URBAN FOREST MANAGEMENT PLAN

The Village of Mamaroneck, New York

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ACKNOWLEDGEMENTS

The Village of Mamaroneck's vision to promote and preserve the urban forest and improve the management of public trees was a fundamental inspiration for this project. This vision will ensure canopy continuity, which will reduce stormwater runoff and improve air quality, public health, and aesthetic values.

The Village of Mamaroneck is thankful for the grant funding it received from the New York State Department of Environmental Conservation.

The Village of Mamaroneck also recognizes the support of the Village Manager Robert Yamuder, Sarah Robertson, Chair of the Village of Mamaroneck Tree Committee, and the entire Village of Mamaroneck Tree Committee.

EXECUTIVE SUMMARY

The Village of Mamaroneck (VOM) has a robust urban forest with a higher tree canopy percent than many communities in the eastern United States. Approximately 46% of the village is covered by tree canopy (Table 1). This canopy cover is an extremely valuable asset and provides over $560,000 in benefits to the village's residents each year (Table 2). However, there are numerous factors threatening the existing urban forest and proactive steps will be required to maintain this tree canopy. Factors that threaten the existing tree canopy include sea level rise, coastal flooding, severe storms, pests, diseases, trees under private care, low tree species diversity, and trees sharing the right-of-way (ROW) with utilities. In response to these threats, the Village of Mamaroneck partnered with NYSDEC and Davey Resource Group, a division of The Davey Tree Expert Company, to develop this comprehensive urban forest management plan to proactively manage these threats.

This plan utilized many resources, including data from the existing tree inventory (a volunteer partial inventory), an i-Tree Canopy analysis, village management efforts, policies and codes, input from meetings and interviews with active players (village staff and residents), and public input recorded during the last village comprehensive plan update.

VOM is off to a good start on a tree inventory and actively plants trees each year. The village also waters its trees and cares for new tree establishment. The annual urban forestry budget in Mamaroneck is $125,000. However, there is no proactive, systematic maintenance in place, nor is there a certified arborist (full- or part-time) on staff or under contract. Additionally, the inventory is only partially complete and does not include professional risk and condition data, both of which are critical to ensuring public safety. This plan makes recommendations to address these gaps within a reasonable budget (only marginally higher than the existing budget), while laying out a strategy to effectively and efficiently manage village resources. The following list of recommendations is detailed in the full report, along with a suggested five-year implementation plan.

- Formally adopt and implement a cyclical management plan for public trees
- Create a position for a dedicated certified arborist
- Complete the tree inventory
- Develop an emerald ash borer strategy
- Initiate a full urban tree canopy assesment
- Define a planting strategy and new tree care program
- Engage the public
- Develop a heritage tree program
- Revise the tree protection ordinance
- Address utility impacts
- Develop a storm response management plan related to urban canopy

With a few strategic management changes, Mamaroneck's urban forest can thrive. This plan is the next step towards making that goal a reality.

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INTRODUCTION

The Village of Mamaroneck (VOM) recognizes the value and services provided by its urban forest, along with the need for an integrated approach to its stewardship. To this end, the village recently partnered with the New York State Department of Environmental Conservation Urban and Community Forestry Program to obtain funds to develop a management plan for VOM's urban forest.

This plan was developed by Davey Resource Group, with guidance and input from the Village Manager, Assistant Manager, Assistant Planner, and the Village of Mamaroneck Tree Committee. Data were incorporated from the existing tree inventory, recent canopy estimate, and village policies and codes, along with meetings and interviews with active players. Input was also collected from a public meeting in August 2016 and ongoing discussions with the aforementioned staff and volunteers. The *2012 Comprehensive Plan Village of Mamaroneck* was also used as a reference and public comment source as well.

This management plan outlines the value and services provided by the local trees, examines the existing tree canopy and management of the village's public trees, summarizes threats facing VOM's canopy, and provides subsequent recommendations and a suggested budget to preserve and improve this important village asset.

WHY TREES?

In an age of tight municipal budgets, aging infrastructure, and fierce competition for village resources, funding can be limited: why should valuable dollars be spent on trees? For one, trees have been shown to provide numerous cost-effective and critical services to communities beyond just aesthetics. Trees provide social, economic, and environmental benefits to residents. **Mamaroneck's 46% tree canopy has been shown to provide over $560,000 in benefits to residents every year** (Table 1). If factoring in additional carbon storage over their lifetime, that number rises by an additional $5.7 million in benefits.

Table 1. Benefits Provided by Village of Mamaroneck Tree Canopy (Public and Private)

Tree Canopy Benefits Village of Mamaroneck	Quantity	Unit	Annual Value
AIR: Carbon Monoxide (CO) Removed	2,060	lbs.	$1,370
AIR: Nitrogen Dioxide (NO_2) Removed	17,622	lbs.	$5,283
AIR: Ozone (O_3) Removed	50,680	lbs.	$106,727
AIR: Sulfur Dioxide (SO_2) Removed	6,080	lbs.	$643
AIR: Dust, Soot, Other Particles Removed (Particulate Matter, PM_{10})	2,740	lbs.	$270,781
Carbon Sequestered	7,927	tons	$178,171
		Total Annual Benefits	$562,974
Carbon Storage Over Canopy's Lifetime (not an annual benefit)	157,881	tons	$5,708,885
		Total Benefits Overall	$6,271,859
Benefits data based on the 2016 i-Tree Canopy assessment. Details on methodology can be found in the appendices.			

Not only does the tree canopy provide quantifiable benefits each year, but it also serves as a tool to reach Mamaroneck's goals and objectives as described in the *2012 Comprehensive Plan Village of Mamaroneck.* Trees help VOM preserve the character of existing neighborhoods, strengthen the retail base by enhancing the attractiveness of commercial areas, conserve watersheds, wetlands, and waterfront, help protect water quality in the Long Island Sound, improve streetscapes, and even assist in traffic calming measures. Citizens expressed their value of local trees in the 2006–2007 public input process of the comprehensive plan, citing the need for tree canopy protection as well as installation of more trees throughout the village. They repeatedly stated there were not enough trees in the village.

What exactly do trees provide to communities? Each of the benefits are discussed in more detail below.

Urban Trees Reduce Energy Costs

Trees provide energy savings by reducing cooling and heating costs, both through providing shade and emissions of moisture. With demand and costs for energy rising, heating and cooling accounts for approximately half of residential energy bills (Department of Energy 2015). In fact, the cooling effect of one healthy tree is equivalent to 10 room-sized air conditioners operating 20 hours a day (North Carolina State University 2012). The shade of properly-placed trees can save homeowners up to 58% on daytime air conditioning costs, while mobile homeowners can save up to 65% (Smith 1999).

Urban Trees Improve Public Health

Trees have been shown to create healthy environments for people in a number of ways. They improve air quality and reduce heat stressed environments. They also have been shown to encourage more outdoor activity and have impacts on mental health as well.

New York City saw a decrease of almost 30% of asthma in young children after increasing its tree canopy through installation of over 300 trees per square kilometer (Lovasi 2008). Studies have also shown that individuals with views or access to greenspace tend to be healthier; employees experience 23% less sick time and greater job satisfaction, and hospital patients recover faster with fewer drugs (Ulrich 1984). Trees have also been shown to have a calming and healing effect on ADHD adults and teens (Burden 2008).

Urban Trees Alleviate Heat Stress

Urban trees are widely accepted as one of the most effective long-term solutions to reducing the effects of urban heat islands. Tree canopy can lower ambient temperatures by 20°F to 45°F (EPA 2015), which is extremely valuable in areas of urban heat islands, where built-up areas without trees experience temperatures 15° to 25°F hotter than nearby less developed areas.

Heat stress has been proven to cause significant public health problems and even mortality. In fact, more Americans die each year from extreme heat than all other natural disasters combined (i.e., hurricanes, floods, tornadoes, lightning) (EPA 2015). Those over 65 or under age 5 are especially vulnerable to heat-related health problems. *These age groups comprise 21% of VOM residents (2010 U.S. Census).*

Urban Trees Clean the Air

Trees can remove up to 60% of street-level air pollution, including carbon dioxide, ozone, nitrogen dioxide, sulfuric dioxide (a component of smog), and small particulate matter (i.e., dust, ash, dirt, pollen, and smoke) (Coder 1996).

Air pollution creates significant public health issues. Those over 65 or under 5 years of age, those with heart disease or COPD, and those working outdoors are most susceptible to health issues from air pollution. Ozone and particulates can especially aggravate respiratory conditions (like asthma) and create long-term health problems (American Lung Association 2015).

VOM's urban forest removes over 79,000 pounds of air pollutants every year, a service valued at approximately $384,000 to the community (Table 1).

Urban Trees Remove Carbon Dioxide

Trees effectively combat the effects of climate change by constantly removing carbon dioxide from the atmosphere, thereby helping to achieve reduction goals. One large tree is able to absorb as much as 48 pounds of CO_2 per year; 1 acre of trees consumes the same amount of CO_2 released by driving an average car for 26,000 miles (Megalos 2015).

As the village is part of a larger region with goals to reduce greenhouse gases as dictated in the 2008 Westchester Global Warming Action Plan (20% below the 2005 base year of 13.1 million tons by 2015, with an 80% reduction by 2050), VOM's tree canopy is a significant tool to reach these reduction goals.

Mamaroneck's existing tree canopy sequesters nearly 8,000 tons of carbon each year and stores nearly 158,000 tons of carbon over the canopy's lifetime (Table 1). This annual sequestration service is valued at over $178,000, while the lifetime benefit of carbon storage is estimated at $5.7 million.

Urban Trees Raise Property Values

In an age where walkability and pedestrian-friendly areas tend to draw the most people, tree cover is a powerful tool in revitalizing districts and neighborhoods. Trees have been shown to increase residential property and commercial rental values by an average of 7% (Wolf 2007). This is beneficial to both property owners and village budget bottom lines. Property values increase and properties sell faster when communities become more desirable places to live.

Urban Trees Make Streets Safer and More Walkable

Trees play a major role in increasing walkability and cyclability, both of which are part of the village's goals in the *2012 Comprehensive Plan*. Trees provide shade and a natural separation between roadways and people.

In addition to creating a more walkable community, the comprehensive plan also includes a goal of traffic calming to reduce the negative impacts of traffic intrusion into residential neighborhoods or other areas with dense pedestrian activity. According to the Federal Highway Administration, tree canopy along a street provides a narrowing speed control measure by creating a "psycho-perceptive sense of enclosure" that discourages speeding (U.S. Department of Transportation 2015). Additionally, multiple studies have shown that traffic speeds and driver stress levels have been reported to be lower on tree-lined streets, contributing to a reduction in road rage and aggressive driving (Wolf 1998a, Kuo and Sullivan 2001b). The buffers between walking areas and driving lanes created by trees also make pedestrians and cyclists feel safer. It is essential to incorporate trees into VOM roadway redesign.

As an added value, more walkable communities can help strengthen retail businesses by the increased foot traffic along storefronts. Also, walkable communities can lower CO_2 emissions by increasing the number of walkers and cyclists, thereby reducing vehicular traffic.

Urban Trees Means More Successful Business Districts

Trees contribute greatly to the success of business districts. Despite the common perception among business owners that trees detract from businesses by hiding signage, studies have shown that tree-covered commercial shopping districts are more successful than those without canopy. Consumers showed a willingness to pay 11% more for goods and shopped for a longer period in shaded and landscaped business districts (Wolf 1998b, 1999, and 2003). They also reported feeling that the quality of products was better in business districts surrounded by trees (Wolf 1998a). Trees can and should be used as a tool to achieve commercial district goals described in the *2012 Comprehensive Plan*.

Urban Trees Reduce Pollution Entering Waterways

Trees reduce the amount of stormwater runoff by intercepting, absorbing, and slowing rainwater. In fact, one mature deciduous tree can intercept over 500 gallons of rainwater a year, while a tree that holds leaves all year round (i.e., pine, magnolia) can intercept up to 4,000 gallons per year (Seitz 2008). Why is this important? As part of the Long Island Sound Watershed, one of the best ways residents can help the health of the Sound is to reduce the quantities of stormwater runoff. See the **Additional Information on Stormwater Management** inset below to learn more about the issue.

As over 29% of the village is covered by impervious surfaces that repel rainwater (buildings, roads, etc.), effective management of stormwater runoff through trees is a key factor of the overall effort to improve local water quality and habitats around Mamaroneck. Protecting and increasing the urban forest can also help VOM meet Phase II regulations, per the Stormwater Pollution Prevention Plan (SWPPP). This will be increasingly important as VOM faces more severe storms in the future due to changes in climate.

Additional Information on Stormwater Management.

As cities grow, the amount of land that naturally absorbs rainwater (i.e., lawns, parks, fields, woods) continues to be developed, while hard surfaces (i.e., roads, buildings, parking lots) that cause runoff become more prevalent. After flowing over roads, parking lots, and lawns, rainwater picks up contaminants, including fertilizers, oil, chemicals, grass clippings, litter, and pet waste. This contaminated stormwater flows directly in the creeks and into sewers that also reach local rivers, Mamaroneck Harbor, and then the Long Island Sound.

Refer to the appendices for more examples of green infrastructure options to help navigate stormwater issues.

Urban Trees Provide Essential Wildlife Habitat

Forests in urban areas are often in fragmented or disconnected patches due to high levels of development, making sustained life difficult for wildlife. However, smaller forests that are connected through planned or informal urban greenways provide essential habitat to a range of birds, pollinators, and other wildlife that feed on insects, including the owls, bald eagles, and osprey that are often found in forests around VOM (Dolan 2015, LISS 2015a).

Waterways near urban areas are also often highly degraded, partly due to a lack of vegetated buffers along water edges. Trees shade the water, cool temperatures, and make the water more inhabitable for a range of wildlife. Fallen leaves are a food source for fish, insects, and invertebrates. Additionally, trees keep soil in place, which prevents high silt loads in streams that can smother aquatic life. Furthermore, trees filter contaminants from runoff and reduce water pollutants (CRR 2015).

The polluted stormwater that flows into creeks running through VOM eventually ends up in the Long Island Sound. The Sound is an estuary, home to more than 1,200 species of invertebrates, 170 species of fish, and dozens of species of migratory birds. It also serves as grounds for commercial and recreational fishing and shellfishing, recreation for boaters, and nature enthusiasts. The health of this natural asset is critical to supporting all of these uses and must thus be protected (LISS 2015b). VOM's position at the base of three drainage basins into the Long Island Sound creates a critical role for the community to prevent pollution from entering Mamaroneck Harbor and the Sound. Much of the land bordering waterways within the community is privately owned, though the village is exploring expanding public access to these waterways. Maintaining shade and nutrients that trees provide along these waterways is important for protecting critical wildlife habitat. Trees should be part of any plans to improve the local watershed. Installing trees in strategic areas that positively influence water quality, along with maintaining all trees, will enable the urban forest to provide the most ecosystem benefits to the community.

Urban Trees Build Stronger, More Vibrant Communities

While less quantifiable, the impacts of urban trees on community building are no less important than other services. Tree-lined streets can create stronger communities and attract new residents. Studies have shown trees are a big part of this effort. One study showed that residents of apartment buildings surrounded by trees reported knowing their neighbors better, socializing with them more often, having stronger communities, and feeling safer and better adjusted than did residents of more barren but otherwise identical areas (Kuo 2001b). According to studies released by the Pennsylvania Horticultural Society, the greening of neighborhoods increases surrounding property values, encourages investment, reduces crime and vandalism, and encourages exercise, which in turn reduces stress. All of these improvements contribute to building a better community (PHS 2015).

