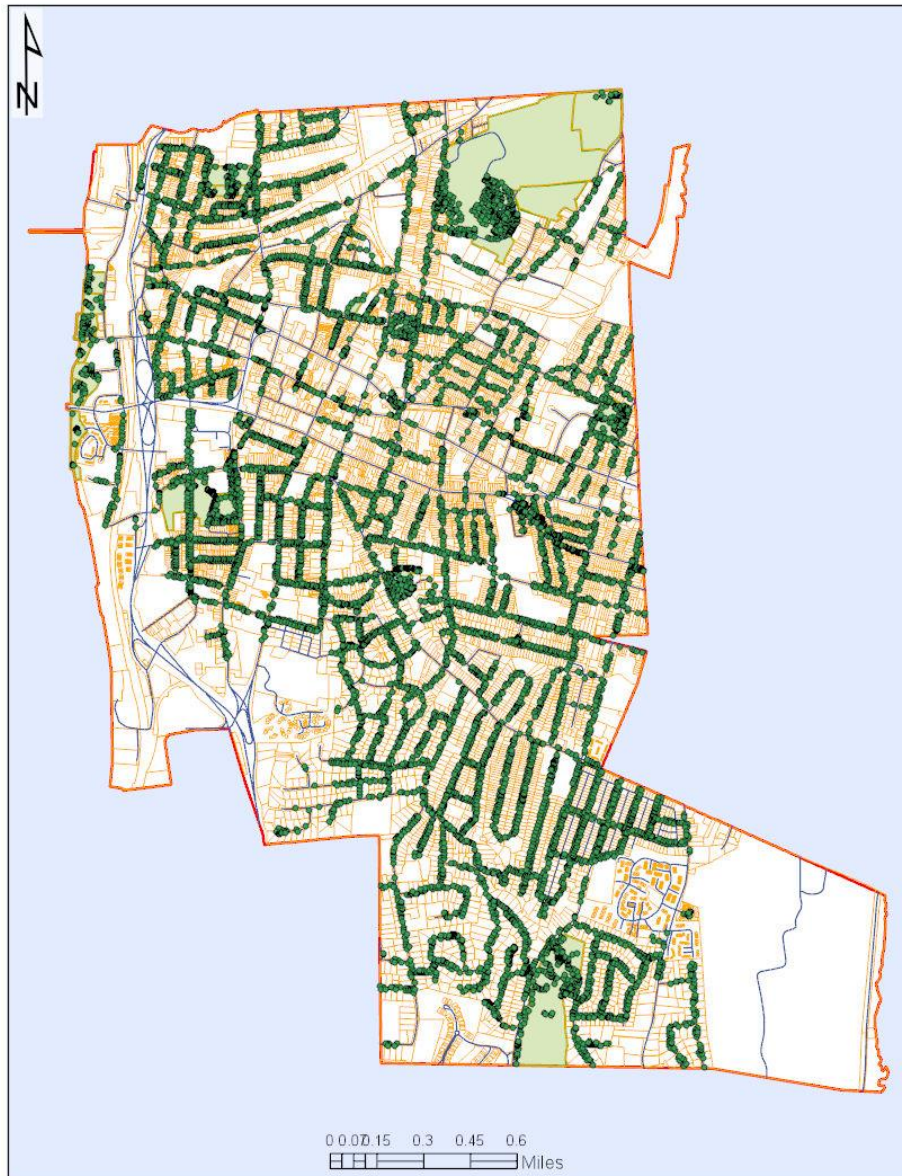


City of Poughkeepsie, NY

Tree Inventory Summary Report

August 2, 2019



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Report Summary

On August 13, 2019 ArborPro, Inc. began operations on a comprehensive GPS inventory of the trees in parks and along street rights-of-way in Poughkeepsie, NY. ArborPro assigned two ISA Certified Arborists to collect detailed information on the condition, size, species, maintenance recommendations, etc. for all trees within the survey area. This summary includes a total of **8,517 sites**, comprised of 6,368 trees (74.8%), 295 stumps (3.5%) and 1,854 vacant planting sites (21.8%). A total of 7,215 sites (84.7%) were collected along street rights-of-way and 1,302 sites (15.3%) were collected in City Parks.

Significant Findings from the Inventory

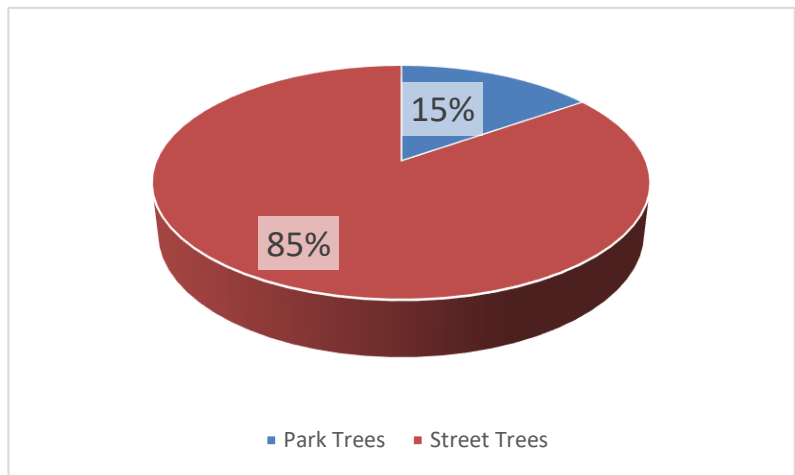
Analysis of the tree inventory found:

1. The five most common species found in Poughkeepsie are: Norway maple (1,725 trees: 27.1%); crabapple (563 trees: 8.8%); Japanese flowering cherry (440 trees: 6.9%); green ash (326 trees: 5.1%); and ornamental pear (291 trees: 4.6%).
2. The three most common young trees (under 6" DBH) are: ornamental pear (73 trees); Japanese flowering cherry (63 trees); and purple-leafed plum (61 trees).
3. The three most common mature trees (over 25" DBH) are: Norway maple (335 trees); littleleaf linden (88 trees); and pin oak (75 trees).
4. The inventory recorded a total of 110 distinct species of trees.
5. 70.4 % of Poughkeepsie 's tree population is in "fair" or better condition; 37.8% is in "good" condition.
6. Trees provide approximately \$904,620 in annual environmental benefits.
7. Breakdown of environmental benefits:
 - Energy savings: \$394,520/year.
 - Stormwater interception: valued at \$93,132/year.
 - Carbon sequestration: valued at \$10,417/year.
 - Improved air quality: \$72,730/year.
 - Improved property value associated with aesthetics: \$333,821.
8. Total replacement cost for all trees is \$31,089,954.

