Hastings-on-Hudson, NY

Street Tree Inventory Report

Prepared for the Village of Hastings-on-Hudson
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<u>Executive Summary</u>

This document reports the results of a street tree inventory conducted in the Village of Hastings-on-Hudson, New York in 2013. Results include:

- 1036 trees and 1217 planting spaces were inventoried in the village's right-of-way

- The stocking level of street trees to available planting spaces for inventoried streets is 45.98% of full stocking

- 71 different species comprise inventoried trees with Norway Maple (22.20%) and Callery Pear (10.33%) occurring most often

- Estimated annual benefits for inventoried street trees as calculated by US Forest Service i-Tree software are $149,594 or $144.40 per tree

- The replacement value of all inventoried street trees as calculated by US Forest Service i-Tree software is $6,963,406.

Inventory Methodology

A street tree inventory was conducted in the Village of Hastings-on-Hudson, NY during the summer of 2013. Data for trees and planting spaces located in the village's right-of-way were 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 provided by The Town of Greenburgh. Site numbers were assigned for trees and planting spaces at each address. 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, an "s" notation for "side" was made. Likewise, if trees and planting spaces were located on a street to the rear of the property street address, an "r" notation for "rear" was made.

(2)   **GPS**: Latitude (Y) and Longitude (X) for right-of-way trees and planting spaces were collected with Garmin 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 <u>associated with the site</u> was assessed by one of two ratings: 1 = No Wire Conflict; 2 = Wire Conflict.

<u>Street Tree Inventory Summary</u>

<u>Stocking Levels</u>

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 street tree inventory accounted for 1036 trees and 1217 planting spaces located in the village's right-of-way. The proportion of trees to potential street trees translates into a 45.98% 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%.

HOH Stocking Level

45.98% ■ Street Trees

54.02% ■ Planting Spaces
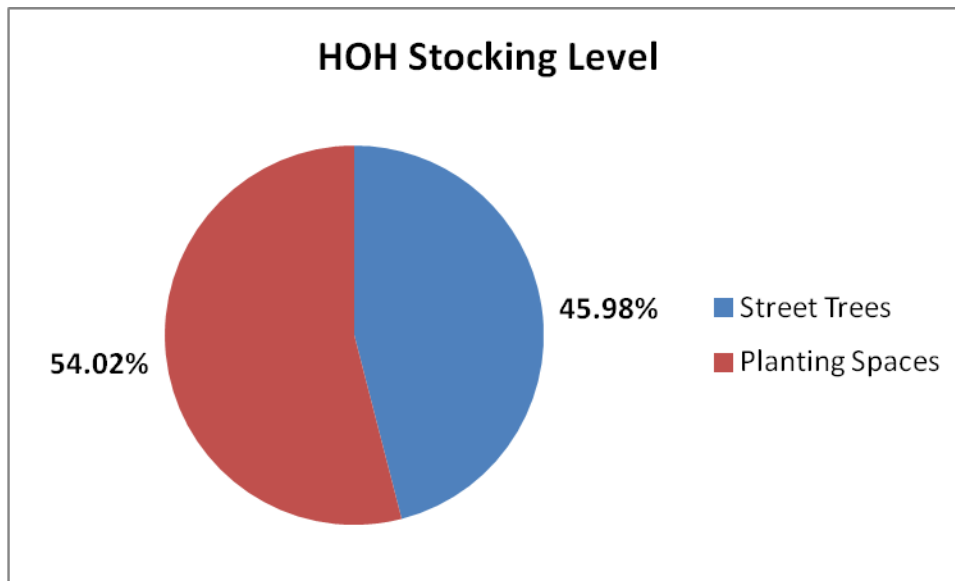
Genus and Species Distribution