VOM is consistently working to foster the development of vibrant places to work and live within the village by strengthening its 11 neighborhoods with tree-lined streets, meeting places, parks, libraries, and public transit. Trees must be part of that development.

Final Thoughts on the Value of Trees in Urban Communities

Trees provide effective solutions to many urban challenges, as shown in the previous pages. VOM's tree canopy specifically has been shown to return $560,000 in annual benefits. So what's next? Many communities often want to to start planting more trees immediately upon learning about the magnitude of services trees provide. However, to effectively and efficiently make long-lasting improvements, it is important to first accurately assess the state of the existing urban forest, establish goals for the future, and use this information to map out the most effective ways to move forward.

STATE OF THE URBAN FOREST

When examining the state of Mamaroneck's urban forest, it is important to assess overall tree canopy as well as public trees managed by the village.

Tree Canopy in Mamaroneck

The recent i-Tree Canopy analysis found that 46% of VOM is covered by tree canopy, while almost a third (29%) of the village is covered by impervious surfaces that repel stormwater (roads, buildings, etc.). Tree canopy analysis results are shown below in Table 2. A detailed methodology can be found in the appendices.

Table 2 & Figure 1. i-Tree Canopy Results (2016)

Village of Mamaroneck Land Cover (2016)	Acres	Cover
Tree Canopy	1,077	46%
Low-Lying Vegetation (lawn, shrubs, etc.)	493	21%
Impervious Surfaces (roads, buildings, etc.)	696	29%
Open Water	78	3%
Bare Soils (construction)	22	1%

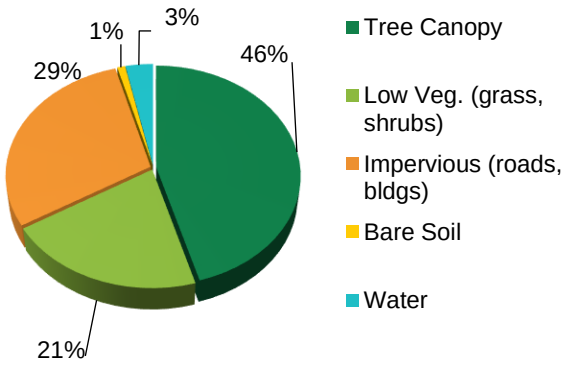


Table 3. Tree Canopy Cover Levels and Goals for Selected Cities

City Canopy Comparisons	Existing		Canopy Goal	
	%	Year	%	By
Atlanta, GA	48%	2008	Increase	Ongoing
Charlotte, NC	47%	2012	50%	2050
Village of Mamaroneck, NY	46%	2016	TBD	TBD
Annapolis, MD	42%	2006	50%	2036
Pittsburgh, PA	40%	2011	60%	2031
New Haven, CT	38%	2009	+10K trees	2014
Washington, DC	35%	2009	40%	2029
Holyoke, MA	27%	2014	30%	Ongoing
Hartford, CT	25%	2013	35%	Ongoing
New York, NY	24%	2006	30%	2036
Providence, RI	23%	2007	30%	2020
Asbury Park, NJ	23%	2013	Increase	Ongoing
Baltimore, MD	20%	2007	40%	2036
Philadelphia, PA	20%	2011	30%	2025
Howard Beach, NY	8%	2013	Increase	Ongoing

The Village of Mamaroneck's tree canopy is excellent in comparison to the selected cities shown in Table 3. Many of these communities have set goals, standards, or policies based on tree canopy targets.

What's an Ideal Canopy Cover? American Forests, a recognized leader in conservation and urban forestry, has worked to establish baseline tree canopy goals for metropolitan areas. For many years, American Forests has recommended an overall 40% tree canopy for cities east of the Mississippi. This included a breakdown of sub-area recommendations of 25% canopy in urban residential areas, and 15% in downtown areas. However, American Forests has recently revised its recommendations to stress that there is not a good universal tree canopy goal that applies to all cities. A city should instead create its own goals based on its local natural environment and community-specific factors. Additionally, a canopy goal should be chosen based on the extent to which that goal *"achieves specific objectives* set locally, such as reaching the canopy percentage necessary to reduce urban heat island temperatures to a specific *range, or to reduce stormwater runoff by a projected amount." As VOM* has already surpassed the original 40% tree canopy recommendation, the *village's* challenge is to maintain or grow its overall tree canopy.

Canopy cover data is extremely useful in making management decisions (i.e., where to plant and where to focus preservation). The data are also helpful in identifying where changes in canopy are occurring and why those changes are occurring. Unfortunately, i-Tree Canopy does not provide the *location* of canopy throughout VOM. In addition, canopy levels are achieved through a point sampling method (see full methodology in Appendix F) and is thus an estimation of existing canopy. A full, high resolution canopy assessment will reveal a more realistic depiction of canopy cover and should be considered for future implementation using the most recent LIDAR imaging resource currently under consideration by the Village. This is further discussed in Recommendation #5.

Public Trees: Village Inventory and Management

The trees on public lands, managed by VOM, were also examined, along with the current management practices. The findings are as follows:

Current Inventory. Just over 1,700 trees have been inventoried and mapped in two phases (first in 2013, then 2016) with varying degrees of data collection by volunteers in the last few years. This number is estimated to be 58% of the total public tree population (88% of street trees) managed by VOM. See *Appendix K: Inventory History* for a full accounting of those inventory projects and methodology to estimate remaining trees that require inventory.

While these efforts are a good start in assessing the urban forest, complete data are required to effectively manage the urban forest. Beyond collecting basic data on the remaining trees not yet inventoried, condition and risk rating must be collected by a qualified, certified arborist to ensure public safety. Complete data are critical for effective management, care, and public safety.

Current Condition. Based on the 2013 inventory data collected, 65% of trees were found to be in Good condition. A total of 28 trees (3%) were found with dead or dying wood, and an additional 43 trees (5%) were found with wood in poor condition. Additionally, 75 trees (9%) have either a large cavity, fungi, or a large crack. A total of 61 trees (7%) were found to require a high priority prune. Condition data were only collected for a portion of the public trees inventoried throughout VOM. However, condition data was assessed by volunteers and is thus not considered to be as accurate as data collection performed by a certified arborist.

Diversity. Species diversity affects maintenance costs, planting goals, canopy continuity, and the forestry program's ability to respond to threats from invasive pests or diseases. The composition of an urban tree population should follow the 10-20-30 rule for diversity: a single *species* should represent no more than 10% of the urban forest, a single *genus* no more than 20%, and a single *family* no more than 30%. Of the inventoried trees illustrated in Figure 2, maple is overabundant (31% of the inventoried population).

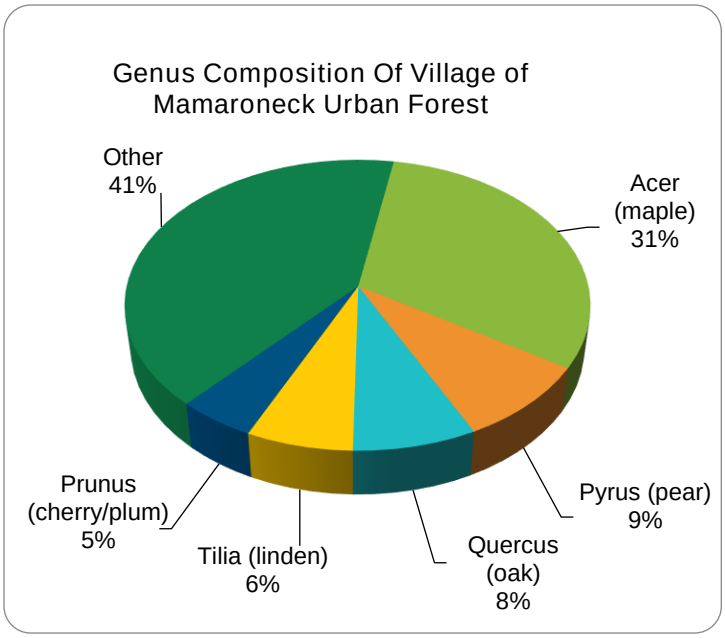


Figure 2. Genus distribution of Village of Mamaroneck's public trees

Size/Age. Analyzing tree size provides an estimate of the relative age of a tree population and offers insight into future maintenance needs, as well as longevity of canopy as a whole (see Figure 3). An ideal distribution suggests that the largest fraction of trees (approximately 40% of the population) should be young (less than 8 inches DBH), while a smaller fraction (approximately 10%) should be in the large-diameter size class (greater than 24 inches DBH) (Richards 1983). A tree population with an ideal distribution would have an abundance of newly-planted and young trees, and lower numbers of established, maturing, and mature trees.

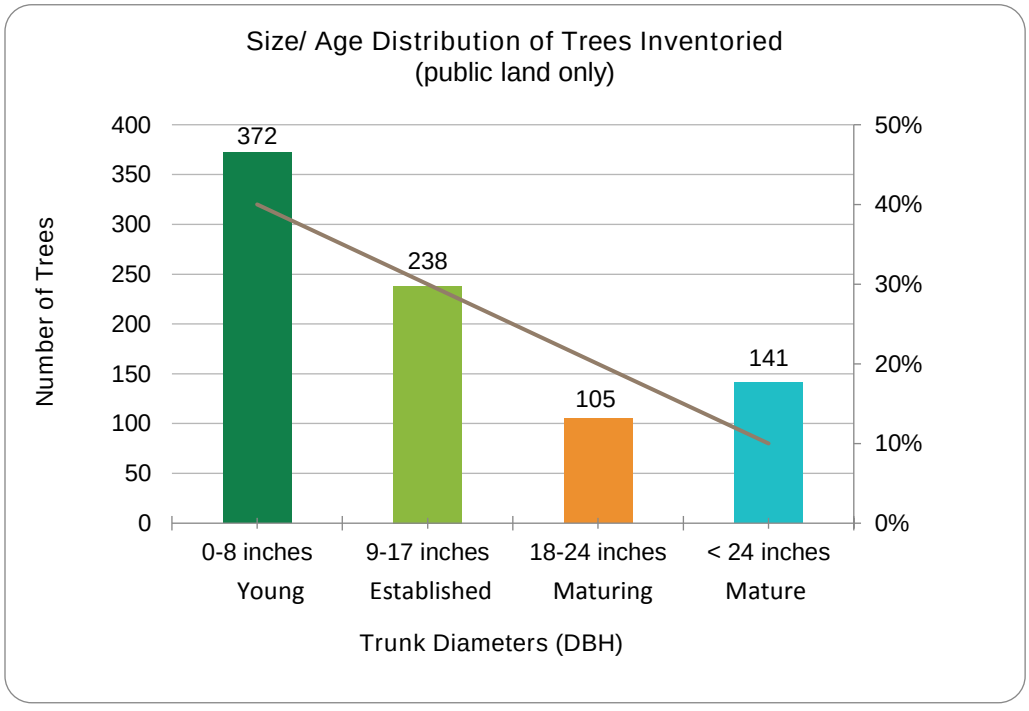


Figure 3. Size (DBH – diameter at breast height) of Village of Mamaroneck's public trees

Current Management Approach. Public trees are managed in VOM under the Department of Public Works. Additionally, the village employs an advisory committee—the Village of Mamaroneck Tree Committee (VOMTC)—which is comprised of seven citizens appointed to monitor, provide and participate in the care of the urban forest. Most pruning, removals, and plantings of public trees are completed by hired contractors. The village also plants a significant number of trees every year (range 100–150). Village leadership recently instituted a new tree care program to ensure new trees survive and become well established. Thanks to the new intiative, new trees are now regularly watered by a dedicated village staff person during the first few years after planting. The staff person uses a truck recently outfitted with a watering tank. There is a tree ordinance in place to protect and preserve public trees. There is no arborist on staff in VOM to offer professional direction and advice for the village in caring for the trees or making tree-related decisions.

Urban Forestry Budget. The current budget allotted to the urban forestry program in the Village of Mamaroeck is $125,000. Though it changes from year to year, typically 40% of the budget is used for planting, and the remaining 60% is used for tree care (pruning and removals as needed). Using benefits data gleaned from inventoried trees, *the community receives $2.84 in benefits for every $1 spent on public tree care* (Table 4).

Table 4. Environmental Benefits Provided by Inventoried Public Trees

Location	Pop.	Tree Related Funding[1]	Total Trees[2]	Leaf Area (acre)	Benefit Provided by Street Trees $/Year				
					CO2	Stormwater	Air Quality	Energy	Aesthetics
Village of Mamaroneck, NY	18,930 (2010)	$38,642	920	16	$1,117	$11,028	$7,948	$44,067	$45,544
Benefits data here are based on i-Tree Streets modeling of Village of *Mamaroneck's existing inventory*.					Total Annual Benefits: $109,704 Return on Investment: $2.84				

[1]Tree condition data are required to obtain benefits values. As only 920 trees within the inventory database included condition data (31% of all public trees in VOM), full benefits data could not be calculated. For this reason, only 31% of the annual budget was used to calculate an accurate ROI.
[2] Number of trees inventoried with data for analysis.
Methodology for i-Tree Streets can be found in Appendix J.

VOM spends the same *per capita* in urban forestry as other communities of similar size but less than the national average. VOM's spend-per-tree is on part with the national average and slightly less than similar-sized communities.

Table 5. Street Tree Funding

Location	Funding/Capita	Funding/Tree
Village of Mamaroneck, NY	$6.60/person	$42.00/tree*
10,000-24,999 population group	$6.22	$45.78/tree
National Average	$8.76/person	$42.59/tree

*Amount based on the estimated 2,976 public trees, $125,000 urban forestry budget.

State of the Urban Forest Summary. Canopy cover in VOM (46%) is currently higher than many communities across the U.S., though data on location of that canopy across the village are not yet available. The village manages just under 3,000 public trees (though not fully inventoried or assessed) without an arborist on staff and with a budget of approximately $125,000. The lack of complete data in both tree canopy and public trees makes decisions on future steps less clear and likely less efficient. While concrete steps have been taken in planting and working on improving new tree care, VOM will benefit from better data on this village asset, as well as added expertise on staff or under contract (further discussed in Recommendation #2). This is especially the case with the threats facing VOM's urban forest, described in the following pages.

THREATS TO THE URBAN FOREST

Despite a substantial tree canopy, proactive action is needed. There are a number of threats facing VOM in the coming years that will stress and likely reduce the overall canopy cover. The loss of canopy poses a threat to air and water quality and leads to higher levels of carbon in the atmosphere, more heat stress, and a degradation of quality of neighborhoods and property values. The following sections provide a summary of the most pressing potential future threats.

Sea Level Rise and Coastal Flooding

The impacts of climate change in Westchester County have the potential to be severe, causing rising sea levels and flooding. This will cause saltwater intrusion, higher storm surges, and coastal erosion. The consequence of such events, over time, is higher tree mortality, as few trees in the Northeast can withstand lengthy exposure to saline or brackish water. There are not a lot of solutions related to preserving tree canopy in this situation except to plant species that are more tolerant to salt exposure (both from salt spray and saline soils). The following tree species are recommended for areas with salt exposure, particularly in the neighborhoods of Shore Acres and Orienta: *Taxodium ascendens* (pond cypress), *T. distichum* (bald cypress), *Nyssa aquatica* (water tupelo), *N. sylvatica* (black tupelo), *Quercus bicolor* (swamp white oak), *Q. lyrata* (overcup oak), and *Magnolia grandiflora* (southern magnolia). These species have been incorporated into the recommended tree species list found in Appendix C.

