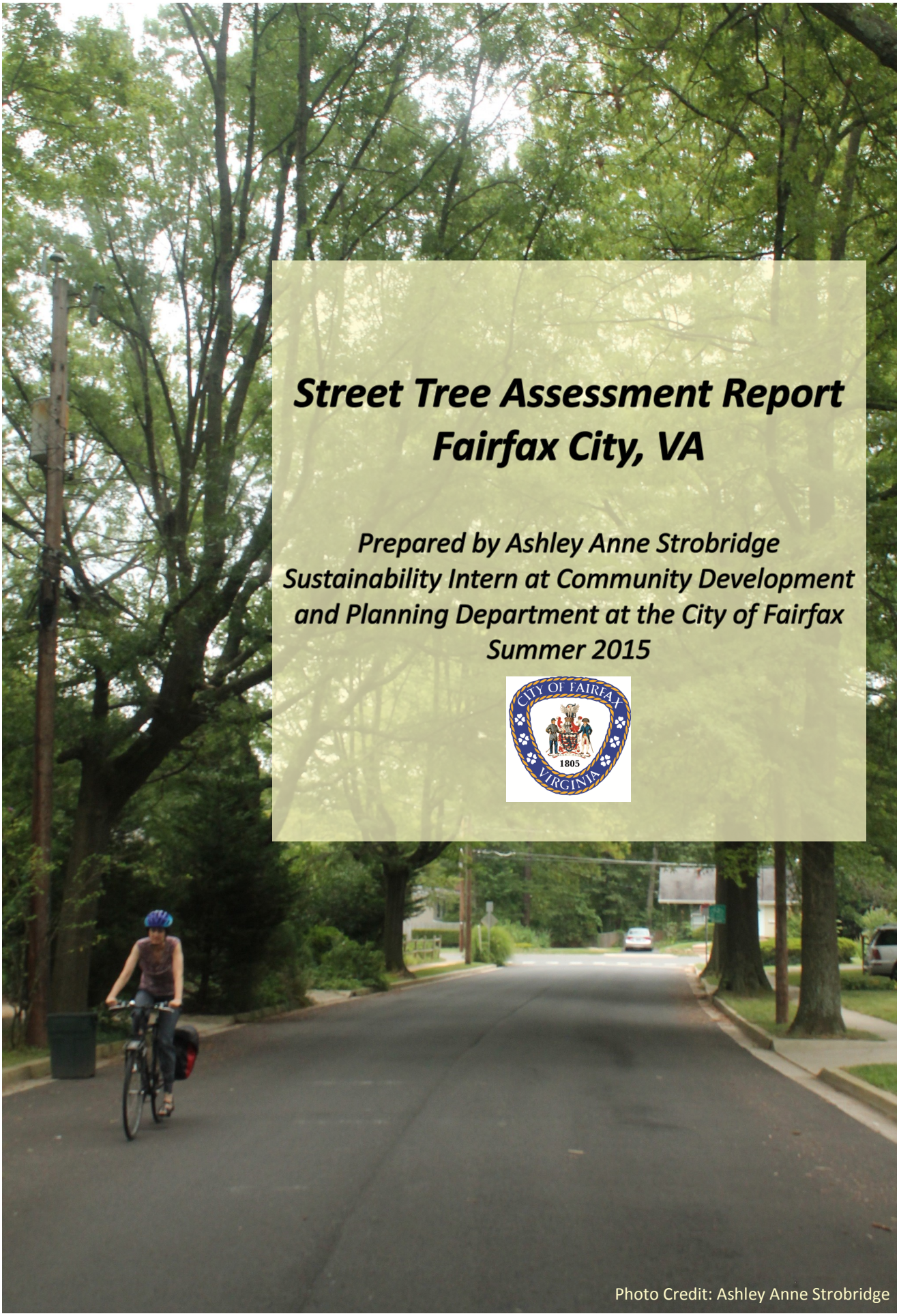

Street Tree Assessment Report Fairfax City, VA

Prepared by Ashley Anne Strobridge
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Summer 2015

