

# Street Tree Assessment Report

## *Buchanan, 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 Buchanan, Virginia to assess tree abundance, composition, functional benefits, and monetary value. Trees residing within the right-of-way along 33% 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

- Buchanan has an estimated 771 street trees.
- Buchanan's five most abundant street tree species are tree-of-heaven, black locust, boxelder, Kwanzan cherry, and black cherry.
- Each year, Buchanan's street trees intercept about 1.3 million gallons of rainfall and sequester nearly 200 thousand pounds of carbon dioxide.
- In total, Buchanan's street trees provide over \$34 thousand in benefits annually or roughly \$44 per tree.
- The replacement value of Buchanan's street trees is estimated at \$1.47 million.

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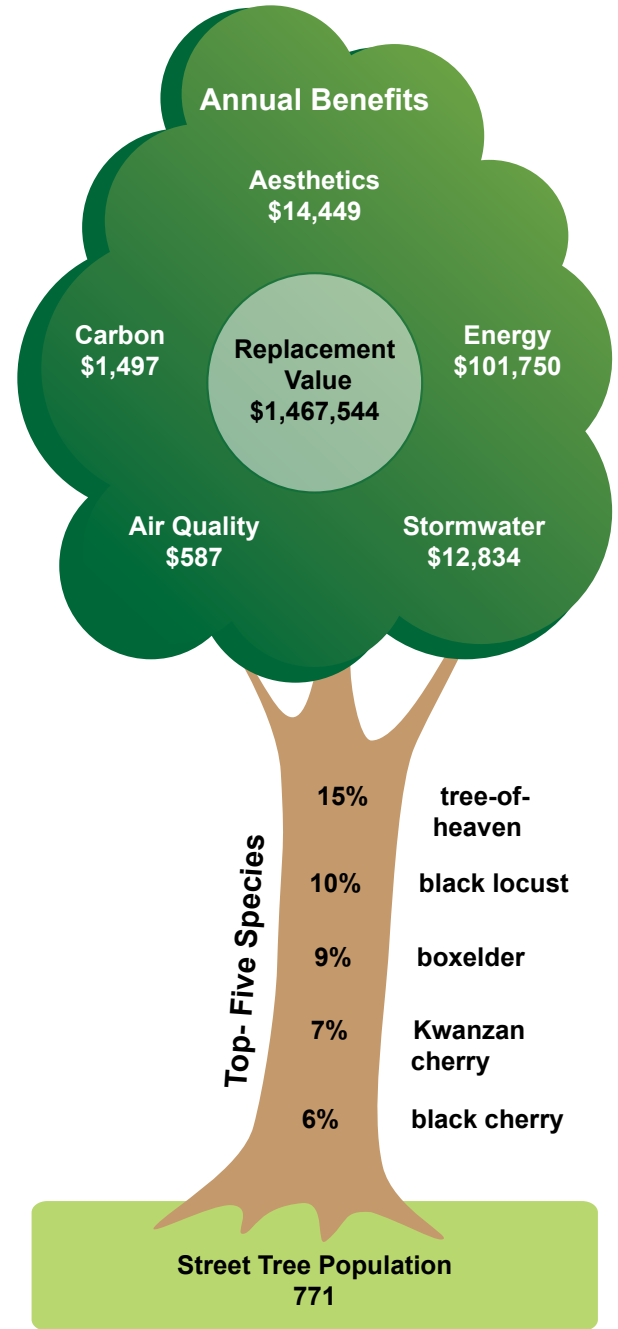
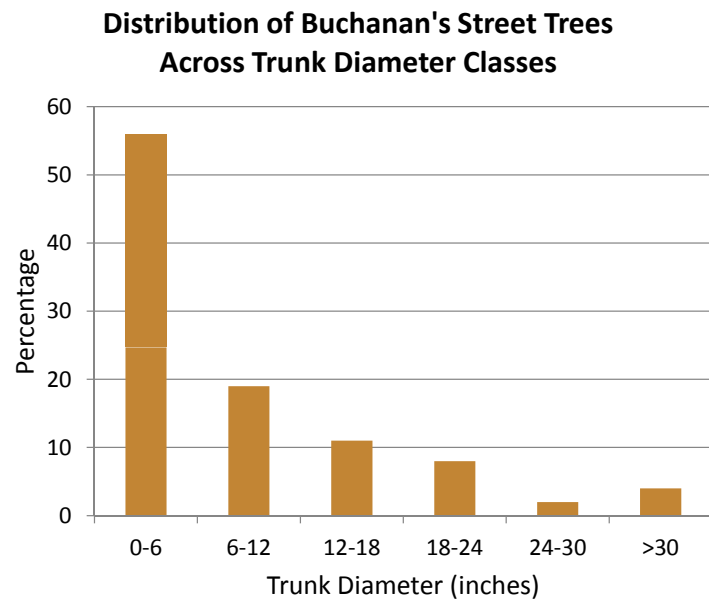