More Frequent and Severe Storms

As a result of sea level changes, increases in the frequency and severity of storms are occurring throughout the East Coast. This impacts the urban forest in a number of ways:

- More storm damage and subsequent loss of trees.
    - Poorly or infrequently managed trees are more susceptible to breakage in storms.
    - Premature post-storm tree removals on private land tend to occur, often as a result of fear and lack of professional assessment.
- Power outages occur when the wrong trees are situated next to power lines.
- High volumes of stormwater runoff due to extensive hard surfaces and less green land cover exacerbate an already difficult problem.

These issues are addressed throughout multiple recommendations in the next section.

Pests and Disease

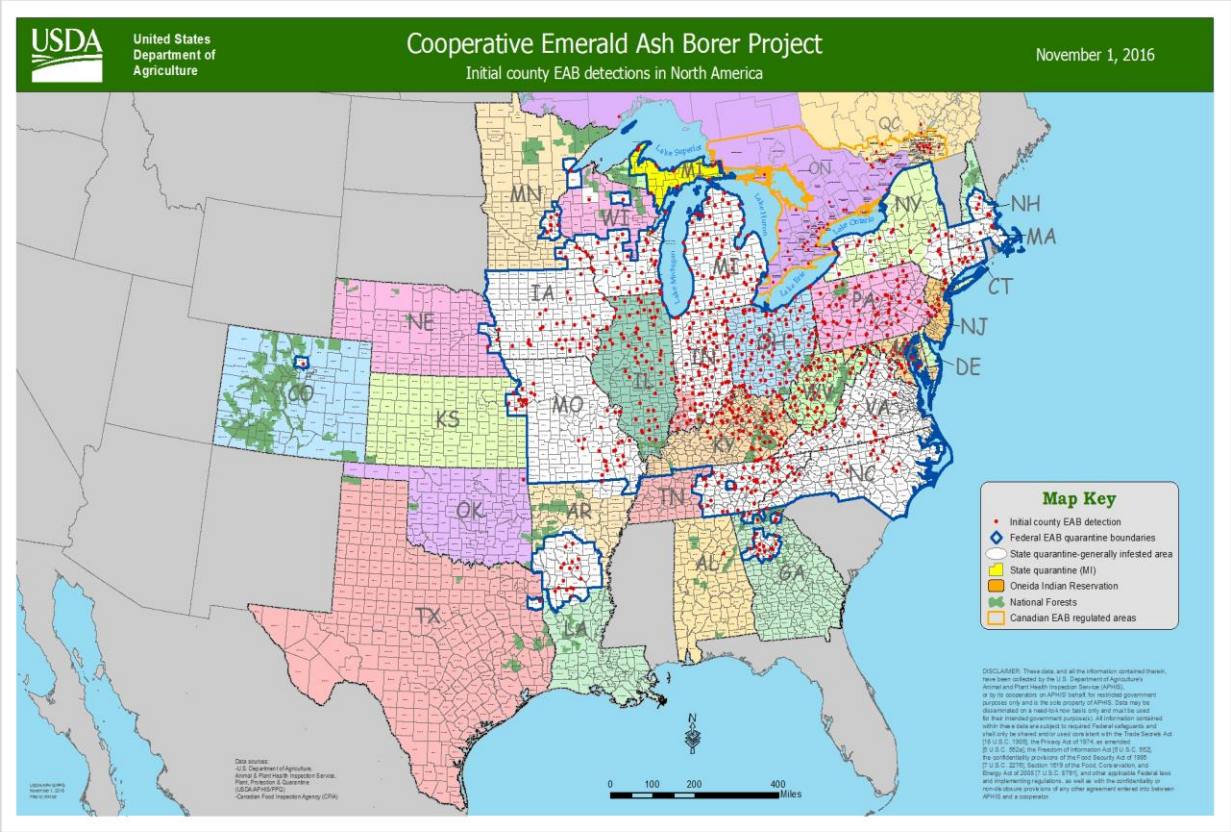
The frequency and severity of pests and disease are likely to worsen throughout the U.S. as the climate warms. Urban forests are consistently under pressure from exotic and invasive insects and diseases.

The solution for local communities lies in proper proactive care (budgeting, monitoring, smart management) as well as planting of more resistant tree species. Below are a few of the more pressing pest and disease issues facing VOM. These issues are addressed in multiple recommendations in the final section of this plan.

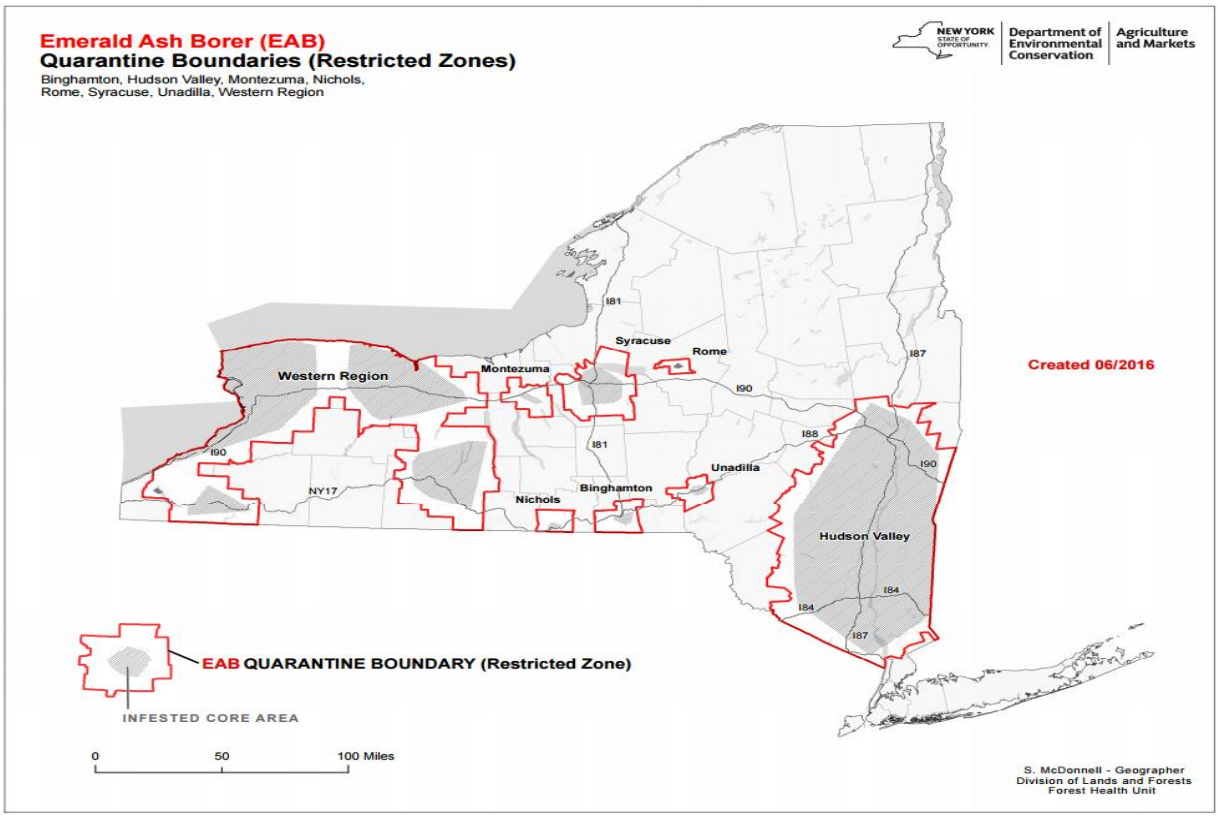
Emerald Ash Borer (EAB). EAB first arrived in the U.S. in 2002 near Detroit and attacks all native ash trees, including white, green, blue, and black ash. Among the public trees managed by the village, 3% (24 trees) are ash and thus susceptible to EAB. Treatment options exist but can be costly. However, without treatment, the mortality rate is 100%. Management options are provided in the recommendations.

Initial symptoms include yellowing and/or thinning of the foliage and longitudinal bark splitting. The entire canopy may die back, or symptoms may be restricted to certain branches. Declining trees may sprout epicormic shoots at the tree base or on branches. Adults exit from the trunk and branches in a characteristic D-shaped exit hole that is about 1/8 inch in diameter. The loss of water and nutrients from the intense larvae tunneling can cause trees to lose between 30% and 50% of their canopies during the first year of infestation. Trees can die within two years following infestation.

Following are maps of the spread of EAB both nationwide and in NY State in closer detail.



Map 1. EAB detections throughout North America (USDA, November 2016)



Map 2. EAB detections throughout New York State (NY DEC, Jun. 2016)

Asian Longhorned Beetle (ALB). ALB is a serious threat to a large number of America's hardwood tree species. Like EAB, this invasive pest arrived from Asia within the last few decades. However, unlike EAB, ALB targets many common species (maple, birch, horse chestnut, poplar, willow, elm, and ash) and is, for the most part, untreatable. Over 35% of VOM's publically-managed trees fall into this group.

Because it is untreatable, if found, the USDA institutes an immediate removal of host trees and a strict quarantine to stop the spread of this devastating pest. Proper identification and destruction of host trees is the only acceptable control practice. The management of ALB is under state and federal regulations. Eradication is possible, but the impact of the process can be devastating to a community. First found in Brooklyn in 1996, ALB has since been detected in Worcester, Massachusetts, southwest Ohio, and Central Long Island. The most important thing is early detection, which requires vigilant monitoring. This is why educating the public and village staff is so important. More information on public engagement is included in Recommendation #7.

Oak Wilt. Oak wilt comes from a fast-acting fungus (*Ceratocystis fagacearum*) considered to be an invasive and aggressive disease. It can result in the decline and death of oak trees in as little as two weeks by clogging the tree's vascular system. Oak comprises 8% of VOM's public trees and likely the same percentage of private trees. Within New York State, oak wilt has been found near Albany, Canandaigua, and in Queens. The fungus is spread from tree to tree by borers and through root grafts underground. This disease is most devastating to trees in the red oak subgenus, including *Quercus coccinea* (scarlet oak), *Q. imbricaria* (shingle oak), *Q. palustris* (pin oak), *Q. phellos* (willow oak), and *Q. rubra* (red oak). Oak wilt also attacks trees in the white oak subgenus, though it is not as prevalent and spreads at a much slower pace in these trees. The most resistant species include *Q. macrocarpa* (burr oak) and *Q. muehlenbergii* (chinkapin). Control and management of oak wilt involves a thorough knowledge of preventive strategies and control protocols such as wound dressings. The best preventive strategy is to limit wounding (including pruning wounds) of oaks during warm weather when the insect vectors are flying.

Other Diseases. Aside from EAB, ALB, and oak wilt, there are other diseases and pest issues that can affect trees in VOM, including anthracnose and verticillium wilt noted below. These diseases require proper management and steps to minimize impact to canopy levels. These diseases do not require treatment.

Anthracnose has been reported on sycamore and plane trees in VOM in past years. It is a common foliar disease of shade trees caused by fungi. Leaf tissue will be killed and defoliation may occur, thus reducing the aesthetic value and vitality of the affected trees. While certain management steps can be taken to reduce the prevalence of this disease (noted below), the best long-term course is to focus on planting resistant tree varieties (noted in Appendix C).

The fungus generally overwinters in infected, dead leaves on the ground. In sycamore, it also overwinters in infected buds or in cankers formed at the base of an infected leaf or twig. During cool and wet springs, minute blister-like swellings in the infected tissues release thousands of spores. These get blown around, land on newly-developed leaves, and cause infection and death of the tissue, resulting in tan to brown areas on the leaves. Varying amounts of leaf drop take place, depending upon the severity of the disease that season. Conditions are then ready to repeat the cycle the following year. Current recommendations for preventing or correcting anthracnose in shade trees include the following:

1. Rake and destroy infected leaves and prune off cankered branches. This will reduce the potential for infection.

2. Fungicidal treatments during leaf development will help prevent leaf infection and defoliation. Trunk injections of Arbortect® can also be used to manage sycamore anthracnose.
3. Over the long term, VOM should understand that anthracnose will periodically surface on susceptible species. The effects over the village's entire tree canopy can be reduced by planting tree species resistant to the fungus.

Verticillium Wilt is caused by a soil-borne fungus. Verticillium is often associated with maple but can affect several other species, including ash, Kentucky coffee tree, elm, and plum. Symptoms include yellow foliage, abnormally heavy seeding, and dieback of shoots and branches. Streaking of vascular tissue can accompany external symptoms. The fungus will persist in the soil indefinitely. If replacement of trees affected with Verticillium wilt is needed, replace with species not susceptible to the fungus such as birch, gingko, pear, or poplar.

Tree pests and diseases have been addressed in the recommended tree species list (less susceptible species) (Appendix C). Funds have been incorporated into the recommended budget (Appendix E) to allot for monitoring and care related to plant health care.

Trees Under Private Care

In most communities, 70–80% of the tree canopy is located on private land. For this reason, success in improving or maintaining tree canopy must include a citizenry that understands: 1) the value of trees and tree canopy to the community; and 2) how to care for and assess trees for health and safety. Understanding these two items helps ensure that old growth trees are not removed without careful consideration of consequences or impact on the community. Some communities require permits for the removal of trees over a certain size or quantity on private land. This can be effective and is being explored in VOM, but it can also be controversial as it pushes the boundaries of private property rights. New policies and regulations also require additional staff time to enforce. Both education and policy options are discussed in the recommendations section of this plan.

Shared ROW Space with Utilities

Finally, trees in the right-of-way (ROW) compete for space and often suffer injury. Public trees must share the right-of-way (ROW) with the many utilities serving a community, both aboveground and underground. Sidewalks, water, cable, power, and gas all vie for space free from obstruction. Canopy losses can occur a number of ways in this area, through damage from utility repairs, clearance of utility lines, installation of new underground utilities, and more. Without active dialogues and partnership between all the players, conflicts of use in ROWs can result in ongoing loss of canopy in communities. This is addressed in multiple recommendations in the next section.

RECOMMENDATIONS

Since a significant portion (46%) of VOM is covered with tree canopy, preservation of the existing canopy should be the focus over the coming years. Based on this focus, and factoring in the state of the current urban forest in VOM and the threats facing the community in the coming years, the following 11 recommendations have been made.

1. Formally adopt and implement a cyclical management plan for public trees
2. Create a position for a dedicated certified arborist
3. Complete the tree inventory
4. Develop an emerald ash borer (EAB) strategy
5. Initiate a full urban tree canopy assessment
6. Define a planting strategy and new tree care program
7. Engage the public
8. Develop a heritage tree program
9. Revise the tree protection ordinance
10. Address utility impacts
11. Develop a storm management plan

Each of these recommendations are discussed in more detail in the following pages. Additionally, the next steps within these recommendations have been prioritized into a five-year plan.

1. Formally Adopt and Implement a Cyclical Management Plan for Public Trees

Ensuring that the existing village trees are properly and proactively cared for is the first priority in preserving tree canopy in the Village of Mamaroneck. Proactive management plans have been shown to reduce long-term care costs, increase public safety, provide more predictable workloads and budgets, reduce utility outages from storms, and improve the health and appearance of the urban environment. In proactive care, tree work is typically performed as part of a cyclical care program in which individual tree health and form are assessed and addressed throughout the village on a regular basis. Every tree in the inventoried population is regularly visited, assessed, and maintained. Davey Resource Group recommends instituting an ongoing, cyclical management program that divides the village into six management sectors to methodically inspect, prune, care for, and plant new trees. See Figure 4 for information on the benefits of ongoing, proactive care related to tree condition.

The cyclical tree care program recommended for VOM is summarized briefly below, and in more detail in the Appendix A.

