

# Street Tree Assessment Report

## *Wytheville, 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 Wytheville, Virginia to assess tree abundance, composition, functional benefits, and monetary value. Trees residing within the right-of-way along 13% 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

- Wytheville has an estimated 6,159 street trees.
- Wytheville's five most abundant street tree species are black locust, black cherry, eastern white pine, black walnut, and Norway maple.
- Each year, Wytheville's street trees intercept over 15 million gallons of rainfall and sequester over 2.3 million pounds of carbon dioxide.
- In total, Wytheville's street trees provide about \$424 thousand in benefits annually or roughly \$69 per tree.
- The replacement value of Wytheville's street trees is estimated at roughly \$17.5 million.

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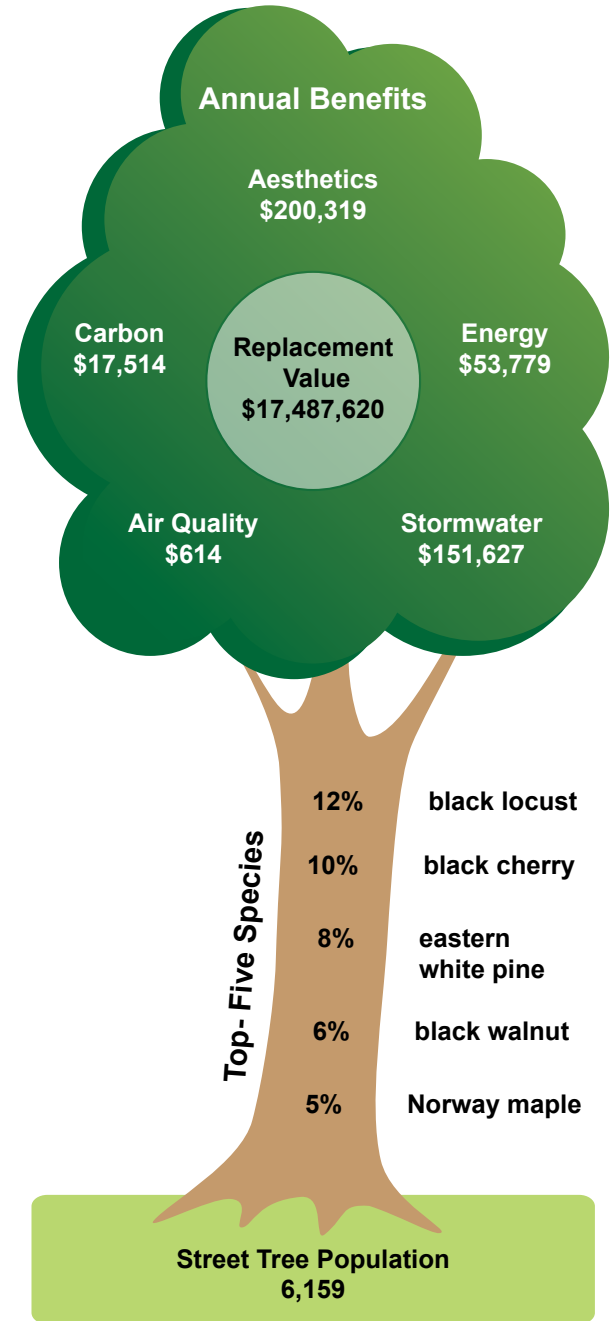
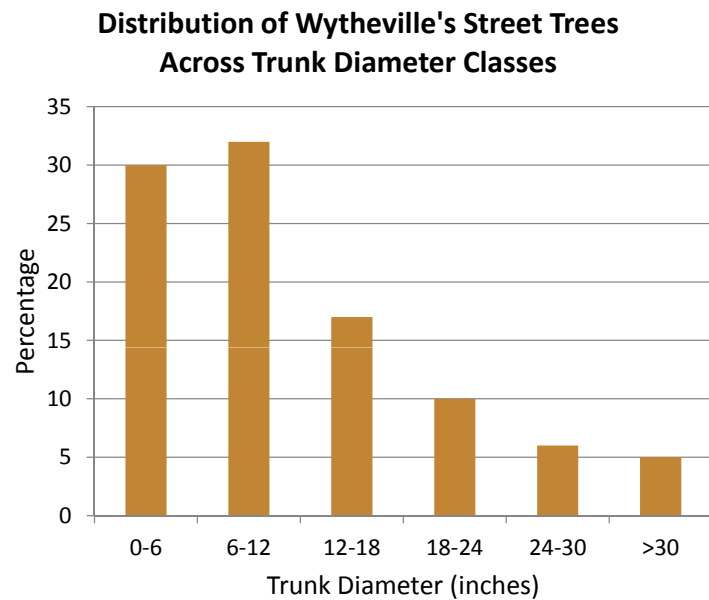