## Street Tree Abundance and Composition

Buchanan’s estimated street tree population is 771. Buchanan’s street trees provide about 9 acres of canopy, which cover roughly 0.5% of the land area. The five most abundant species are tree-of-heaven (15%), black locust (10%), boxelder (9%), Kwanzan cherry (7%), and black cherry (6%). The most important species (accounting for leaf area and canopy cover in addition to tree count) include silver maple (14%), tree-of-heaven (9%), black locust (9%), sugar maple (8%), and eastern white pine (8%).

Large-stature, broadleaf deciduous trees are the most common tree form amongst Buchanan’s street trees. Over 75% of Buchanan’s street trees are smaller than 12 in. trunk diameter while less than 5% are larger than 30 in. The majority of Buchanan’s street trees (~76%) were rated in fair to good condition.



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

Foliage Type	Small (< 25')	Medium (25 - 45')	Large (> 45')	Total	% of Total
Broadleaf Deciduous	137	211	327	675	88
Broadleaf Evergreen	18	0	0	18	2
Conifer Evergreen	3	30	45	78	10
<b>Total</b>	<b>158</b>	<b>241</b>	<b>372</b>	<b>771</b>	<b>100</b>
<b>% of Total</b>	<b>20</b>	<b>31</b>	<b>48</b>	<b>100</b>	

## Street Tree Benefits and Value

Gross annual benefits provided by Buchanan’s street trees are valued at \$34,380. These benefits come from contributions that street trees make to real estate aesthetics, rainfall interception, energy conservation, air pollution reduction, and CO<sub>2</sub> sequestration. Each year, Buchanan’s street trees intercept roughly 1.3 million gallons of rainfall, conserve a combined 43 megawatt-hours of electricity and 1.6 thousand therms of natural gas for home cooling and heating, absorb 291 pounds of air pollution, and remove about 200 thousand pounds of carbon from the atmosphere. In addition, Buchanan’s street trees currently store about 2 million pounds of carbon, which is valued at over \$14 thousand.

On a per-tree basis, the most beneficial tree species are honey locust (\$148 per year), sugar maple (\$146 per year), silver maple (\$144 per

year), red mulberry (\$107 per year), and northern hackberry (\$105 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 \$45 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 Buchanan’s street trees is estimated at \$1,467,544. 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 Buchanan's street trees.

Benefit Type	Resource Units	Total \$	Avg. \$/Tree
Aesthetic enhancements	–	14,449	18.74
Rainfall Interception (gallons)	1,296,250	12,834	16.65
Energy Conservation <sup>1</sup>	–	101,750	6.5
Electricity (MWh)	43	66,523	–
Natural Gas (therms)	1,649	35,227	–
Air Pollution reduction (lb) <sup>2</sup>	291	587	0.76
CO <sub>2</sub> sequestration (lb) <sup>3</sup>	199,574	1,497	1.94
<b>Total Benefits</b>	–	<b>34,380</b>	<b>44.59</b>

<sup>1</sup>Sum of electricity and natural gas conservation.

<sup>2</sup>Net pollution reduction (O<sub>3</sub>, NO<sub>2</sub>, PM<sub>10</sub>, and SO<sub>2</sub>) 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.

<sup>3</sup>Net sequestration accounting for gross tree sequestration, tree decomposition emissions, and tree maintenance machinery emissions.

## Street Tree Opportunities

Buchanan has a highly valuable street tree population. To sustain this resource and its benefits, the town 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 14% of the street tree population, tree-of-heaven is above this threshold. It is a noxious, invasive plant that displaces more desirable species and should be eradicated wherever resources permit. Similarly, the maple genus exceeds the 20% threshold. Planting efforts should temper the use of maple species to ensure the diversity and health of Buchanan'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, no native ash street trees were tallied during the inventory, suggesting that ash trees are absent or in very low abundance in Buchanan. No native ash trees should be planted for the foreseeable future due to the presence of ash borer throughout Virginia.

About half of Buchanan's street tree population comprises large-stature species such as oak, which make a substantially smaller contribution to annual

benefits than large-maturing trees. 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 Buchanan'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 in. 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 Buchanan's street trees for the future.

This assessment has reported gross benefits of Buchanan'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 2009 median home price, used to calculate street tree aesthetic benefits for Buchanan was \$112,448 as reported by [www.city-data.com](http://www.city-data.com). Additional information about methods used in this street tree assessment can be found [on our website](#).

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