        The partial inventory accounted for 1036 trees located in the village's right-of-way. A significant percentage of the trees inventoried (38.71%) were Maples (*Acer* genus) (see graph below).
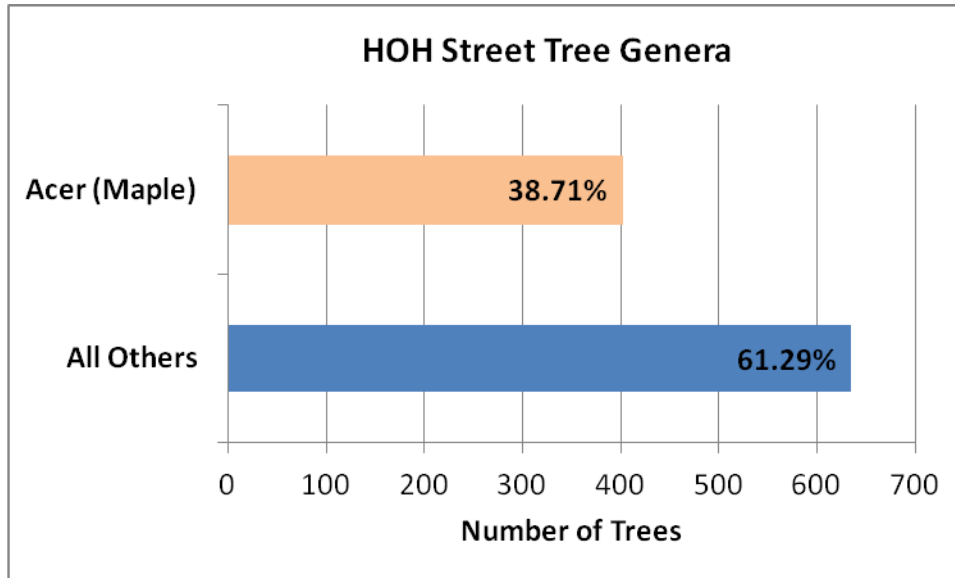
No other genus besides *Acer* accounted for more than 10.42% of all inventoried street trees (see table below).

Genus	Trees	Percentage
Acer	401	38.71%
Pyrus	108	10.42%
Quercus	104	10.04%
Prunus	67	6.47%
Gleditsia	56	5.41%
Platanus	39	3.76%
Malus	32	3.09%
Ulmus	27	2.61%
Robinia	22	2.12%
All Others	180	17.37%

Regarding the population of inventoried street trees, Norway Maple (*Acer platanoides*) accounted for 22.20%, Callery Pear (*Pyrus calleryana*) 10.33%, Honeylocust (*Gleditsia triacanthos*) 5.41%, Northern Red Oak (*Quercus rubra*) 5.41%, Red Maple (*Acer rubrum*) 4.63%, and Silver Maple (*Acer saccharinum*) 3.96% of all inventoried trees (see graph below).
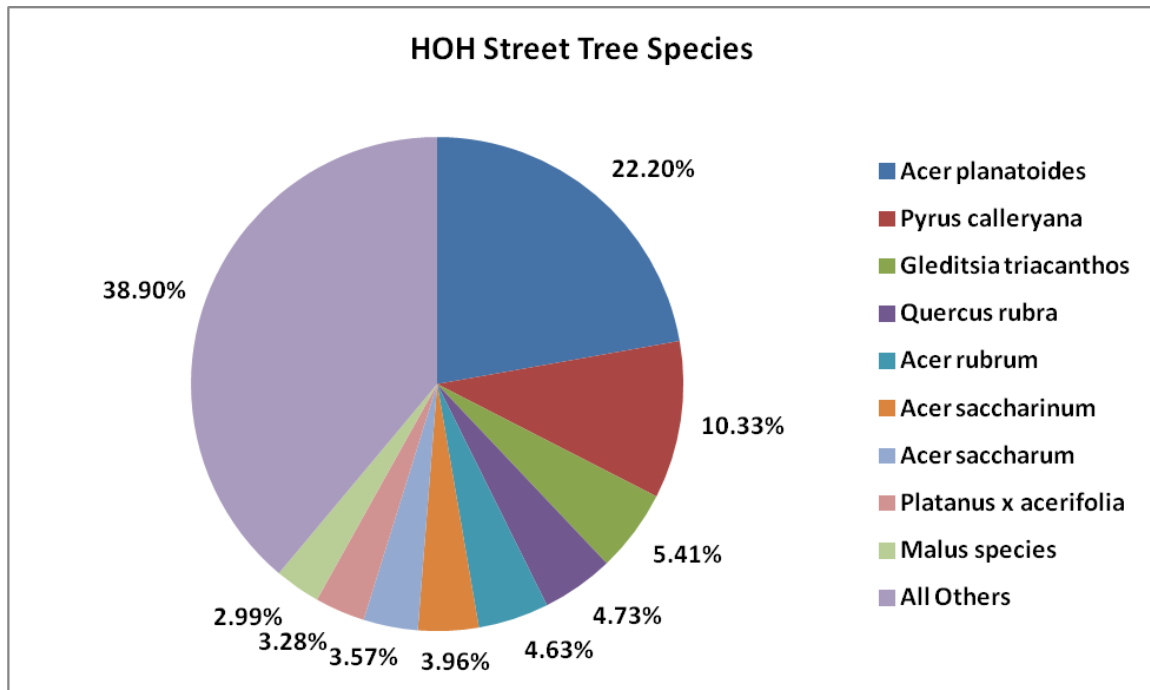

