									Tree Count	% of Total	Running %
	0-3	4-6	7-12	13-18	19-24	25-30	31-36	37-42	43+			
Common Crapemyrtle (<i>Lagerstroemia indica</i>)	56%	28%	15%	1%						167	20.1%	20.1%
Post Oak (<i>Quercus stellata</i>)	1%	9%	46%	36%	4%	2%	1%			149	17.9%	38.0%
Callery Pear (<i>Pyrus calleryana</i>)	5%	35%	46%	12%	2%					57	6.9%	44.8%
Live Oak (<i>Quercus virginiana</i>)	14%	28%	26%	30%	2%					50	6.0%	50.8%
Blackjack Oak (<i>Quercus marilandica</i>)		37%	49%	10%	5%					41	4.9%	55.8%
Shumard Oak (<i>Quercus shumardii</i>)	2%	7%	61%	24%	5%					41	4.9%	60.7%
Cedar Elm (<i>Ulmus crassifolia</i>)	25%	6%	47%	16%	6%					32	3.8%	64.5%
Texas Red Oak (<i>Quercus buckleyi</i>)	15%	19%	48%	19%						27	3.2%	67.8%
Slash Pine (<i>Pinus elliottii</i>)		4%	8%	58%	23%	8%				26	3.1%	70.9%
Chinese Pistache (<i>Pistacia chinensis</i>)	4%	40%	52%	4%						25	3.0%	73.9%
American Elm (<i>Ulmus americana</i>)			13%	42%	33%	4%	4%	4%		24	2.9%	76.8%
Sugarberry (<i>Celtis laevigata</i>)		5%	47%	42%	5%					19	2.3%	79.1%
White Ash (<i>Fraxinus americana</i>)	25%	50%	25%							16	1.9%	81.0%
Sweetgum (<i>Liquidambar styraciflua</i>)	13%	19%	69%							16	1.9%	82.9%
Eastern Redcedar (<i>Juniperus virginiana</i>)	8%	17%	58%	17%						12	1.4%	84.4%
Chinese Elm (<i>Ulmus parvifolia</i>)	17%	25%	42%	17%						12	1.4%	85.8%
Bur Oak (<i>Quercus macrocarpa</i>)	9%	64%	27%							11	1.3%	87.1%
Baldcypress (<i>Taxodium distichum</i>)	27%	18%	18%	36%						11	1.3%	88.5%
Arizona Ash (<i>Fraxinus velutina</i>)	20%	20%	30%	10%	20%					10	1.2%	89.7%
Silver Maple (<i>Acer saccharinum</i>)			67%	33%						9	1.1%	90.7%
Pecan (<i>Carya illinoensis</i>)		22%	11%	11%	33%		22%			9	1.1%	91.8%
Green Ash (<i>Fraxinus pennsylvanica</i>)			100%							6	0.7%	92.5%
Catalpa (<i>Catalpa species</i>)	20%		40%	20%	20%					5	0.6%	93.1%
Southern Magnolia (<i>Magnolia grandiflora</i>)	80%		20%							5	0.6%	93.8%
White Mulberry (<i>Morus alba</i>)		20%		20%	40%		20%			5	0.6%	94.4%
Eastern Redbud (<i>Cercis canadensis</i>)	75%	25%								4	0.5%	94.8%
Japanese Black Pine (<i>Pinus thunbergii</i>)			100%							4	0.5%	95.3%
Siberian Elm (<i>Ulmus pumila</i>)			50%	25%	25%					4	0.5%	95.8%
Water Oak (<i>Quercus nigra</i>)	33%		33%	33%						3	0.4%	96.2%
Weeping Willow (<i>Salix babylonica</i>)		100%								3	0.4%	96.5%
Chinese Tallowtree (<i>Triadica sebifera</i>)		33%	67%							3	0.4%	96.9%
Common Persimmon (<i>Diospyros virginiana</i>)	50%		50%							2	0.2%	97.1%
Honeylocust (<i>Gleditsia triacanthos</i>)	50%	50%								2	0.2%	97.4%
Yaupon Holly (<i>Ilex vomitoria</i>)		50%	50%							2	0.2%	97.6%
Osage-Orange (<i>Maclura pomifera</i>)			100%							2	0.2%	97.8%
Black Locust (<i>Robinia pseudoacacia</i>)	50%		50%							2	0.2%	98.1%
Black Willow (<i>Salix nigra</i>)		50%			50%					2	0.2%	98.3%
Unknown Species (Unknown species)	50%	50%								2	0.2%	98.6%
Mimosa (<i>Albizia julibrissin</i>)			100%							1	0.1%	98.7%
Chinaberry (<i>Melia azedarach</i>)			100%							1	0.1%	98.8%
Red Mulberry (<i>Morus rubra</i>)			100%							1	0.1%	98.9%
Loblolly Pine (<i>Pinus taeda</i>)				100%						1	0.1%	99.0%
American Sycamore (<i>Platanus occidentalis</i>)					100%					1	0.1%	99.2%
Eastern Cottonwood (<i>Populus deltoides</i>)					100%					1	0.1%	99.3%
Carolina Laurelcherry (<i>Prunus caroliniana</i>)	100%									1	0.1%	99.4%
Mexican Plum (<i>Prunus mexicana</i>)		100%								1	0.1%	99.5%
Chinkapin Oak (<i>Quercus muehlenbergii</i>)		100%								1	0.1%	99.6%
Gum Bumelia (<i>Sideroxylon lanuginosum</i>)			100%							1	0.1%	99.8%
Oriental Arborvitae (<i>Thuja orientalis</i>)		100%								1	0.1%	99.9%
Mexican Fanpalm (<i>Washingtonia robusta</i>)	100%									1	0.1%	100.0%

