

Street Tree Assessment Report

Martinsville, 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 2009, a sample street tree inventory was conducted in Martinsville, Virginia to assess tree abundance, composition, functional benefits, and monetary value. Trees residing within the right-of-way along 12% 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

- Martinsville has an estimated 3,566 street trees.
- Martinsville's five most abundant street tree species are flowering dogwood, crapemyrtle, red maple, privet, and black locust.
- Each year, Martinsville's street trees intercept over 5 million gallons of rainfall and sequester about 742 thousand pounds of carbon dioxide.
- In total, Martinsville's street trees provide over \$116 thousand in benefits annually or roughly \$33 per tree.
- The replacement value for Martinsville's street trees is estimated at about \$7 million.

*Prepared by Virginia Tech
Department of Forest Resources and
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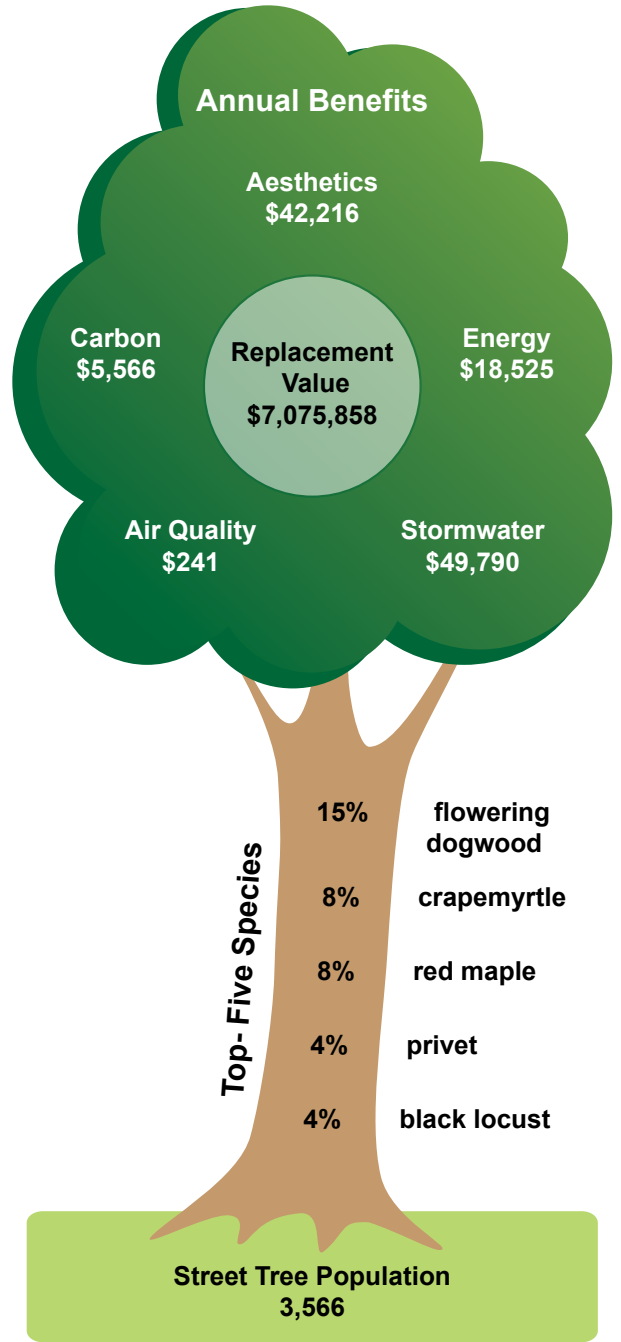
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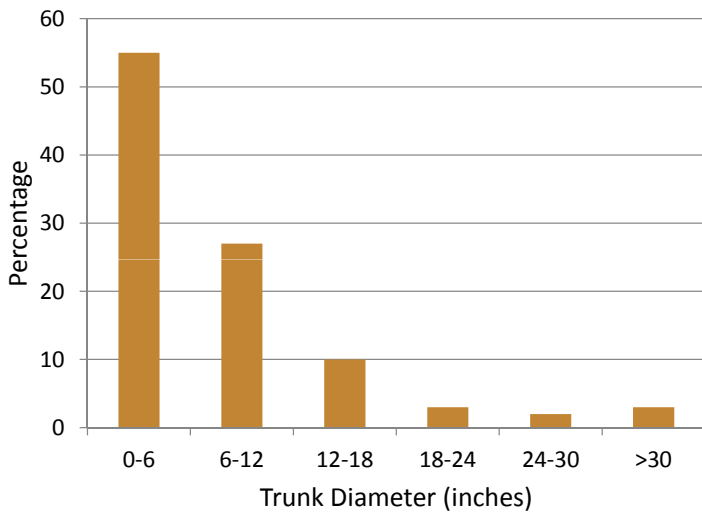
Street Tree Abundance and Composition