Year One
Sector 1: Inventory Update

Year Two
Sector 1: Tree Care (Pruning, Removals, Health Care), Planting, and Public Engagement
Sector 2: Inventory Update

Year Three
Sector 1: Year 1 of Young Tree Care
Sector 2: Tree Care, Planting and Public Engagement
Sector 3: Inventory Update

Year Four
Sector 1: Year 2 of Young Tree Care
Sector 2: Year 1 of Young Tree Care
Sector 3: Tree Care, Planting, and Public Engagement
Sector 4: Inventory Update

Year Five
Sector 1: Year 3 of Young Tree Care
Sector 2: Year 2 of Young Tree Care
Sector 3: Year 1 of Young Tree Care
Sector 4: Tree Care, Planting, and Public Engagement
Sector 5: Inventory Update

Year Six
Sector 1: none
Sector 2: Year 3 of Young Tree Care
Sector 3: Year 2 of Young Tree Care
Sector 4: Year 1 of Young Tree Care
Sector 5: Tree Care, Planting, and Public Engagement
Sector 6: Inventory Update

Year Seven
Repeat cycle pattern starting again with inventory in Sector 1

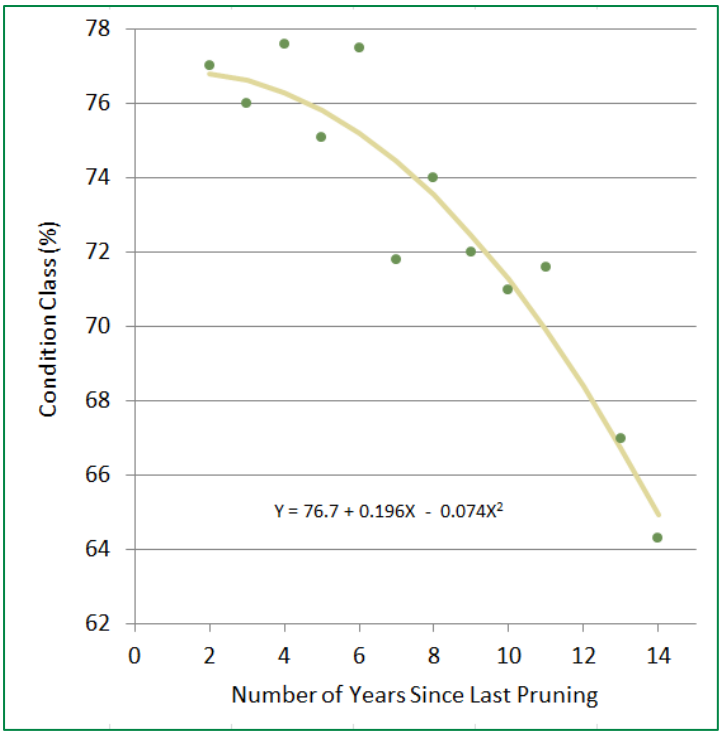


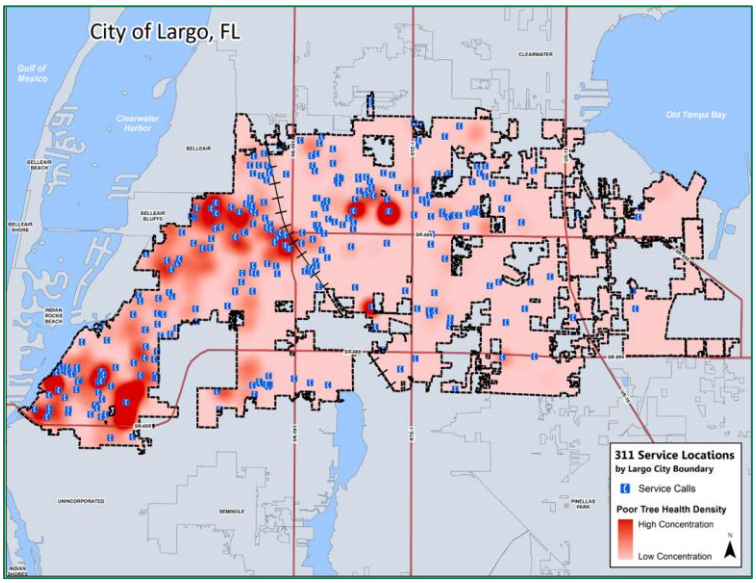
Figure 4. Relationship between average tree condition class and number of years since last pruning (adapted from Miller and Sylvester 1981).

Communities that do not utilize a methodical care cycle like the one described above typically spend the majority of their resources responding to service requests from citizens. This is not always an ideal approach to tree care, as the trees in most need are not always attended to first in this approach, as shown in the experience of Largo, Florida (see the following case study).

Case Study: Case for Proactive Tree Care, Largo, Florida

The City of Largo primarily plans tree work in response to requests from citizens, often submitted via the eGov (311) system. Davey Resource Group analyzed two years of eGov tree-related service requests by comparing the requested service locations to locations of trees in poor condition.

While the map indicates that calls (blue dots) are coming from all over the city, most of the calls are not coming from the areas in highest need of pruning and care (shown in red) according to the city's professionally-completed tree inventory. This suggests that Largo's request-based system does not effectively reach the trees with the highest need for care and is, therefore, an ineffective method for managing the urban forest. A proactive care plan is integral to real progress and effective maintenance.



2. Create a Position for a Dedicated Certified Arborist

The second priority for VOM is hiring an arborist. A proactive tree management program like the one recommended above requires that an experienced ISA Certified Arborist be available on an ongoing basis to monitor tree condition and complete other tree care tasks critical to the success of an urban forest. An arborist would also be responsible for the following:

- Tree protection ordinance assistance and enforcement
- Management of annual tree care program
- Engagement of the public in tree canopy benefits, tree preservation, and planting efforts
- Effective liaison with active utilities in the area

A number of options can be considered here, ranging from funding a VOM staff arborist (either full-time or part-time), sharing a dedicated arborist position with surrounding communities with similar needs, or if hiring is not realistic, utilizing a qualified contract urban forester on an as-needed basis. No matter the route chosen, an additional staff person is required to implement all the programs and changes recommended in this plan. Additional work includes assisting with administrative and public engagement and relations tasks, such as keeping the tree inventory database current, managing applications for heritage and champion tree status, conducting outreach programs, coordinating landscape volunteers, developing a historic tree walk with app, assisting with grant applications, and helping manage volunteers and potential interns.

Whether full-time or part-time, an arborist position creates a structure that will result in more frequent and dedicated professional expertise on the ground in VOM. It is important, however, that the individual be TRAQ (Tree Risk Assessment Qualification) qualified. The training that arborists receive with this qualification prepares them to make tree risk assessments that protect the village and its citizens from safety hazards and liability associated with potentially hazardous tree conditions. TRAQ has official risk designations, which considers who or what is at risk and which trees should be prioritized. A designated individual in this role will make it easier to maintain clear and consistent communications with utilities and the public.

Funding required for various arborist scenarios follows and is included in the recommended budget found in the Funding section.

- Full-time arborist either funded 100% by VOM or shared between the surrounding communities. Estimated funding needed: salary plus benefits, approximately $65,000 per year.
- Consulting Urban Forester hired on a part-time or as-needed basis. To implement this plan, a part time consulting forester would be required on at least a part time basis (30-60 hours per month) if not more. Estimated funding: 30-60 hours per month at $75 per hour, $2,250 - $4,500 per month or $27,000 - $54,000 per year.
- Identify one or more maintenance staff for ISA certification and later TRAQ, ideally one also with landscape/horticulture skills. Estimated funding needed: ISA-certified arborist training and testing may realistically cost $2,500 (includes study materials, classes, application, and testing) + current existing salary. Three years of training is estimated.

3. Complete the Tree Inventory

VOM's tree inventory is only 58% complete and does not currently include full risk or condition assessment data. This should be remedied in the near future for a number of reasons.

Comprehensive tree inventories are essential first and foremost to ensure public safety through the professional assessment and cataloging of tree condition on a regular basis. Comprehensive tree inventories also facilitate short- and long-term planning by providing a basis for annual budgets, identification of planting opportunities, managing exposure to potential threats, and improving the overall health of trees, all of which resulting in less work long term.

Access to inventory data can also increase village operational efficiency by defining a work program with the entire public tree population in mind, decreasing travel between work sites, and decreasing equipment needs and paperwork. Inventories also encourage strong public relations by facilititating the ability to adaquately respond to citizen requests and provide data on the overall tree population and benefits to the community. Finally, inventories provide a repository for documenting all work on trees, which is important in analyzing budgets and when legal documentation is needed.

A complete inventory can be achieved in one of two ways—a one-time village-wide inventory, or a gradual sector-by-sector inventory across the span of six years (as included in Recommendation #1). A one-time village wide inventory is ideal, as it immediately mitigates any high risk trees, but also costs more at one time. A sector-by-sector inventory allows costs to be spread over a number of years, but means that trees are not examined for risk all at once. At-risk trees that aren't addressed in the immediate future can be a public issue.

As the last 800+ trees inventoried in 2016 was undertaken by a volunteer, proving that this is also an option. However, keep in mind that volunteers cannot assess tree condition and risk assessment, which is an important part of ensuring public safety in urban forestry.

A Note on Risk Assessment. Establishing risk thresholds and a risk management program are important. Trees provide valuable benefits to a community. These benefits typically increase as trees mature. However, along with this increase in benefits can come an associated increase in risk. Entire trees may fail, or limbs may fall from standing trees. Repairs to existing infrastructure can also cause damage to tree roots and increase risk to unacceptable levels. Sidewalk and curb repair that require the removal of *offending roots may undermine the tree's support* structure. Understanding risk, identifying levels of risk, and taking reasonable steps to mitigate or reduce risk are challenges that face those who manage the urban forest. As with all municipal infrastructure, trees should be periodically assessed for risk. Tree risk assessment should only be done by an arborist with the appropriate training and *experience. The International Society of Arboriculture's* Tree Risk Assessment Qualification is an indicator of this training and experience.

Regardless of which approach is taken, it is strongly recommended to complete a professional inventory and collect the following information:

- Basic data – species, location, size, etc.
- Risk assessment – condition assessment and risk rating
- Potential planting sites - by collecting potential planting sites during an inventory, valuable time can be saved when it is time to plant new trees. This is also often required to obtain NYSDEC planting grants.
- Maintenance needs – young tree pruning, structural pruning, hazard mitigation pruning, removal.

4. Develop an Emerald Ash Borer (EAB) Strategy

There are different management strategies for dealing with EAB. As the borer was found in parts of Westchester County in 2014 (see map in *Threats* section), it is strongly recommended that VOM put an action plan in place. Some of the most important questions to answer in developing a plan include:

- How many ash trees does the village have?
- Where are the ash located?
- What actions should the village take?
- What about ash trees on private land?

Ash Quantity and Location. In order to answer the first two questions, an up-to-date inventory is essential (as already mentioned in the prior recommendation). This is critical to efficient and cost-effective management in planning for treatments. Based on the partial inventory data available, it is estimated that Mamaroneck manages an estimated 48[1] ash trees (almost 3% of all public trees) that will need to be addressed in coming years. This does not take into account the numbers of ash trees on private property that can impact the public right-of-way. That data are not currently available, though we can assume it is also at least 3% of all private trees.

EAB Management Strategies. Treatment has been shown to be effective on any ash trees that are not yet showing symptoms of infestation. However, as treatment is required on an ongoing basis

(every 1–2 years depending on the chemical used), costs can be substantial over the long term. Without treatment, mortality is 100% within 2–4 years of infestation.

There is no current plant health care line item specified within VOM's urban forestry budget.

Four strategies for managing public ash trees have been examined and analyzed in consideration of economic costs and public safety. Mamaroneck must determine which strategy is best for the village based on acceptable risk levels and budget. In the most basic terms, the options include the following:

- Strategy 1: Do Nothing
- Strategy 2: Remove and Replace all Ash
- Strategy 3: Treat all Ash
- Strategy 4: A Combination of Strategies

Strategy 1: Do Nothing. Some communities opt to do nothing proactive to deal with ash, opting to remove them as they become infected and create a threat to public safety. In this scenario, funds must be set aside based on the number of removals that will ultimately occur. This strategy has the highest liability risk, especially without regular scheduled cyclical tree inspections (as described in Recommendation #1). **Immediate Cost: $0**

Strategy 2: Remove and Replace All Ash Now. In this strategy, all public ash trees are removed at once, regardless of condition. By the end of 2017, remove and replace all 48+ ash trees. This strategy would ensure public safety from the dying ash but would have an immediate impact on the village's budget. In addition to the financial burden, removing mature ash trees, many of which are likely still in Good condition, would take away all of the valuable benefits that these trees provide to the community and would likely be an unpopular option among the citizens as they see seemingly healthy trees come down. Additionally, replacing all of these ash trees with alternate species once they have been removed will be very important. I**mmediate Cost: The total approximate cost for this strategy would be just over $80,000 (Table 6).**

Table 6. Remove and Replace All Ash Now Costs

Management Strategy	Management Action*	# of Trees	Avg. Cost	Totals
Remove and Replace All Ash Trees	Remove All	48	$980	$47,040
	Replace All	48	$500	$24,000
	Stump Removal	48	$200	$9,600
			Total	$80,640

*Cost per management action was provided by the Village of Mamaroneck.

Strategy 3: Treat All Ash. Starting immediately, this strategy treats all public ash trees in VOM every other year. Treatment costs are based on the diameter at breast height category size of the village's ash trees to be treated, obtained from inventory data. **Cost: The total cost to treat all ash trees one time would be nearly $9,000 (Table 7).**

Table 7. Cost to Treat All Ash

Management Strategy	Management Action	# of Trees	Cost*
Treat All Ash Trees	One Treatment	48	$8,730

*Cost for treatment is based on an estimated $15 per caliper/DBH inch average. Local estimates for this service will vary.

Strategy 4: Combination of Removals and Treatment. This strategy is intended to provide an option for a combination of removing and treating ash trees to stabilize annual removals, annual budgets, and prolong the life of ash trees in good condition or of special value to a community. Factors contributing to removal include any ash in already poor condition, those not in a visible location, and those that have been requested for removal by citizens or utilities in prior years. Treatments on some trees are undertaken in some cities to slow down the rate of decline and removal for budget purposes. **Cost: As full inventory data with tree condition are not available at this time, cost estimates cannot be provided for this scenario.**

Ash on Private Property. As stated above in the Threats section, public education and awareness are key components to managing ash on private property. People will first need assistance in identifying ash trees to know if they have any. Then, people will need to become aware of management options. Armed with this knowledge, the public is more likely to be supportive of strategic removals of public ash if they fully understand the issue. The ash issue may also provide an opportunity to involve the public; such events can focus on ash replacement efforts after removals. Resources for outreach are provided in Appendix D.

5. Initiate a Full Urban Tree Canopy Assessment

During the development of this plan, tree canopy in VOM was estimated using i-Tree Canopy. This tool provides an *estimate* of overall canopy based on a sampling of points across the village. This tool is a good starting point to analyze and benchmark village canopy and the benefits it provides. However, the tool doesn't provide *location* of canopy – where it is, where it isn't, and where canopy has been lost or gained over the years – nor is it extremely accurate. More detailed canopy information is only available through a full urban tree canopy (UTC) assessment done by a technical professional.

It is recommended that VOM initiate a full canopy assessment with two years of high resolution LIDAR (2005 and 2018 for instance) to obtain accurate information by neighborhood, census block, or other segmentation, and also to identify areas that have changed in recent years. This can provide insight and direction on where to focus planting or tree care efforts, and to help identify problem areas, along with ways to rectify losses and get on track to reach future canopy goals. Additionally, the UTC should ideally be reassessed every five years to track progress and identify sources of loss. Many communities require this regular UTC update in their tree ordinance and comprehensive plans.

