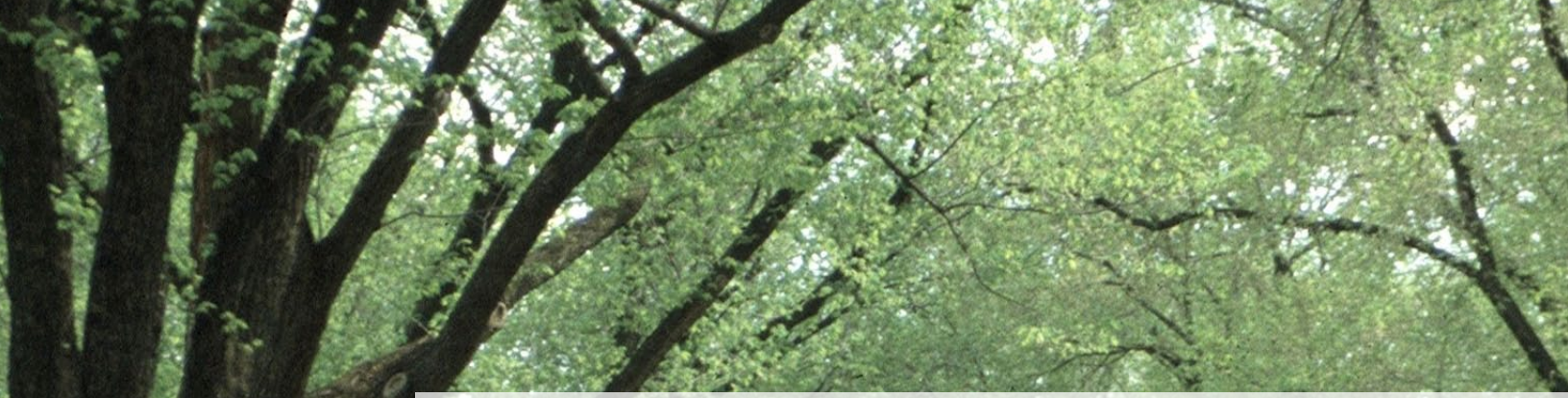

Street Tree Assessment Report

Falls Church, Virginia

Overview

Street trees are a vital community asset that enhance our day-to-day lives and mitigate many of the negative impacts of urbanization. In 2011, a sample street tree inventory was conducted in Falls Church, Virginia to assess tree abundance, composition, functional benefits, and monetary value. Trees residing within the right-of-way along 16% of public streets were surveyed to determine their species, size, condition, and placement. Inventory data were collected by Virginia Tech for this assessment report. The inventory data were analyzed using i-Tree Streets assessment software developed by the U.S. Forest Service.

Key Findings

- Falls Church has an estimated 3,934 street trees.
- Falls Church's five most abundant street tree species are red maple, flowering dogwood, willow oak, eastern redbud, and black tupelo.
- Each year, Falls Church's street trees intercept about 9.4 million gallons of rainfall and sequester over 1.2 million pounds of carbon dioxide.
- In total, Falls Church's street trees provide over $668 thousand in benefits annually or roughly $170 per tree.
- The replacement value of Falls Church's street trees is estimated at about $16.8 million.