As a general rule, no one tree species should constitute more than 10% of the street tree population and no one tree genus should exceed 20% of the street tree population. For species, the percentages of Norway Maple (22.20%) and Callery Pear (10.33%) exceed the 10% rule and indicate these species are overrepresented in the population. For genus, the percentage of trees in the *Acer* genus (38.71%) exceeds the 20% rule and indicates that Maples are significantly overrepresented in the population.

A complete list of inventoried tree species can be found as an appendix.

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).
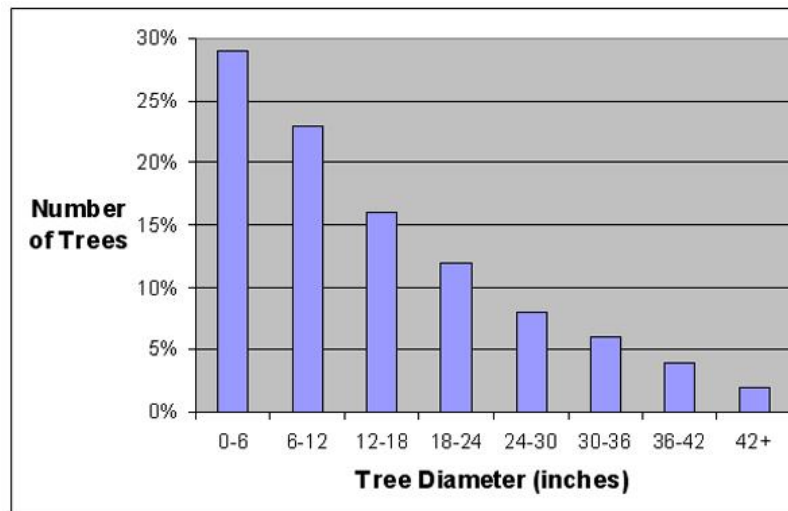