Source Funds/Partnerships for a Full UTC. Funding can be secured in advance by partnering with other local entities (nonprofits, villages/towns) or applying for grants. Costs can be shared through partnerships by implementing a UTC with partners on a larger scale like Westchester County. In researching partners, identify other groups that would benefit from tree canopy data, such as the Long Island Sound Coastal Management Program or the local regional council of governments, which is tasked with air quality goals.

Set a Canopy Goal (optional). Based on the findings of a UTC, the Village of Mamaroneck can set a tree canopy goal, which provides a metric to track progress of future work. A canopy goal can help provide the motivation and reasoning behind village code, help motivate and engage citizens of a community, and also demonstrate a municipality's commitment to protecting, managing, and expanding the urban forest and environment.

6. Define a Planting Strategy and New Tree Care Program

Tree canopy losses cannot be replaced quickly. It takes decades for trees to grow and provide the same benefits as mature, established trees. However, we know that loss of trees over time is inevitable, whether from natural mortality, storm damage, construction, or pest and disease issues. For this reason, strategic and proactive planting and follow-up young tree maintenance is essential to reducing the impact of trees lost over time. There are three points to consider when formalizing a planting strategy.

Point 1: Incorporate Planting into Cyclical Program. It is recommended to incorporate ongoing planting work into the proposed cyclical tree care program described in Recommendation #1. This includes regular cataloging of potential planting sites throughout the village (on public land or beyond the right-of-way – see inset on following page), scheduled planting periods throughout all village sectors, and a scheduled new tree care program.

Point 2: Plant According to Best Practices. Tree planting and new tree care should be done according to established best practices. This includes solid decisions on site, species, and new tree care, which are discussed below. Also, consider refraining from any planting unless funds can be secured for three subsequent years of new tree care.

Tree Species List. There is a current *recommended* but not mandatory tree planting list. It has been specified by the trustees that exceptions can be made on a case-by-case basis by the village manager and VOMTC (tree committee).

A revised recommended street tree planting list can be found in Appendix C, which includes the addition of more trees showing salt/flooding tolerance. Edits have made based on best tree choices according to threats facing VOM in the coming years. In addition to utilizing these species, awareness of planting for genus and species diversity is also important. The planting list must also take into consideration the changing climate. The Village of Mamaroneck is currently in Zone 6b. As the climate continues to warm, it will move into Zone 7. There are trees listed in Zone 7 that can be planted if the appropriate site is chosen with respect to the microclimate. For example, *Quercus lyrata* is very tolerant of inundation (flooding), and southern magnolia can also grow well in southern New York. To maximize the benefits trees provide, the village should be committed to planting the largest-growing tree that a given planting location can support without compromising its natural form.

Planting Specifications. VOMTC has created guidelines for tree plantings that were approved by the village trustees in 2010 as an addendum to Code 318-7.

This guideline follows:

- No trees that mature at a height greater than 30 feet are to be planted below Con Edison distribution lines.
- Trees that mature at less than 40 feet shall be planted at least 30 feet from any adjacent tree.
- Trees that mature at more than 40 feet shall be planted at least 40 feet from any adjacent tree.
- When planting trees or issuing RFPs for planting trees, the following standards are required: excavation 12" wider than root ball; add topsoil if needed when planting and backfilling; removal of excess soil as needed; removal of all twine, burlap, and wire from the top 9 inches of the root ball; top of the root ball of planting material shall be at or no more than 1 inch above existing grade but never below the existing grade after planting; watering to saturation at time of planting; and 3–4 inches of mulch over area of excavation.

Additionally, the ANSI A300 Part 6 Planting and Transplanting Standard and the ISA *Best Management Practices for Tree Planting* should be used to further develop the tree planting guideline. These resources discuss among other items proper tree selection from nurseries, planting techniques, and new tree care.

Planting Beyond the Right-of-Way (BROW)

Planting beyond the right-of-way (BROW) is an option for citing more new trees within the Village of Mamaroneck. There are additional benefits to BROW planting, including providing alternatives to planting sites with limited soil volume, compacted soils, overhead wires, underground utilities, sidewalks, road salt, and passing vehicles. These challenges all significantly hinder a tree's ability to thrive and survive, and limit the selection of trees that can be safely and appropriately planted within the village right-of-way. BROW planting can result in greater soil volume for the trees and fewer conflicts with utilities and vehicles.

Additional BROW advantages include:

- New partnerships between VOM's tree managers and private owners help make the most of the village's public tree care tax dollars and resources.
- Provides an effective avenue to work with residents in selecting and planting the "right tree for the right place."
- Less chance for tree disfigurement as a result of fewer conflicts with utilities and vehicles.
- Healthier trees due to less compacted soil and more soil volume.
- Potentially improved reliability of electric and other utilities.

Planting beyond the right-of-way is being implemented in parts of New York (Wegener 2014). According to the New York State attorney General, "an incidental benefit to a private individual or entity does not invalidate an expenditure of public funds if a public purpose is primarily served by that expenditure" (Murphy v. Erie Co., 28 N.Y.2d 80, 88 (1971). This effectively states that public funds can be used to plant trees beyond the right-of-way as there is a public benefit from the growth of the trees.

In line with this finding, the New York State Urban Forestry Council and the New York State Department of Environmental Conservation (NYSDEC) Urban Forestry Program both agree on the benefits of planting beyond the right-of-way and NYSDEC tree planting grants allow for grant-funded trees to be planted up to ten feet beyond the right-of-way.

Should VOM decide to pursue such a program, the first step is to have the village attorney review the Association of Town's finding that "local municipalities have the authority to enact a local law to provide trees to property owners according to the Municipal Home Rule Law, §10(i)(a)(ii)(12) of the NY Const., Art IX, §2 under their police powers" (Wegener 2014). And then to have the trustees pass a resolution approving such a program. Sample resolution language follows:

The Village of Mamaroneck may plant shade trees acquired with state, local, or private funds upon adjoining land at a distance not exceeding ten feet from the edge of a right-of-way; however, the written consent of the owner of such adjoining land shall first be obtained.

Once passed, potential sites can be identified from the inventory and property owners educated on the concept and an agreement obtained for a tree planting by the village and for future care and maintenance including watering and mulching to be the responsibility of the property owner. A sample form and other BROW resources can be found Appendix G.

Young Tree Care. Quality care for the first 3–5 years of a new tree's establishment is very important and has multiple tangible benefits. Most obviously, it prevents wasting planting funds by lowering the mortality rate of new trees, but it also reduces the amount of care needed in future years. Older trees that were selected, planted, and maintained with proper care while young will have fewer defects that are less costly to maintain and longer lived in urban environments than trees that were not correctly planted or poorly cared for over time.

Point 3: Use Tree Planting to Engage the Public. Recognize that tree planting and new tree care are one of the most effective avenues to engage the public in the urban forest. Local businesses, corporations, and utilities are attracted to contributing to very visual projects in a community. Tree planting is a hands-on simple task for volunteers to do with immediate visual results. It can be easy to get kids involved and other community groups to plant trees in a volunteer event on a Saturday morning. Tree plantings provide two types of engagement: one is a small commitment for a one-time tree planting event; and the other is the slightly larger commitment and more training required of "tree stewards." Following the planting, new tree care programs entail work that volunteers can be trained on without worrying about being involved with difficult and dangerous work on large established trees. The public can't be involved in large tree care that requires skill and heavier machinery but can participate in young tree care and maintenance.

The Village of Mamaroneck is already employing the tree stewards practice through the Citizen Volunteer Tree Trimming Corps that prunes young trees around the village, under the guidance and training of a local arborist. The Corps uses hand tools to prune trees that were recently planted and are causing obstructions to walkways or have broken limbs. The Corps staff consists of members of the Tree Committee and members of the Committee for the Environment as well as some local youth involved with boy scouts and girl scouts. Ways to adjust or improve upon the current practices are detailed in Recommendation #7.

7. Engage the Public

There are multiple ways to engage the public to improve care of and quantity of local tree canopy. Topics or messages must first be defined and limited in number. The public has a limited capacity for messages in today's world. More effective communication occurs through choosing a few messages and repeating them over and over. After messaging is chosen, avenues of targeted communication to deliver those messages can be determined and implemented.

Messaging. Important topics and messages that should be considered for Mamaroneck are as follows:

Current Canopy and Value of Mamaroneck Trees. Present the current canopy level and benefits the canopy provides, as well as the village's canopy goal. This is typically the first message to send out as all other messages should connect back to this one. This can also be a way to "roll out" the urban forest management plan to the public (why Mamaroneck needs canopy, current canopy level, what the canopy goals are, and how plans to achieve those goals).

Along the same lines, the value of tree canopy can be conveyed to business owners. Educating local business owners on the impact a shady commercial district can have on sales (see study referenced on page 6) can also be a method to boost the desire for increased canopy along main thoroughfares and neighborhood streets while engaging the public. Additionally, the value of mature trees could be highlighted. People often do not realize that the large tree they have is a value to their property, the community, wildlife, and the environment. A landmark or heritage tree program that provides a plaque or notification for a valuable old tree will make removal of those trees less likely. This is further discussed in Recommendation #8.

Links to samples of brochures and programs to help develop an engagement program in Mamaroneck can be found in in Appendix D.

Examples of Volunteer Tree Care Programs

Tree Tenders, Pittsburgh, PA. In 1993, the Pittsburgh Shade Tree Commission (PSTC) created a volunteer program named Tree Tenders® to help plant and care for existing trees. Tree Tenders® from neighborhoods were trained to care for newly-planted trees. The PSTC also helped community groups organize tree care work events and maintained a small tool bank for use by volunteers. In 2006, Tree Pittsburgh, a 501(c)(3) charitable, nonprofit urban forestry organization, was established and continued the volunteer program and created a certificated Tree Tenders® program. Tree Pittsburgh requires that Tree Tenders® take an 8-hour course and learn about urban forestry practices, tree biology and health, proper planting, pruning, and maintenance. The cost of the course is $40 (scholarships are available), which includes registration, materials, light food, and instruction. Tree Tenders® participate in events organized by Tree Pittsburgh that include tree care days, pruning workshops, and tree planting. Since 2006, Tree Pittsburgh has certified over 1,300 Tree Tenders®.

CommuniTree Stewards, Syracuse, NY. Funded by the City of Syracuse and Onondaga County, the CommuniTree Steward Program started in 2002 to cost-effectively plant and maintain trees by exchanging tree maintenance classes for volunteer work on public trees. The program is run by Cornell Cooperative Extension (CCE). Students enroll in the winter and begin the required CCE courses in April. Coursework includes tree biology, tree identification, soils, matching tree species to the site, tree planting, basic pruning, structural pruning, proper mulching, and watering. Students are closely monitored and instructed during forestry projects. By the end of the summer, most students need little supervision; by the fall, CommuniTree Stewards participate in large-scale, bare-root planting events. Veteran Tree Stewards, who return annually to work on tree projects and plantings, will often pair up with new Tree Stewards and will serve as instructors. CommuniTree Stewards have planted thousands of trees in the City of Syracuse and Onondaga County villages. Volunteers are also able to serve on specialty projects such as tree inventories and invasive species mapping. Veteran CommuniTree Stewards have gone on to organize their own neighborhood projects, so the program has had an impact beyond its original intended area.

Combining Youth Employment Opportunities with New Tree Care in Indianapolis. Newly-planted public trees in Indianapolis don't always have predetermined caretakers. For this reason, Keep Indianapolis Beautiful (the city's nonprofit tree partner) employs a team of young people to plant, mulch, stake, water, and prune public trees for seven weeks each summer. The Youth Tree Team program, which began in 2008, pays local high school students to take on this role of promoting new tree establishment and care. The program is supported through corporate donations, a foundation, and other donations.

How You Can Get Involved. What are the next steps you want people to take? The village should decide the answer and insert this "ask" on every outreach piece or effort. This must be decided locally but options include:

- Promote the fact that citizens can currently opt-in for a tree (either through a BROW program noted on previous page, or for a street tree). Alternatively, raise funds for a tree giveaway (usually saplings) at Arbor Day for citizens to plant on private property.
- Volunteer at a tree planting (one Saturday morning commitment)
- Join the Citizen Volunteer Tree Trimming Corps
- Donate funds for an upcoming planting.
- Official "adopt" a heritage tree (discussed further in Recommendation #8).

Tree Threats. Public trees are subject to demise as a result of disease infestation as well as neglect and poor care. With education, the citizens of VOM can help become aware of the common threats to the tree canopy and what they can do to help. Ideas and content examples for engaging the public about threats follow with links to resources provided in the appendices.

Emerald Ash Borer. Education on what to expect, how to identify ash trees, what the village is doing about EAB on public land, and options for management on their own land.

- *Asian Longhorned Beetle.* While education on pest identification and early detection is important, spread of the beetle and the accompanying tree mortality is not something that is controllable on a local scale. The important action step is monitoring and notifying the NYSDEC if located. Information on ALB should be incorporated into the village website with a link to USDA APHIS and NYSDEC resources.
- *General Tree Care.* There are a number of actions people take that are detrimental to trees at all stages of life, including improper mulching and pruning. Easy tips and tidbits of information to share with citizens are important.

Storm Response. This topic focuses on helping private citizens handle storm damage, and preparing for effective outreach after storms. Ensure there are messages related to post-storm tree preservation in that messaging. See Recommendation #11 for further discussion on this topic.

Avenues of Communication. There are numerous avenues to convey the message to citizens.

- *Cable Television.* The Village of Mamaroneck has a robust announcement program on cable. Short tree care tips, bits of information on Mamaroneck's tree canopy, announcements of volunteer events, or tips on handling storm response should be added to this outlet as available.
- *Social Media.* While Mamaroneck has a citizen volunteer tree trimming corps, a tree committee, and an environmental committee in place, aside from a small number of pages on the Village's website, there is little-to-no visibility of these activities online. Social media sites such as Facebook and Twitter can create buzz and promote involvement in the current urban forestry activities occurring locally.
- *Comprehensive Plan.* The overall village canopy goals or efforts to promote canopy preservation should be incorporated into the next comprehensive plan (expected to be updated in 2018). This ensures urban forestry goals continue through the turnover common in elections and staff changes.
- *Presentations to village leadership and local groups.* Part of the roll-out of a plan involves defining audiences, partnerships, potential champions, and reaching out to the public, with

the goal of encouraging the audience to learn about and join in on the work called for in this plan. This can be done through multiple presentations to varying audiences - trustees, village boards/committees, business association, village staff, regional environmental groups, and others. Also consider having a presence at public events like block parties and official events such as Clean & Green Day, where the public can be educated on VOM's tree programs and goals. Be sure to have an "ask" at the end of the presentation or during the education process. What do you want them to do next? This work often unearths new partners and funding sources that can otherwise go untapped.

- *Boost Citizens Volunteer Tree Trimming Corps.* Augment regular volunteers with arborists in training and mature high school or college interns to assist in outreach, new tree care, coordinating planting plans, and assisting at community outreach events.

Partnerships should be initiated with organizations that can help promote, enhance, and preserve the UTC. Organizations can include local businesses, local utilities, regional partners, and the Village of Mamaroneck Tree Committee. Other audiences to engage can include young people, businesses, landscape architect firms, regional groups, the general public, and all village staff departments. Actions that can be taken by each partner should be defined.

8. Develop a Heritage Tree Program

Without mature and majestic trees, Mamaroneck would be an entirely different place. A program dedicated to the promotion of these trees is highly useful in the effort to preserve them, especially on private property. Historic tree appreciation and protection efforts go a long way towards preserving large trees, but also in generating public interest and appreciation for trees.

