City of Oneonta, NY

Street Tree Inventory Report

Prepared for the City of Oneonta by the Cornell University Student Weekend Arborist Team (SWAT)

December 2011

Executive Summary

This document reports the findings of the street tree inventory conducted in the City of Oneonta, New York on September 17 and October 1, 2011 by the Student Weekend Arborist Team (SWAT) of Cornell University. Trees and planting spaces in the right-of-way were inventoried for most, but not all city streets. Results may vary slightly if and when all city streets are inventoried. These results include:

- 1028 trees and 540 planting spaces were inventoried
- 961 trees and 540 planting spaces were inventoried on September 17 and October 1, 2011; an additional 67 trees were inventoried on July 15, 2011, but planting spaces were not inventoried on that date
- The stocking level of street trees to available planting spaces for those streets where planting spaces were taken is 63.94% of full stocking
- 60 different species comprise inventoried street trees with Norway Maple (21.50%) and Sugar Maple (14.88%) occurring most often
- 44.75% of street trees have diameters less than 12” while 55.25% have diameters greater than or equal to 12”
- The total estimated annual benefits for all inventoried street trees are $134,113 or $131.48 per tree
- The replacement value of all inventoried street trees is $4,995,015

Introduction

Publicly managed street trees are increasingly recognized as an important community resource, both for their aesthetic appeal and the social and ecosystem benefits they provide including improved air quality, reduced storm water runoff and greenhouse gas emissions, and increased residential property values. Management of this resource requires having adequate information to make informed decisions regarding such things as the number of trees to be planted annually to compensate for tree mortality, species selection of newly planted trees to promote species diversity, and the maintenance needs and costs associated with existing trees. A street tree inventory is a critical tool in obtaining this information. By providing up-to-date information about diversity, condition, and age, a street tree inventory enables a community to care for its existing street trees as well as to plan intelligently for the future. Undertaking a street tree inventory, therefore, signifies a community's investment in and commitment to the current and future well-being not just of its trees, but that of the community itself.

SWAT

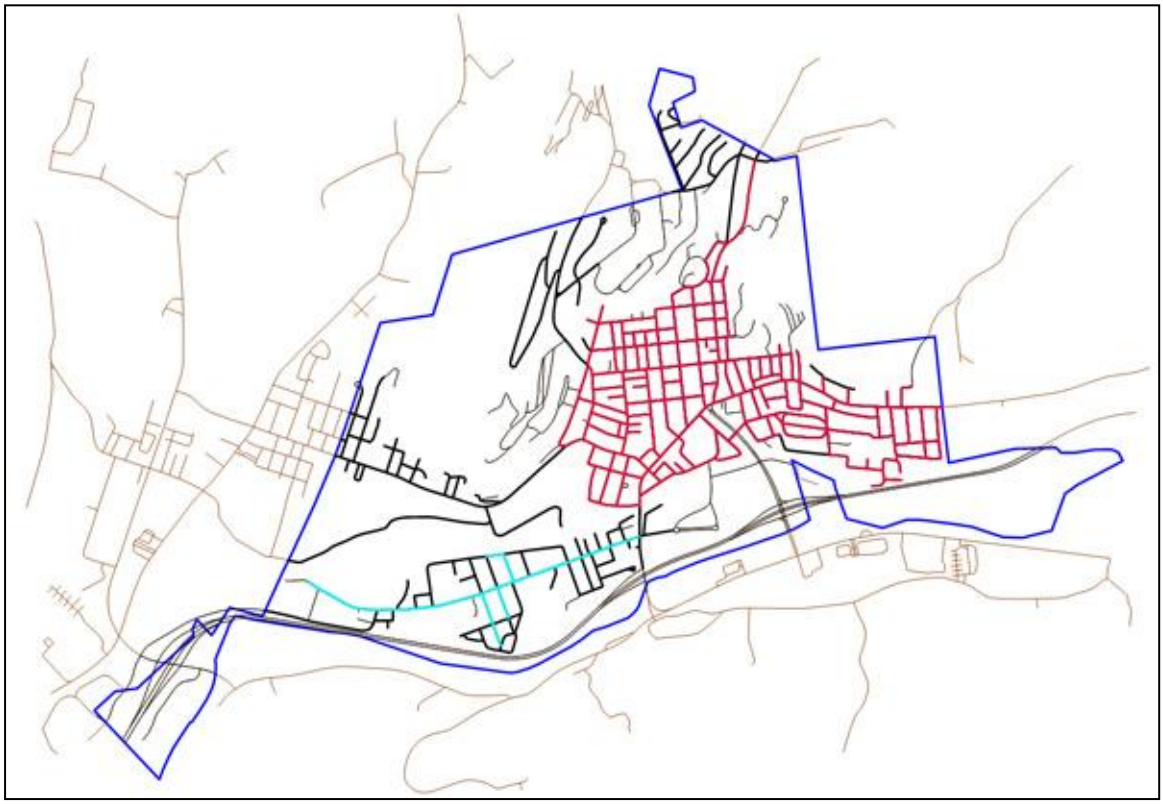
In 2002, a work team of Cornell University faculty, Extension educators, and urban forestry professionals in New York State perceived that smaller communities were being underserved with regard to community forestry planning. To address this problem, the work team devised a master planning process for these smaller communities. This process included training a group of Cornell University students to collect street tree inventory data using handheld Personal Digital Assistant computers (PDAs). These students, undergraduates and graduates who had taken courses in tree species identification, became the Student Weekend Arborist Team (SWAT), so named because they would inventory communities entirely in one or two weekend days.

SWAT was piloted in September 2002 with thirteen students in the villages of Liverpool (Onondaga County) and Cobleskill (Schoharie County). All street trees and potential planting spaces in the public right-of-way were counted. Data was subsequently analyzed and a workshop held on December 4, 2002 for officials in both villages and interested officials from other communities. Liverpool and Cobleskill learned about their community forest resources and were advised regarding future goals and implementation strategies. The pilot project was judged a success and SWAT has been repeated every fall with a new group of Cornell students trained each year. Including the City of Oneonta street tree inventory, SWAT has conducted thirty-five inventories between 2002 and 2011, approximately one-third of all street tree inventories conducted in New York State during that time.

Inventory Methodology

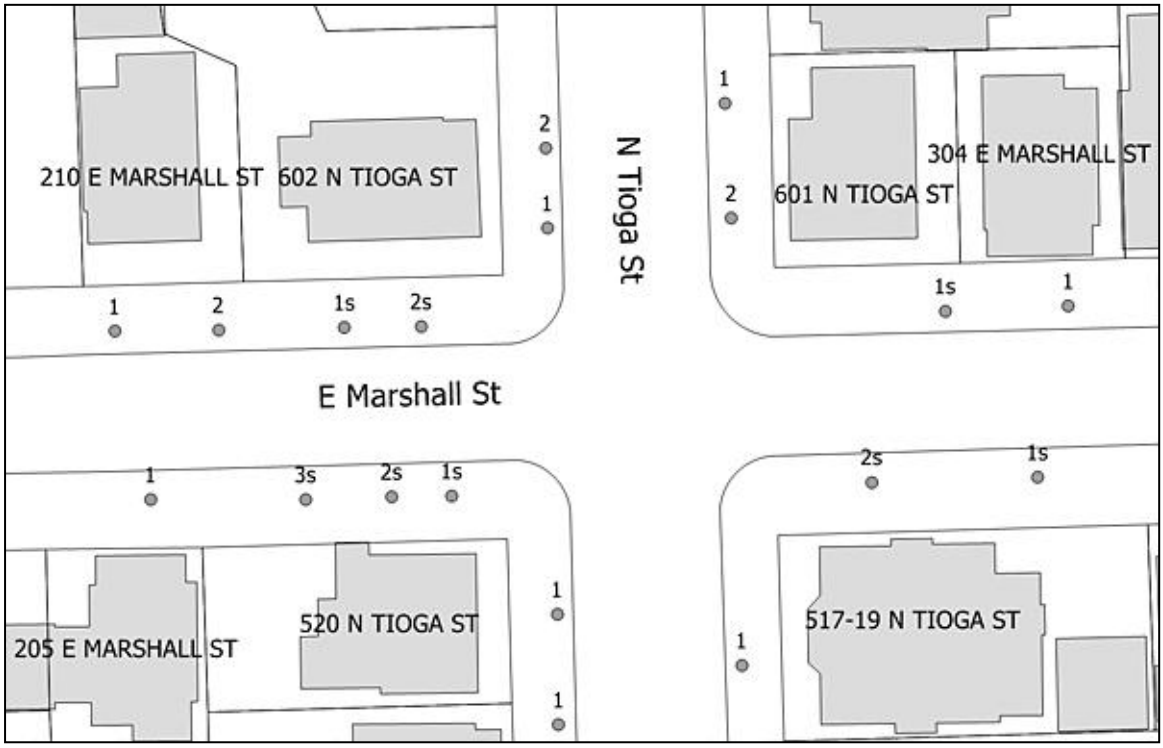
The SWAT inventory in Oneonta was conducted on September 17 and October 1, 2011. Trees and planting spaces in the city's right-of-way were inventoried for most but not all city streets. Trees on several streets in the city's sixth ward were also inventoried on July 15, 2011, but planting spaces were not inventoried on that date. Selection of streets to be inventoried was made in consultation with the city's Environmental Board and its Community Development/Engineering Office. Streets judged to contain the most street trees were prioritized to be inventoried. Streets associated with Hartwick College and SUNY Oneonta, located in Wilber and Neahwa Parks, and stated to be privately managed were excluded.

Streets inventoried by SWAT on September 17 and October 1, 2011 where data on trees and planting spaces were taken are shown in red in the map below. Streets where data for trees only were taken on July 15, 2011 are shown in tourquoise. Streets that might have been surveyed, but were not are shown in thicker black line weight. Streets and highways excluded from the inventory are shown in thinner black line weight.



Data was collected in a walking survey with Pharos PDAs equipped with the USDA Forest Service's i-Tree MCTI/STRATUM PDA utility. Data collected includes the following:

(1) **Tree Location**: Locations for right-of-way trees and planting spaces were established primarily by property address according to a tax parcel shapefile supplied by Otsego County. If an address was unavailable, a location was assigned based upon the next sequential address. Site numbers were assigned for trees and planting spaces at each address. For addresses with multiple trees and/or planting spaces, site numbers were assigned from left to right facing the property. Trees and planting spaces located at street corners were assigned the property address, but if located on a side street different than the property street address, a notation for "side" was made. Likewise, if trees and planting spaces were located on a street to the rear of the property street address, a notation for "rear" was made. Site numbering is illustrated below.



(2) **GPS**: Latitude (Y) and Longitude (X) for right-of-way trees and planting spaces were collected with Garmin 60 CSx GPS receivers typically accurate when WAAS enabled to less than 5 meters. Coordinates were rectified post-inventory to conflate with aerial orthoimagery available from the New York State GIS Clearinghouse.

(3) **Location Site**: Placement of right-of-way trees and planting spaces was assessed by one of five ratings: 1= front yard or lawn; 2 = treelawn planting strip less than four feet wide; 3 = treelawn planting strip greater than four feet wide; 4 = sidewalk tree pit; 5 = street median.

(4) **Species**: Trees were identified and assigned their respective botanical names. Common names were added subsequent to the inventory.

(5) **DBH**: Trunk diameter at breast height (approximately 4.5 feet above the ground) was measured to the nearest inch. DBH is the most commonly used measure of tree size and age. It is not an absolute measure, however, as relationships between DBH and canopy spread or DBH and tree age vary by species.

(6) **Condition Wood**: The health of a tree's wood (its structural health) was assessed by one of four ratings: 1= Dead or Dying – *extreme problems*; 2 = Poor – *major problems*; 3 = Fair – *minor problems*; 4 = Good – *no apparent problems*.

(7) **Condition Leaves**: The health of a tree's leaves (its functional health) was assessed by one of four ratings: 1= Dead or Dying – *extreme problems*; 2 = Poor – *major problems*; 3 = Fair – *minor problems*; 4 = Good – *no apparent problems*.