     If, however, a community is not planting trees regularly, the following trend line may be observed for its trees, where a disproportionate share of its trees are in the larger (older) sizes (see graph below).
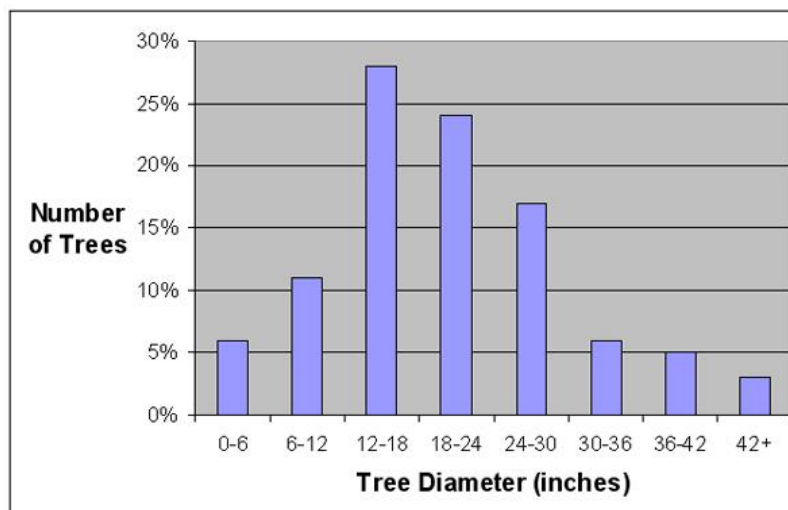
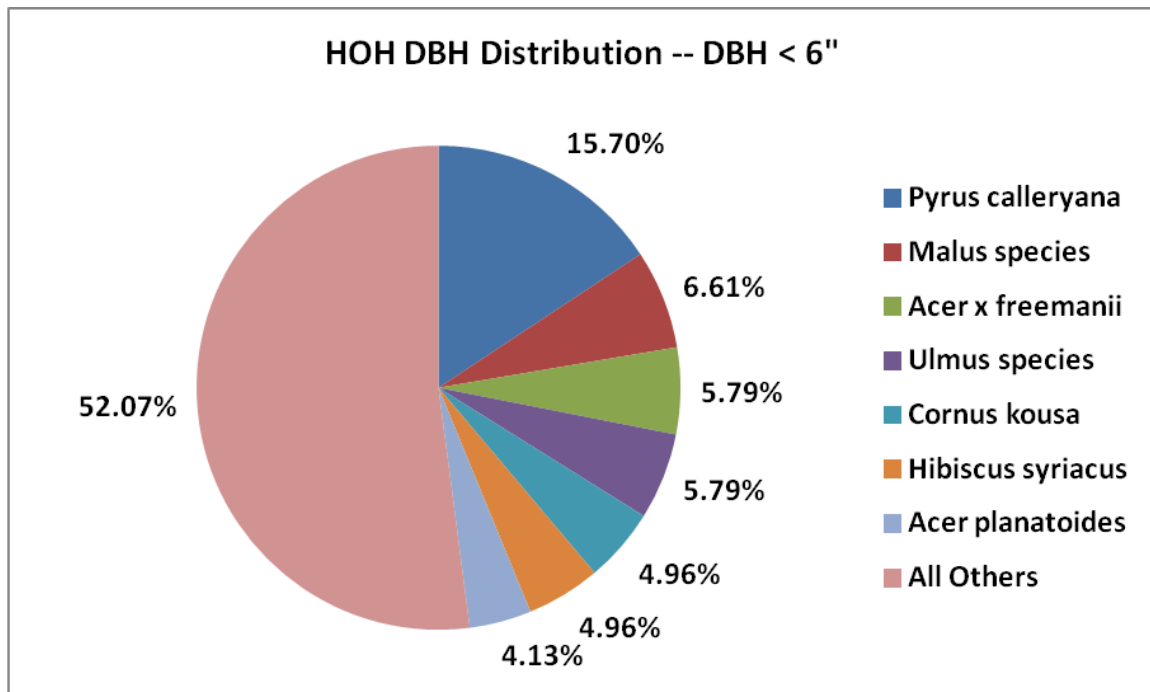The graph below plots the DBH distribution for Hastings-on-Hudson inventoried street trees against an ideal, J-shaped distribution.
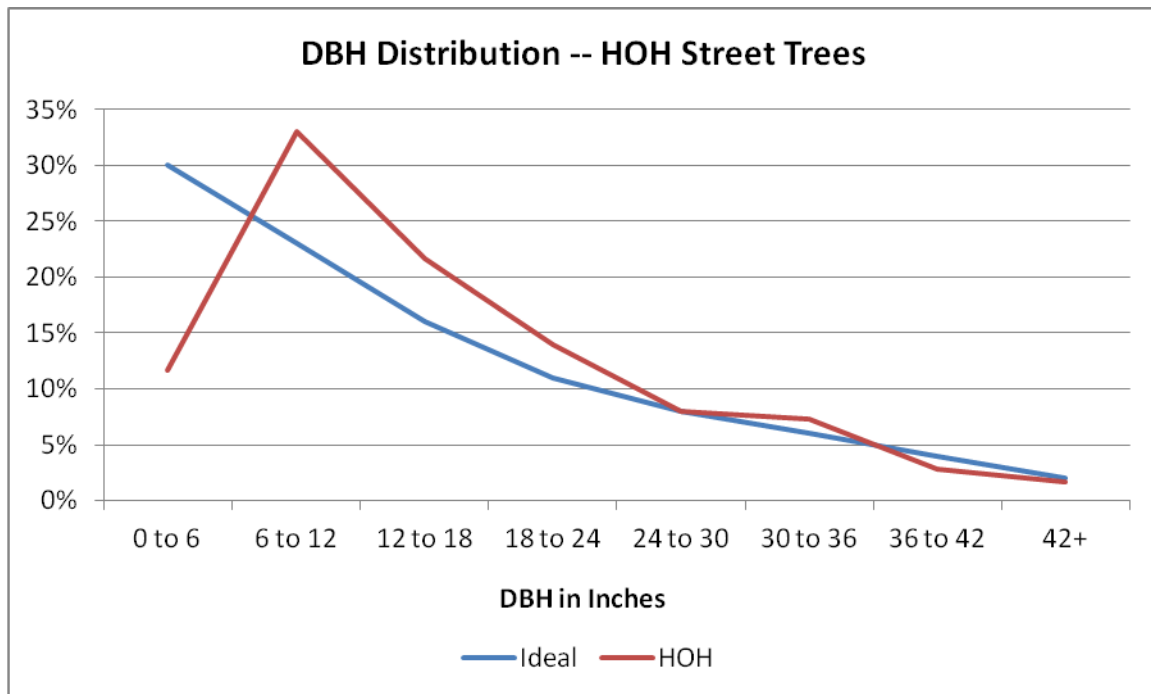