Photo Credit: Ashley Anne Strobridge

Overview

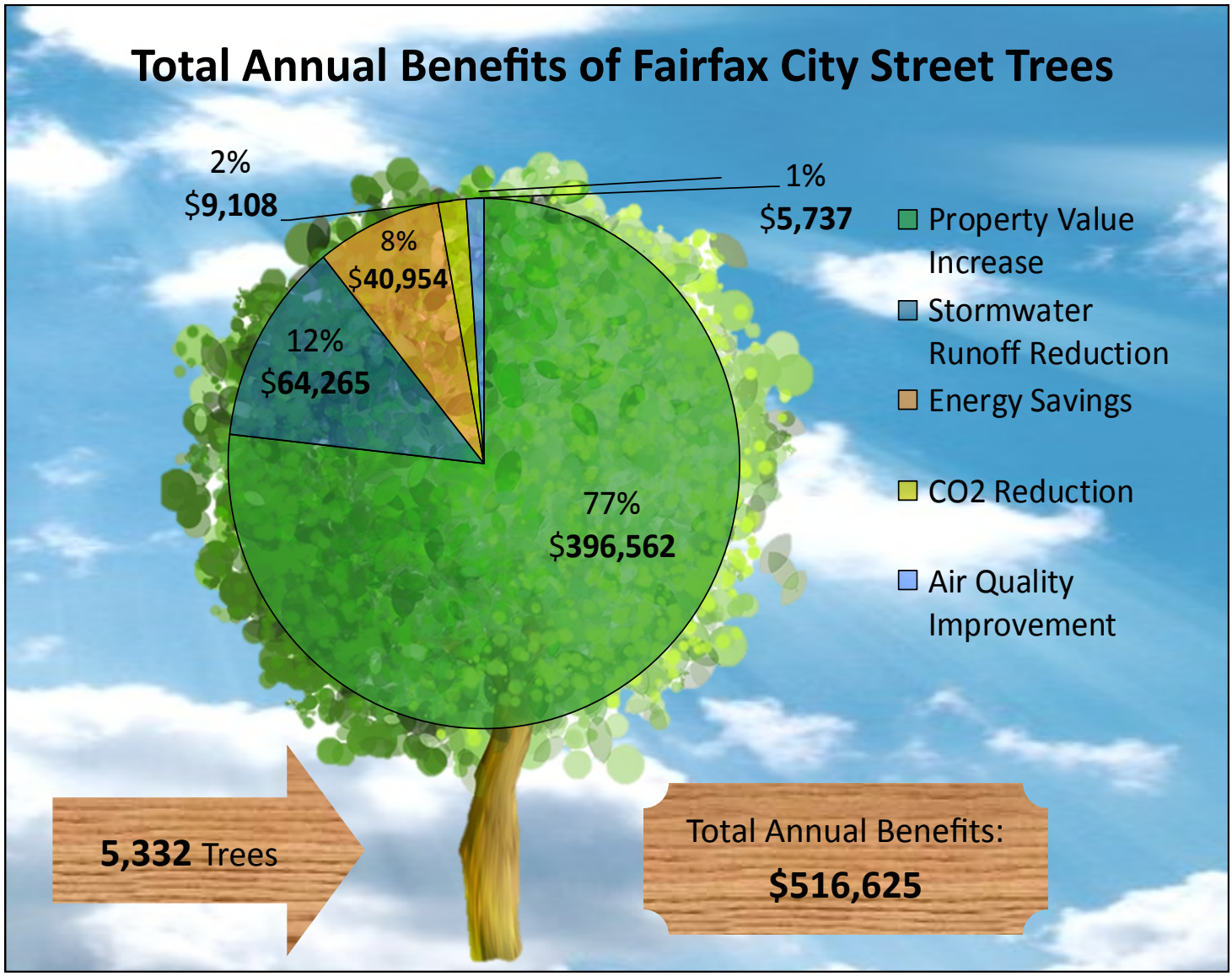
The City of Fairfax's street trees are a community asset that provide over a half of a million dollars of environmental, economic, and aesthetic benefits to the City annually, all while mitigating the effects of urbanization and climate change. The benefits of trees far outweigh their costs, especially over time, highlighting the importance of not only planting trees, but of providing proper ongoing maintenance and protection.

The 2007 and 2011 public street tree survey data was used to assess tree abundance, population composition, functional benefits, and monetary value of the City's public street trees. The data was analyzed using the i-Tree Streets assessment software, developed by the U.S. Forest Service.