(8) **Percent Deadwood:** "Deadwood" refers to branches over two inches in diameter that are dead, dying, or diseased. The percentage of deadwood in the tree canopy was assessed by one of five ratings: 1= less than 10%; 2 = 10 – 25%; 3 = 25 – 50%; 4 = 50 – 75%; 5 = greater than 75%.

(9) **Maintenance Recommendation**: Tree maintenance needs were assessed by one of four ratings: 1 = None – *no maintenance necessary*; 2 = Train – *routine maintenance for a young tree*; 3 = Routine Prune – *routine maintenance of a mature tree*; 4 = High Priority Prune – *a tree requiring immediate maintenance with deadwood 4" in diameter or greater.*

(10) **Consult**: Based on the visual condition of the tree, the need for a certified arborist to be brought in to examine the tree was assessed by one of two ratings: 1 = No Consult; 2 = Consult.

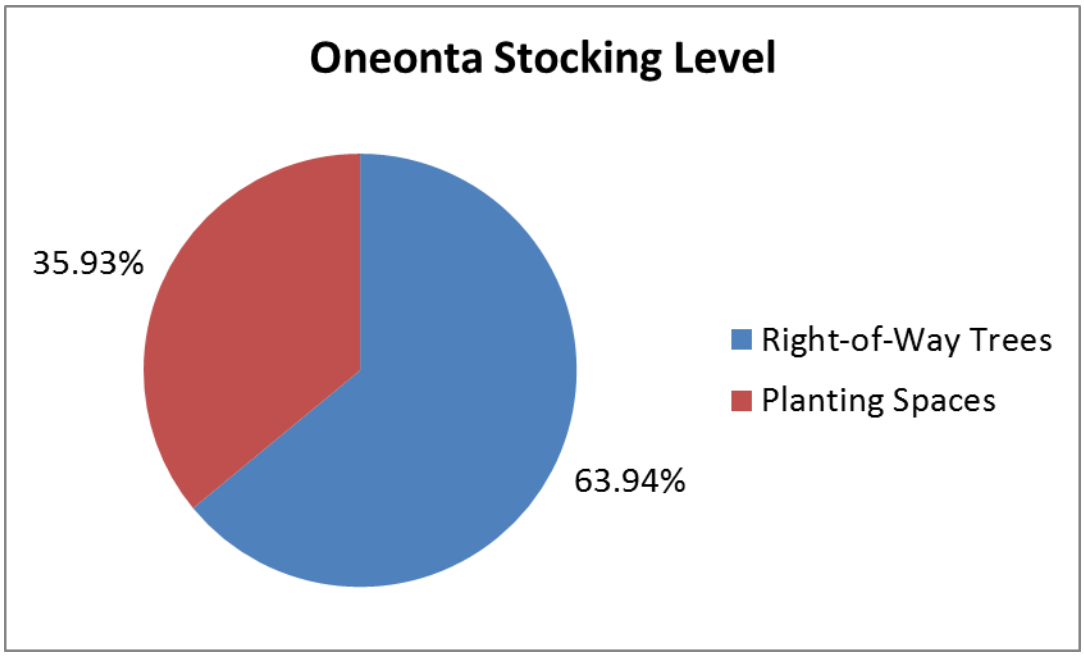
(11) **Wire Conflict**: The presence or absence of single or triple phase overhead utility wires associated with the site was assessed by one of two ratings: 1 = No Wire Conflict; 2 = Wire Conflict.

Street Tree Inventory Summary

Stocking Levels

Two methodologies are commonly used to determine street tree stocking levels. The first compares the number of street trees per mile of street to an ideal 100% stocking level (180 trees per mile of street). The second compares the number of existing street trees to the total number of potential street trees (number of trees plus the number of available planting spaces). This report utilizes the second methodology.

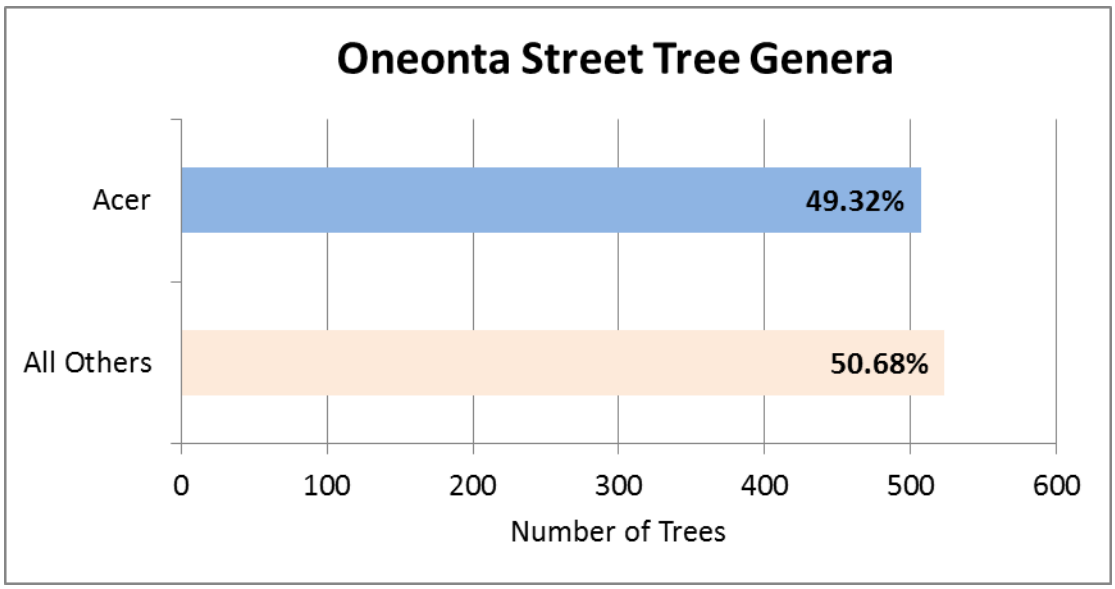
The 2011 Oneonta street tree inventory accounted for 1028 trees and 540 planting spaces located in the right-of-way. Excluding the 67 trees inventoried on July 15, 2011 where no corresponding planting space data was taken, the proportion of trees to potential street trees translates into a 63.94% street tree stocking level (see graph below). A 60% stocking level is the national average and most municipalities have stocking levels between 50 and 75%. However, it should be noted that all Oneonta streets were not surveyed and streets judged to contain the most street trees were prioritized to be inventoried. Therefore, if all Oneonta streets were to be inventoried, stocking levels could expect to be less than 63.94%.



Genera and Species Distribution

The City of Oneonta street tree inventory accounted for 1028 publicly managed trees in the city's right-of-way.

A significant percentage of all inventoried right-of-way trees (49.32%) were Maples (*Acer* genus) (see graph below).

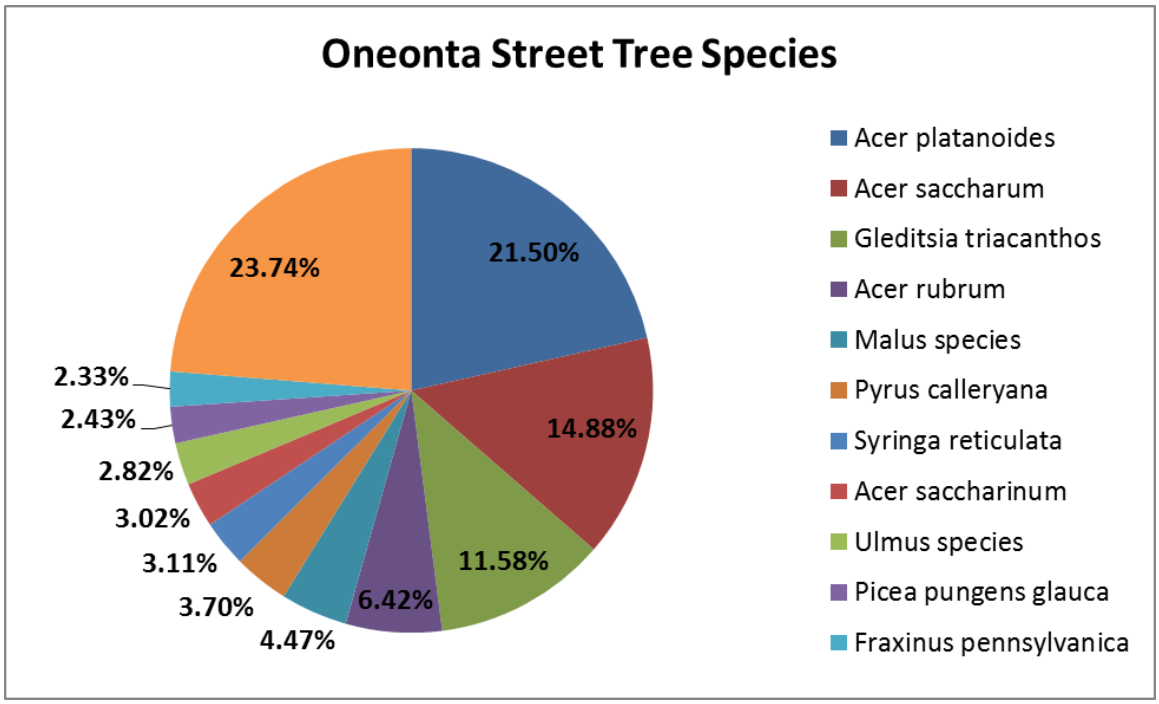


No other genus besides *Acer* accounted for more than 11.58% of all inventoried street trees (see table below).

Genus	**Number of Trees**	**Percentage**
Acer (Maple)	507	49.32%
Gleditsia (Honeylocust)	119	11.58%
Malus (Apple)	48	4.67%
Picea (Spruce)	45	4.38%
Pyrus (Pear)	38	3.70%
Fraxinus (Ash)	36	3.50%
Ulmus (Elm)	35	3.40%
Prunus (Cherry)	32	3.11%
Syringa (Lilac)	32	3.11%
Tilia (Linden)	30	2.92%
Quercus (Oak)	16	1.56%
All Others	90	8.75%

Within the *Acer* genus, Norway Maple (*Acer platanoides*) accounted for 43.59%, Sugar Maple (*Acer saccharum*) 30.18%%, Red Maple (*Acer rubrum*) 13.02%, Silver Maple (*Acer saccharinum*) 6.11%, and Freeman Maple (*Acer x freemanii*) 2.76% of all Maples.

Regarding the population of inventoried street trees, Norway Maple (*Acer platanoides*) accounted for 21.50%, Sugar Maple (*Acer saccharum*) 14.88%, Honeylocust (*Gleditsia triacanthos*) 11.58%, and Red Maple (*Acer rubrum*) 6.42% of all trees (see graph below; a complete species list can be found as an appendix).

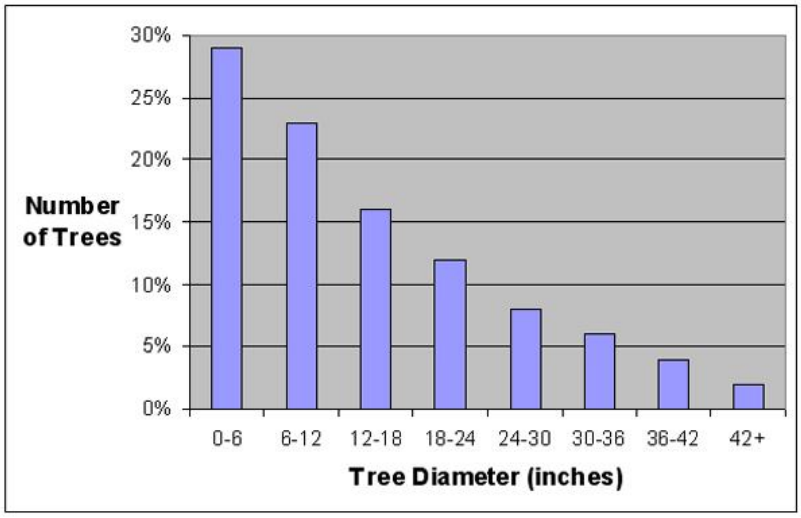


As a general rule, no one tree species should constitute more than 10% of the street tree population and no one tree genus should exceed 20% of the street tree population. For species, the percentages of Norway Maple (21.50%), Sugar Maple (14.88%), and Honeylocust (11.58%) exceed the 10% rule and indicate these species are overrepresented in the population. For genus, the percentage of trees in the *Acer* genus (49.32%) exceeds the 20% rule and indicates that Maples are overrepresented in the population.