This graph suggests an insufficient number of young trees are currently being planted in the city's right-of-way to compensate for the future loss of older trees. This is also reflected in the distribution of Norway Maple (*Acer platanoides*), the most prevalent street tree in the village.
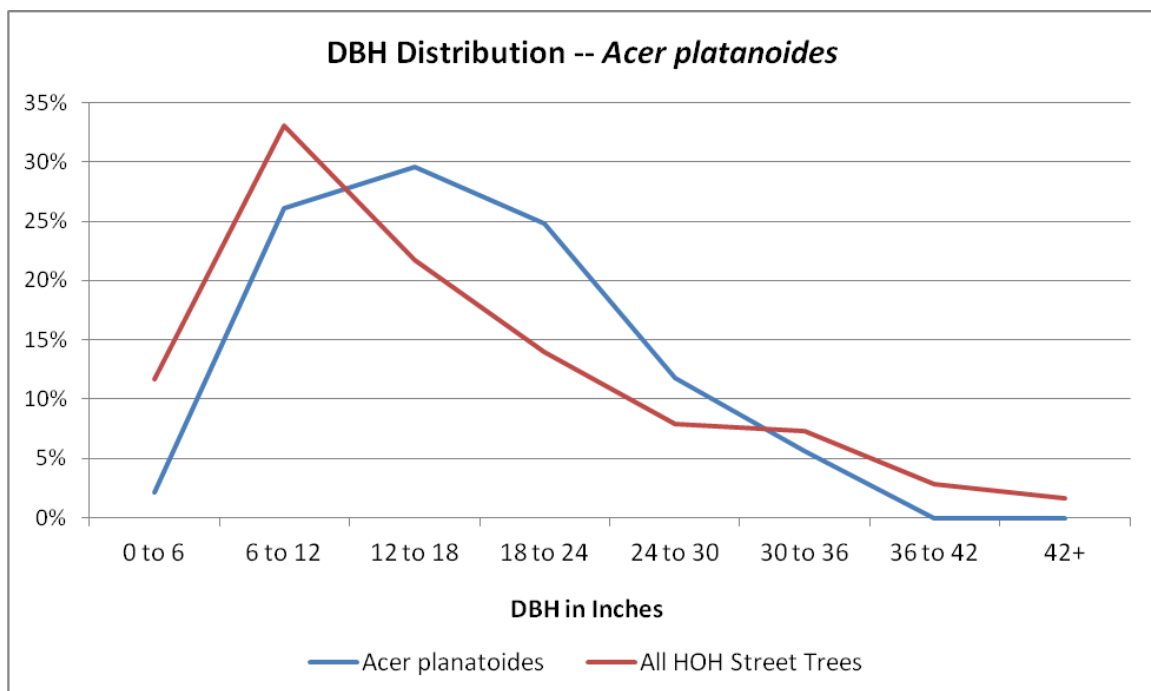
The two graph below depict the DBH distribution of inventoried trees by species for trees with a DBH less than 6 inches.