Key Findings

- As presented below, the City's street trees generate $516,525 in benefits annually.
- Proper tree management would reduce annual tree maintenance costs, increasing the net benefits of the City's street trees.
- The City has approximately 5,332 public street trees, with the top five most abundant tree species being the Dogwood, Red Maple, Silver Maple, Linden, and Cherry.
- The City's street trees intercept over 6.4 millions gallons of rainfall and sequester over a million pounds of carbon dioxide each year.
- The replacement value of the City's public street trees is over $11.2 million

*Portions of above text courtesy of Eric Wiseman of Virginia Tech Dept. of Forest Resources and Environmental Conservation



Annual Benefits of City of Fairfax Street Trees

Trees Reduce Stormwater Run-off and Improve Water Quality

Trees reduce peak stormwater runoff and associated pollutants entering local water bodies. Trees also reduce stormwater volumes by intercepting a portion of rainfall, which evaporates and never reaches the ground. Tree roots increase rainfall infiltration and storage in the soil. Tree canopies reduce soil erosion by diminishing the impact of raindrops on barren surfaces.

The City's street trees intercept nearly 6.5 million gallons of stormwater per year for an annual savings of **$64,265.**

Trees Reduce Atmospheric Carbon Dioxide

Trees reduce atmospheric carbon by capturing and storing CO_2 as they grow. By reducing demand for heating and cooling, trees indirectly reduce CO_2 by avoiding power plant emissions associated with energy production.

The City's street trees capture over a million pounds of CO_2 per year for an annual savings of **$9,108**.

Trees Improve Air Quality

Trees improve air quality by trapping particulates, absorbing gaseous pollutants, and releasing oxygen. By cooling urban heat islands and shading parked cars, trees indirectly reduce ozone levels. The Environmental Protection Agency recognizes tree planting as an ozone reduction measure in state implementation plans.

The City's street trees remove 449.1 pounds of particulate matter, 484.1 pounds of ozone, 177.1 pounds of nitrogen oxide, and 84.6 pounds of sulfur dioxide per year. The annual savings including indirect costs are **$5,737.**

Trees Save Energy

Trees reduce the demand for energy to heat and cool buildings by providing shade, lowering summertime temperatures, and reducing wind speeds. Secondary benefits are reduced water consumption and pollutants emissions by local power plants.

The City's street trees save over 258 MWh of electricity and nearly eleven thousand Therms of natural gas per year for an annual savings of **$40,954.**

Trees Improve Property Values and Beautify Our Communities

Trees are the single strongest positive influence on scenic quality in our community. They increase the attractiveness of retail business areas. Studies found shoppers are willing to pay up to 11% more for goods and services in a well-landscaped business district. Trees increase property values. People will pay 3-7% more for properties with many trees. Trees foster safer and more sociable neighborhoods. Views of trees ease mental fatigue and stress, help concentration, reduce sickness, and provide settings for recreation and relaxation. Trees also help reduce noise, provide a refuge for wildlife, and help connect residents with their natural environment.

The City's Street Trees increase property values annually by **$396,562**

Diversity Improves Urban Forest Resilience

A diverse palette of trees helps guard against catastrophic loss to insects and diseases or environmental stresses. A general guideline for urban forest diversity is to have no more than 5% of any one species and 10% of any one genus.