Preserving heritage trees can happen informally through a general appreciation campaign, or more formally through a village ordinance. This work can include local historical groups and/or local businesses (particularly ones established over 100 years ago) or other donors to "adopt" a historic tree to help fund its preservation. Establishing such a program could include the following:

- Identification of the large, unique, or historic trees on private property through a nomination process promoted via social media, the local historical society, neighborhood organizations, and the village's website.
- Investigation of any existing or potential state or national champion status tree by engaging local NYSDEC foresters.
- Highlighting such finds in the *Journal News* or the Village of Mamaroneck's historical society newsletter.

Two Case Studies on Historic Tree Programs

Historic Homes Tour, Elgin, IL. In the past, during the holiday season, the City of Elgin, Illinois sponsored and organized an historic homes tour. They incorporated large/interesting trees on those properties as part of the tour. The trees were adorned with large tree tags or signs that illustrated the benefits of the trees, along with information about the species and size. Signage promoting the benefits of trees was also included for public street trees along the walking route so that tour goers could learn more about the benefits of trees, ask questions, and explore the urban forest in engaging ways. Trees are prominent features on many of these beautiful properties, so by including them in the scope of a historic homes tour, folks were encouraged to connect the value of trees to the history and heritage of their community.

Revisiting the Moses Cleveland Trees. In Cleveland, Ohio, the Western Reserve Land Conservancy and Holden Arboretum have begun to revisit their catalogue of trees in existence during Moses Cleveland's time. Moses Cleveland was the original surveyor of the land on which the City of Cleveland sits. This program was launched by Arthur B. Williams, a local naturalist and the Natural History Museum's Curator of Education in the 1940s with 150 selected trees. Last inventoried in 1971 as part of Cleveland's 175th birthday, a committee was formed to locate and assess the original 150 Moses Cleveland Trees. They found that 92 of the original trees were still standing and in good shape. Today, these trees are being revisited and mapped as part of a public appreciation campaign of the City of Cleveland's urban forest. This campaign will sustain the spirit of the original program and hopefully inspire a new generation of tree advocates in Cleveland.

- Notification to property owners of their heritage trees, and creation and distribution of plaques for each tree.
- Development of an app that brings together the locations, photographs, species, facts, and historic descriptions for historic trees and provides an online tree walk to offer.

9. Revise the Tree Protection Ordinance

A tree protection ordinance is critical to tree canopy preservation and care. Davey Resource Group reviewed the two existing ordinances – Chapter 296 Streets and Sidewalks and Chapter 318 Trees, along with the new suggested additions to Chapter 318 on preserving trees on private property. General comments and recommendations on these ordinances follow. Specific recommendations have been submitted to the village for streamlining and improving the code. Recommendations include pulling administrative and procedural items out of the code (better suited to village operational policies instead), the addition of subsection headings for readability, tightening up the ordinance with practical and specific language, and moving some items currently under 318-14 to the ordinance as a whole. The next step for VOM is to edit or adopt the code changes in order to protect tree canopy for years to come.

Suggestion #1. Adjust Fines. Currently, the fine for damage or removal of trees (violation of the current ordinance) is "a fine not exceeding $250" per the § 296-16 Penalties for Offenses section of village code. However, the loss to the village of a mature tree is much higher and the lost tree is not quickly or easily replaceable. Fees should be based on the value of the asset lost using the Council of Tree and Landscape Appraisers (CTLA) model, which takes into account a variety of factors, including species, condition, size, and location. This model is endorsed by all the major arboriculture, horticulture, and real estate industry organizations.

Suggestion #2: Incorporate Canopy Goal. Once in place, insert the fact that there is canopy goal in the Purpose and Definitions (if one is adopted). However, refrain from inserting an exact number to allow for future adjustments without having to change code.

Suggestion #3: Consider adding a utility representative to the VOMTC membership in §318.2. Also, if there is not already a tree expert on the committee, one should be added to the board.

Suggestion #4: Remove much of the procedural text from the code, especially the newer suggested code addition. Create a village policy internal document to include the procedural information instead. This will ease the readability of the code, ensuring the public can understand the main points.

Suggestion #5: There is a written approval requirement for pruning in Chapter §296:11. H. A permit process of some kind should be required for all work or impacts on trees, including by the utilities. Utility companies can apply for a permit once a year with the plan for work spelled out. This creates an additional interaction point between the VOM arborist and the utility.

Suggestion #6: All best practices for planting, pruning, removal, and other work can be covered by *citing ANSI A300 standards* on tree care in the code. This removes the need to spell out every requirement in detail.

A copy of the Ithaca NY tree code can be referenced in Appendix L, to provide sample code text.

10. Address Utility Impacts

As stated earlier, public trees must share the right-of-way (ROW) with the many utilities serving a community, both aboveground and underground. Utility companies are obligated to maintain reliable service, which includes routine maintenance and emergency restoration. Tree losses can occur. The key to managing this shared space is partnership and ongoing dialogue. A few things to keep in mind:

- Utilities do not want to prune or remove trees under power lines as it costs money. In most cases, the wrong tree was planted under the wires, and they are left trying to alleviate the ensuing situation.
- The accepted method of pruning in these cases is the American National Standards Institute (ANSI) A300 Part 1 Standard for pruning (which includes utility pruning).
- Invite Con Edison or other utility representatives to join the VOMTC to ensure ongoing conversation. This can be incorporated into the final meeting associated with this Urban Forest Management Plan development.
- The village and utility should have a meeting to agree on a work process and institute guidelines that come out of that meeting in a memorandum of understanding (MOU). A sample memorandum between the Society of Municipal Arborists and the Utility Arborist Association can be found in the appendices to use as a starting point. The following points can be made in the MOU between the village and the utility to formalize and expand upon the relationship:
    - Con Edison shall provide maps showing which circuits are planned for line clearance work within the village in the coming year.
    - A village and utility representative will drive (or walk) the circuit(s) to examine the trees and discuss any trees of special concern. Any oaks should be noted and pruned only at appropriate times to limit the spread of oak wilt.
    - The utility's tree crew or contractor will have an International Society of Arboriculture (ISA) Certified Arborist (preferably also with Utility Specialist Certification) on site during the line clearance operation.
    - Tree crew leaders shall be experienced in and practice ANSI A300 Part 1 Standard for pruning.
    - Con Edison should designate a representative to sit on the Village of Mamaroneck Tree Committee.
    - The village will not plant large tree species directly under primary distribution lines and will not plant any trees under transmission lines. Con Edison can identify and provide maps of these lines to the village.
- Consider planting areas beyond the right-of-way (BROW) (see description in planting recommendation #6) to lessen the space conflicts that arise within the ROW.
- A dedicated arborist (see Recommendation #2) can interact on a regular basis in a peer-to-peer way with the utility representative, often resulting in a better partnership.

11. Develop a Storm Response Plan Related to Urban Canopy

An urban forestry-focused disaster management plan is critical in tree canopy preservation—both pre- and post-storm—and can take many forms.

Pre-Storm. Most of the work in pre-storm disaster management is proactive maintenance of trees described in Recommendation #1. This will greatly reduce the number of hazards present and ultimately make the urban forest more storm-ready and less susceptible to damage. However, work systems can be planned in advance that serve as an addendum to a village-wide emergency management plan, or simply as a summary of the urban forestry division's expected role in a disaster for staff education and preparedness purposes. Plans can include:

- Chain-of-command description and clarification
- Method of communication to be used in emergencies
- A triage process for tree debris removal (often clearing critical lanes and access to hospitals and other key sites first)
- Designated pre-set sites for debris to facilitate quick and safe removals
- Prearranged tree pruning and removal contract agreements after disasters to avoid high-rate fees in last-minute situations

Post-Storm. The first steps post storm are to implement the triage process and clear major thoroughfares and dangerous situations in a methodical and prioritized order as described above.

However, disaster management related to urban trees needs to look further than immediate response. A predefined communications plan will make major strides in tree preservation in the weeks after a storm (mentioned in Recommendation #7). Many trees can withstand high winds and storm damage and rebound after severe storm events. However, after a storm, trees with no leaves may appear dead or dangerous to the untrained eye, and unwarranted removals may occur. Forward-thinking disaster plans can include a communication plan to explain this to the public, along with a system or access to expertise to help property owners safely determine which trees can be saved. Without a proactive preservation plan, many trees fall prey to uneducated contractors offering to remove every tree that experiences any damage.

After a storm event, the plan should be updated and modified to increase efficiency and reflect any organizational changes.

Tool to Estimate Management of Storm Damage

i-Tree Storm is a free tool available to municipalities that standardize a method to assess widespread damage immediately after a severe storm in a simple, credible, and efficient manner. This assessment method provides information on the time and funds needed to mitigate storm damage.

Pre-Storm. Using the pre-storm protocol, randomized street tree assessments are performed to obtain the potential time and cost estimates for debris cleanup by calculating the amount of tree debris in cubic yards, hazard tree pruning, and tree removals. The reason for completing this pre-storm random sample assessment is twofold:

- Helping community officials understand the implications of storm-related tree damage in terms of costs and resources needed for the cleanup; and
- Obtaining more accurate calculations from an i-Tree Storm actual post-storm assessment, which eases the reporting required by FEMA.

Post Storm: After a storm hits, the same sample plots are resurveyed, and time and cost estimates are produced community-wide for use in reporting. The sample post-storm damage assessment should be followed by an extensive survey of tree damage to obtain a complete and accurate account of the necessary cleanup work and direct the prioritization of cleanup.

Funding to Implement Plan

The following suggested budget has been developed to aid in the implementation of this urban forest management plan. It is important to note, however, that funding can only be *estimated* as a full tree inventory is not currently available (required to clearly define work). For this reason, the budget has been delivered as a working Excel™ file as well so that numbers can be adjusted as necessary to reach the most accurate numbers.

While a proactive program can raise current budgetary needs, the long-term benefits have a substantial payoff. This level of care will reduce municipal tree care management costs and potentially minimize the costs related to other village infrastructure like stormwater management.

How much is enough? Urban forestry spending levels can be compared to other similar municipalities (shown on page 9), but the real determinant of adequate funding is whether the proactive cyclical care management plan described in Recommendation #1 can be implemented.

Considering that the current annual budget is $125,000, the following suggested budget is likely a feasible option for the village.

Table 8. Estimated Budget Required

Projected Workload		Year 1 (2017)	Year 2 (2018)	Year 3 (2019)	Year 4 (2020)	Year 5 (2021)	Year 6 (2022)
Yearly Assessment	Village-Wide Windshield Overall Check	$0	$0	$0	$0	$0	$0
	Re-Inventory of One Management Sector	$0	$0	$0	$0	$0	$0
Cyclical Pruning & PHC	Routine	$72,900	$72,900	$72,900	$72,900	$72,900	$72,900
	Priority/Safety or Storm Response	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Removals	Removals	$14,800	$9,800	$9,800	$9,800	$9,800	$9,800
	Stump Removal	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500
PHC	Plant Health Care	$0	$0	$0	$0	$0	$0
Tree Succession	Planting (50 trees per year)	$15,250	$15,250	$15,250	$15,250	$15,250	$15,250
	Young Tree Care/Training	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
Subtotal		$117,450	$112,450	$112,450	$112,450	$112,450	$112,450
Staffing Scenarios							
Dedicated Arborist Staff Addition (choice of one)	Scenario 1 (FT arborist city employee)	$65,000	$65,000	$65,000	$65,000	$65,000	$65,000
	Scenario 2 (PT consultant - 40 hours/month at $75/hour)	$36,000	$36,000	$36,000	$36,000	$36,000	$36,000
	Scenario 3 (train existing staff)	$2,500	$2,500	$2,500	$0	$0	$0
YEARLY TOTAL (using staff scenario 1)		$182,450	$177,450	$177,450	$177,450	$177,450	$177,450
YEARLY TOTAL (using PT consultant scenario 2)		$153,450	$148,450	$148,450	$148,450	$148,450	$148,450
YEARLY TOTAL (using trained staff scenario 3)		$119,950	$114,950	$114,950	$114,950	$114,950	$114,950

The budget above incorporates the cyclical care and hiring of a certified arborist. The budget also reflects a lower *but continual* annual planting budget of 50 trees per year. This can be adjusted, as mentioned earlier. A full budget with notes and assumptions can be found in Appendix E.

Consider Partnerships. Additionally, consider partnering with organizations interested in restoring coastal areas such as those VOM already works with to help share costs.

Water quality organizations such as the Long Island Sound Study (LISS) have funded numerous restoration projects and plantings around the Sound and may be willing to partner on projects that reduce the amount of water runoff into the Sound from the village. Other groups focused on air quality, energy conservation, or creating walkable/bikeable communities may also be interested in partnering on tree-related projects.

NEXT STEPS

Based on the recommendations described above, the next steps mentioned throughout the 11 recommendations have been prioritized into a five-year plan of action for VOM.

YEAR ONE

1. Divide the village into sectors and start implementation, beginning with Year One of a cyclical management system. It is recommended that each sector be assessed every six years. Start Sector 1 work, which entails completing remaining inventory and filling in missing data in the existing inventory of public trees (part of cyclical care system). All trees in the ROW (i.e., street trees, parks) should be inventoried and assessed for risk with complete data on condition, work needed, and physical characteristics. See sample schedule in Appendix A.
2. Establish the village's acceptable risk thresholds and create a risk management program (connected to cyclical care above) using TRAQ terminology (Low, Moderate, High, Extreme risk). This can be as simple as incorporating a risk assessment field in the cyclical care inventory process mentioned above, and developing a one-page policy on what the city's process is to assess risk on an ongoing basis and what an acceptable level of risk is, and what requires immediate attention.
3. Explore creating a part-time or shared village arborist position to implement plan. This position should be filled by someone who is TRAQ qualified or able to perform risk assessments.
4. Readjust budget for five-year implementation of this plan (see full budget table in Appendix E). Request additional funds from trustees for any gap in financial resources.
5. Develop a roll-out plan to share the findings and next steps of this plan with the public. Use the plan as a tool to create discussion and educate residents about the urban forest. Create a strategy to reach all groups (neighborhoods, young residents, business community, etc.) and address where they fit into the implementation of this plan and how they can join a team to foster the urban forest. It is important to have a range of events, tasks, and groups for people who would like to participate. Some residents may want to be part of a subcommittee, where others may want to participate in one-time planting events.
6. Schedule a date for a group meeting with village staff, tree committee, and Davey representative to coordinate future utility work. After meeting, create and sign memorandum of agreement with Con Edison.
7. Formalize an agreed-upon emerald ash borer (EAB) strategy. This should include an educational component, which educates the public in Westchester County.
8. Consider establishing a canopy goal. While this is an optional step, it can be extremely useful for engaging the public and justifying why funds need to be spent on tree care. Also, if canopy cover is regularly assessed, it can be used to gauge the effectiveness of current management strategies.

9. Consider updating VOM's recommended planting list with the suggestions in Appendix C.
10. Complete the recommended tree ordinance changes (including improving readability, pulling out administrative and procedural items, and inclusion of private land protection as desired locally).
11. Create a young tree care training program for use next year (Year 2 of cyclical care). See the appendices for sample program structure.

YEAR TWO

1. Continue cyclical care program.
2. Use tree planting efforts from above program as an opportunity to engage the public and implement young tree care and value of trees training program in place for staff and volunteers.
3. Implement agreed-upon EAB management plan.
4. Develop a heritage tree program through a volunteer subcommittee of the tree committee. The subcommittee would be responsible for the identification of historic trees on public and private property through a nomination process, investigating potential or existing state or national champion status trees, and promoting findings in media, and evaluating the potential of a 'Heritage Tree Walk' mobile phone application.