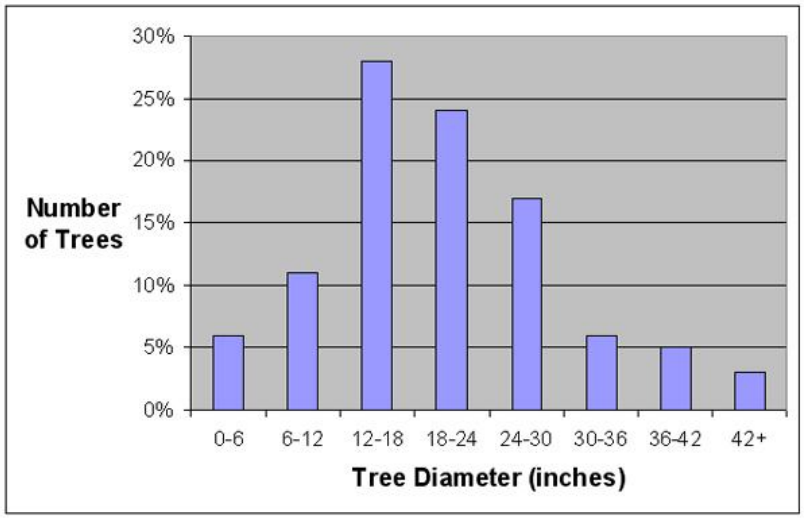
Diameter Distribution

DBH (tree trunk diameter at breast height) is not only a measure of tree age and size, but also a valuable indicator of the benefits provided by street trees. In general, the older and larger the tree, the more the benefits provided. At the same time, there must be a sufficient number of younger, smaller trees in the street tree population to account for the loss of trees over time and thereby maintain a sustainable community forest.

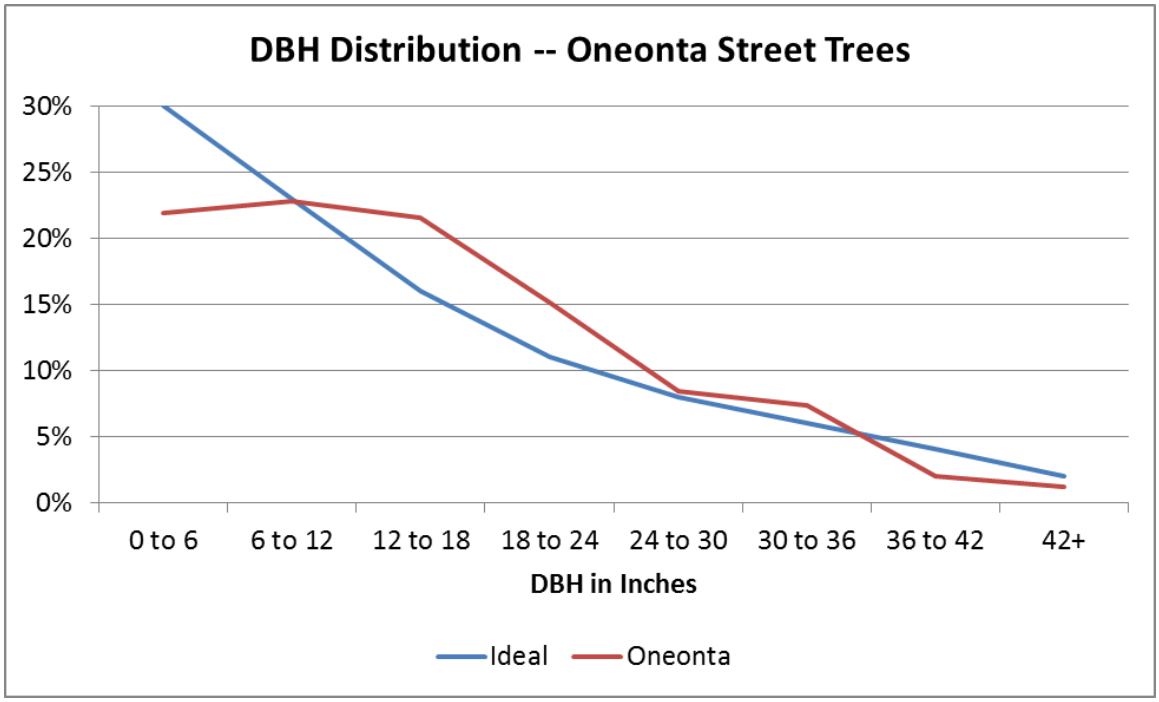
If a community is planting trees regularly, the following J-shaped trend line should be observed for its trees, tapering off at the larger (older) sizes (see graph below).



If, however, a community is not planting trees regularly, the following trend line may be observed for its trees, where a disproportionate share of its trees are in the larger (older) sizes (see graph below).



The graph below plots the DBH distribution for inventoried street trees in Oneonta against an ideal, J-shaped distribution for community trees.

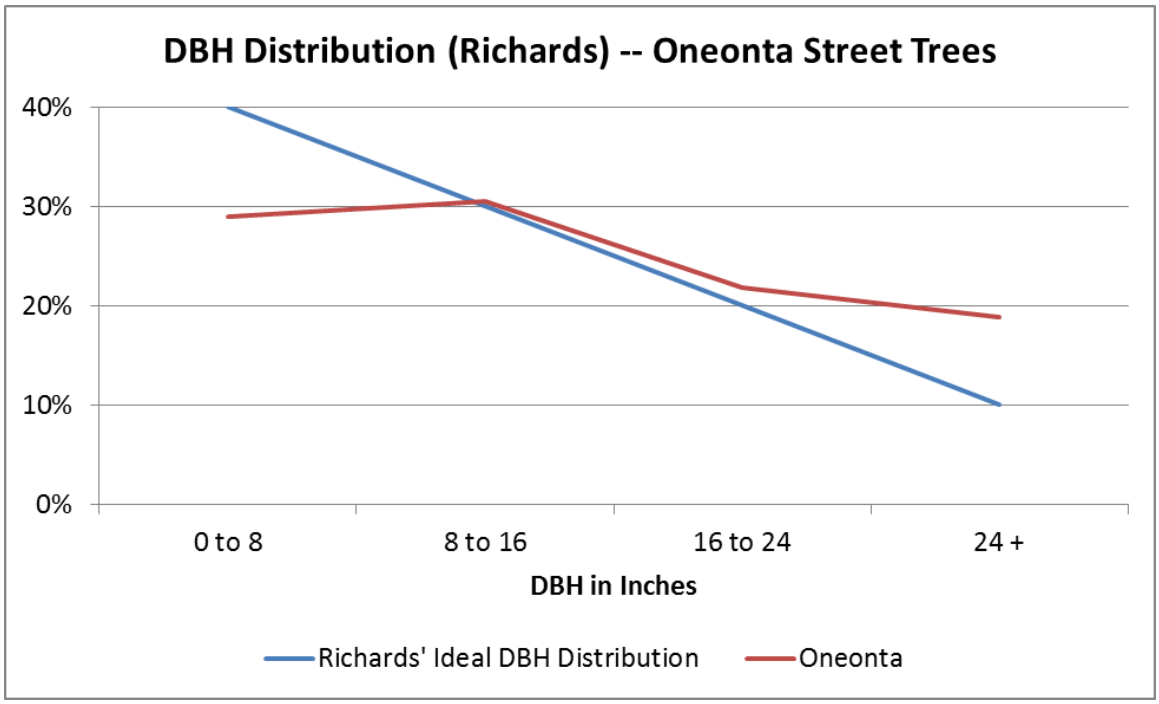


This graph suggests that while many young trees have recently been planted, the number of new plantings needs to increase to fully compensate for the future loss of older trees.

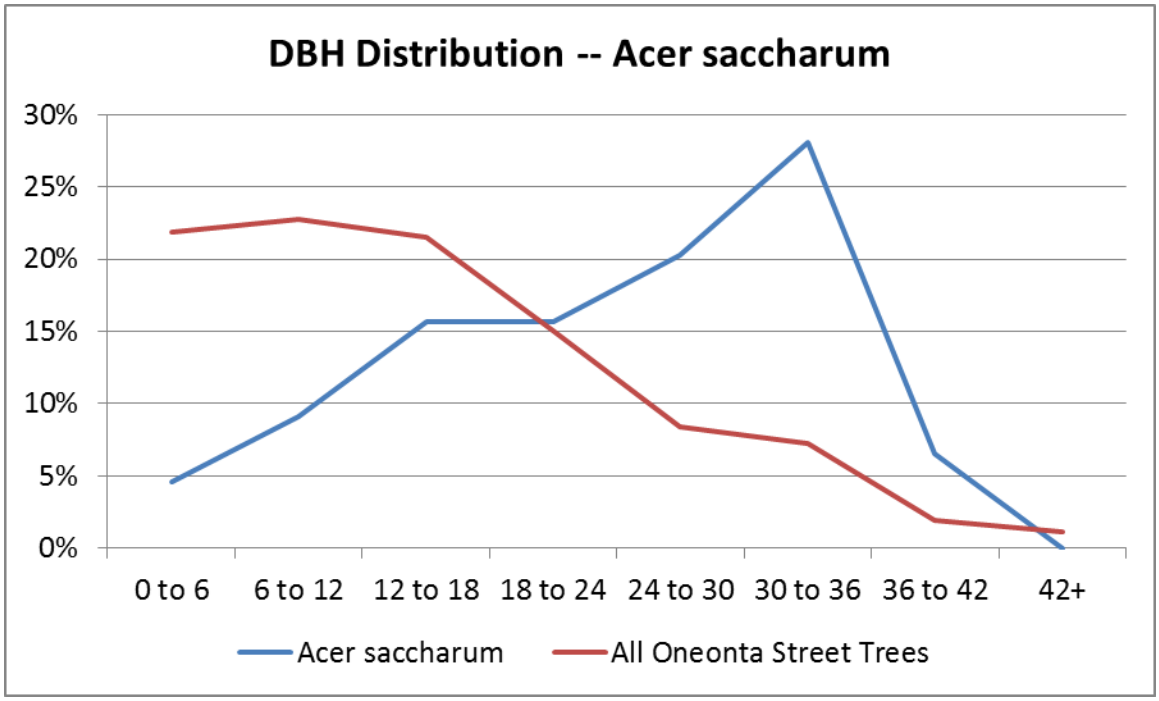
Another metric of diameter distribution has been postulated by Richards (1983).[1] According to Richards, an ideal distribution of street trees would find 40% of trees with a DBH less than 8 inches, 30% 8 to 16 inches, 20% 16 to 24 inches, and 10% greater than 24 inches.

The graph below plots the DBH distributions for inventoried Oneonta street trees in relation to Richards' ideal DBH distribution.