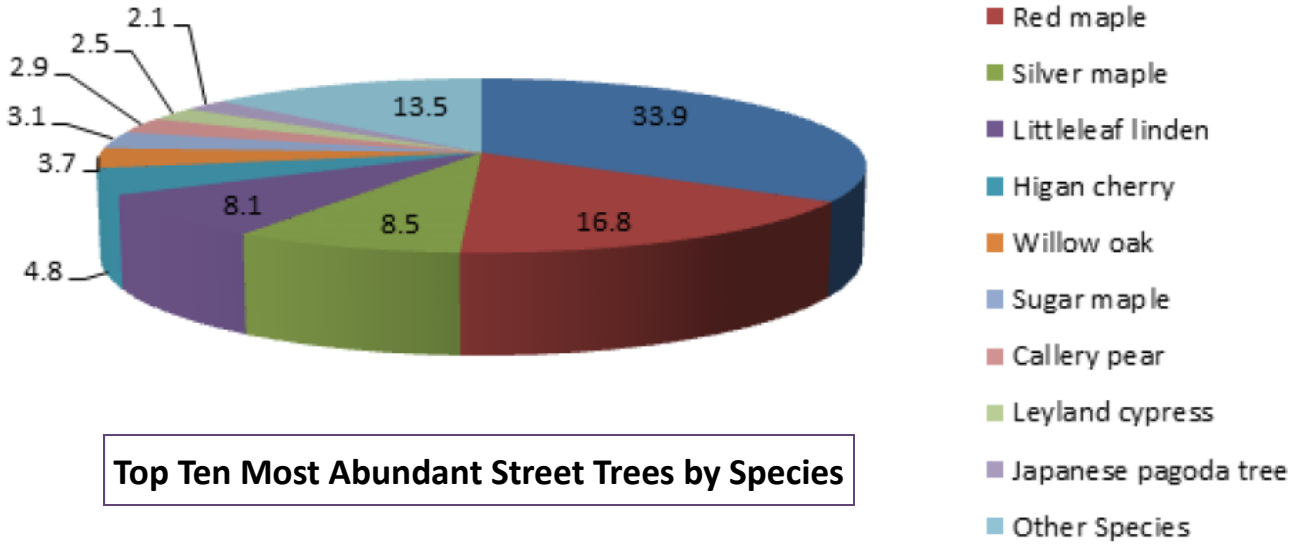
Dogwood and Red Maples make up over 50% of the City's street tree population, posing a threat from diseases like anthracnose. Diseases like this are more likely to affect monocultures, which is where you have a large percentage of one species of plant or tree in an area.

*Above icons and portions of above text courtesy of Wisconsin Department of Natural Resources

Street Tree Abundance, Composition, and Replacement Value

The City of Fairfax has approximately 5,332 street trees. As shown in the pie chart below, over 50% of Fairfax City's street trees are made up of two species: Dogwood and Red Maple. This lack of diversity means that the City is vulnerable to massive tree-loss if a disease, like anthracnose, were to wipe out the City's Dogwoods, which would leave the City with ~34% fewer trees.

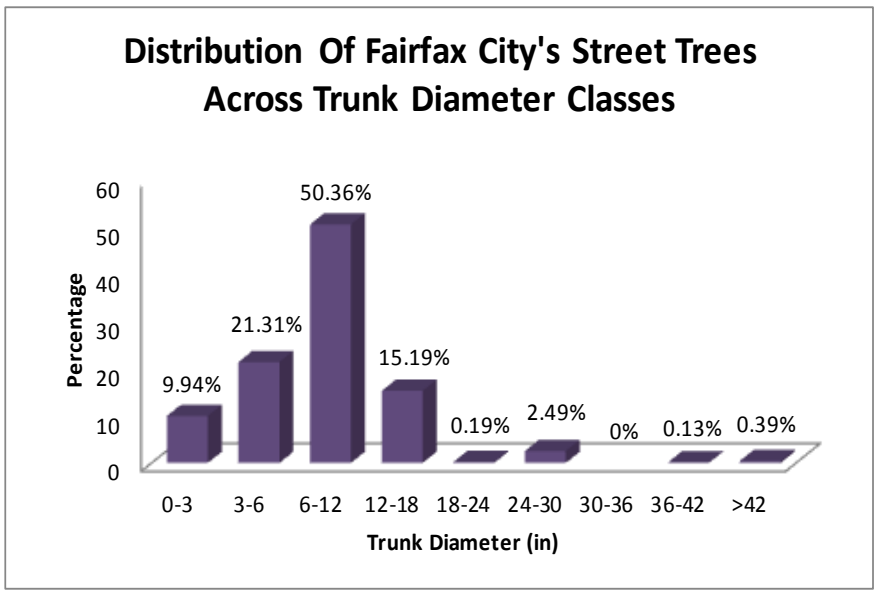
Red Maples are somewhat more resistant to disease, though according to the USDA Forest Service they are susceptible to many trunk rot fungi and stem diseases. Red Maples also make appropriate street trees.