YEARS THREE–FIVE

1. Continue a cyclical care program.
2. Explore additional partnerships that will boost public knowledge and the value of trees in VOM.
3. Develop a storm plan related to urban canopy to help manage and minimize losses (both before and after storms).

REASSESS

After completion of this five-year plan of action, work completed to date should be summarized and revised as needed to create a plan or make adjustments for the next five years. Benchmark metrics for success (canopy cover update, number of volunteers involved in tree projects, number of trees pruned and preserved, etc.) should be measured and next steps should be determined.

CONCLUSION

Tree management in an urban forest can be challenging. Navigating the recommendations of experts, the needs of residents, the pressures of local economics and politics, the concerns for public safety and liability issues, the physical aspects of trees, the forces of nature and severe weather events, and the desires for all of these issues to be resolved all at once can be daunting. By implementing this plan, VOM can carefully consider and address each specific issue with a knowledgeable understanding of trees and their needs.

GLOSSARY

aesthetic/other report: The i-Tree Streets Aesthetic/Other Report presents the tangible and intangible benefits of trees reflected by increases in property values in dollars ($).

air quality report: The i-Tree Streets Air Quality Report quantifies the air pollutants (ozone [O_3], nitrogen dioxide [NO_2], sulfur dioxide [SO_2], coarse particulate matter less than 10 micrometers in diameter [PM_{10}]) deposited on tree surfaces and reduced emissions from power plants (NO_2, PM_{10}, Volatile Oxygen Compounds [VOCs], SO_2) due to reduced electricity use measured in pounds (lbs.). Also reported are the potential negative effects of trees on air quality due to Biogenic Volatile Organic Compounds (BVOC) emissions.

American National Standards Institute (ANSI): ANSI is a private, nonprofit organization that facilitates the standardization work of its members in the United States. ANSI's goals are to promote and facilitate voluntary consensus standards and conformity assessment systems, and to maintain their integrity.

ANSI A300: Tree care performance parameters established by ANSI that can be used to develop specifications for tree maintenance.

arboriculture: The art, science, technology, and business of commercial, public, and utility tree care.

canopy: Branches and foliage that make up a tree's crown.

canopy cover: As seen from above, it is the area of land surface that is covered by tree canopy.

carbon dioxide report: The i-Tree Streets Carbon Dioxide Report presents annual reductions in atmospheric CO_2 due to sequestration by trees and reduced emissions from power plants due to reduced energy use in pounds. The model accounts for CO_2 released as trees die and decompose and CO_2 released during the care and maintenance of trees.

community forest: see urban forest.

tree condition: The general condition of each tree rated during the inventory according to the following categories adapted from the International Society of Arboriculture's rating system: Excellent (100%), Very Good (90%), Good (80%), Fair (60%), Poor, (40%), Critical (20%), Dead (0%).

cycle: Planned length of time between vegetation maintenance activities.

defect: See structural defect.

diameter: See tree size.

diameter at breast height (DBH): See tree size.

Extreme Risk tree: Applies in situations where tree failure is imminent, there is a high likelihood of impacting the target, and the consequences of the failure are "severe." In some cases, this may mean immediate restriction of access to the target zone area in order to prevent injury.

failure: In terms of tree management, failure is the breakage of stem or branches, or loss of mechanical support of the tree's root system.

further inspection: Notes that a specific tree may require an annual inspection for several years to make certain of its maintenance needs. A healthy tree obviously impacted by recent construction serves as a prime example. This tree will need annual evaluations to assess the impact of construction on its root system. Another example would be a tree with a defect requiring additional equipment for investigation.

genus: A taxonomic category ranking below a family and above a species and generally consisting of a group of species exhibiting similar characteristics. In taxonomic nomenclature, the genus name is used, either alone or followed by a Latin adjective or epithet, to form the name of a species.

geographic information system (GIS): A technology that is used to view and analyze data from a geographic perspective. The technology is a piece of an organization's overall information system framework. GIS links location to information (such as people to addresses, buildings to parcels, or streets within a network) and layers that information to provide a better understanding of how it all interrelates.

grow space size: Identifies the minimum width of the tree grow space for root development.

high risk tree: The High Risk category applies when consequences are "significant" and likelihood is "very likely" or "likely," or consequences are "severe" and likelihood is "likely." In a population of trees, the priority of High Risk trees is second only to Extreme Risk trees.

inventory: See tree inventory.

i-Tree Streets: i-Tree Streets is a street tree management and analysis tool that uses tree inventory data to quantify the dollar value of annual environmental and aesthetic benefits: energy conservation, air quality improvement, CO_2 reduction, stormwater control, and property value increase.

i-Tree Tools: State-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools. The i-Tree Tools help communities of all sizes to strengthen their urban forest management and advocacy efforts by quantifying the structure of community trees and the environmental services that trees provide.

management costs: Used in i-Tree Streets, they are the expenditures associated with street tree management presented in total dollars, dollars per tree, and dollars per capita.

Moderate Risk tree: The Moderate Risk category applies when consequences are "minor" and likelihood is "very likely" or "likely"; or likelihood is "somewhat likely" and consequences are "significant" or "severe." In populations of trees, Moderate Risk trees represent a lower priority than High or Extreme Risk.

monoculture: A population dominated by one single species or very few species.

net annual benefits: Specific data field for i-Tree Streets. Village-wide benefits and costs are calculated according to category and summed. Net benefits are calculated as benefits minus costs.

ordinance: See tree ordinance.

overhead utilities: The presence of overhead utility lines above a tree or planting site.

right-of-way (ROW): See street right-of-way.

risk: Combination of the probability of an event occurring and its consequence.

species: Fundamental category of taxonomic classification, ranking below a genus or subgenus, and consisting of related organisms capable of interbreeding.

street right-of-way (ROW): A strip of land generally owned by a public entity over which facilities, such as highways, railroads, or power lines, are built.

street tree: A street tree is defined as a tree within the right-of-way.

structural defect: A feature, condition, or deformity of a tree or tree part that indicates weak structure and contributes to the likelihood of failure.

sulfur dioxide (SO_2): A strong-smelling, colorless gas that is formed by the combustion of fossil fuels. Sulfur oxides contribute to the problem of acid rain.

summary report: A report generated by i-Tree Streets that presents the annual total of energy, stormwater, air quality, carbon dioxide, and aesthetic/other benefits. Values are reflected in dollars per tree or total dollars.

tree: A tree is defined as a perennial woody plant that may grow more than 20 feet tall. Characteristically, it has one main stem, although many species may grow as multi-stemmed forms.

tree benefit: An economic, environmental, or social improvement that benefits the community and results mainly from the presence of a tree. The benefit received has real or intrinsic value associated with it.

tree height: If collected during the inventory, the height of the tree is estimated by the arborist and recorded in 10-foot increments.

tree inventory: Comprehensive database containing information or records about individual trees typically collected by an arborist.

tree ordinance: Tree ordinances are policy tools used by communities striving to attain a healthy, vigorous, and well-managed urban forest. Tree ordinances simply provide the authorization and standards for management activities.

tree size: A tree's diameter measured to the nearest inch in 1-inch size classes at 4.5 feet above ground, also known as diameter at breast height (DBH) or diameter.

urban forest: All of the trees within a municipality or a community. This can include the trees along streets or rights-of-way, in parks and green spaces, in forests, and on private property.

urban tree canopy (UTC) assessment: A study performed of land cover classes to gain an understanding of the tree canopy coverage, particularly as it relates to the amount of tree canopy that currently exists and the amount of tree canopy that could exist. Typically performed using aerial photographs, GIS data, or Lidar.

volatile organic compounds (VOCs): Hydrocarbon compounds that exist in the ambient air and are by-products of energy used to heat and cool buildings. Volatile organic compounds contribute to the formation of smog and/or are toxic. Examples of VOCs are gasoline, alcohol, and solvents used in paints.

young tree train: Data field based on *ANSI A300* standards, this maintenance activity is characterized by pruning of young trees to correct or eliminate weak, interfering, or objectionable branches to improve structure. These trees can be up to 20 feet tall and can be worked with a pole pruner by a person standing on the ground.

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APPENDIX A
CYCLICAL CARE APPROACH (SAMPLE)

Once the village is divided into six management sectors, implement the care for trees within each sector in a methodical cyclical approach as follows. Note: if resulting required budget is higher than feasible, raise the number of management sectors.

YEAR ONE

Sector 1: Inventory Update. Trained village staff or part-time arborist to re-inventory the entire area to prepare for upcoming cyclical care, assess risk, and identify future planting sites. This work also includes identification of potential new planting sites.

The arborist should assess trees for pruning needs based on ANSI A300 Part 1 standards. The highlights of these standards include the following:

- Correct structure
- Clean the crown to remove dead and diseased wood and hangers
- Assess risk and make the determination as to whether trees should be scheduled for removal

YEAR TWO

Sector 1: Tree Care, Planting, and Public Engagement

Spring - Tree Care and Public Engagement: Village staff/contractors prune or remove any trees in need of care as determined by the recently completed inventory in this sector. While pruning and removal work is being done, the Village or Tree Committee can work with neighborhood groups in this sector to update them on the plan and the state of the trees in their neighborhood and talk about new planting sites inventoried in prior year.

Fall – Planting and Public Engagement: Potential volunteer planting event in that sector using inventory data and establishement of future care team for new trees.

Sector 2: Inventory Update. Trained village staff or part-time arborist to re-inventory the entire area to prepare for upcoming cyclical care, assess risk, and identify future planting sites. This work includes identification of potential new planting.

YEAR THREE

Sector 1: Year 1 of Young Tree Care. Train tree care team (youth, neighbors, others) on three-year young tree care program on newly-planted trees (pruning, watering, mulching).

Sector 2: Tree Care, Planting, and Public Engagement

Spring - Tree Care and Public Engagement: Village staff/contractors prune or remove any trees in need of care, as determined by the recently completed inventory in this sector. While pruning and removal work is being done, the Village or Tree Committee can work with neighborhood groups in this sector to update them on the plan and the state of the trees in their neighborhood and talk about new planting sites inventoried in the prior year.

Fall – Planting and Public Engagement: Volunteer planting event in that sector using inventory data and establishment of future care team for new trees.

Sector 3: Inventory Update. Trained village staff or part-time arborist to re-inventory the entire area to prepare for upcoming cyclical care, assess risk, and identify future planting sites. This work includes identification of potential new planting sites.

YEAR FOUR

Sector 1: Year 2 of Young Tree Care. Second year of young tree care program on newly-planted trees (pruning, watering, mulching) by team (youth, neighbors, others).

Sector 2: Year 1 of Young Tree Care. Train tree care team (youth, neighbors, others) on three-year young tree care program on newly-planted trees (pruning, watering, mulching).

Sector 3: Tree Care, Planting, and Public Engagement

Spring - Tree Care and Public Engagement: Village staff/contractors prune or remove any trees in need of care as determined by the recently completed inventory in this sector. While pruning and removal work is being done, the Village or Tree Committee can work with neighborhood groups in this sector to update them on the plan and the state of the trees in their neighborhood and talk about new planting sites inventoried in prior year.

Fall – Planting and Public Engagement: Volunteer planting event in that sector using inventory data and establishement of future care team for new trees.

Sector 4: Inventory Update. Trained village staff or part-time arborist to re-inventory the entire area to prepare for upcoming cyclical care, assess risk, and identify future planting sites. This work includes identification of potential new planting sites.

YEAR FIVE

Sector 1: Year 3 of Young Tree Care. Third and final year of young tree care program on newly-planted trees (pruning, watering, mulching) by team (youth, neighbors, others).

Sector 2: Year 2 of Young Tree Care. Second year of young tree care program on newly-planted trees (pruning, watering, mulching) by team (youth, neighbors, others).

Sector 3: Year 1 of Young Tree Care. Train care team (youth, neighbors, others) on three-year young tree care program on newly-planted trees (pruning, watering, mulching).

Sector 4: Tree Care, Planting, and Public Engagement

Spring - Tree Care and Public Engagement: Village staff/contractors prune or remove any trees in need of care as determined by the recently completed inventory in this sector. While pruning and removal work is being done, the Village or Tree Committee can work with neighborhood groups in this sector to update them on the plan and the state of the trees in their neighborhood and talk about new planting sites inventoried in the prior year.

Fall – Planting and Public Engagement: Volunteer planting event in that sector using inventory data and establishment of future care team for new trees.

Sector 5: Inventory Update. Trained village staff or part-time arborist to re-inventory the entire area to prepare for upcoming cyclical care, assess risk, and identify future planting sites. This work includes identification of potential new planting sites.

YEAR SIX

Sector 1: None.

Sector 2: Year 3 of Young Tree Care. Third and final year of young tree care program on newly-planted trees (pruning, watering, mulching) by team (youth, neighbors, others).

Sector 3: Year 2 of Young Tree Care. Second year of young tree care program on newly-planted trees (pruning, watering, mulching) by team (youth, neighbors, others).

Sector 4: Year 1 of Young Tree Care. Train care team (youth, neighbors, others) on three-year young tree care program on newly-planted trees (pruning, watering, mulching).

Sector 5: Tree Care, Planting, and Public Engagement

Spring - Tree Care and Public Engagement: Village staff/contractors prune or remove any trees in need of care as determined by the recently completed inventory in this sector. While pruning and removal work is being done, the Village or Tree Committee can work with neighborhood groups in this sector to update them on the plan and the state of the trees in their neighborhood and talk about new planting sites inventoried in the prior year.

Fall – Planting and Public Engagement: Volunteer planting event in that sector using inventory data and establishment of future care team for new trees.

Sector 6: Inventory Update. Trained village staff or part-time arborist to re-inventory the entire area to prepare for upcoming cyclical care, assess risk, and identify future planting sites. This work includes identification of potential new planting sites.

YEAR SEVEN

Repeat cycle pattern starting again with re-inventory in Sector 1.

APPENDIX B
NEW TREE CARE BEST PRACTICES

YEAR 1

At Planting:

- Prune tree for co-dominant stems and broken or dead branches only.
- Create a watering dish or berm at the edge of the root ball, not the planting hole.
- Mulch a 4-foot diameter area under the tree. Maximum of 3 inches deep and nothing against the trunk of the tree.
- Water thoroughly. Apply 20 gallons per tree within eight hours of planting.

The Summer Following Planting (from Leaf-On to Leaf-Off):

- Water Once per Week - 10 to 15 gallons: Applied at a rate less than 3 gallons per minute. Note: Watering will only be skipped if more than 1 inch of rainfall during that week.

Fall After Planting (After Leaf Fall - late October, early November)

- Control weeds in mulched area.

YEAR 2

Spring, Before Leaf Out (late March):

- Remove any staking, and all wire, tags, and twine.
- Control weeds in mulch bed.
- Refresh mulch to 3 inches. Mulch should be rotting about 33% per year by volume. Each tree should require about 1 inch of fresh mulch.
- Remove suckers, dead, and broken branches.

Fall, After Leaf Fall (late October, early November):

- Control weeds in mulch bed.

YEAR 3

Spring, Before Leaf Out (late March):

- Control weeds in mulch bed
- Refresh mulch to 3 inches. Mulch should be rotting about 33% per year by volume. Each tree should require about 1 inch of fresh mulch.
- Begin structural pruning practices: prune to establish central leader; raise lower branches so the crown of the tree is on the upper two-thirds of the tree; establish good branching structure and remove suckers, dead, and broken branches.

APPENDIX C: RECOMMENDED TREE SPECIES

Davey Resource Group has edited the Village of Mamaroneck's recommended species list to optimize diversity and overall health of the urban forest. Added trees and changes in notes or cultivars are shown in blue. This list should also be considered another opportunity to educate the public. Use the Specifications column to help explain features or reasoning for this tree to the public.