Distribution of Trees by Location

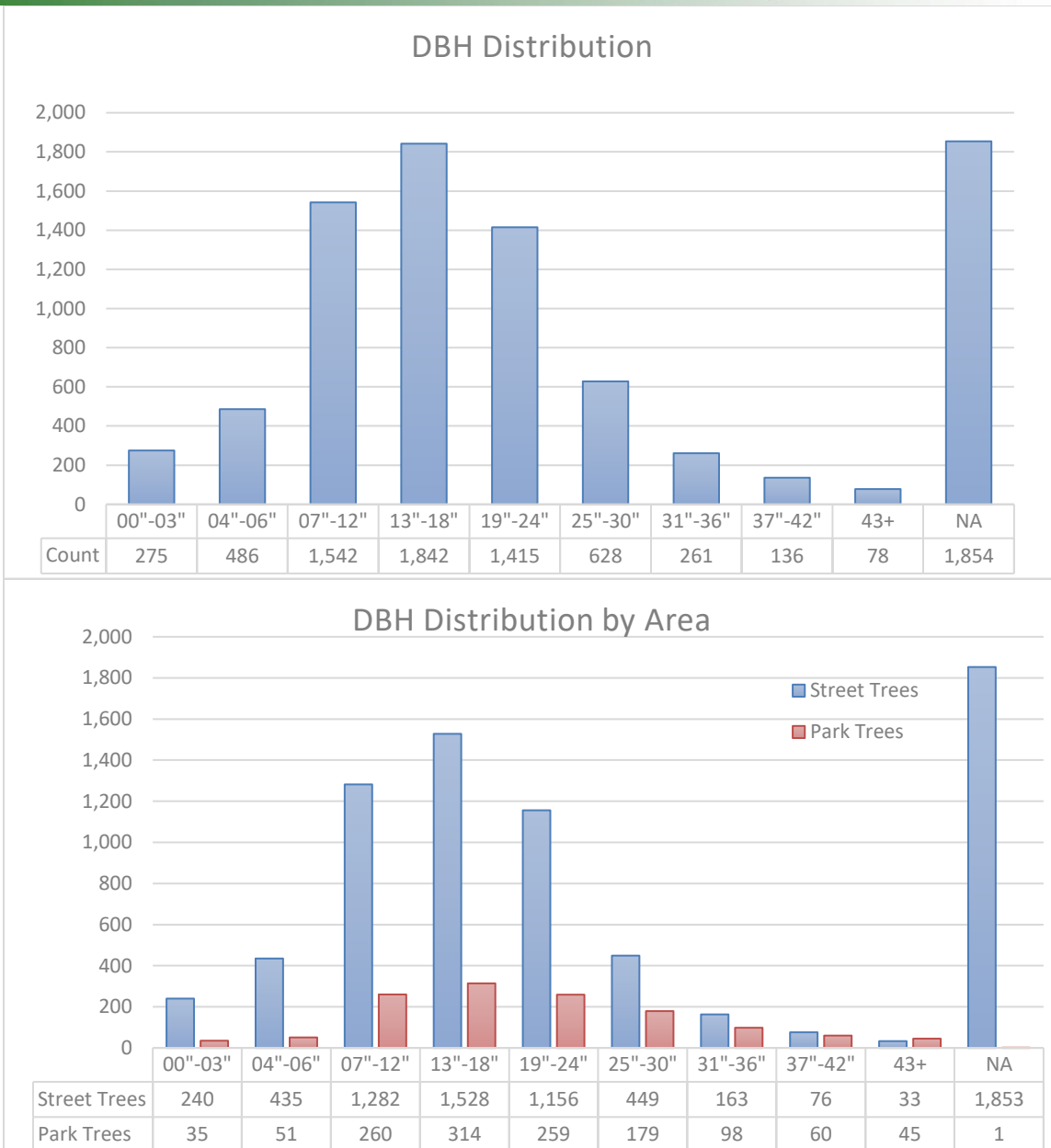
The table to the below provides a summary of the number of trees recorded in each area.

Location	Tree Count
Bartlett Park	108
Clinton Reservoir Park	7
College Hill Park	327
Dongan Park	10
Eastman Park	197
Hulme Park	16
Kaal Rock Park	72
King Street Park	79
Malcom X Park	7
Mansion Square Park	45
Morgan Lake Park	19
Pershing Park	22
Pulaski Park	145
Soldiers Fountain	4
Spratt Park	174
Waryas Park	70
Total Park Trees	1,302
Street Trees	7,215
Grand Total	8,517



Size Characteristics

The general size of a tree provides insight into the age and value of the tree as well as the overall age of the urban forest. There are two industry-wide recognized size characteristics, height and diameter at breast height. Diameter at breast height (DBH) is determined by the diameter of the tree at 4.5 feet above grade. DBH range distribution can be used to analyze the relative age distribution of an urban forest. This allows a city to adjust their planting plans to ensure that there are enough young trees to replace aging and over-mature trees. It is important that all age classes are adequately represented throughout the urban forest to ensure a healthy, vibrant tree canopy for future generations.



Tree Condition

Good – The tree has no major structural problems; no significant damage from diseases or pests; no significant mechanical damage; a full, balanced crown, and normal twig condition and vigor for its species.

Fair – The tree may exhibit the following characteristics: minor structural problems and/or