## Street Tree Abundance and Composition

Wytheville's estimated street tree population is 6,159. Wytheville's street trees provide about 94 acres of canopy, which cover roughly 1% of the land area. The five most abundant species are black locust (12%), black cherry (10%), eastern white pine (8%), black walnut (6%), and Norway maple (5%). The most important species (accounting for leaf area and canopy cover in addition to tree count) include black locust (13%), black cherry (10%), eastern white pine (8%), red maple (8%), and Norway maple (7%).

Large-stature, broadleaf deciduous trees are the most common tree form amongst Wytheville's street trees. Over 60% of Wytheville's street trees are smaller than 12 in. trunk diameter while less than 5% are larger than 30 in. The majority of Wytheville's street trees (~90%) were rated in fair to good condition.



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

| Foliage Type        | Small (< 25') | Medium (25 - 45') | Large (> 45') | Total        | % of Total |
|---------------------|---------------|-------------------|---------------|--------------|------------|
| Broadleaf Deciduous | 964           | 1,442             | 2,616         | 5,022        | 82         |
| Broadleaf Evergreen | 125           | 8                 | 0             | 133          | 2          |
| Conifer Evergreen   | 8             | 259               | 737           | 1,004        | 16         |
| <b>Total</b>        | <b>1,097</b>  | <b>1,709</b>      | <b>3,353</b>  | <b>6,159</b> | <b>100</b> |
| <b>% of Total</b>   | <b>18</b>     | <b>28</b>         | <b>54</b>     | <b>100</b>   |            |

## Street Tree Benefits and Value

Gross annual benefits provided by Wytheville's street trees are valued at \$423,853. 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, Wytheville's street trees intercept roughly 15 million gallons of rainfall, conserve a combined 472 megawatt-hours of electricity and 17 thousand therms of natural gas for home cooling and heating, absorb 2,240 pounds of air pollution, and remove about 2.3 million pounds of carbon from the atmosphere. In addition, Wytheville's street trees currently store about 23 million pounds of carbon, which is valued at over \$174 thousand.

On a per-tree basis, the most beneficial tree species are silver maple (\$225 per year), red maple (\$197 per year), pin oak (\$144 per year),

sugar maple (\$143 per year), and Norway maple (\$95 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 \$69 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 Wytheville's street trees is estimated at \$17,487,620. 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 Wytheville's street trees.

| Benefit Type                                    | Resource Units | Total \$       | Avg. \$/Tree |
|---|----------------|----------------|--------------|
| Aesthetic enhancements                          | –              | 200,319        | 32.52        |
| Rainfall Interception (gallons)                 | 15,314,766     | 151,627        | 24.62        |
| Energy Conservation <sup>1</sup>                | –              | 53,779         | 8.73         |
| Electricity (MWh)                               | 472            | 35,802         | –            |
| Natural Gas (therms)                            | 17,187         | 17,977         | –            |
| Air Pollution reduction (lb) <sup>2</sup>       | 2,240          | 614            | 0.10         |
| CO <sub>2</sub> sequestration (lb) <sup>3</sup> | 2,335,224      | 17,514         | 2.84         |
| <b>Total Benefits</b>                           | –              | <b>423,853</b> | <b>68.81</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

Wytheville 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. Wytheville's street trees are predominantly naturally-occurring species such as black locust (12%) and black cherry (10%) that tend to develop at forest edges near roadways. In such cases, it is difficult to influence species diversity. However, maples are commonly planted, and at 14% of the street tree population, the maple genus could become overly abundant. Planting efforts should temper the use of maples to ensure the diversity and health of Franklin City'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 6% of Wytheville's street trees and account for only 5% of the street tree canopy cover. However, Wytheville 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 82% of Wytheville'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 Wytheville'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 Wytheville's street trees for the future.

This assessment has reported gross benefits of Wytheville'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 Wytheville was \$139,500 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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