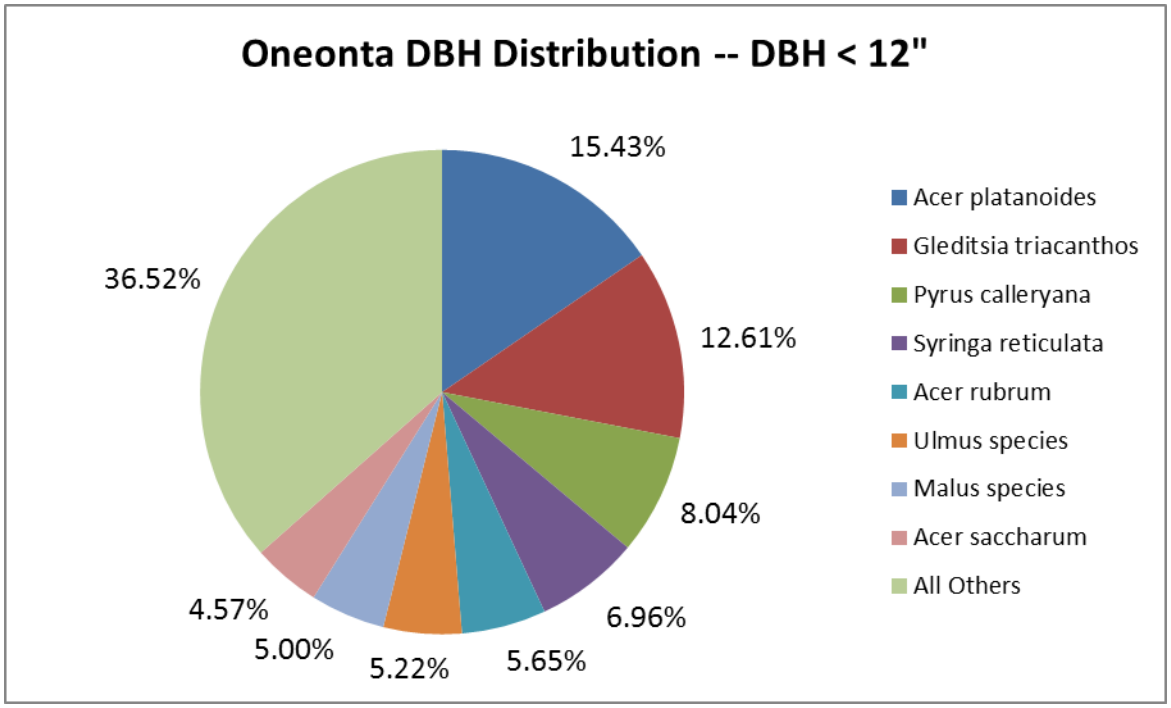
[1] Richards, N.A. (1983) Diversity and stability in a street tree population. *Urban Ecology*, 7:159-171.

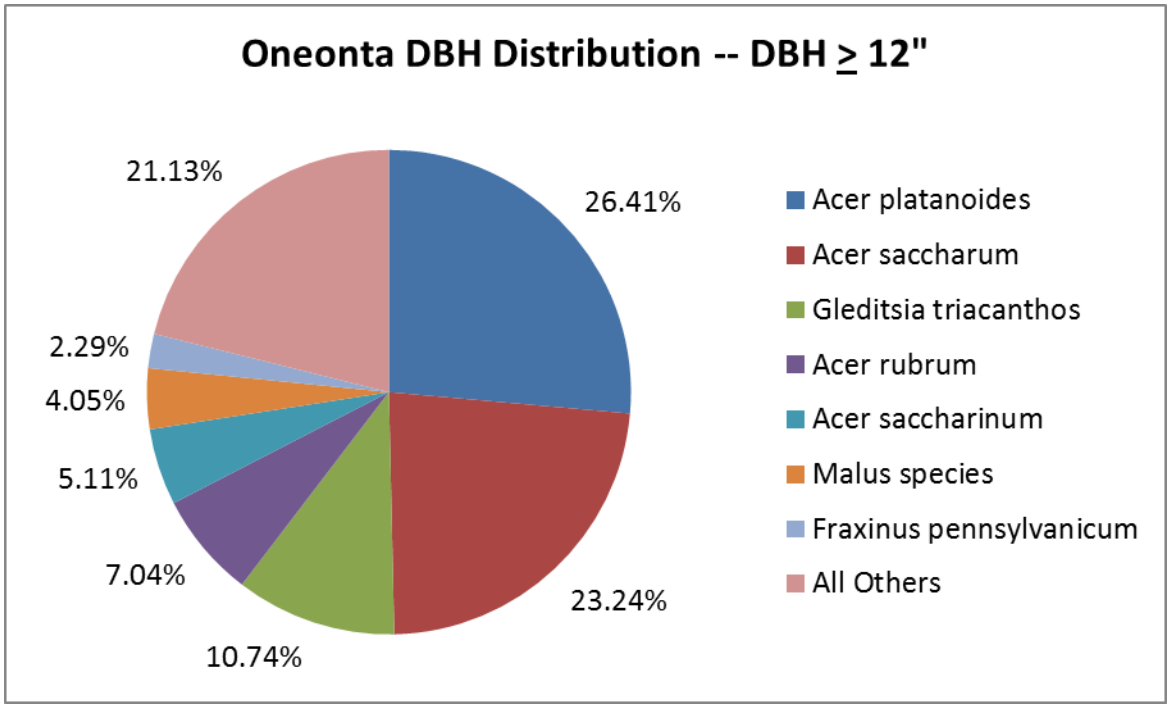


This graph confirms the finding that additional young trees need to be planted along city streets to account for the future loss of older trees. Many of these older trees are Sugar Maples (*Acer saccharum*) and the graph below clearly indicates the Sugar Maple component of the street tree population is older than the overall profile Oneonta street trees.



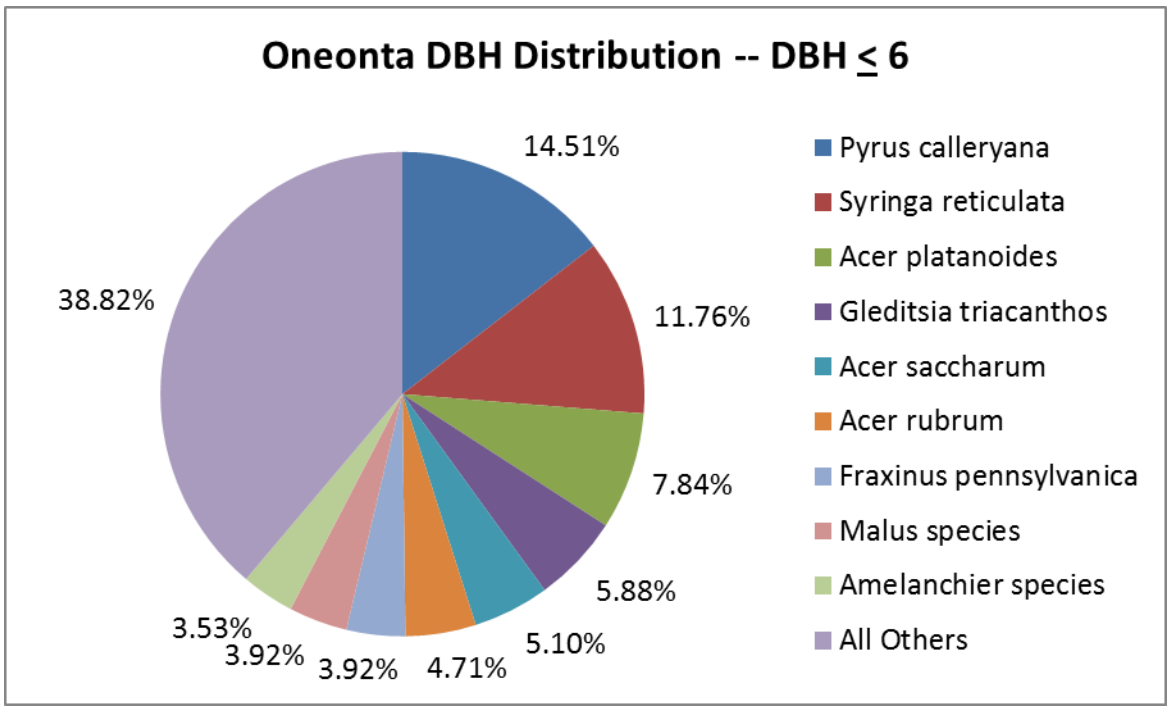
The two graphs below depict the DBH distribution of inventoried trees by species for trees with a DBH less than 12 inches and trees with a DBH of 12 inches and greater.





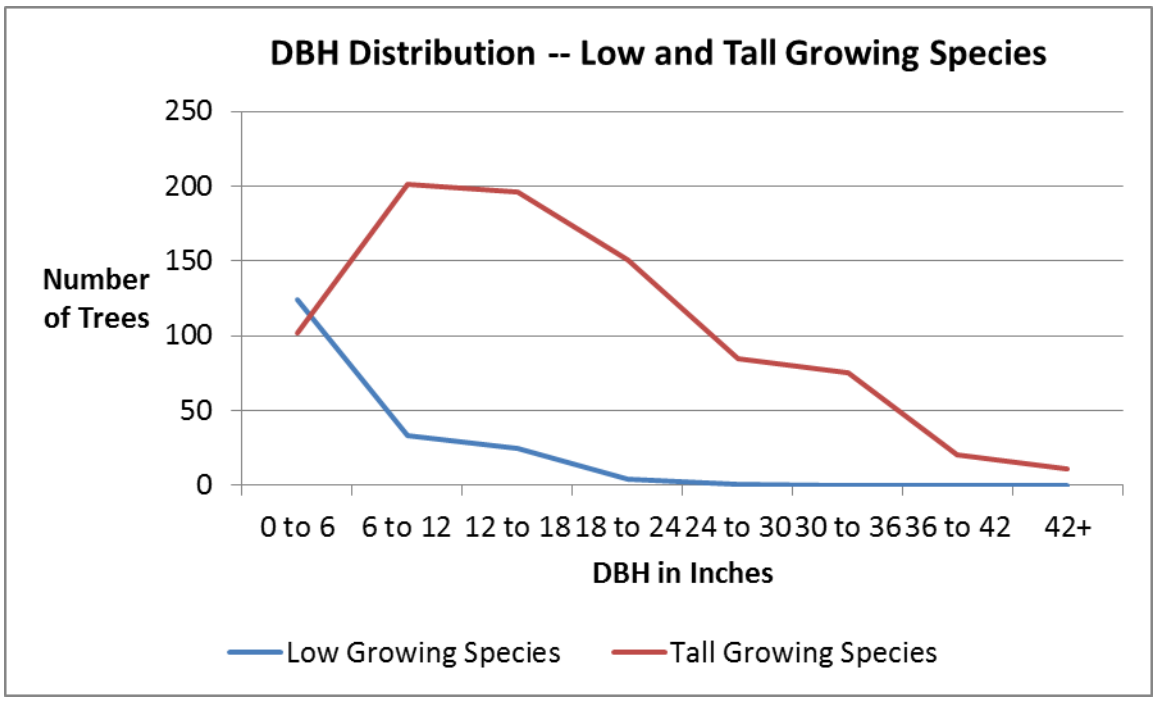
44.75% of right-of-way trees have trunk diameters less than 12 inches while 55.25% have diameters greater than or equal to 12 inches. Norway Maple (*Acer platanoides*) and Sugar Maple (*Acer saccharum*) dominate the larger DBH classes, and Norway Maple (*Acer platanoides*), Honeylocust (*Gleditsia triacanthos*), Callery Pear (*Pyrus calleryana*), and Japanese Tree Lilac (*Syringa reticulata*) are the most prevalent species in the smaller DBH classes.