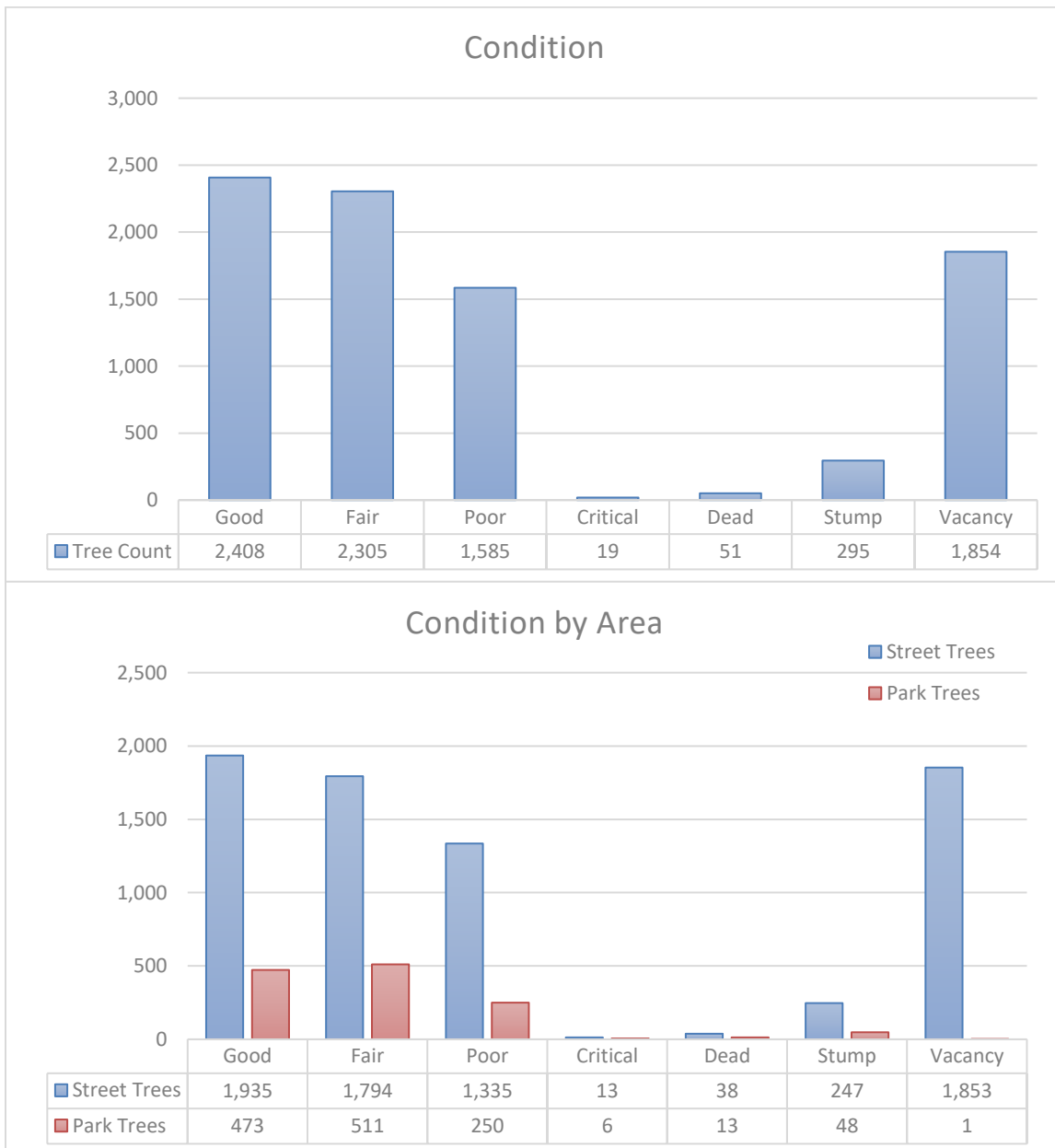
Tree Condition	Tree Count	%
Good	2,408	28.3%
Fair	2,305	27.1%
Poor	1,585	18.6%
Critical	19	0.2%
Dead	51	0.6%
Stump	295	3.5%
Vacancy	1,854	21.8%
Total	8,517	

mechanical damage; significant damage from non-fatal or disfiguring diseases; minor crown imbalance or thin crown; minor structural imbalance; or stunted growth compared to adjacent trees.

Poor – The tree appears healthy but may have structural defects. This classification also includes healthy trees that have unbalanced structures or have been topped. Trees in this category may also have severe mechanical damage, decay, severe crown dieback or poor vigor/failure to thrive.

Critical – The tree is in a state of decline and may be showing severe signs of stress or poor health.

Dead –This category refers only to dead trees.



Recommended Maintenance

Priority 1 Prune - Trees that require priority one pruning are recommended for trimming to remove hazardous deadwood, hangers, or broken branches. These trees have broken or hanging limbs, hazardous deadwood, and dead, dying, or diseased limbs or leaders greater than four inches in diameter.

Priority 1 Removal - Trees designated for removal have defects that cannot be cost-effectively or practically treated. The majority of the trees in this category will have a large percentage of dead crown and pose an elevated level of risk for failure. Any hazards that could be seen as potential dangers to persons or property and seen as potential liabilities would be in this category. Large dead and dying trees that are high liability risks are included in this category. These trees are the first ones that should be removed.

Recommended Maintenance	Tree Count	%
Priority 1 Prune	74	0.9%
Priority 1 Removal	102	1.2%
Priority 2 Prune	1,063	12.5%
Priority 2 Removal	377	4.4%
Routine Prune	4,071	47.8%
Training Prune	681	8.0%
Stump Removal	295	3.5%
Plant Tree	1,854	21.8%
Total	8,517	

Priority 2 Prune - These trees have dead, dying, diseased, or weakened branches between two and four inches in diameter and are potential safety hazards.

Priority 2 Removal - Trees that should be removed but do not pose a liability as great as the first priority will be identified here. This category would need attention as soon as "Priority One" trees are removed.

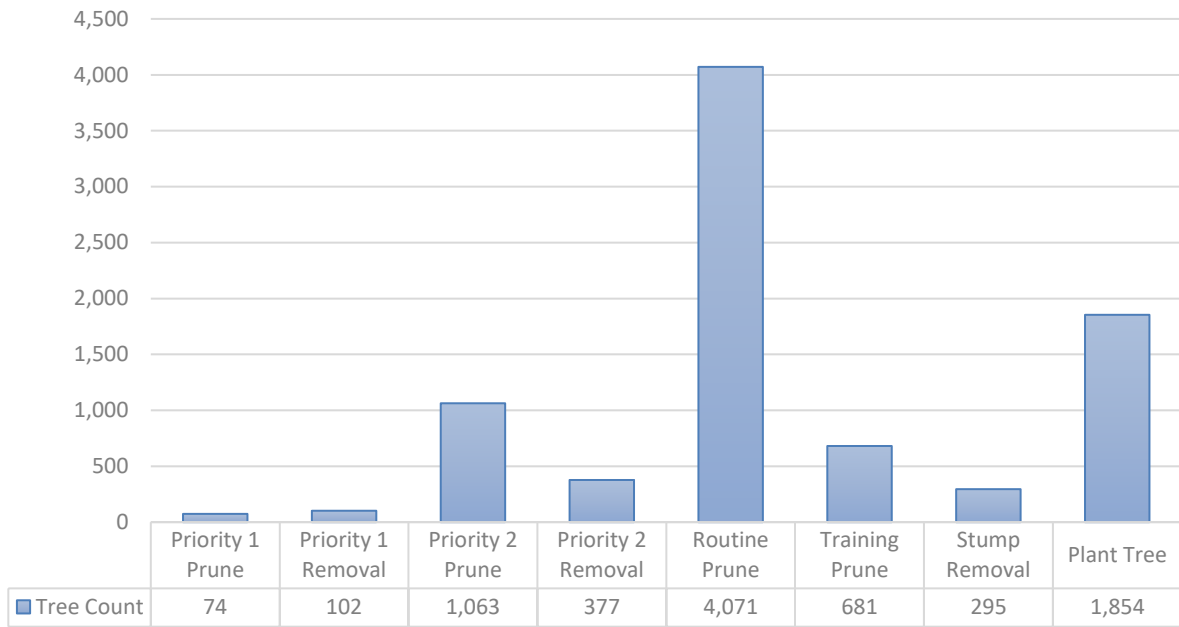
Routine Prune - These trees require routine horticultural pruning to correct structural problems or growth patterns, which would eventually obstruct traffic or interfere with utility wires or buildings.