Martinsville’s estimated street tree population is 3,566. Martinsville’s street trees provide about 32 acres of canopy, which cover roughly 0.5% of Martinsville’s land area. The five most abundant species are flowering dogwood (15%), crapemyrtle (8%), red maple (8%), privet (4%), and black locust (4%). The most important species (accounting for leaf area and canopy cover in addition to tree count) include white oak (9%), southern red oak (8%), red maple (8%), flowering dogwood (8%), and tulip poplar (6%).

Small-stature, broadleaf deciduous trees are the most common tree form amongst Martinsville’s street trees. Over 80% of Martinsville’s street trees are smaller than 12 in. trunk diameter while less than 3% are larger than 30 in. The majority of Martinsville’s street trees (~90%) were rated in fair to good condition.



Distribution of Martinsville's Street Trees Across Trunk Diameter Classes



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

Foliage Type	Small (< 25')	Medium (25 - 45')	Large (> 45')	Total	% of Total
Broadleaf Deciduous	1,070	912	871	2,853	80
Broadleaf Evergreen	290	25	0	315	9
Conifer Evergreen	66	232	100	398	11
Total	1,426	1,169	971	3,566	100
% of Total	40	33	27	100	

Street Tree Benefits and Value

Gross annual benefits provided by Martinsville's street trees are valued at \$116,338. 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, Martinsville's street trees intercept roughly 5 million gallons of rainfall, conserve a combined 160 megawatt-hour of electricity and 6,104 therms of natural gas for home cooling and heating, absorb 766 pounds of air pollution, and remove about 742 thousand pounds of carbon from the atmosphere. In addition, Martinsville's street trees currently store nearly 8 million pounds of carbon, which is valued at over \$57 thousand.

On a per-tree basis, the most beneficial tree species are white oak (\$179 per year), southern red oak (\$174 per year), silver maple (\$114 per year), tulip poplar (\$69 per year), and chestnut oak (\$67

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 \$33 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 Martinsville's street tree population is estimated at over \$7,075,858. 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 Martinsville's street trees.

Benefit Type	Resource Units	Total \$	Avg. \$/Tree
Aesthetic enhancements	–	42,216	11.84
Rainfall Interception (gallons)	5,028,993	49,790	13.96
Energy Conservation ¹	–	18,525	5.19
Electricity (MWh)	160	12,140	–
Natural Gas (therms)	6,104	6,385	–
Air Pollution reduction (lb) ²	766	241	0.07
CO ₂ sequestration (lb) ³	742,149	5,566	1.56
Total Benefits	–	116,338	32.62

¹Sum of electricity and natural gas conservation.

²Net 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.

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

Street Tree Opportunities

Martinsville 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. At 15% of the street tree population, flowering dogwood is overly abundant. Although dogwood is a popular species, planting efforts should temper its use to ensure the diversity and health of Martinsville'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 0.5% of Martinsville's street trees and account for only 0.09% of the street tree canopy cover. However, Martinsville 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 40% of Martinsville's street tree population comprises small-stature species such as flowering dogwood, which make a substantially smaller contribution to annual benefits than large-maturing trees. For example, the average white oak in Martinsville provides over 16 times the gross annual benefits of the



average dogwood. As such, preference should be given to planting large-maturing trees whenever landscape conditions allow.

The size distribution of Martinsville'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, there are relatively few street trees greater than 18 inch diameter, which probably reflects the dominance of small-stature species. 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 Martinsville's street trees for the future.

This assessment has reported gross benefits of Martinsville'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.

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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 Martinsville was \$89,200 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](#).

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