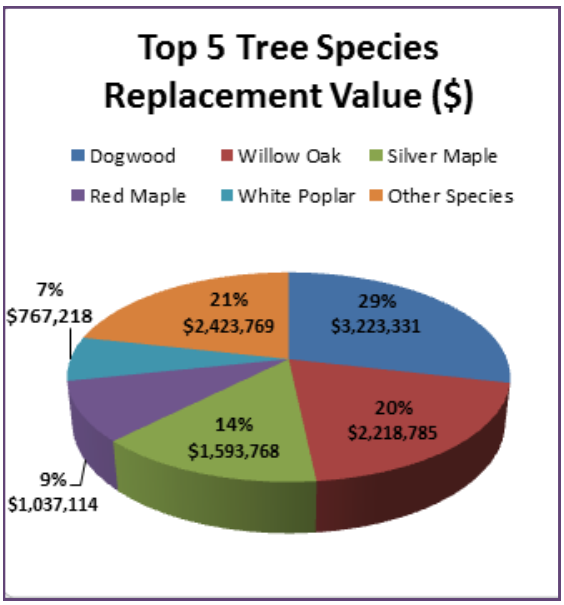


Top Ten Most Abundant Street Trees by Species

As presented in the bar graph below left, the City's street trees are distributed across a wide variety of trunk diameters, though most of the trees are between 3 and 18 inches.

The pie chart below right shows the replacement value of the whole population of City's street trees by species, highlighting the top 5 tree species totals. The Total Replacement Value of all of Fairfax City's Street Trees is **$11,263,985.**





The Benefits of Proper Tree Management

In fiscal year 2015, the City spent approximately $181,705 on tree management, not including administration costs or infrastructure repair costs from tree-related damage. These costs could be greatly reduced with proper tree care and planning, increasing the City's total net benefits from public trees. As presented below, there is currently a net benefit of $334,920 after subtracting the 'Total Maintenance Costs' from the 'Total Benefits'.

Fairfax

Total Annual Benefits, Net Benefits, and Costs for Public Trees

8/6/2015

*$/tree is an average across all species and is not representative of actual costs per tree

Benefits	Total ($)	Standard Error	* $/tree	Standard Error	$/capita	Standard Error
Energy	40,954	(N/A)	7.68	(N/A)	1.66	(N/A)
CO2	9,108	(N/A)	1.71	(N/A)	0.37	(N/A)
Air Quality	5,737	(N/A)	1.08	(N/A)	0.23	(N/A)
Stormwater	64,265	(N/A)	12.05	(N/A)	2.60	(N/A)
Aesthetic/Other	396,562	(N/A)	74.37	(N/A)	16.04	(N/A)
Total Benefits	516,625	(N/A)	96.89	(N/A)	20.89	(N/A)
Costs						
Planting	35,000		6.56		1.42	
Contract Pruning	59,005		11.07		2.39	
Pest Management	1,000		0.19		0.04	
Irrigation	19,200		3.60		0.78	
Removal	2,500		0.47		0.10	
Administration	0		0.00		0.00	
Inspection/Service	50,000		9.38		2.02	
Infrastructure Repairs	0		0.00		0.00	
Litter Clean-up	5,000		0.94		0.20	
Liability/Claims	0		0.00		0.00	
Other Costs	10,000		1.88		0.40	
Total Costs	181,705		34.08		7.35	
Net Benefits	334,920	(N/A)	62.81	(N/A)	13.54	(N/A)
Benefit-cost ratio	2.84	(N/A)				

"Right Tree, Right Place"

With proper tree management, the City can reduce tree maintenance costs and increase tree benefits. Paramount to this goal is the idea of "Right Tree, Right Place." This is the concept that with proper tree planning, the right tree in the right place can bring the City benefits, both financial and aesthetic, for decades to come; whereas the wrong tree in the wrong place will generate problems that will be damaging for both the City's economic stability, and the views of residents and visitors to the City. As stated previously, studies have shown that shoppers are willing to pay up to 11% more for goods and services in a well-landscaped business district, so the City's economic wellbeing and the health and beauty of its trees go hand in hand.