Training Prune - Young, large-growing trees that are still small must be pruned to correct or eliminate weak, interfering, or objectionable branches in order to minimize future maintenance requirements. These trees, up to 20 feet in height, can be worked with a pole-pruner by a person standing on the ground.

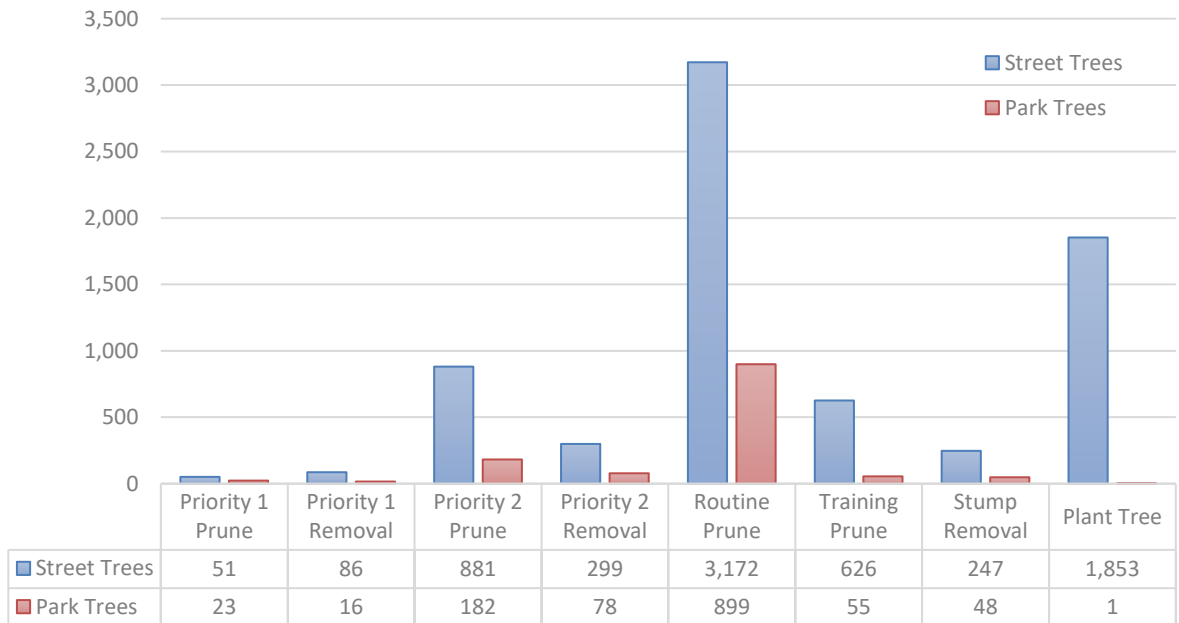
Stump Removal - This category indicates a stump that should be removed.

Plant Tree - During the inventory, vacant planting sites will be identified by street and address. The size of the site is designated as small, medium, or large (indicating the ultimate size that the tree will attain), depending on the growing space available and the presence of overhead wires.