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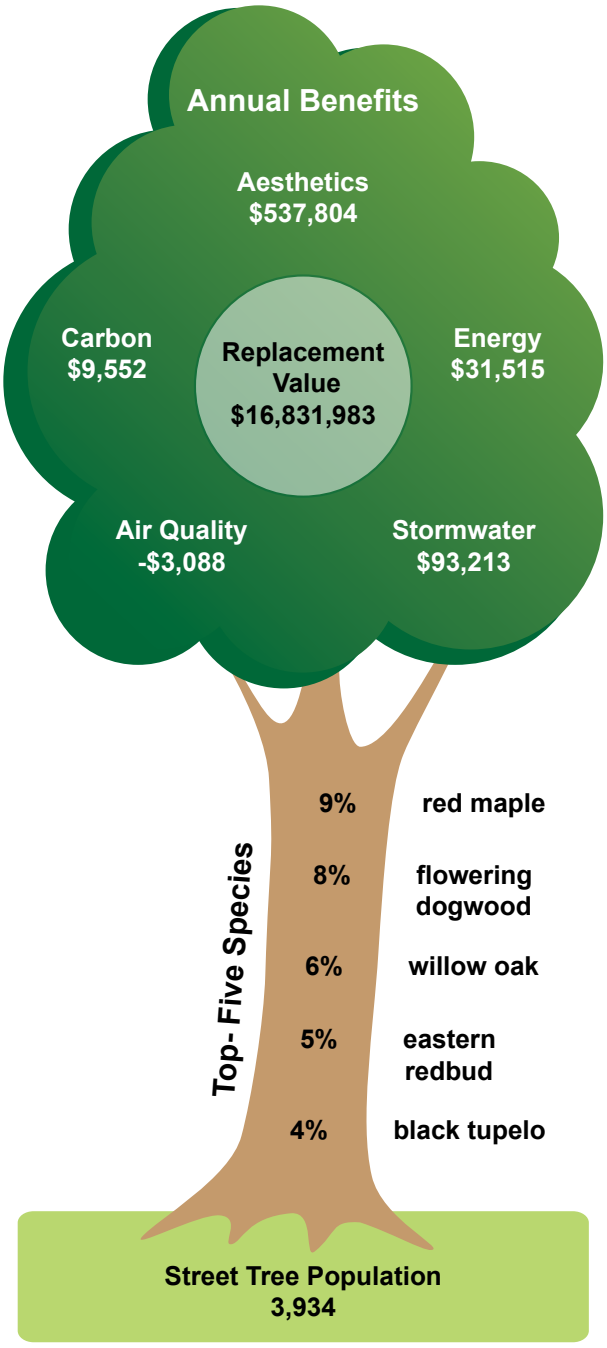
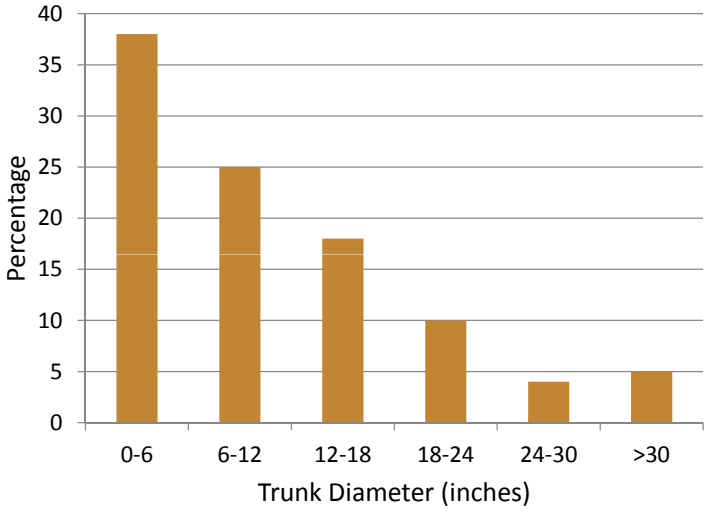
Street Tree Abundance and Composition

Falls Church's estimated street tree population is 3,934. Falls Church's street trees provide about 55 acres of canopy, which cover roughly 4.3% of the land area. The five most abundant species are red maple (9%), flowering dogwood (8%), willow oak (6%), eastern redbud (5%), and black tupelo (4%). The most important species (accounting for leaf area and canopy cover in addition to tree count) include red maple (16%), willow oak (7%), tulip poplar (7%), pin oak (6%), and flowering dogwood (4%).

Large-stature, broadleaf deciduous trees are the most common tree form amongst Falls Church's street trees. About 63% of Falls Church's street trees are smaller than 12 in. trunk diameter while about 5% are larger than 30 in. The majority of Falls Church's street trees (~97%) were rated in fair to good condition.



Distribution of Falls Church's Street Trees Across Trunk Diameter Classes



Relative abundance of Falls Church's street trees by foliage type and mature height class.

Foliage Type	Small (< 25')	Medium (25 - 45')	Large (> 45')	Total	% of Total
Broadleaf Deciduous	1,048	720	1,545	3,313	**84**
Broadleaf Evergreen	242	25	0	267	**7**
Conifer Evergreen	6	205	143	354	**9**
Total	**1,297**	**950**	**1,689**	**3,934**	**100**
% of Total	**33**	**24**	**43**	**100**	

Street Tree Benefits and Value

Gross annual benefits provided by Falls Church's street trees are valued at $668,996. These benefits come from contributions that street trees make to real estate aesthetics, rainfall interception, energy conservation, air pollution reduction, and CO2 sequestration. Each year, Falls Church's street trees intercept roughly 9.4 million gallons of rainfall, conserve a combined 278 megawatt-hour of electricity and 10 thousand therms of natural gas for home cooling and heating, and remove about 1.2 million pounds of carbon from the atmosphere. In addition, Falls Church's street trees currently store nearly 15 million pounds of carbon, which is valued at over $109 thousand. Although Falls Church's street trees have a net positive impact on air pollution – removing over 765 pounds of pollutants annually – its current mix of tree species heavily emits biogenic volatile organic compounds (BVOCs), which results in a negative monetary value for pollution reduction.

On a per-tree basis, the most beneficial tree species are pin oak ($484 per year), silver maple ($464 per year), tulip poplar ($460 per year), red maple ($427 per year), and white oak ($308 per year). These values reflect the large size that these trees have attained, providing abundant leaf area and canopy cover. The average street tree provides about $170 in gross benefits annually. Gross benefits do not account for annual costs associated with planting, maintenance, or removal, which were not available for this analysis.