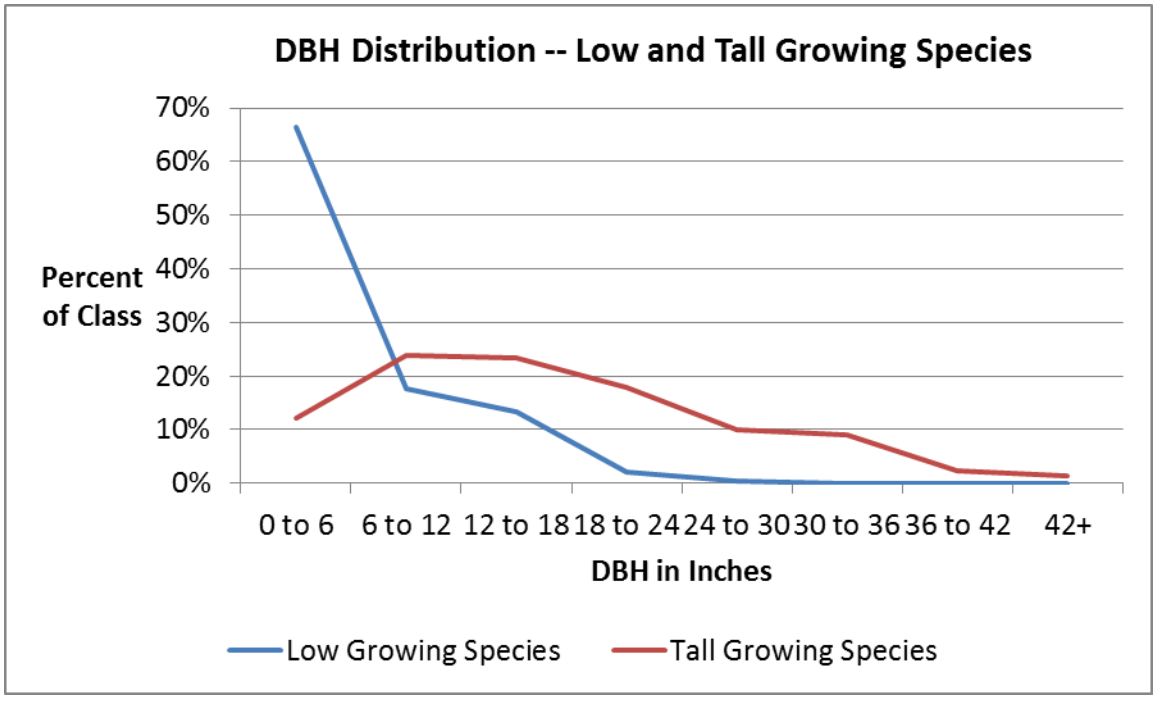
The graph below depicts the DBH distribution of right-of-way trees by species for trees with a DBH of 6 inches and less and indicates the species of trees most recently planted. Callery Pear (*Pyrus calleryana*) and Japanese Tree Lilac (Syringa reticulate) are the most prevalent species in this DBH class.



Finally, the two graphs below depict the DBH distribution of tall and low growing species. Low growing species include trees that would not be expected to grow higher than 30 feet and therefore would likely not interfere with single or triple phase utility wires; conversely, tall growing species include trees that would be expected to grow taller than 30 feet.

Tall growing tree species accounted for 81.81% of all right-of-way trees and low growing tree species accounted for 18.19% of all right-of-way trees.

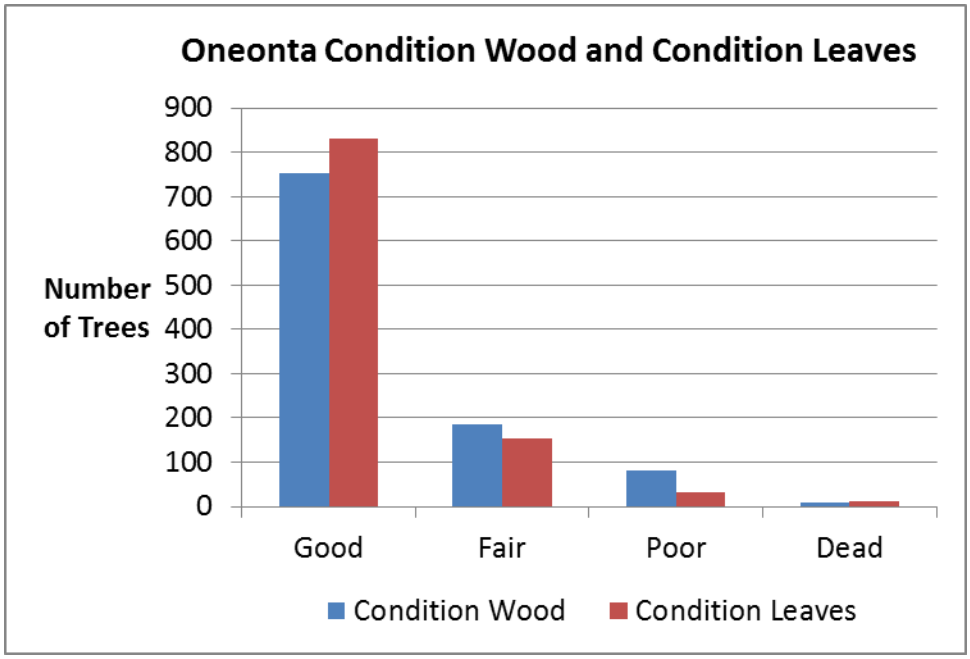




While low and tall growing tree species are being planted in roughly equal numbers, the percentage of low growing tree species being planted relative to existing low growing tree species far exceeds the percentage of tall growing tree species being planted relative to existing tall growing tree species. This trend if it continues foreshadows a long-term shift in the composition of the city's street tree population.

Tree Condition and Maintenance

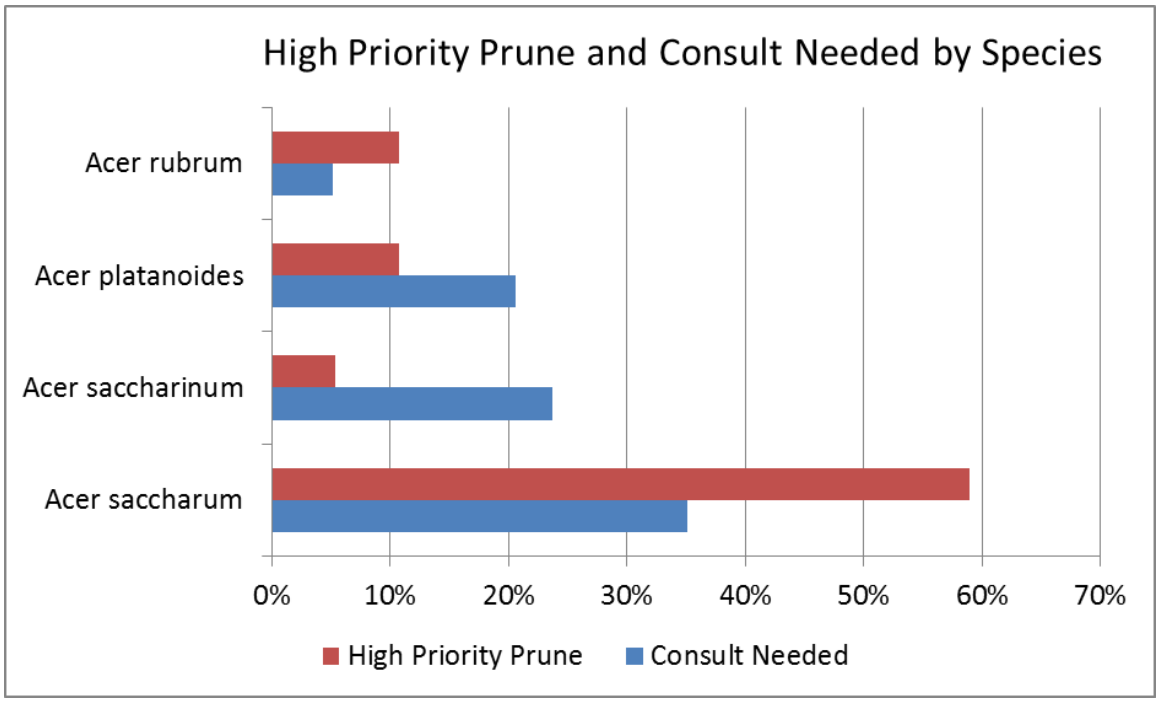
Most inventoried Oneonta trees are in good condition and a great majority is in at least fair condition (see graph below).



Most inventoried trees (94.55%) are in need of a Routine Prune at most. 5.45% of inventoried trees require a High Priority Prune and 9.44% should be inspected by a licensed arborist (see table below).

Maintenance Recommendation	**Number of Trees**	**Percentage**
None	702	68.29%
Train	44	4.28%
Routine Prune	226	21.98%
High Priority Prune	56	5.45%
Consult Needed		
No	931	90.56%
Yes	97	9.44%

The graph below indicates that Sugar Maples (*Acer saccharum*) and Silver Maples (*Acer saccharinum*) are the largest contributors to maintenance needs and concerns.



Note: Most mature Silver Maples (*Acer saccharinum*) are given a "Consult Needed" designation due to their (1) age and large size and (2) V shaped branching structure which renders them vulnerable to sudden catastrophic failure; accordingly, these Silver Maples warrant an inspection by a certified arborist even when in apparent good condition.

STRATUM Analysis

i-Tree Streets is a computer-based analysis tool developed by the United States Forest Service for street tree management. It uses street tree inventory data to (1) quantify the dollar value of annual benefits such as CO_2 reduction energy conservation, air quality improvement, storm water control, and property value increase, and (2) evaluate the benefits, costs, and management needs of community trees.

Based on the data collected in the 2011 street tree inventory, an analysis using i-Tree Streets was performed for inventoried Oneonta street trees. This analysis revealed the following:

The total estimated annual benefits for inventoried street trees are $134,113 or $131.48 per tree. Of this total, energy conservation is $56,983, CO_2 reduction is $1,436, air quality improvement is $10,245, stormwater control is $14,117, and property value increase is $51,333. Not surprisingly, Norway and Sugar Maples, the most prevalent tree species inventoried, contribute many of these benefits. Norway Maples account for $33,939 in annual benefits, or 25.3% of the total and Sugar Maples account for $29,957 in annual benefits, or 22.3% of the total.

The replacement value of inventoried street trees is $4,995,015. The replacement value of inventoried Norway Maples is $1,394,044 or 27.91% of the total, and the replacement value of inventoried Sugar Maples is $1,006,713 or 20.15% of the total.

A suite of i-Tree Streets tables can be found in an appendix of this report. Zone 1 in the tables signifies those streets inventoried by SWAT on September 17 and October 1, 2011. Zone 2 in the tables signifies those streets in the sixth ward inventoried on July 15, 2011.

Management Recommendations

Data from the 2011 Oneonta street tree inventory revealed the following:

- The stocking level is consistent with the national average with trees occupying 63.94% of available planting spaces for those streets inventoried.

- The population is insufficiently diverse with a disproportionately large number of Norway and Sugar Maples, and Maple trees more generally.

- The DBH distributions indicate that, while many young trees have been planted recently, additional trees need to be planted to account for the future loss of older trees and the city's Sugar Maples in particular are aging.

- Trees are generally in good condition. 972 trees (94.55%) are in need of a Routine Prune at most, but 56 trees (5.45%) were given a rating of High Priority Prune and 97 trees were given a rating of Consult Needed (9.44%) and should be inspected by a certified arborist. Norway and Sugar Maples comprise a high proportion of trees rated High Priority Prune and Consult Needed.