Total Number of Public Trees Sampled: 832

Total Number of Species Sampled: 50

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 Dallas/Fort Worth 'Basic Price' (\$56 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
Post Oak	80%	12.9"	1,755	\$3,024.26	\$5,306,265	28.8%
American Elm	73%	19.6"	283	\$5,695.53	\$1,609,639	8.7%
Slash Pine	70%	17.2"	306	\$4,889.50	\$1,496,997	8.1%
Live Oak	100%	10.2"	589	\$2,533.97	\$1,491,953	8.1%
Shumard Oak	80%	11.3"	483	\$2,461.18	\$1,188,255	6.5%
Common Crapemyrtle	80%	4.8"	1,967	\$439.00	\$863,311	4.7%
Callery Pear	60%	9"	671	\$1,077.24	\$723,055	3.9%
Cedar Elm	78%	10.1"	377	\$1,808.96	\$681,650	3.7%
Pecan	68%	20.6"	106	\$6,382.02	\$676,369	3.7%
Blackjack Oak	67%	9.6"	483	\$1,301.26	\$628,246	3.4%
Texas Red Oak	65%	9.3"	318	\$1,358.88	\$432,045	2.3%
Chinese Pistache	86%	7.8"	294	\$1,279.39	\$376,638	2.0%
Sugarberry	65%	12.6"	224	\$1,674.68	\$374,688	2.0%
Baldcypress	80%	10.1"	130	\$2,003.99	\$259,580	1.4%
Arizona Ash	71%	11.9"	118	\$2,129.52	\$250,764	1.4%
Eastern Redcedar	87%	9.4"	141	\$1,764.70	\$249,364	1.4%
Chinese Elm	73%	8.8"	141	\$1,400.19	\$197,857	1.1%
White Mulberry	45%	21"	59	\$3,294.47	\$193,972	1.1%
Sweetgum	67%	7.8"	188	\$972.46	\$183,222	1.0%
Catalpa	73%	12.9"	59	\$2,839.93	\$167,210	0.9%
Silver Maple	45%	11.4"	106	\$1,077.88	\$114,234	0.6%
White Ash	80%	5.8"	188	\$566.64	\$106,761	0.6%
Bur Oak	86%	6.2"	130	\$731.26	\$94,721	0.5%
Siberian Elm	51%	14.4"	47	\$1,907.76	\$89,860	0.5%
Eastern Cottonwood	67%	21"	12	\$7,277.45	\$85,696	0.5%
Green Ash	80%	9"	71	\$1,197.02	\$84,574	0.5%
American Sycamore	60%	21"	12	\$6,517.12	\$76,743	0.4%
Water Oak	68%	10.1"	35	\$1,720.90	\$60,794	0.3%
Black Willow	53%	15.3"	24	\$2,281.18	\$53,724	0.3%
Japanese Black Pine	60%	9"	47	\$1,122.21	\$52,859	0.3%
Loblolly Pine	80%	15"	12	\$4,433.42	\$52,206	0.3%
Chinese Tallowtree	66%	7.9"	35	\$1,013.28	\$35,796	0.2%
# Yaupon Holly	70%	7.3"	24	\$913.78	\$21,521	0.1%
Gum Bumelia	78%	9"	12	\$1,556.13	\$18,324	0.1%
Common Persimmon	65%	6.5"	24	\$666.40	\$15,694	0.1%
Southern Magnolia	53%	4.2"	59	\$234.97	\$13,835	0.1%
Osage-Orange	67%	9"	24	\$501.26	\$11,805	0.1%
Weeping Willow	53%	5"	35	\$326.35	\$11,529	0.1%
Red Mulberry	56%	9"	12	\$837.92	\$9,867	0.1%
Chinaberry	53%	9"	12	\$793.03	\$9,338	0.1%
Mimosa	38%	9"	12	\$758.11	\$8,927	0.0%
Chinkapin Oak	80%	5"	12	\$492.60	\$5,801	0.0%
# Oriental Arborvitae	60%	5"	12	\$369.45	\$4,351	0.0%
Mexican Plum	60%	5"	12	\$369.45	\$4,351	0.0%
Eastern Redbud	45%	2.8"	47	\$67.54	\$3,181	0.0%
# Mexican Fanpalm	50%	1.5'	12	\$84.00	\$989	0.0%
# Carolina Laurelcherry	70%	1.5"	12	\$38.79	\$457	0.0%
Black Locust	73%	6.5"	24	\$15.17	\$357	0.0%
Honeylocust	55%	3.7"	24	\$0.00	\$0	0.0%
# Unknown Species	50%	3.7"	24	\$0.00	\$0	0.0%
Estimated Totals:			9,804	Avg: \$1,877 ea	\$18,399,374	