For example, when the City's street trees are topped by Dominion Power for being to close to power lines, not only do the trees themselves suffer, but we lose the aesthetic attraction provided by beautiful trees that translates directly to the financial benefits for the City. This can be avoided with proper tree management & planning, including approaches like planting low-growing trees as street trees. There are many attractive small trees such as Hornbeams and well-chosen Red Maples, which make excellent downtown street trees, and which would serve as better street trees than the current large-growing Willow Oaks that line many of the streets downtown. Willow Oaks make attractive street trees where they have space to grow, like on residential streets where their size will not interfere with street lights, signs, or where they are unlikely to run into buildings or power lines. However, in a down-town setting, they can be hazardous and costly (due to pruning, removal, and replacement costs). Choosing the right tree for the right place improves tree health, reduces maintenance costs, and improves aesthetics.

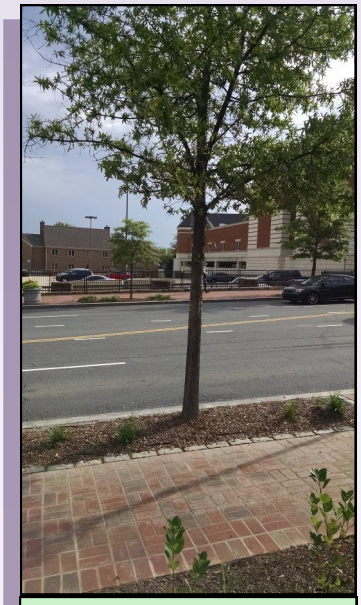
Why Is Proper Tree Management Important?

As the City undergoes its proposed redevelopment, it is an excellent opportunity to examine our tree management approaches & to plan for a prosperous future with proper tree care & maintenance. As is evident from the benefits segment of this report, trees have a great deal to offer communities, not only in environmental and beautification benefits, but also in financial benefits. Keeping all this in mind, it is clear that Fairfax City's trees are an asset that should not be under-valued, & which need expert care to maintain their value over time.

Issues with lack of tree management & planning

The City does not currently have a full time arborist on staff or a tree management plan in place. This is detrimental to the health of the City's trees, increases maintenance/replacement costs, and does not allow the City to take full advantage of the environmental and financial benefits of trees. Due to this, the City faces the following issues:

- **Tall trees can interfere with power lines, signs, and street lights.** An example of a tall tree is a Willow Oak. They naturally grow to over 4 stories, or 80-100 feet tall with a 60-90 ft. branch spread, requiring a large plot for root growth. As the Willow Oak street trees grow, they can interfere with power lines, signs, and street lights. Dominion Power prunes trees if they get too close to power lines, which can cause tree damage (or death) and poor aesthetics.
- **Trees that that drop fruit/flowers have been planted as street trees.** For example, Cherry trees were planted around the fountain pad in the new Old Town Square Park. If they survive to maturity, they will drop blossoms, & fruit into the fountain & sidewalk, clogging the fountain, & creating expensive clean-up costs (See photo #2 below).
- **Trees have been planted in restricted rooting space and compacted soil.** For example, root balls are being cut to fit trees into smaller locations than they are suited for (See photo #1 below), causing the trees to go into shock and die.
- **Poor quality trees have been planted.** Using poor quality trees contributes to long-term poor tree health and increased maintenance costs.
- **Private property owners are at risk of improperly trimming trees.** Private property owners (or their contractors) may use poor tree management practices, such as tree topping. Topping a tree may cause it to die, in turn, creating a hazard to residents (See photo #3 below). The City of Fairfax can use education and outreach campaigns to increase awareness of proper tree management techniques.



1. Species selection for street trees planted in tighter, urban environments should be carefully considered

2. When Cherry trees mature, they will drop blossoms & fruit which may clog the fountain.

3. White Oak on Tedrich Dr., dead and posing a hazard due to being topped.

Recommendations

- Develop Best Management Practices (BMPs) for City-wide tree management in order to develop our tree canopy and maintain the health of our trees to maximize community, environmental, and financial benefits for years to come.
    - ⇒ BMPs should include avoiding tree-topping and root ball cutting, and consulting with arborists on staff to get tree recommendations for various planting site locations. Also making appropriate space allowances for trees (2 inch diameter tree trunk = 4 foot diameter hole).
- Incorporate BMPs into the Comprehensive Plan, Zoning Ordinance, Public Facilities Manual, Tree Ordinance and Permit Process.
- Develop an Urban Forest Management Plan which includes detailed short and long-term goals and actions to effectively and proactively manage the City's urban forest.
- Consider creating a full-time arborist position to manage the City's urban forest. Duties may include reviewing private development plans and permit applications (where trees are involved); managing risks associated with City-owned trees; leading the City in design and landscaping practices for the City's public spaces, facilities, and streetscapes; and conducting education and outreach to citizens and businesses regarding the City's urban forest.