Based on this data, this report makes the following recommendations:

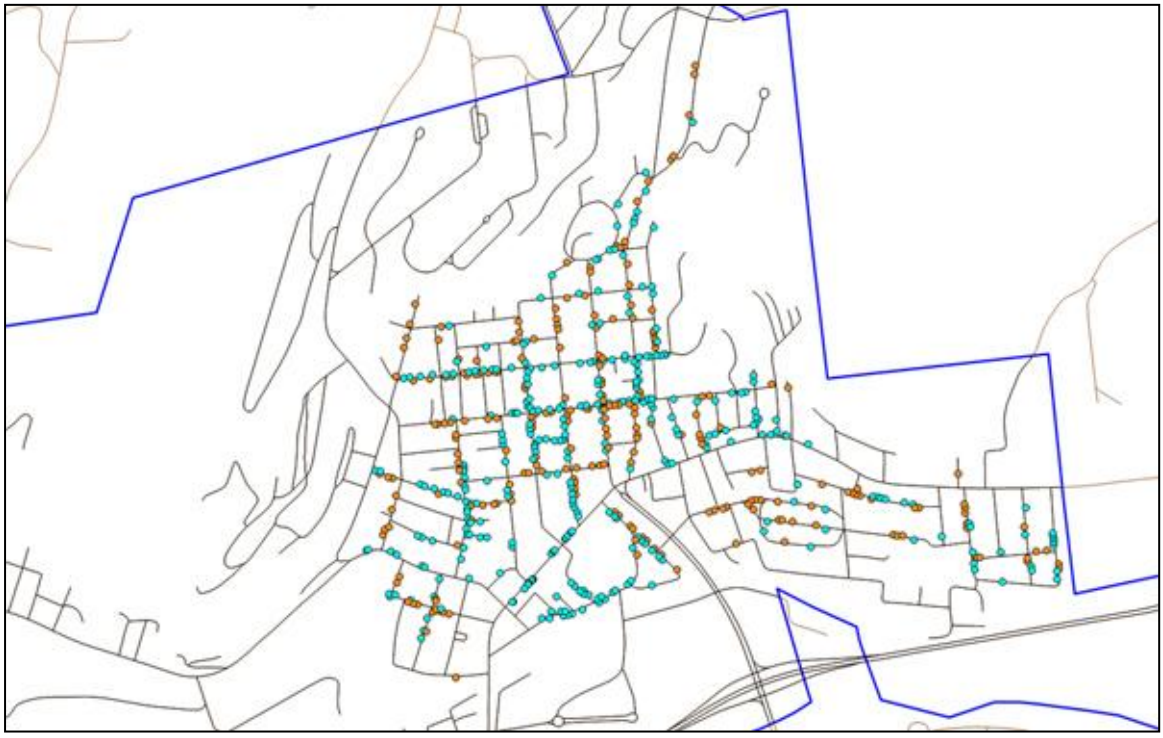
- Additional trees need to be planted to compensate for the future loss of older trees.

- New plantings should primarily include genera other than Maples (*Acer*) and species other than Norway Maple (*Acer platanoides*), Sugar Maple (*Acer saccharum*), and Honeylocust (*Gleditsia triacanthos*). As a general rule, no tree species should comprise more than 10% and no tree genera should comprise more than 20% of the overall street tree population. That way, if a species or genus becomes susceptible to an insect or disease, a majority of the community's trees will likely not be affected.

- The 63.94% stocking level for inventoried streets is consistent with the national average, but opportunities exist for additional plantings. Typically after an inventory, more resources are spent on the deferred maintenance of older trees than on planting new trees. New plantings, however, are needed to maintain or increase stocking levels and replace trees that may be removed.

- Decisions on where to plant new trees are typically based on a community's perceived greatest need and many communities find that a cluster planting provides the greatest visibility and impact. A map of the 540 planting spaces identified in the inventory (see next page) indicates where in Oneonta plantings might occur. This map also specifies planting spaces not located beneath single or triple phase utility wires. A decision may be made to prioritize these planting spaces since conflicts with wires can be avoided, particularly for tall growing tree species where sufficient planting volume

exists. The inventory found 228 planting spaces (42.22%) located beneath utility wires and 312 spaces (57.78%) that are not. For example, of the 23 planting spaces identified on Maple Street, 15 spaces (65.22%) are subject to potential wire conflicts, whereas of the 42 planting spaces identified on Spruce Street, 30 spaces (71.43%) are not subject to potential wire conflicts. A table indicating stocking levels and planting spaces without wire conflicts for individual streets is included as an appendix.



City of Oneonta Planting Spaces – spaces with no single or triple phase utility wire conflicts are in turquoise

- Ideally, new trees would be planted in all available planting sites. Budget limitations, however, coupled with the opposition of some property owners to a tree planted in the right-of-way make that goal difficult, if not impossible, to achieve. If maximizing street tree benefits is a priority, then taller growing tree species should be emphasized where possible versus smaller growing species. The table below details the relative benefits of a mature crabapple and a mature sugar maple, both in good condition.

Species	DBH	Energy	CO2	Air Quality	Storm Water	Aesthetic/Other	Total	Replacement Value
Malus spp.	15	$44.61	$0.90	$7.64	$8.27	$20.48	$81.90	$4,976
Acer saccharum	36	$120.73	$3.58	$22.68	$50.21	$110.58	$307.78	$17,580

- Inventory results reveal that while low and tall growing tree species are being planted in roughly equal numbers, the percentage of low growing tree species being planted relative to existing low growing tree species exceeds the percentage of tall growing tree species being planted relative to existing tall growing tree species. This trend foreshadows a shift in the composition of the street tree population and a reduction in the provision of street tree benefits. To increase the provision of street tree benefits, greater numbers of tall growing tree species that de-emphasize Norway Maple, Sugar Maple, and Honeylocust should be planted where sufficient planting volume exists and overhead single or triple phase utility wires are absent.

- Where small trees are advisable, due primarily to the presence of overhead single or triple phase utility wires, trees selected for planting sites should mature at less than 30'. Appropriate species to consider would be various disease resistant Crabapples, Winter King Hawthorn, Amelanchier (Serviceberry), Cornelian Cherry Dogwood (tree form), Amur Maackia, Globe or Bessoniana Black Locust, Japanese Lilac, and American Hornbeam among others. A list of both smaller and taller maturing trees appropriate for urban street tree plantings can be found in the "Recommended Urban Trees" booklet available from Cornell University's Urban Horticulture Institute (http://www.hort.cornell.edu/uhi/outreach/recurbtree/index.html).

- 118 of 540 planting spaces (21.85%) are located in narrow treelawns (i.e. grassy strip between the sidewalk and curb) approximately four feet wide or less (see map below).

City of Oneonta Planting Spaces – spaces with narrow treelawns

Narrow treelawns typically offer less planting volume than treelawns of greater width. Planting tall growing tree species in these types of spaces can negatively impact tree growth and health and result in sidewalk damage due to tree root growth. Therefore, to maximize street tree benefits, improve tree growth and health, and reduce sidewalk damage, consideration should be given to planting tall growing tree species on front yards and lawns adjacent to sidewalks (i.e. on private property) where treelawns are narrow or do not exist subject to agreement with the property owner. This inventory did not map front yards and lawns where such plantings might occur, but a list of possible sites can be generated easily in a windshield survey conducted by car.

- The Emerald Ash Borer is an invasive beetle that has devastated Ash (*Fraxinus*) populations in the Midwest and has now spread to New York State. Accordingly, new plantings of Ash trees should be avoided. This inventory located 36 Ash trees or 3.50% of all trees inventoried.

- 56 trees (5.45%) were given a rating of "High Priority Prune" and 97 a rating of "Consult Needed" (9.44%). It must be stressed that neither one of these ratings implies a "hazard" or "removal" designation. This inventory did not make hazard tree evaluations or recommendations for tree removals. These ratings do signify, however, that in the case of High Priority Prune maintenance of the tree is highly recommended, and in the case of Consult Needed the tree should be inspected by a certified arborist. Both tasks should be performed in a timely manner.

- Finally, a street tree inventory is a snapshot in time, a useful tool in maintaining a healthy urban forest and planning for a future sustainable one. Its usefulness depends greatly on keeping the information current. Having obtained an inventory, the city should make a commitment to update inventory data as trees are pruned, removed, or planted.

Appendix 1 –Species Distribution of Inventoried Oneonta Street Trees

Botanic	Number of Trees		Botanic	Number of Trees	
Acer platanoides	221	21%	Robinia pseudoacacia	5	1% <
Acer saccharum	153	15%	Ulmus americana	5	1% <
Gleditsia triacanthos	119	12%	Crataegus crus-galli	4	1% <
Acer rubrum	66	6%	Betula populifolia	3	1% <
Malus species	46	4%	Cornus florida	3	1% <
Pyrus calleryana	38	4%	Gymnocladus dioicus	3	1% <
Syringa reticulata	32	3%	Pinus nigra	3	1% <
Acer saccharinum	31	3%	Pinus resinosa	3	1% <
Ulmus species	29	3%	Pinus strobus	3	1% <
Picea pungens glauca	25	2%	Prunus cerasifera	3	1% <
Fraxinus pennsylvanica	24	2%	Prunus sargentii	3	1% <
Prunus serotina	17	2%	Sorbus alnifolia	3	1% <
Tilia cordata	17	2%	Amelanchier laevis	2	1% <
Picea abies	15	1%	Betula nigra	2	1% <
Acer x freemanii	14	1%	Cercis canadensis	2	1% <
Catalpa speciosa	14	1%	Maackia amurensis	2	1% <
Fraxinus americana	12	1%	Malus pumila	2	1% <
Tilia americana	11	1%	Prunus virginiana ‘Shubert’	2	1% <
Amelanchier species	9	1%	Quercus alba	2	1% <
Acer campestre	8	1%	Sorbus aucuparia	2	1% <
Acer palmatum	7	1%	Fagus sylvatica	1	1% <
Acer tataricum ssp. ginnala	7	1%	Juglans nigra	1	1% <
Quercus palustris	7	1%	Populus deltoides	1	1% <
Thuja occidentalis	7	1%	Prunus species	1	1% <
Quercus rubra	6	1%	Prunus virginiana	1	1% <
Tsuga canadensis	6	1%	Quercus robur	1	1% <
Betula papyrifera	5	1% <	Sassafras albidum	1	1% <
Cornus kousa	5	1% <	Tilia tomentosa	1	1% <
Picea glauca	5	1% <	Tilia x euchlora	1	1% <
Prunus subhirtella	5	1% <	Ulmus rubra	1	1% <

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Appendix 2 -- Stocking Levels and Planting Spaces Without Wires by Street

OnStreet	Number of Existing Trees	Available Planting Spaces	Stocking Percentage	Planting Spaces w/o Wires	Percentage of Available Spaces
3RD ST	3	0	100.00%	0	0.00%
4TH ST	5	0	100.00%	0	0.00%
5TH ST	3	1	75.00%	1	100.00%
6TH ST	5	1	83.33%	0	0.00%
8TH ST	1	1	50.00%	1	100.00%
BELMONT PARK	0	2	0.00%	0	0.00%
BROAD ST	9	1	90.00%	1	100.00%
BROOK ST	3	1	75.00%	0	0.00%
BUGBEE RD	1	0	100.00%	0	0.00%
CEDAR ST	8	6	57.14%	4	66.67%
CENTER ST	44	42	51.16%	23	54.76%
CENTRAL AVE	5	2	71.43%	1	50.00%
CHERRY ST	0	12	0.00%	8	66.67%
CHESTER ST	0	5	0.00%	0	0.00%
CHESTNUT ST	12	7	63.16%	7	100.00%
CHURCH ST	12	19	38.71%	13	68.42%
CLIFF ST	3	0	100.00%	0	0.00%
CLINTON ST	17	5	77.27%	0	0.00%
DIETZ ST	17	12	58.62%	8	66.67%
DIVISION ST	21	3	87.50%	1	33.33%
DRAPER ST	5	6	45.45%	6	100.00%
EAST END AVE	1	9	10.00%	7	77.78%
EAST ST	68	31	68.69%	16	51.61%
ELM ST	69	28	71.13%	15	53.57%
FACTORY ST	1	0	100.00%	0	0.00%
FAIR ST	13	4	76.47%	0	0.00%
FAIRVIEW ST	1	1	50.00%	0	0.00%
FONDA AVE	13	0	100.00%	0	0.00%
FORD AVE	27	26	50.94%	16	61.54%
FOREST AVE	0	1	0.00%	1	100.00%
FRANKLIN ST	2	0	100.00%	0	0.00%
FREDERICK ST	9	1	90.00%	1	100.00%
GARDNER PL	8	3	72.73%	2	66.67%
GAULT AVE	0	5	0.00%	4	80.00%
GILBERT ST	5	0	100.00%	0	0.00%
GRAND ST	16	18	47.06%	9	50.00%
GROVE ST	26	11	70.27%	4	36.36%
HARMON AVE	2	0	100.00%	0	0.00%
HAZEL ST	3	2	60.00%	2	100.00%
HICKEY ST	0	3	0.00%	1	33.33%