Recommended Maintenance



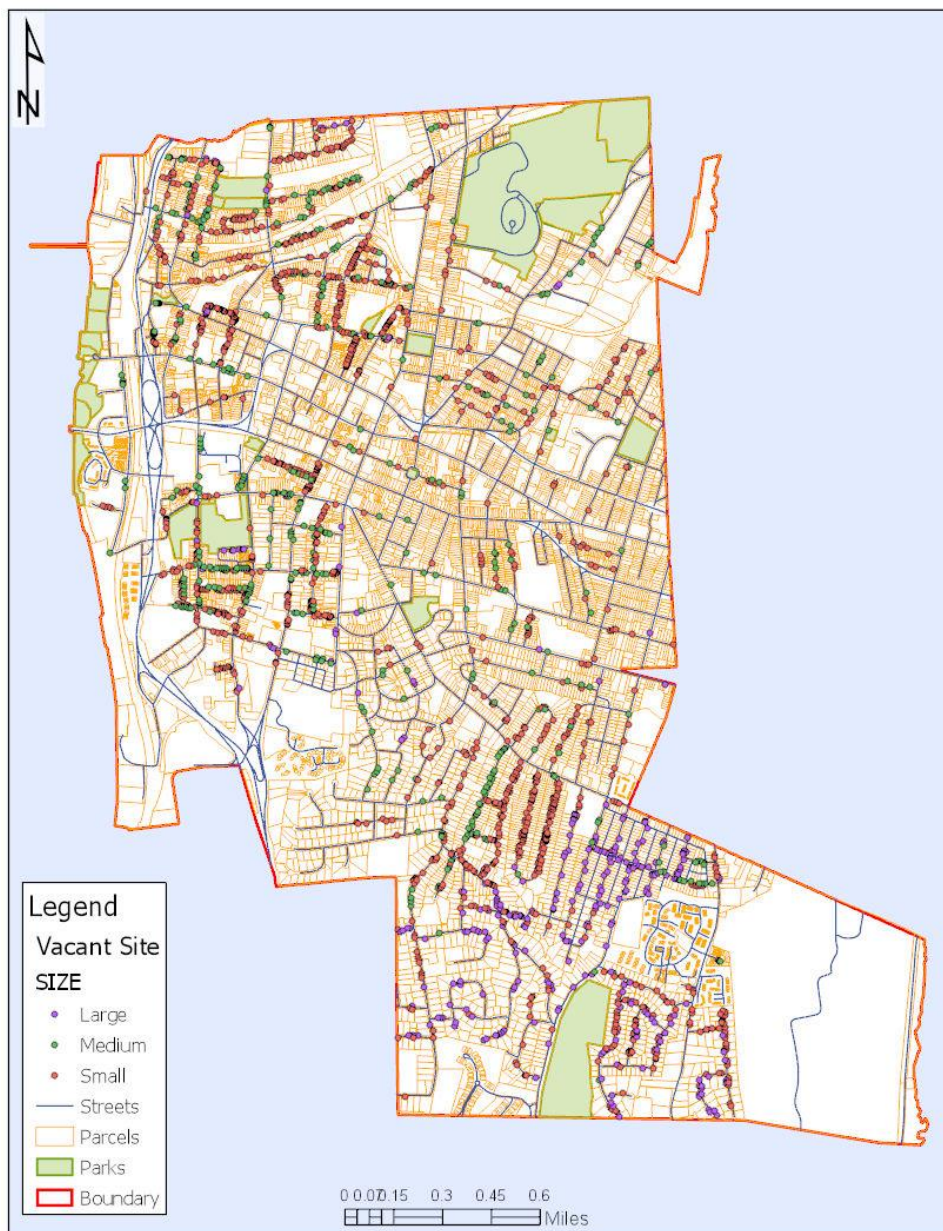
Recommended Maintenance by Area



Vacant Sites

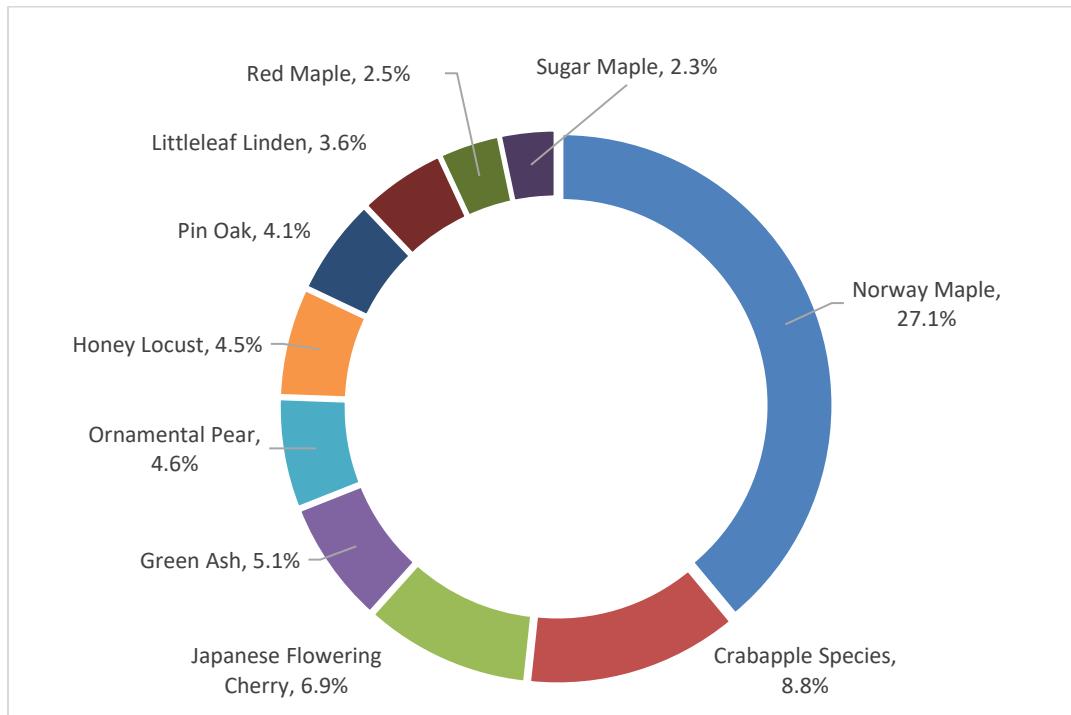
Vacant planting sites were recorded in suitable areas and can be used for future tree plantings. Vacant sites were recorded based on the size of the planting location and the available rooting space. The size of the vacant site is based on the height of a potential tree at maturity. The criteria used to determine size is as follows: Small – 4-6’ of root space, Medium – 6-8’ of root space, Large – 8’ or more of available root space.

Vacant Site Size	Count
Large Vacant Site	285
Medium Vacant Site	423
Small Vacant Site	1,146
Total	1,854



Species and Distribution

Below are the top 10 species for Poughkeepsie, NY.



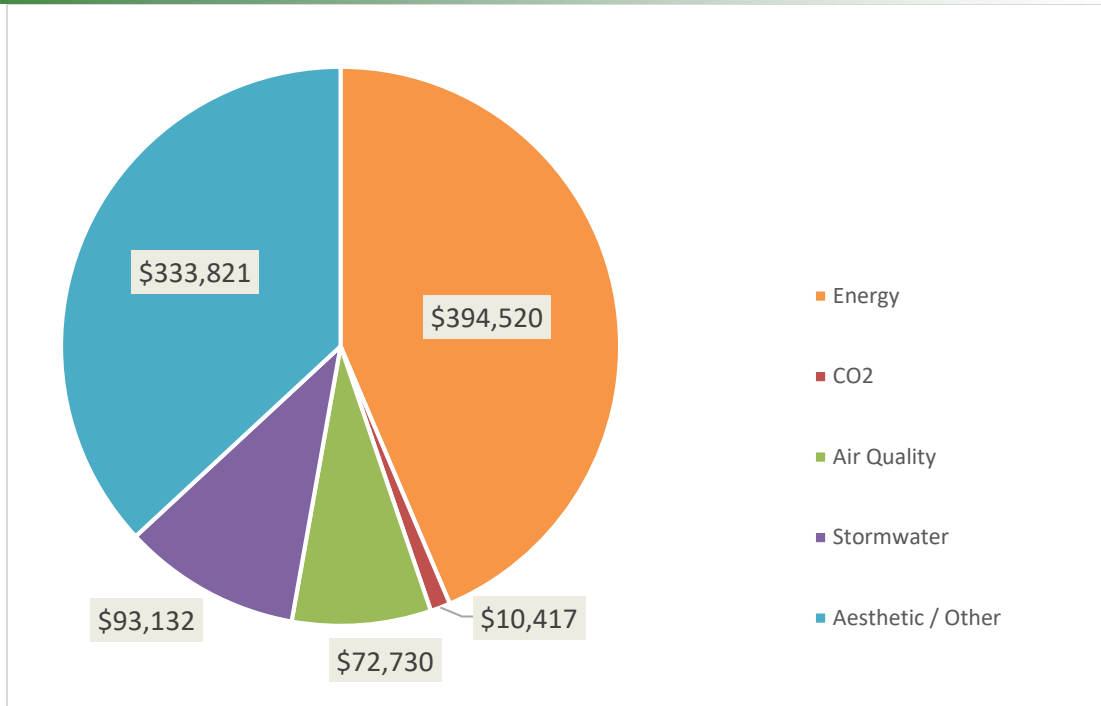
Benefits of a Healthy Urban Forest

Trees provide a host of environmental, social, and economic benefits in urban areas. When properly maintained, trees can reduce pollution, improve mental health, and lower energy costs. It is important to understand the benefits trees provide as they can offset the cost associated with tree maintenance. A properly implemented tree maintenance program will maximize tree benefits in the urban setting, allowing trees to provide benefits that meet or exceed the time and money invested in maintenance activities.