HOH DBH Distribution -- DBH < 6"

- Pyrus calleryana — 15.70%
- Malus species — 6.61%
- Acer x freemanii — 5.79%
- Ulmus species — 5.79%
- Cornus kousa — 4.96%
- Hibiscus syriacus — 4.96%
- Acer planatoides — 4.13%
- All Others — 52.07%

Callery Pear (*Pyrus calleryana*) and Crabapple (*Malus species*) are the most prevalent species in this DBH class.

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Tree Condition and Maintenance

Most street trees inventoried in Hastings-on-Hudson were found to be in good condition (see graph below).
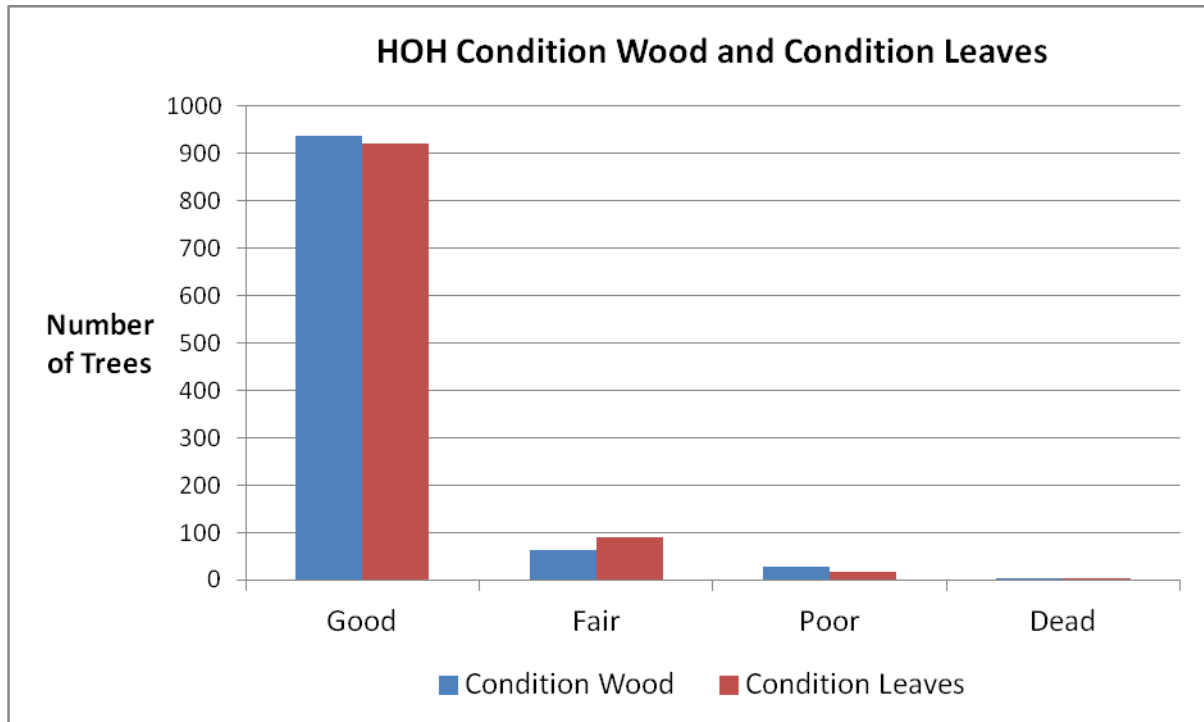
Most inventoried street trees (95.16%) were found to be in need of a Routine Prune at most while 4.84% were rated a High Priority Prune. 3.00% of inventoried trees were rated "Yes" for "Consult Needed" and should be inspected by a licensed arborist (see table below).