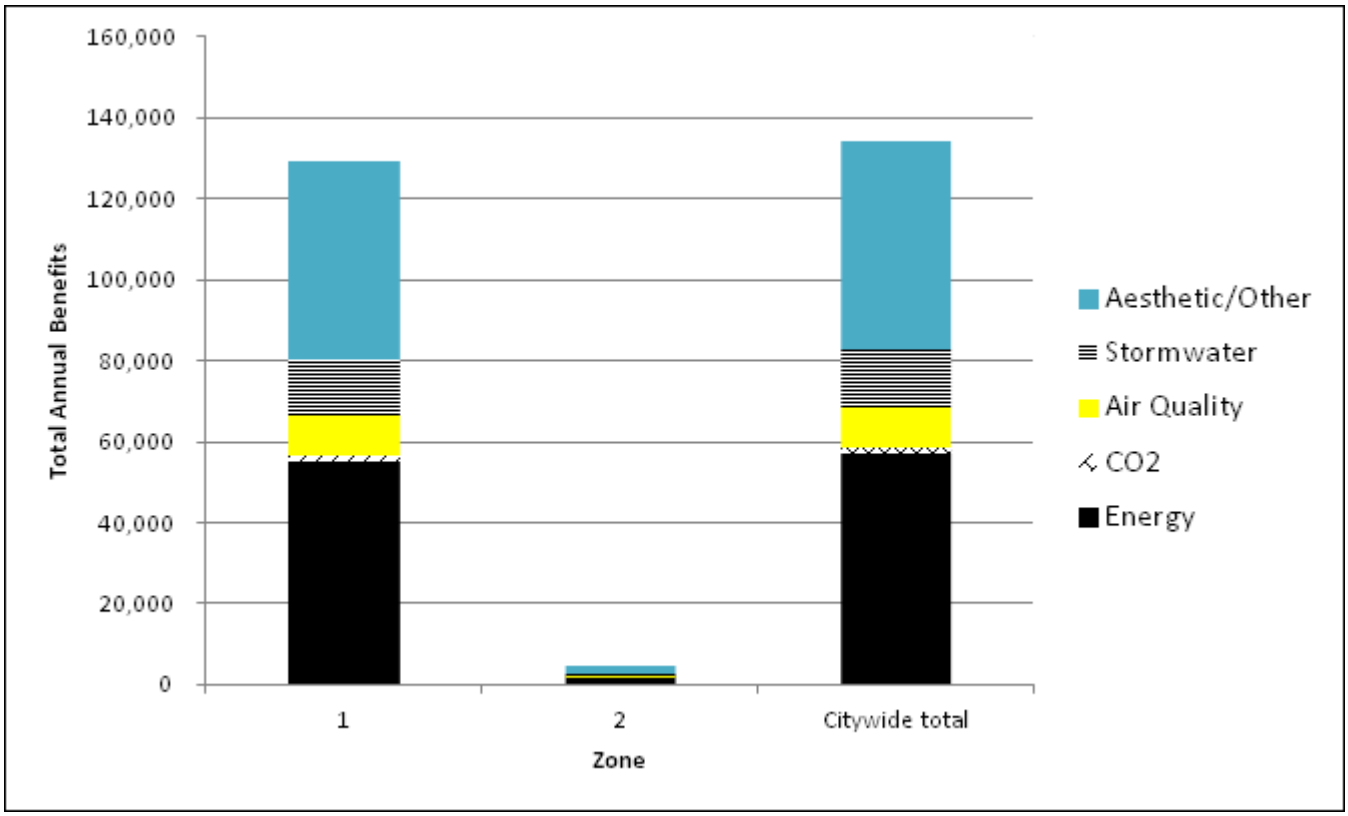
OnStreet	Number of Existing Trees	Available Planting Spaces	Stocking Percentage	Planting Spaces w/o Wires	Percentage of Available Spaces
HICKORY ST	10	0	100.00%	0	0.00%
HIGH ST	2	4	33.33%	3	75.00%
HIGHLAND ST	2	1	66.67%	0	0.00%
HILL PL	1	3	25.00%	2	66.67%
HUDSON ST	13	10	56.52%	3	30.00%
IRVING PL	7	2	77.78%	1	50.00%
LAWN AVE	0	4	0.00%	4	100.00%
LEWIS ST	3	1	75.00%	0	0.00%
LINDEN AVE	18	5	78.26%	2	40.00%
LUTHER ST	1	0	100.00%	0	0.00%
MAIN ST	71	25	73.96%	25	100.00%
MAPLE ST	38	23	62.30%	8	34.78%
MARKET ST	22	16	57.89%	16	100.00%
MILLER ST	3	0	100.00%	0	0.00%
MONROE AVE	12	2	85.71%	1	50.00%
MONROE ST	1	0	100.00%	0	0.00%
MYRTLE AVE	3	0	100.00%	0	0.00%
N 5TH ST	10	1	90.91%	0	0.00%
N BELMONT CIR	19	7	73.08%	2	28.57%
NORMAL AVE	10	1	90.91%	0	0.00%
NORTON AVE	8	2	80.00%	0	0.00%
OAK ST	13	5	72.22%	5	100.00%
OTSEGO ST	13	0	100.00%	0	0.00%
PINE ST	4	8	33.33%	1	12.50%
POTTER AVE	5	0	100.00%	0	0.00%
PROSPECT ST	3	1	75.00%	1	100.00%
REYNOLDS AVE	1	6	14.29%	2	33.33%
REYNOLDS ST	12	6	66.67%	4	66.67%
RIVER ST	43	0	100.00%	0	0.00%
ROOSEVELT AVE	3	7	30.00%	3	42.86%
ROSE AVE	6	10	37.50%	5	50.00%
ROW	7	0	100.00%	0	0.00%
S BELMONT CIR	10	3	76.92%	2	66.67%
S MAIN ST	1	6	14.29%	6	100.00%
SAND ST	18	0	100.00%	0	0.00%
SPRING ST	11	3	78.57%	1	33.33%
SPRUCE ST	33	42	44.00%	30	71.43%
STAPLETON AVE	4	0	100.00%	0	0.00%
STATE ST	5	4	55.56%	4	100.00%
SUSQUEHANNA ST	2	0	100.00%	0	0.00%
TAFT AVE	1	0	100.00%	0	0.00%
TILTON AVE	7	0	100.00%	0	0.00%
UNION ST	1	11	8.33%	5	45.45%

OnStreet	Number of Existing Trees	Available Planting Spaces	Stocking Percentage	Planting Spaces w/o Wires	Percentage of Available Spaces
VALLEYVIEW ST	13	14	48.15%	6	42.86%
W BROADWAY	2	0	100.00%	0	0.00%
WALL ST	0	1	0.00%	1	100.00%
WALLING AVE	13	4	76.47%	3	75.00%
WALLING BLVD	13	2	86.67%	1	50.00%
WALNUT ST	37	11	77.08%	3	27.27%
WATER ST	3	1	75.00%	1	100.00%
WATKINS AVE	34	9	79.07%	5	55.56%
WELLS AVE	1	0	100.00%	0	0.00%
WEST ST	6	5	54.55%	0	0.00%
WILSON RD	0	4	0.00%	4	100.00%
YAGER AVE	8	0	100.00%	0	0.00%
YOUNGMAN AVE	2	1	66.67%	0	0.00%

Oneonta

Total Annual Benefits of Public Trees by Zone ($)

11/10/201

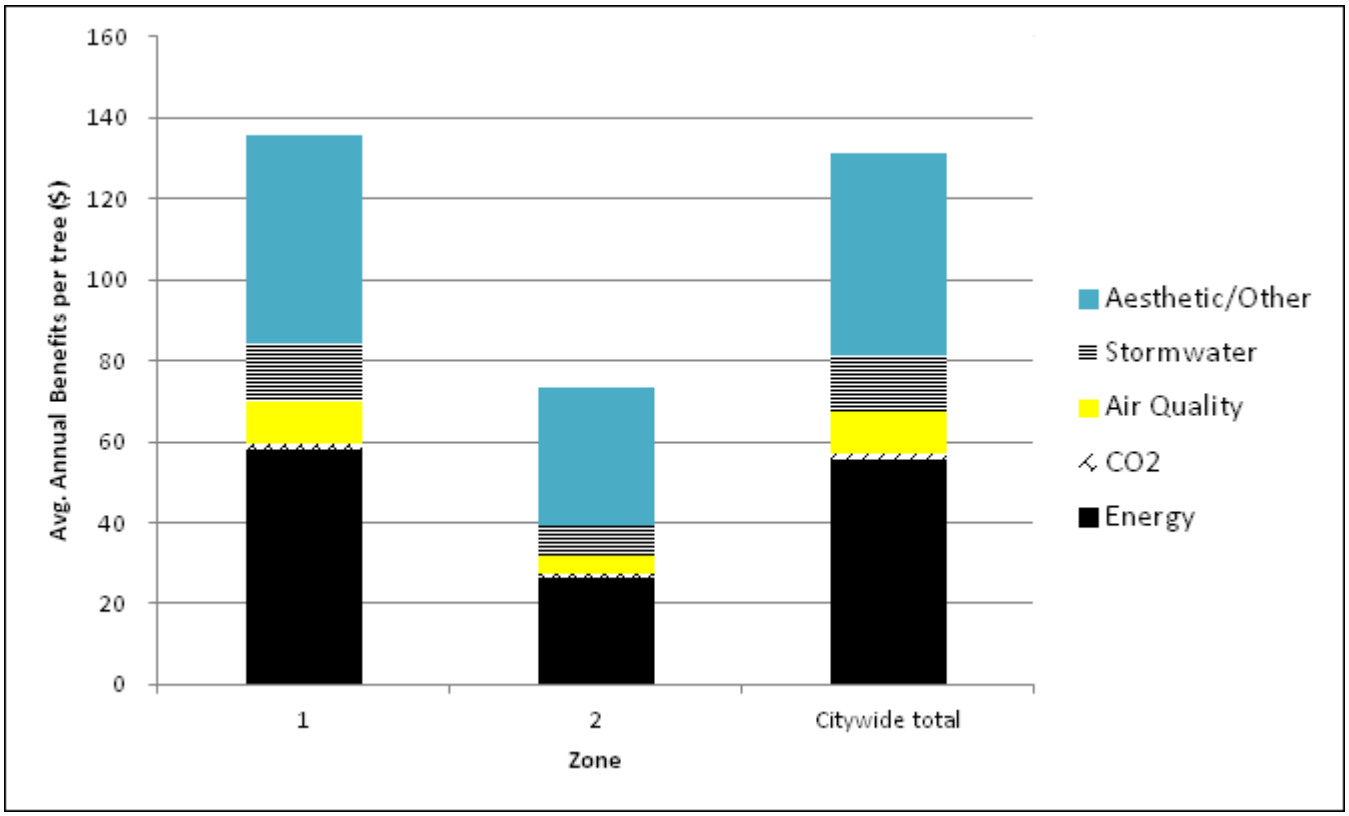


Zone	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
1	55,203	1,391	9,916	13,640	49,057	129,207	(N/A)	96.3
2	1,780	45	329	477	2,275	4,906	(N/A)	3.7
Citywide total	56,983	1,436	10,245	14,117	51,333	134,113	(N/A)	100.0

Oneonta

Annual Benefits of Public Trees by Zone ($/tree)

11/10/2011



Zone	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error
1	57.93	1.46	10.40	14.31	51.48	135.58	(N/A)
2	26.56	0.67	4.91	7.12	33.96	73.22	(N/A)
Citywide total	55.87	1.41	10.04	13.84	50.33	131.48	(N/A)

Oneonta

Total Annual Benefits of Public Trees by Species ($)