What is an Arborist?

An Arborist is an individual who is trained in the art and science of planting, caring for, and maintaining individual trees. Arborists are trained in proper pruning techniques that maintain a tree's health while making sure that growth does not interfere with utilities, structures, or streets, or pose any risk to the public. Arborists are also skilled in tree removal, as well as tree planting, including making tree species recommendations that are appropriate for a particular location. Choosing the right tree for the right place is paramount in order keep maintenance costs down and make sure the City doesn't lose money in tree care, when we could be reaping diverse benefits from healthy trees.

- Seek advice from the City's Tree Commission regarding what rules, regulations, procedures and actions they recommend can be taken by the City to preserve and protect the urban forest.
- Gather more data on Fairfax City's trees for further analysis:
    - ⇒ Conduct a tree canopy analysis using iTree Canopy, GIS, and GPS software.
    - ⇒ Conduct a new tree inventory including parks and open spaces

Methodology

About This Report

This report was authored and designed by Ashley Strobridge with the City of Fairfax Community Development and Planning Division.

This report is based on data from the 2007 and 2011 Fairfax City Public Street survey data. Survey data was analyzed using i-Tree Streets assessment software version 5.1.5. Benefit estimates were based on i-Tree modeling data from Charlotte, North Carolina reference city in the South Climate Region.

The average home resale value for the City of Fairfax was used to assess the Aesthetic and Property Value portion of the costs benefit analysis. To arrive at the average market value of Fairfax housing units, City Community, Development, and Planning Staff examined the 2015 assessed value of a sample of 2,524 detached and duplex houses in the City. These houses had an average assessed value of $522,556. To translate this assessed value into market (or sale) value, staff looked at housing sales transactions between January and July, 2015. 112 detached/duplex housing units sold (as market-rate sales via MLS listings) between January 1 and July 24, 2015 – and these sold for an average of 105.6% of their 2015 assessed value. Applying the averaged assessed value to the average assessment-to-sale ratio ($522,556 x 105.6%), staff arrived at a figure of $551,819 for an average market value of detached/duplex homes in the City of Fairfax.

Stormwater management fees for Charlotte, NC, were used as the basis for calculating the implied value of each gallon of stormwater intercepted by trees. In Charlotte, monthly stormwater fees are assessed to cover the cost of its stormwater management program. These fees are used as a proxy for the public's willingness to pay for stormwater management. Residential and commercial customers are charged the same amount, $93 per acre of impervious surface per month. The cost of controlling runoff from a 10-year storm is used as the basis for valuing rainfall interception by trees in Charlotte. This event is selected because most BMPs, such as retention-detention basins, are designed to operate effectively for storm events up to this size. Runoff from larger events are assumed to bypass BMPs, directly entering the system without pretreatment. Also, tree crown interception does not increase after crowns are saturated, which usually occurs before storm events reach this magnitude. Runoff from one acre of impervious surface for a 10-year, 24-hour storm event (4.9 in) is 113,114 gal, assuming an average runoff coefficient of 0.85. Assuming an annual stormwater management fee of $1,116 per acre of impervious surface, the resulting control cost is $0.0099 per gal.

Energy benefits were assessed based on $/kWh charged by Dominion Power to Fairfax City residents for electricity services (.11/kWh as of July, 2015). $/Therm cost for Natural Gas was also taken into account for electricity benefit price assessment, but since prices for Nat. Gas change daily, the automatic input value of $1.046 /Therm based on the reference city's price for natural gas was used.

Tree maintenance costs were assessed based on Fairfax City Fiscal Year 2015 Expenditures document with assistance from City of Fairfax Public Works Certified Arborist/Utility 3 Employee Charles (CJ) Crabtree. CJ Crabtree also assisted in interpreting the survey data.

Additional information about methods used in this street tree assessment to assess cost and benefit prices can be found here: http://www.fs.fed.us/psw/programs/uesd/uep/products/2/cufr_647_gtr200_piedmont_tree_guide.pdf

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