Maintenance Recommendation	Number of Trees	Percentage
None	414	40.04%
Train	40	3.87%
Routine Prune	530	51.26%
High Priority Prune	50	4.84%
Consult Needed		
No	1003	97.00%
Yes	31	3.00%

i-Tree Streets Analysis

        i_Tree Streets is a computer-based street tree management and analysis tool developed by the USDA Forest Service for urban forest management. It uses street tree inventory data to quantify the dollar value of annual urban forest benefits such as energy conservation, air quality improvement, CO_2 reduction, storm water control, and property value increase. Benefits provided by street trees have generally been found to amount to five times the costs associated with them.

        Based on the data collected in the street tree invenrtory, an i-Tree Streets analysis was performed which revealed the following:

        The total estimated annual benefits for all inventoried street trees amount to $149,594 or $144.40 per tree. Of this total, energy conservation is $62,623, CO_2 reduction is $1,672, air quality improvement is $11,496, stormwater mitigation is $15,466, and property value increase is $58,337.

        The replacement value of all inventoried street trees is $6,963,406. The replacement value of inventoried Norway Maples is $1,425,315, or 20.47% of the total; the replacement value of inventoried Northern Red Oaks is $1,113,992, or 16.00% of the total.

Planting Spaces

        1217 planting spaces were inventoried in the village's right-of-way. For each planting space, the presence or absence of overhead single or triple phase utility wires is noted. "Planting Spaces – No Wires" are coded in the data as "01" and "Planting Spaces – Wires" are coded in the data as "02." Of the 613 planting spaces, 277 (50.37%) were identified as having no utility wires overhead and 604 (49.63%) were identified as having utility wires overhead.

        The presence or absence of overhead utility wires is important to consider when selecting a street tree species to be planted. Where overhead utility wires are present, smaller growing tree species maturing at less than 30' in height are advisable. Appropriate species to consider are disease resistant Crabapples, Winter King Hawthorn, Amelanchier (Serviceberry), Cornelian Cherry Dogwood (tree form), Amur Maackia, Globe or Bessoniana Black Locust, Japanese Tree Lilac, American Hornbeam, and Imperial Honeylocust among others.

        Where overhead utility wires are <u>not</u> present, and where planting volumes are adequate, taller growing tree species maturing at more than 30' in height should be considered to maximize the benefits provided by street trees since taller growing tree species provide more benefits than smaller growing tree species. The table below contains the annual benefits and

replacement value associated with a mature Crabapple and a mature Sugar Maple, both in good condition.

Tree Species	DBH	Energy	CO2	Air Quality	Storm Water	Aesthetic/ Other	Total Benefits	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

A list of smaller and taller maturing tree species 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).