The replacement value of Falls Church's street trees is estimated at $16,831,983. This is the value of street trees as a structural asset, and reflects the cost to replant trees in a quantity sufficient to replace their current level of functional benefits. Because a large street tree produces the same amount of benefits as numerous nursery-sized trees, replacing a large tree would require significant resources that may not be feasible due to both spatial and budgetary constraints.

Gross annual benefits provided by Falls Church's street trees.

Benefit Type	Resource Units	Total $	Avg. $/Tree
Aesthetic enhancements	–	537,804	136.67
Rainfall Interception (gallons)	9,414,843	93,213	23.69
Energy Conservation[1]	–	31,515	8.01
Electricity (MWh)	278	21,088	–
Natural Gas (therms)	9,969	10,427	–
Air Pollution reduction (lb)[2]	765	-3,088	-0.78
CO_2 sequestration (lb)[3]	1,273,617	9,552	2.43
Total Benefits	**–**	**668,996**	**170.02**

[1]Sum of electricity and natural gas conservation.

[2]Net pollution reduction (O3, NO2, PM10, and SO2) accounting for pollutant deposition, pollutant avoidance, and BVOC emissions. Note, if Resource Units value is negative, BVOC emissions exceeded pollution reduction. If only total $ is negative, then BVOC pricing exceeded pollutant pricing, but pollution reduction still occurred.

[3]Net sequestration accounting for gross tree sequestration, tree decomposition emissions, and tree maintenance machinery emissions.

Street Tree Opportunities

Falls Church has a highly valuable street tree population. To sustain this resource and its benefits, the city should continue to focus on planting diverse, functional species and maintaining trees to ensure their health, safety, and appearance. Urban forestry experts generally recommend that a municipal tree population comprise no more than 10% of a single species and 20% of a single genus in order to minimize impacts of pest outbreaks and other species-specific disorders. Both red maple and flowering dogwood are very close to the 10% species threshold. Planting efforts should temper the use of these two species to ensure the diversity and heath of Falls Church's street trees.

One of the most noxious pests threatening Virginia's street trees is emerald ash borer, an insect introduced from Asia that has killed millions of native ash trees in the United States. Fortunately, native ash species comprise just 2.5% of Falls Church's street trees and account for only 3.6% of the street tree canopy cover. However, Falls Church must remain vigilant in managing street tree diversity because there is ongoing risk of unforeseen introduction of noxious tree pests into the United States.

About 67% of Falls Church's street tree population comprises medium- and large-stature species such as maple and oak. This is a favorable distribution given that larger trees provide higher levels of benefits, yet presence of overhead utility lines may require planting of small-stature tree species in certain places to minimize power disruptions and pruning costs.

The size distribution of Falls Church's street trees suggests a stable age structure. Because street trees inevitably grow old and die or must be removed to accommodate land use changes, an ample number of young trees must always exist in order to sustain street tree benefits. The fact that the two diameter classes that encompass the largest percentage of the total street tree population are the 0-6 and 6-12 inch diameter classes, respectively, is a source of optimism. However, ongoing planting efforts, with particular focus on large stature, highly functional tree species, should be taken to ensure a high level of benefits will be provided by Falls Church's street trees for the future.

Falls Church's street trees comprise a number of species that produce large amounts of BVOCs, which are precursors to ground-based ozone. Heavy emitters of BVOCs in Falls Church include tulip poplar, pin oak, willow oak, and white ash. Falls Church should consider planting more low-BVOC street trees such as gingko, linden, and certain maples if maximizing air quality benefits is a key community objective. However, this planting strategy should not compromise efforts to maximize canopy cover or species diversity. Urban forestry experts generally believe that trees have a net positive impact on air quality, regardless of BVOC emissions, by lowering air temperature and reducing fossil fuel combustion in urban areas.

This assessment has reported gross benefits of Falls Church's street trees, which may not fully reflect the true value of this vital resource. Direct and indirect costs of administering and managing street trees can vary considerably based on species composition, tree size distribution, and other local environmental and economic factors. Therefore, findings of this report should be carefully interpreted in the context of local circumstances that impact tree benefits and costs.

About This Report

This report was co-authored by Eric Wiseman and Julia Bartens with the Department of Forest Resources and Environmental Conservation at Virginia Tech. Report layout and design by Sarah Gugercin.

This report was made possible through grants from the Virginia Department of Forestry and the U.S. Forest Service. Technical assistance was graciously provided by the Davey Resource Group.

Inventory data were analyzed using i-Tree Streets assessment software version 4.0.4. Benefit estimates were based on i-Tree modeling data from the Charlotte, North Carolina reference city in the South Climate Zone. The 2010 median home price, used to calculate street tree aesthetic benefits for Falls Church was $641,900 as reported by the U.S. Census Bureau in http://quickfacts.census.gov/qfd/index.html. Additional information about methods used in this street tree assessment can be found on our website.

Date of Publication: July 2012.