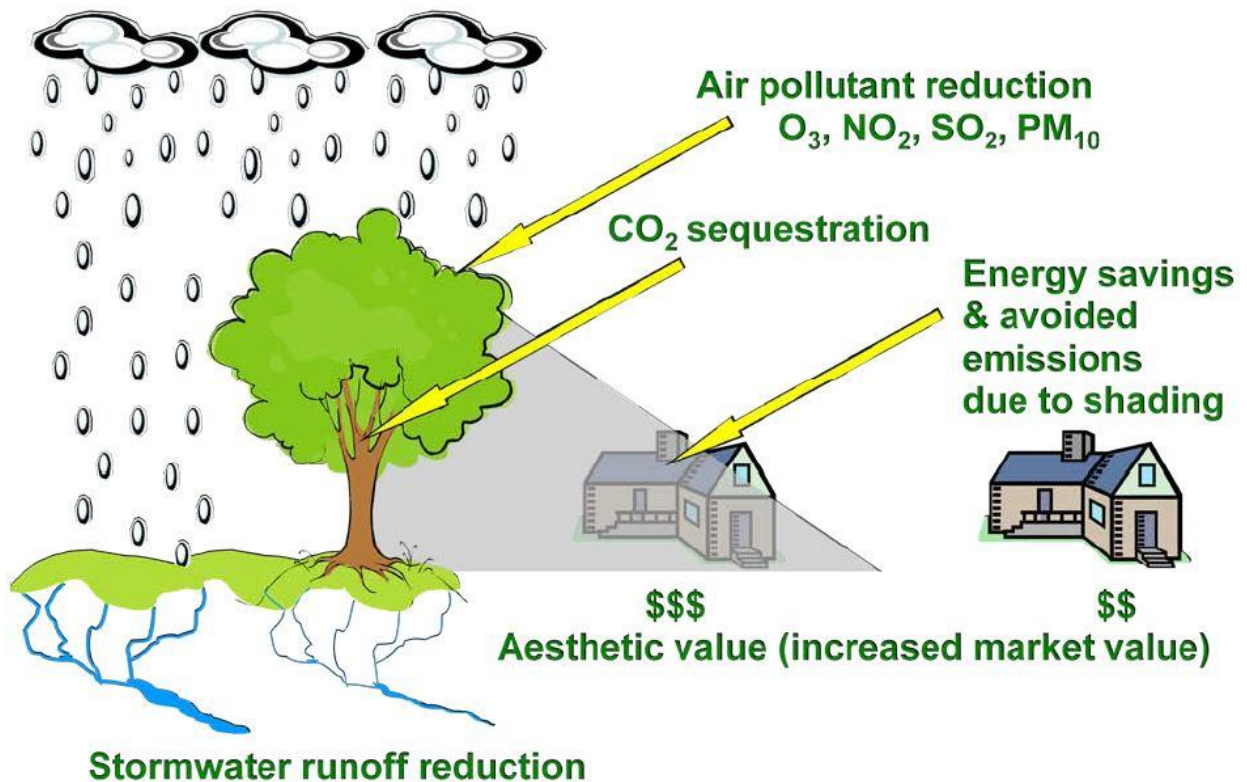
The i-Tree Streets application was used to quantify the benefits provided by Poughkeepsie’s trees. This application uses growth and benefit models designed around predominant urban trees to calculate the specific benefits that trees provide in dollar amounts. The benefits calculated by i-Tree Streets include energy conservation, air quality improvements, carbon dioxide (CO₂) reduction, stormwater control, and aesthetic/other. It creates annual benefit reports that demonstrate the value urban trees provide to the surrounding community.

The trees in Poughkeepsie provide a total of **\$904,620 in annual benefits**.

The total replacement cost for all trees is **\$31,089,954**.



Ecosystem services provided by urban trees



Energy Conservation

Public trees contribute to energy conservation by providing shade that reduces cooling costs in the summer and diverting wind to reduce heating costs in the winter. The savings in electricity and natural gas are converted into monetary values to illustrate the annual energy savings that trees provide. The inventoried tree population accounts for a savings of \$394,520 in energy consumption each year.

	Total Electricity (MWh)	Electricity (\$)	Total Natural Gas (Therms)	Natural Gas (\$)	Total (\$)	Avg. \$/Tree
Total	604.69	84,716.68	220,030.66	309,803.17	394,519.85	61.95

Air Quality

Trees improve air quality by removing a number of pollutants from the atmosphere, including ozone, nitrogen dioxide, and particulate matter. The estimated value of pollutants removed by the inventoried tree population each year is \$72,730.

	Total Deposition (\$)	Total Avoided (\$)	BVOC Emissions (lb)	BVOC Emissions (\$)	Total (lb)	Total (\$)	Avg. \$/tree
Total	39,477.03	36,162.62	- 1,259.42	- 2,909.27	14,421.79	72,730.38	11.42

Carbon Dioxide Sequestration

It is well known that trees absorb carbon dioxide and release oxygen into the atmosphere as a product of photosynthesis. Carbon absorbed during this process is ultimately stored in the wood of trees. The amount of carbon sequestered by the inventoried tree population is valued at \$10,417 annually.

	Sequestered (lb)	Sequestered (\$)	Decomposition Release (lb)	Maintenance Release (lb)	Total Release (\$)	Avoided Avoided (lb)	Avoided (\$)	Net Total (lb)	Total (\$)	Avg. \$/tree
Total	1,726,369.21	5,697.02	- 311,944.24	- 79,117.52	- 1,290.50	1,821,308.44	6,010.32	3,156,615.89	10,416.83	1.64

Stormwater Control

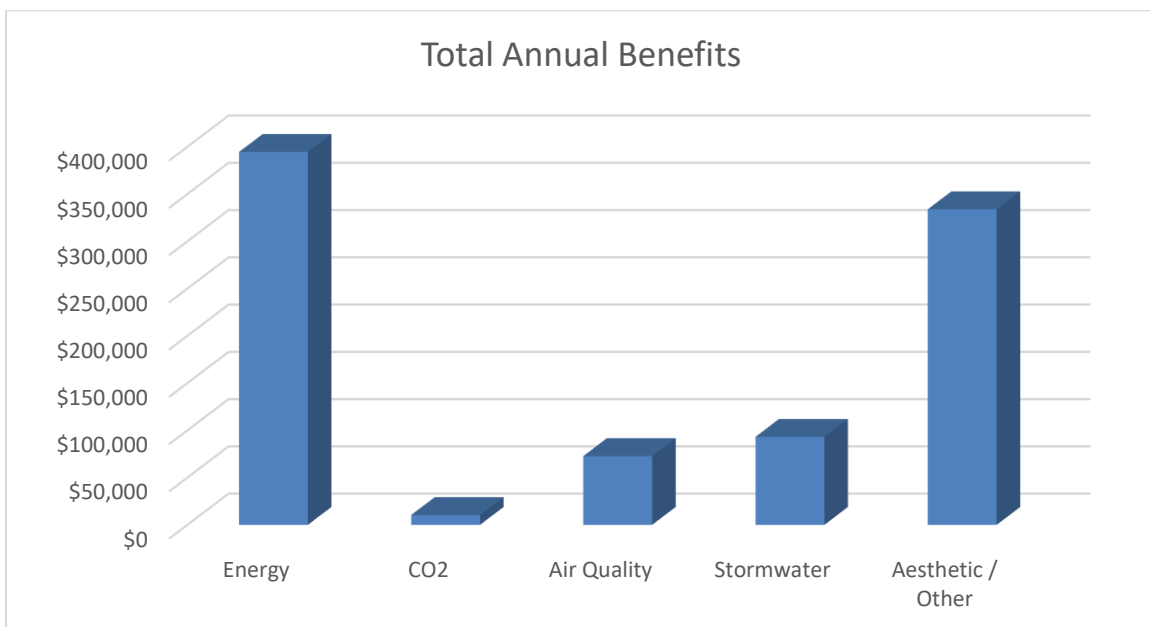
Trees reduce the costs associated with diverting stormwater by intercepting rainfall before it hits the ground and enters the storm runoff system. This greatly reduces the strain placed on public stormwater runoff systems and can represent a significant monetary savings by reducing the amount of infrastructure needed to divert stormwater throughout the city. The estimated savings in the management of stormwater runoff is \$93,132 annually.