11/10/201

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error	% of Total $
Acer platanoides	13,911	460	2,566	3,068	13,934	33,939	(±0)	25.3
Acer saccharum	12,531	329	2,217	3,960	10,920	29,957	(±0)	22.3
Gleditsia triacanthos	8,066	162	1,363	1,500	7,961	19,052	(±0)	14.2
Acer rubrum	3,982	75	714	1,013	2,839	8,623	(±0)	6.4
Malus species	1,463	27	245	258	779	2,772	(±0)	2.1
Pyrus calleryana	318	11	59	71	1,483	1,941	(±0)	1.4
Syringa reticulata	211	4	31	26	273	544	(±0)	0.4
Acer saccharinum	3,467	80	697	1,160	1,421	6,825	(±0)	5.1
Elm	1,146	27	187	239	2,070	3,669	(±0)	2.7
Picea pungens 'glauca'	898	17	170	260	565	1,909	(±0)	1.4
Fraxinus pennsylvanica	1,491	34	284	367	1,204	3,380	(±0)	2.5
Prunus serotina	642	17	104	104	238	1,106	(±0)	0.8
Tilia cordata	729	14	122	146	565	1,576	(±0)	1.2
Picea abies	743	13	144	215	253	1,368	(±0)	1.0
Acer x freemanii	759	17	138	204	588	1,706	(±0)	1.3
Catalpa speciosa	582	11	102	150	593	1,438	(±0)	1.1
Fraxinus americana	1,001	22	188	229	662	2,103	(±0)	1.6
Tilia americana	320	7	55	80	503	965	(±0)	0.7
OTHER STREET TREI	4,725	107	859	1,067	4,482	11,240	(±0)	8.4
Citywide Total	56,983	1,436	10,245	14,117	51,333	134,113	(±0)	100.0

Oneonta

Annual Benefits of Public Trees by Species ($/tree)

11/10/2011

Species	Energy	CO_2	Air Quality	Stormwater	Aesthetic/Other	Total ($)	Standard Error
Acer platanoides	62.95	2.08	11.61	13.88	63.05	153.57	(N/A)
Acer saccharum	83.54	2.19	14.78	26.40	72.80	199.71	(N/A)
Gleditsia triacanthos	67.78	1.36	11.46	12.60	66.90	160.10	(N/A)
Acer rubrum	60.33	1.14	10.81	15.35	43.01	130.65	(N/A)
Malus species	32.50	0.61	5.44	5.73	17.31	61.60	(N/A)
Pyrus calleryana	8.59	0.29	1.59	1.92	40.08	52.46	(N/A)
Syringa reticulata	6.60	0.12	0.96	0.80	8.52	17.01	(N/A)
Acer saccharinum	111.84	2.58	22.49	37.43	45.83	220.16	(N/A)
Elm	39.50	0.92	6.45	8.26	71.39	126.53	(N/A)
Picea pungens 'glauca'	35.91	0.68	6.80	10.40	22.58	76.37	(N/A)
Fraxinus pennsylvanic	62.11	1.42	11.83	15.28	50.18	140.83	(N/A)
Prunus serotina	37.77	1.03	6.13	6.12	14.01	65.05	(N/A)
Tilia cordata	42.87	0.84	7.16	8.59	33.22	92.69	(N/A)
Picea abies	49.51	0.85	9.62	14.33	16.88	91.21	(N/A)
Acer x freemanii	54.20	1.23	9.84	14.54	42.03	121.84	(N/A)
Catalpa speciosa	41.58	0.77	7.28	10.72	42.36	102.71	(N/A)
Fraxinus americana	83.43	1.86	15.69	19.12	55.19	175.29	(N/A)
Tilia americana	29.06	0.65	5.03	7.28	45.72	87.74	(N/A)
OTHER STREET TRI	33.51	0.76	6.09	7.57	31.79	79.72	(N/A)

Oneonta

Importance Values for Public Most Abundant Trees

11/10/2011

Species	Number of Trees	% of Total Trees	Leaf Area (ft²)	% of Total Leaf Area	Canopy Cover (ft²)	% of Total Canopy Cover	Importance Value
Acer platanoides	221	21.7	528,584	18.9	215,663	24.4	21.6
Acer saccharum	150	14.7	925,832	33.0	200,109	22.6	23.5
Gleditsia triacanthos	119	11.7	286,402	10.2	122,289	13.8	11.9
Acer rubrum	66	6.5	199,905	7.1	61,786	7.0	6.9
Malus species	45	4.4	45,497	1.6	17,720	2.0	2.7
Pyrus calleryana	37	3.6	12,385	0.4	4,494	0.5	1.5
Syringa reticulata	32	3.1	3,565	0.1	2,305	0.3	1.2
Acer saccharinum	31	3.0	245,745	8.8	64,158	7.3	6.4
Ulmus species	29	2.8	56,429	2.0	15,371	1.7	2.2
Picea pungens 'glauca'	25	2.5	33,925	1.2	13,560	1.5	1.7
Fraxinus pennsylvanica	24	2.4	72,830	2.6	24,716	2.8	2.6
Prunus serotina	17	1.7	17,016	0.6	8,048	0.9	1.1
Tilia cordata	17	1.7	27,201	1.0	10,364	1.2	1.3
Picea abies	15	1.5	27,425	1.0	11,528	1.3	1.3
Acer x freemanii	14	1.4	41,187	1.5	11,978	1.4	1.4
Catalpa speciosa	14	1.4	30,557	1.1	8,860	1.0	1.2
Fraxinus americana	12	1.2	43,927	1.6	16,079	1.8	1.5
Tilia americana	11	1.1	17,596	0.6	4,744	0.5	0.7
OTHER TREES	141	13.8	188,058	6.7	70,113	7.9	9.5
Total	1,020	100.0	2,804,065	100.0	883,886	100.0	100.0

Oneonta

Replacement Value for Public Trees by Species

11/10/2011

Species	DBH Class (in) 0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total	Standard Error	% of Total
Acer platanoides	953	5,373	86,229	204,750	468,050	318,762	233,750	26,212	49,965	1,394,044	(±0)	27.91
Acer saccharum	696	1,082	14,933	60,102	106,539	232,542	453,799	137,021	0	1,006,713	(±0)	20.15
Gleditsia triacanthos	289	3,825	88,834	249,697	63,210	0	0	0	0	405,856	(±0)	8.13
Acer rubrum	983	1,070	32,653	53,804	192,834	141,442	66,614	39,161	0	528,562	(±0)	10.58
Malus species	509	3,102	22,044	83,428	17,858	0	0	0	0	126,940	(±0)	2.54
Pyrus calleryana	3,946	6,998	3,609	2,541	0	0	0	0	0	17,094	(±0)	0.34
Syringa reticulata	4,124	2,756	3,294	0	0	0	0	0	0	10,174	(±0)	0.20
Acer saccharinum	0	0	2,229	2,979	8,795	52,457	123,688	44,984	125,873	361,006	(±0)	7.23
Elm	353	739	26,644	14,706	0	11,628	0	0	0	54,070	(±0)	1.08
Picea pungens 'glauca'	0	3,141	9,882	38,161	17,589	9,623	0	0	0	78,395	(±0)	1.57
Fraxinus pennsylvanica	0	4,311	1,647	13,439	31,757	13,633	40,116	0	29,290	134,192	(±0)	2.69
Prunus serotina	0	0	6,865	11,477	24,063	7,842	13,322	0	0	63,568	(±0)	1.27
Tilia cordata	0	3,121	2,091	25,722	53,233	0	0	0	0	84,166	(±0)	1.69
Picea abies	149	593	2,091	31,364	21,938	54,215	0	34,845	0	145,195	(±0)	2.91
Acer x freemanii	430	1,362	2,902	0	20,080	6,490	0	14,995	0	46,258	(±0)	0.93
Catalpa speciosa	464	841	8,245	0	0	15,683	0	0	19,632	44,865	(±0)	0.90
Fraxinus americana	164	0	0	11,828	13,608	27,581	0	0	0	53,180	(±0)	1.06
Tilia americana	0	4,062	1,476	11,284	0	0	26,328	0	0	43,151	(±0)	0.86
Amelanchier species	1,077	0	0	0	0	0	0	0	0	1,077	(±0)	0.02
Acer campestre	149	593	10,455	0	10,969	0	0	0	0	22,166	(±0)	0.44
Acer ginnala	893	593	0	0	0	0	0	0	0	1,486	(±0)	0.03
Acer palmatum	0	418	10,147	5,642	0	0	0	0	0	16,208	(±0)	0.32
Quercus palustris	0	0	2,406	8,936	5,642	0	13,633	0	0	30,618	(±0)	0.61
Thuja occidentalis	0	0	10,147	5,642	10,969	0	0	0	0	26,759	(±0)	0.54
Quercus rubra	0	662	5,070	13,948	13,633	0	0	0	0	33,312	(±0)	0.67
Betula papyrifera	0	0	2,406	4,643	5,642	0	0	0	0	12,692	(±0)	0.25
Cornus kousa	475	627	0	0	0	0	0	0	0	1,102	(±0)	0.02
Prunus subhirtella	430	908	0	2,103	0	0	0	0	0	3,441	(±0)	0.07
Robinia pseudoacacia	191	0	3,294	0	8,306	13,633	0	0	0	25,423	(±0)	0.51
Tsuga canadensis	0	0	0	12,298	16,611	0	0	0	0	28,909	(±0)	0.58
Ulmus americana	164	454	1,203	4,643	0	0	0	0	0	6,465	(±0)	0.13
Crataegus crus-galli	191	1,570	0	0	0	0	0	0	0	1,761	(±0)	0.04
Picea glauca	0	593	2,091	5,642	1,290	0	0	0	0	9,617	(±0)	0.19
Betula populifolia	0	908	1,203	0	0	0	0	0	0	2,111	(±0)	0.04
Cornus florida	396	0	1,026	0	0	0	0	0	0	1,422	(±0)	0.03
Gymnocladus dioicus	256	627	0	0	0	0	0	0	0	884	(±0)	0.02
Pinus nigra	0	0	0	1,647	5,958	0	0	0	0	7,605	(±0)	0.15

Species	DBH Class (in) 0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	Total	Standard Error	% of Total
Pinus resinosa	0	0	1,869	4,245	8,220	0	0	0	0	14,334	(±0)	0.29
Pinus strobus	0	476	0	0	9,637	15,852	0	0	0	25,966	(±0)	0.52
Prunus cerasifera	193	385	759	0	0	0	0	0	0	1,337	(±0)	0.03
Prunus sargentii	191	970	0	0	0	0	0	0	0	1,160	(±0)	0.02
Sorbus alnifolia	0	1,229	0	0	0	0	0	0	0	1,229	(±0)	0.02
Amelanchier laevis	464	0	0	0	0	0	0	0	0	464	(±0)	0.01
Betula nigra	0	0	0	4,311	0	0	0	26,212	0	30,523	(±0)	0.61
Cercis canadensis	430	0	0	0	0	0	0	0	0	430	(±0)	0.01
Maackia amurensis	339	0	0	0	0	0	0	0	0	339	(±0)	0.01
Malus pumila	0	0	0	2,979	0	9,194	0	0	0	12,172	(±0)	0.24
Prunus virginiana 'Shubei	0	908	0	0	0	0	0	0	0	908	(±0)	0.02
Quercus alba	0	0	0	6,974	13,633	0	0	0	0	20,607	(±0)	0.41
Sorbus aucuparia	0	0	1,522	0	0	0	0	0	0	1,522	(±0)	0.03
Fagus sylvatica	0	0	1,973	0	0	0	0	0	0	1,973	(±0)	0.04
Juglans nigra	0	0	0	0	0	0	0	22,358	0	22,358	(±0)	0.45
Prunus species	0	0	0	2,541	0	0	0	0	0	2,541	(±0)	0.05
Prunus virginiana	198	0	0	0	0	0	0	0	0	198	(±0)	0.00
Quercus robur	0	506	0	0	0	0	0	0	0	506	(±0)	0.01
Sassafras albidum	0	0	1,405	0	0	0	0	0	0	1,405	(±0)	0.03
Tilia x euchlora	109	0	0	0	0	0	0	0	0	109	(±0)	0.00
Tilia tomentosa	0	0	2,091	0	0	0	0	0	0	2,091	(±0)	0.04
Ulmus rubra	0	0	0	0	0	0	0	22,358	0	22,358	(±0)	0.45
Citywide total	19,206	54,803	374,738	901,476	1,150,064	930,574	971,249	368,145	224,759	4,995,015	(±0)	100.00