Additional Comments

The DBH distributions derived from the street tree inventory indicate that the overall street tree population is aging and that additional new trees need to be planted to compensate for tree mortality in order to maintain street tree stocking levels at least at its current percentage. Inventory results also indicate that the street tree population is insufficiently diverse with a disproportionately large number of Norway Maples, and Maple trees more generally. As a general rule, no one street tree species should comprise more than 10% of the overall street tree population and no one street tree genus should comprise more than 20% of the overall street tree population. That way, if a street tree species or genus becomes susceptible to an insect or disease, a majority of a community's trees will likely not be affected. Both Norway Maple (*Acer platanoides*) and Callery Pear (*Pyrus calleryana*) were found to violate the 10% rule for species and Maple (*Acer*) was found to violate the 20% rule for genera. Therefore, new street tree plantings should primarily include genera other than Maples and species other than Norway Maple and Callery Pear.

The inventory also identified 13 Ash (*Fraxinus*) trees or 1.25% of all trees inventoried. The Emerald Ash Borer is an invasive beetle that has devastated Ash trees in the Midwest and has now spread to New York State. New plantings of Ash trees should be avoided and consideration should be given to the likely need to remove established Ash trees in the future.

Appendix 1 –Species Distribution of Hastings on Hudson Inventoried Trees

Botanic	Trees	Percentage	Botanic	Trees	Percentage
Acer planatoides	230	22.20%	*Juglans nigra*	4	0.39%
Pyrus calleryana	107	10.33%	*Prunus sargentii*	4	0.39%
Gleditsia triacanthos	56	5.41%	*Syringa reticulata*	4	0.39%
Quercus rubra	49	4.73%	*Cercis canadensis*	3	0.29%
Acer rubrum	48	4.63%	*Cornus florida*	3	0.29%
Acer saccharinum	41	3.96%	*Cotinus coggygria*	3	0.29%
Acer saccharum	37	3.57%	*Juniperus virginiana*	3	0.29%
Platanus x acerifolia	34	3.28%	*Prunus subhirtella*	3	0.29%
Malus species	31	2.99%	*Quercus robur*	3	0.29%
Prunus serrulata	26	2.51%	*Sassafras albidum*	3	0.29%
Quercus palustris	26	2.51%	*Styphnolobium japonicum*	3	0.29%
Robinia pseudoacacia	22	2.12%	*Acer negundo*	2	0.19%
Prunus serotina	21	2.03%	*Ailanthus altissima*	2	0.19%
Ulmus americana	18	1.74%	*Betula lenta*	2	0.19%
Zelkova serrata	18	1.74%	*Betula papyrifera*	2	0.19%
Acer palmatum	17	1.64%	*Celtis occidentalis*	2	0.19%
Acer pseudoplatanus	17	1.64%	*Chionanthus virginicus*	2	0.19%
Pinus strobus	17	1.64%	*Crataegus viridis*	2	0.19%
Cornus kousa	15	1.45%	*Fraxinus americana*	2	0.19%
Quercus coccinea	14	1.35%	*Picea pungens*	2	0.19%
Morus alba	12	1.16%	*Quercus velutina*	2	0.19%
Fraxinus pennsylvanica	11	1.06%	*Abies species*	1	0.10%
Quercus alba	10	0.97%	*Acer griseum*	1	0.10%
Tilia americana	9	0.87%	*Acer nigrum*	1	0.10%
Hibiscus syriacus	8	0.77%	*Carya glabra*	1	0.10%
Picea abies	8	0.77%	*Catalpa speciosa*	1	0.10%
Ulmus species	8	0.77%	*Crataegus crusgalli*	1	0.10%
Acer x freemanii	7	0.68%	*Koelreuteria paniculata*	1	0.10%
Liriodendron tulipifera	7	0.68%	*Liquidambar styraciflua*	1	0.10%
Morus rubra	7	0.68%	*Malus pumila*	1	0.10%
Prunus species	7	0.68%	*Populus deltoides*	1	0.10%
Tilia cordata	7	0.68%	*Pyrus communis*	1	0.10%
Prunus cerasifera	6	0.58%	*Thuja occidentalis*	1	0.10%
Aesculus hippocastanum	5	0.48%	*Tilia tomentosa*	1	0.10%
Ginkgo biloba	5	0.48%	*Ulmus parvifolia*	1	0.10%
Platanus occidentalis	5	0.48%			