	Total rainfall interception (Gal)	Total (\$)	Avg. \$/tree
Total	11,641,522.00	93,132.18	14.63

Aesthetic/Other

Trees provide many social and economic benefits that are classified as aesthetic/other in the i-Tree Streets application. The major economic benefit in this category is increased property values. Trees contribute to higher property values when compared to similar properties that do not have trees. The major social benefits provided by trees are lower crime rates, improved mental health, greater time spent in businesses with tree lined streets, and higher productivity in the workplace when a view of nature is available. The inventoried trees contribute \$333,821 annually in aesthetic/other benefits.

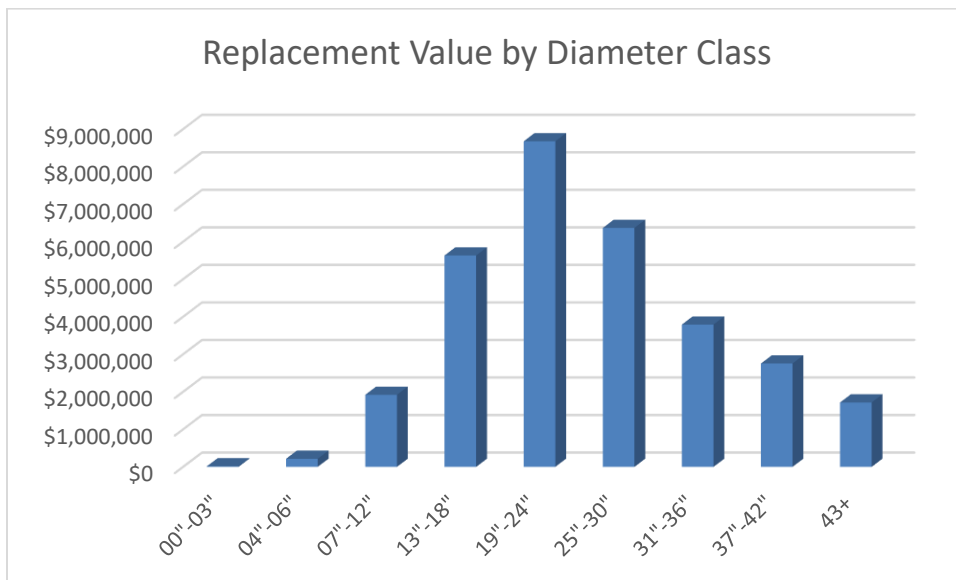
	Total (\$)	Avg \$/tree
Total	333,821.12	52.42



Total Replacement Value

In addition to Environmental Benefits, the Association can consider the Total Replacement Value for its urban forest. Total Replacement Value is the amount of money it would take to completely replace the existing urban forest with trees of the same size. While this is a scenario that will likely never happen, it gives a specific dollar value of all inventoried trees in their current state. Replacement value differs from Environmental Benefits in that it shows how much the trees are worth instead of the dollar values that they provide in benefits. For example, a mature sugar maple could provide \$2,100 in environmental benefits by reducing stormwater runoff, improving air quality, etc. but the total cost of replacing an 18” DBH sugar maple would be \$24,270. According to i-Tree Streets, the total replacement cost for Poughkeepsie’s trees is \$31,089,954. The table below shows the breakdown of Replacement Value by Diameter Class.

DBH (inches)	Replacement Value
00"-03"	\$16,496
04"-06"	\$215,624
07"-12"	\$1,919,476
13"-18"	\$5,632,509
19"-24"	\$8,676,003
25"-30"	\$6,366,978
31"-36"	\$3,790,881
37"-42"	\$2,755,690
43+	\$1,716,296
Total	\$31,089,954



Below is a species frequency report for the entire inventory:

Botanical Name	Common Name	Count	%
<i>Acer campestre</i>	Hedge Maple	29	0.3%
<i>Acer ginnala</i>	Amur Maple	35	0.4%
<i>Acer palmatum</i>	Japanese Maple	16	0.2%
<i>Acer plantanoides</i>	Norway Maple	1725	20.3%
<i>Acer platanoides</i> 'Crimson King'	Crimson King Maple	93	1.1%
<i>Acer pseudoplatanus</i>	Sycamore Maple	5	0.1%
<i>Acer rubrum</i>	Red Maple	160	1.9%
<i>Acer rubrum</i> 'Armstrong'	Armstrong Red Maple	12	0.1%
<i>Acer saccharinum</i>	Silver Maple	51	0.6%
<i>Acer saccharum</i>	Sugar Maple	146	1.7%
<i>Aesculus hippocastanum</i>	Common Horsechestnut	16	0.2%
<i>Ailanthus altissima</i>	Tree of Heaven	32	0.4%
<i>Albizia julibrissin</i>	Mimosa; Silk Tree	2	0.0%
<i>Betula nigra</i>	River Birch	5	0.1%
<i>Betula papyrifera</i>	Paper Birch	6	0.1%
<i>Betula pendula</i>	European White Birch	1	0.0%
<i>Betula populifolia</i>	Gray Birch	3	0.0%
<i>Carpinus caroliniana</i>	American Hornbeam	7	0.1%
<i>Carya cordiformis</i>	Bitternut Hickory	6	0.1%
<i>Carya glabra</i>	Pignut Hickory	32	0.4%
<i>Carya ovata</i>	Shagbark Hickory	19	0.2%
<i>Carya tomentosa</i>	Mockernut Hickory	5	0.1%
<i>Castanea mollissima</i>	Chinese Chestnut	2	0.0%
<i>Catalpa bignonioides</i>	Eastern Catalpa	3	0.0%
<i>Catalpa speciosa</i>	Western Catalpa	3	0.0%
<i>Cedrus atlantica</i>	Atlas Cedar	1	0.0%
<i>Celtis occidentalis</i>	Common Hackberry	9	0.1%
<i>Cercidiphyllum japonicum</i>	Katsura Tree	9	0.1%
<i>Cercis canadensis</i>	Eastern Redbud	11	0.1%
<i>Chamaecyparis thyoides</i>	Atlantic White Cedar	4	0.0%
<i>Cladrastis kentukea</i>	American Yellowwood	3	0.0%
<i>Cornus florida</i>	Eastern Dogwood	33	0.4%
<i>Cornus kousa</i>	Kousa Dogwood	9	0.1%
<i>Cornus mas</i>	Cornelian Cherry	4	0.0%
<i>Cornus species</i>	Dogwood Species	1	0.0%
<i>Crataegus crus-galli</i>	Cockspur Thorn	14	0.2%
<i>Crataegus crus-galli</i> f. <i>inermis</i>	Thornless Hawthorn	1	0.0%
<i>Crataegus species</i>	Hawthorn Species	20	0.2%

<i>Fagus grandifolia</i>	American Beech	2	0.0%
<i>Fagus sylvatica</i>	European Beech	6	0.1%
<i>Fraxinus americana</i>	White Ash	28	0.3%
<i>Fraxinus nigra</i>	Black Ash	1	0.0%
<i>Fraxinus pennsylvanica</i>	Green Ash	326	3.8%
<i>Ginkgo biloba</i>	Maidenhair Tree	71	0.8%
<i>Gleditsia triacanthos</i>	Honey Locust	287	3.4%
<i>Ilex opaca</i>	American Holly	2	0.0%
<i>Juglans cinerea</i>	Butternut	1	0.0%
<i>Juglans nigra</i>	Black Walnut	24	0.3%
<i>Juniperus virginiana</i>	Eastern Red Cedar	15	0.2%
<i>Koelreuteria paniculata</i>	Goldenrain Tree	12	0.1%
<i>Larix laricina</i>	Tamarack	8	0.1%
<i>Liquidambar styraciflua</i>	American Sweet Gum	14	0.2%
<i>Liriodendron tulipifera</i>	Tulip Tree	1	0.0%
<i>Maclura pomifera</i>	Osage Orange	1	0.0%
<i>Magnolia acuminata</i>	Cucumber Magnolia	2	0.0%
<i>Magnolia stellata</i>	Star Magnolia	1	0.0%
<i>Magnolia x soulangeana</i>	Saucer Magnolia	5	0.1%
<i>Malus domestica</i>	Edible Apple Species	3	0.0%
<i>Malus floribunda</i>	Crabapple Species	563	6.6%
<i>Morus alba</i>	White Mulberry	35	0.4%
<i>Morus alba 'Pendula'</i>	Weeping White Mulberry	2	0.0%
<i>Morus rubra</i>	Red Mulberry	4	0.0%
<i>Phellodendron amurense</i>	Amur Corktree	4	0.0%
<i>Picea abies</i>	Norway Spruce	69	0.8%
<i>Picea glauca</i>	White Spruce	6	0.1%
<i>Picea pungens</i>	Colorado Spruce	19	0.2%
<i>Picea species</i>	Spruce Species	1	0.0%
<i>Pinus mugo</i>	Mugho Pine	1	0.0%
<i>Pinus nigra</i>	Austrian Black Pine	33	0.4%
<i>Pinus strobus</i>	White Pine	96	1.1%
<i>Pinus sylvestris</i>	Scotch Pine	15	0.2%
<i>Platanus occidentalis</i>	American Sycamore	58	0.7%
<i>Platanus x acerifolia</i>	London Plane Tree	37	0.4%
<i>Platycladus orientalis</i>	Oriental Arborvitae	5	0.1%
<i>Populus deltoides</i>	Cottonwood	11	0.1%
<i>Prunus cerasifera</i>	Purple-Leafed Plum	86	1.0%
<i>Prunus serotina</i>	Eastern Black Cherry	14	0.2%
<i>Prunus serrulata</i>	Japanese Flowering Cherry	440	5.2%
<i>Prunus species</i>	Stone Fruit Species	18	0.2%

<i>Pseudotsuga menziesii</i>	Douglas Fir	6	0.1%
<i>Pyrus calleryana</i>	Ornamental Pear	291	3.4%
<i>Pyrus communis</i>	Edible Pear	2	0.0%
<i>Quercus alba</i>	White Oak	44	0.5%
<i>Quercus bicolor</i>	Swamp White Oak	12	0.1%
<i>Quercus coccinea</i>	Scarlet Oak	2	0.0%
<i>Quercus michauxii</i>	Swamp Chestnut Oak	4	0.0%
<i>Quercus palustris</i>	Pin Oak	258	3.0%
<i>Quercus rubra</i>	Red Oak	115	1.4%
<i>Quercus velutina</i>	Black Oak	26	0.3%
<i>Rhamnus cathartica</i>	Common Buckthorn	8	0.1%
<i>Robinia pseudoacacia</i>	Black Locust	85	1.0%
<i>Salix babylonica</i>	Weeping Willow	1	0.0%
<i>Sassafras albidum</i>	Sassafras	11	0.1%
<i>Sorbus americana</i>	American Mountain Ash	1	0.0%
<i>Sorbus aucuparia</i>	European Mountain Ash	1	0.0%
Stump	Stump	295	3.5%
<i>Styphnolobium japonicum</i>	Japanese Pagoda Tree	23	0.3%
<i>Syringa reticulata</i>	Japanese Tree Lilac	82	1.0%
<i>Syringa vulgaris</i>	Common Lilac	13	0.2%
<i>Taxus species</i>	Yew Species	30	0.4%
<i>Thuja occidentalis</i>	American Arborvitae	9	0.1%
<i>Tilia americana</i>	American Linden	17	0.2%
<i>Tilia cordata</i>	Littleleaf Linden	230	2.7%
<i>Tilia tomentosa</i>	Silver Linden	5	0.1%
<i>Tsuga canadensis</i>	Eastern Hemlock	116	1.4%
<i>Ulmus americana</i>	American Elm	8	0.1%
<i>Ulmus procera</i>	English Elm	4	0.0%
<i>Ulmus pumila</i>	Siberian Elm	17	0.2%
<i>Ulmus rubra</i>	Slippery Elm	2	0.0%
<i>Ulmus x species</i>	Hybrid Elm	5	0.1%
Unidentifiable Tree	Unidentifiable Tree	1	0.0%
Vacant Planting Site - Large	Vacant Planting Site - Large	285	3.3%
Vacant Planting Site - Medium	Vacant Planting Site - Medium	423	5.0%
Vacant Planting Site - Small	Vacant Planting Site - Small	1146	13.5%
<i>Zelkova serrata</i>	Sawleaf Zelkova	79	0.9%