Size Group	Common Name	Botanical Name	Highlighted Cultivars	Specifications Use this column to help explain features or reasoning for this tree to the public. This is another opportunity to educate the public.
Small (Under 30)	Amur maackia	Maackia amurensis		
Small (Under 30)	Crabapple	Malus spp.	Any cultivar resistant to fireblight and scab.	
Small (Under 30)	Hawthorn	Crataegus viridus	Crusader®	Single stem
Small (Under 30)	Hawthorne, English	Crataegus laevigata	'Crimson Cloud'	
Small (Under 30)	Japanese Flowering cherry*^	Prunus sargentii	'Accolade'	
Small (Under 30)	Japanese Flowering cherry*^	Prunus serrulata	'Kwanzan'	
Small (Under 30)	Kousa dogwood	Cornus kousa		Single stem only on street. Multistem is appropriate in park environments.
Small (Under 30)	Maple, Hedge*^	Acer campestre	Evelyn', 'Stgrezam', 'Schichtel's Upright'	Single stem only on street. Multistem is appropriate in park environments.
Small (Under 30)	Maple, Trident*^	Acer buegerianum	Streetwise®, 'Abtir'	
Small (Under 30)	Redbud^	Cercis canadensis		Single stem
Small (Under 30)	Serviceberry	Amelanchier laevis	Autumn Brilliance	Single stem only on street. Multistem is appropriate in park environments.
Medium (30-60)	Cypress, Pond	Taxodium ascendens		Tolerates flooding
Medium (30-60)	Hackberry	Celtis occidentalis	'Magnifica'	
Medium (30-60)	Honey Locust	Gleditsia triacanthos var. inermis	Shademaster' or 'Skymaster'	There are many cultivars of this tough tree, but make sure it is thornless (var. inermis).
Medium (30-60)	Hornbeam, American	Carpinus caroliniana		
Medium (30-60)	Hornbeam, European	Carpinus betulus	straight species, 'Columnaris' or 'Fastigiata'	
Medium (30-60)	Japanese Pagodatree^	Styphnolobium japonicum (Sophora japonica)	Regent® or 'Princeton Upright'	
Medium (30-60)	Linden, Littleleaf^	Tilia cordata	'Greenspire'	
Medium (30-60)	Maple, Red*^	Acer rubrum	'October Glory'	There are MANY suitable cultivars, remove the cultivar suggestion

Size Group	Common Name	Botanical Name	Highlighted Cultivars	Specifications Use this column to help explain features or reasoning for this tree to the public. This is another opportunity to educate the public.
Medium (30-60)	Oak, English^	Quercus robur	'Crimson Spire'	Columnar. There are many suitable cultivars, remove the cultivar suggestion
Medium (30-60)	Southern Magnolia*	Magnolia grandiflora	Edith Bogue' 'Bracken's Brown Beauty'	Can take some flooding and brackish water
Medium (30-60)	Tupelo, Black^	Nyssa sylvatica		Tolerates flooding
Medium (30-60)	Zelkova, Japanese	Zelkova serrata		
Tall (Over 60)	Bald Cypress	Taxodium distichum	Apache Chief' 'Shawnee Brave'	Tolerates flooding and drought
Tall (Over 60)	Elm, American*^	Ulmus americana	Valley Forge' 'New Harmony'	Cannot plant w/in 100 yds of each other. Why?
Tall (Over 60)	Elm, Chinese*^	Ulmus parvifolia		
Tall (Over 60)	Elm, Danada Charm*^	Ulmus japonica x wilsoniana	Morton Red Tip'	
Tall (Over 60)	Gingko / Maidenhair Tree	Gingko biloba	'Princeton Sentry'	Male only - females have excessive fruit with foul odor.
Tall (Over 60)	London Planetree	Platanus x acerfolia	Bloodgood'	This is the common cultivar that is resistant to anthracnose (though there are others).
Tall (Over 60)	Maple, Freeman*^	Acer x. freemanii	'Autumn Blaze'	
Tall (Over 60)	Maple, Sugar*^	Acer saccharum		
Tall (Over 60)	Oak, Overcup^	Quercus lyrata		Tolerates flooding and drought
Tall (Over 60)	Oak, Pin*^	Quercus palustris	'Crownright'	Avoid other cultivars. Why?
Tall (Over 60)	Oak, Red*^	Quercus rubra		
Tall (Over 60)	Oak, Shumard^	Quercus shumardii		
Tall (Over 60)	Oak, Swamp White^	Quercus bicolor		Tolerates flooding
Tall (Over 60)	Oak, Willow^	Quercus phellos		
Tall (Over 60)	Sweetgum, American	Liquidambar stryraciflua	Cherokee 'Ward'	
Tall (Over 60)	Tupelo, Water^	Nyssa aquatica		Tolerates flooding
* It has been estimated that over 30% of the trees in Mamaroneck are maples. To help increase plant diversity, we recommend plant maples sparingly and opting for other tree species.				
^ Species susceptible to verticillium wilt. As verticillium is soil borne, it will remain in the soil after a diseased tree is removed. Do not replant with a species susceptible to verticillium.				

In addition to the previous list, the following websites have search funtions which provide the ability to search for various tree attributes such as salt tolerance:

- http://woodyplants.cals.cornell.edu/plant/index?PlantSearch
- http://www.hort.cornell.edu/uhi/outreach/recurbtree/index.html

Further Suggested Tree Species List for USDA Hardiness Zone 6. If the village is interested in further expanding the suggested species, the following list represents the complete list of trees Davey Resource Group typically recommends for communities in zone 6 such as the Village of Mamaroneck. This allows for some flexibility as local availability from nurseries will vary. These have been evaluated for factors such as size, disease and pest resistance, seed or fruit set, and availability.

Large Trees: Greater than 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Acer rubrum	red maple	Red Sunset®
Acer saccharum	sugar maple	'Legacy'
Aesculus flava*	yellow buckeye	
Betula alleghaniensis*	yellow birch	
Betula lenta*	sweet birch	
Betula nigra	river birch	Heritage®
Carpinus betulus	European hornbeam	'Franz Fontaine'
Carya illinoensis*	pecan	
Carya lacinata*	shellbark hickory	
Carya ovata*	shagbark hickory	
Castanea mollissima*	Chinese chestnut	
Celtis laevigata	sugar hackberry	
Celtis occidentalis	common hackberry	'Prairie Pride'
Cercidiphyllum japonicum	Katsura tree	'Aureum'
Diospyros virginiana*	common persimmon	
Fagus grandifolia*	American beech	
Fagus sylvatica*	European beech	(Numerous exist)
Ginkgo biloba	ginkgo	(Choose male trees only)
Gleditsia triacanthos inermis	thornless honeylocust	'Shademaster'
Gymnocladus dioica	Kentucky coffeetree	Prairie Titan®
Juglans nigra*	black walnut	
Larix decidua*	European larch	
Liquidambar styraciflua	American sweetgum	'Rotundiloba'
Liriodendron tulipifera*	tuliptree	'Fastigiatum'
Magnolia acuminata*	cucumbertree magnolia	(Numerous exist)
Magnolia macrophylla*	bigleaf magnolia	
Metasequoia glyptostroboides	dawn redwood	'Emerald Feathers'
Nyssa sylvatica	black tupelo	
Platanus occidentalis*	American sycamore	
Platanus × acerifolia	London planetree	'Yarwood'
Quercus alba	white oak	

Large Trees: Greater than 45 Feet in Height at Maturity (Continued)

Scientific Name	Common Name	Cultivar
Quercus bicolor	swamp white oak	
Quercus coccinea	scarlet oak	
Quercus lyrata	overcup oak	
Quercus macrocarpa	bur oak	
Quercus montana	chestnut oak	
Quercus muehlenbergii	chinkapin oak	
Quercus palustris	pin oak	
Quercus imbricaria	shingle oak	
Quercus phellos	willow oak	
Quercus robur	English oak	Heritage®
Quercus rubra	northern red oak	'Splendens'
Quercus shumardii	Shumard oak	
Styphnolobium japonicum	Japanese pagodatree	'Regent'
Taxodium distichum	common baldcypress	'Shawnee Brave'
Tilia americana	American linden	'Redmond'
Tilia cordata	littleleaf linden	'Greenspire'
Tilia × euchlora	Crimean linden	
Tilia tomentosa	silver linden	'Sterling'
Ulmus parvifolia	Chinese elm	Allée®
Zelkova serrata	Japanese zelkova	'Green Vase'

Medium Trees: 31 to 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Aesculus × carnea	red horsechestnut	
Alnus cordata	Italian alder	
Asimina triloba*	pawpaw	
Cladrastis kentukea	American yellowwood	'Rosea'
Corylus colurna	Turkish filbert	
Eucommia ulmoides	hardy rubber tree	
Koelreuteria paniculata	goldenraintree	
Ostrya virginiana	American hophornbeam	
Parrotia persica	Persian parrotia	'Vanessa'
Pistacia chinensis	Chinese pistache	
Prunus maackii	amur chokecherry	'Amber Beauty'
Prunus sargentii	Sargent cherry	
Pterocarya fraxinifolia*	Caucasian wingnut	
Quercus acutissima	sawtooth oak	
Quercus cerris	European turkey oak	
Sassafras albidum*	sassafras	

Small Trees: 15 to 30 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Acer buergerianum	trident maple	Streetwise®
Acer campestre	hedge maple	Queen Elizabeth™
Acer cappadocicum	coliseum maple	'Aureum'
Acer ginnala	amur maple	Red Rhapsody™
Acer griseum	paperbark maple	
Acer nigrum	black maple	
Acer pensylvanicum*	striped maple	
Acer triflorum	three-flower maple	
Aesculus pavia*	red buckeye	
Amelanchier arborea	downy serviceberry	(Numerous exist)
Amelanchier laevis	Allegheny serviceberry	
Carpinus caroliniana*	American hornbeam	
Cercis canadensis	eastern redbud	'Forest Pansy'
Chionanthus virginicus	white fringetree	
Cornus alternifolia	pagoda dogwood	
Cornus kousa	Kousa dogwood	(Numerous exist)
Cornus mas	corneliancherry dogwood	'Spring Sun'
Corylus avellana	European filbert	'Contorta'
Cotinus coggygria*	common smoketree	'Flame'
Cotinus obovata*	American smoketree	
Crataegus phaenopyrum*	Washington hawthorn	Princeton Sentry™
Crataegus viridis	green hawthorn	'Winter King'
Franklinia alatamaha*	Franklinia	
Halesia tetraptera*	Carolina silverbell	'Arnold Pink'
Laburnum × watereri	goldenchain tree	
Maackia amurensis	amur maackia	
Magnolia × soulangiana*	saucer magnolia	'Alexandrina'
Magnolia stellata*	star magnolia	'Centennial'
Magnolia tripetala*	umbrella magnolia	
Magnolia virginiana*	sweetbay magnolia	Moonglow®
Malus spp.	flowering crabapple	(Disease resistant only)
Oxydendrum arboreum	sourwood	'Mt. Charm'
Prunus subhirtella	Higan cherry	'Pendula'
Prunus virginiana	common chokecherry	'Schubert'
Staphylea trifolia*	American bladdernut	
Stewartia ovata	mountain stewartia	
Styrax japonicus*	Japanese snowbell	'Emerald Pagoda'
Syringa reticulata	Japanese tree lilac	'Ivory Silk'

Note: * denotes species that are **not** recommended for use as street trees.

Large Trees: Greater than 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Abies balsamea	balsam fir	
Abies concolor	white fir	'Violacea'
Cedrus libani	cedar-of-Lebanon	
Chamaecyparis nootkatensis	Nootka falsecypress	'Pendula'
Cryptomeria japonica	Japanese cryptomeria	'Sekkan-sugi'
× Cupressocyparis leylandii	Leyland cypress	
Ilex opaca	American holly	
Picea omorika	Serbian spruce	
Picea orientalis	Oriental spruce	
Pinus densiflora	Japanese red pine	
Pinus strobus	eastern white pine	
Pinus sylvestris	Scotch pine	
Pinus taeda	loblolly pine	
Pinus virginiana	Virginia pine	
Psedotsuga menziesii	Douglas-fir	
Thuja plicata	western arborvitae	(Numerous exist)
Tsuga canadensis	eastern hemlock	

Medium Trees: 31 to 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Chamaecyparis thyoides	Atlantic whitecedar	(Numerous exist)
Juniperus virginiana	eastern redcedar	
Pinus bungeana	lacebark pine	
Pinus flexilis	limber pine	
Pinus parviflora	Japanese white pine	
Thuja occidentalis	eastern arborvitae	(Numerous exist)

Small Trees: 15 to 30 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Ilex × attenuata	Foster's holly	
Pinus aristata	bristlecone pine	
Pinus mugo	mugo pine	

Dirr's Hardy Trees and Shrubs (Dirr 2013) and *Manual of Woody Landscape Plants (5th Edition)* (Dirr 1988) were consulted to compile this suggested species list. Cultivar selections are recommendations only and are based on Davey Resource Group's experience. Tree availability will vary based on availability in the nursery trade.

APPENDIX D
RESOURCES FOR PUBLIC OUTREACH

The following websites are good resources for public outreach materials to help educate the citizens of the Village of Mamaroneck about proper care of trees and threats to trees.

EAB

The NYSDEC provides good information on the latest EAB status in NY. They also provide printed outreach materials about EAB as well as a multiple of other pests. See http://www.dec.ny.gov/animals/48199.html

ALB

The USDA provides good information on the latest ALB information. They also provide printed outreach materials for adults and kids about ALB at no cost. https://www.aphis.usda.gov/aphis/resources/pests-diseases/asian-longhorned-beetle.
Additionallly, the NYSDEC has information and outreach materials on their site as well: http://www.dec.ny.gov/animals/7255.html

General Tree Care

There are a number of resources online that provide good information on tree care, though many are too technical for the average citizen. Two resources are recommended here as good examples of simple tree care education resources available to all.

KYRoots.org is a site targeted to the general public with graphical small tips on tree care that may serve as a good example of reaching the public with simple tips.

TREES ARE GOOD
www.treesaregood.org

ISA also has a good list of materials to educate homeowners and other tree owners. This information is housed on a site developed specifically for public education: *www.TreesAreGood.org*. This site provides brochures and information PDFs on a wide variety of tree care topics inluding: Benefits of Trees, Tree Values, Choosing The Right Tree (species and purchasing), Managing Tree Hazards and Risks, Recognizing Tree Risk, Avoiding Tree Damage during Construction, Treatment of Tree Damaged by Construction, Safe Response to Tree-Related Storm Damage, Tree Health Care, Trees and Turf, Proper Mulching Techniques, Insect and Disease Problems, Mature Tree Care, New Tree Planting, Avoiding Tree and Utility Conflicts, Pruning Your Trees, Pruning Mature Trees, Why Topping Hurts Trees, and a comprehensive Tree Owner's Manual. There are also classroom curriculum, information on planning tree programs in your community, and online activity resources.

APPENDIX E
BUDGET

Below is an estimated urban forestry budget using rounded numbers for the Village of Mamaroneck to complete the work outlined in this plan over a five-year cycle.

Projected Workload		Year 1 (2017)	Year 2 (2018)	Year 3 (2019)	Year 4 (2020)	Year 5 (2021)	Year 6 (2022)	Notes
Yearly Assessment	Village-Wide Windshield Overall Check	$0	$0	$0	$0	$0	$0	Estimated at two full days of windshield inspection work. This number is $0 under the assumption that it will be covered in the responsibilities of the hired arborist.
	Re-Inventory of One Management Sector	$0	$0	$0	$0	$0	$0	Estimated at three full days of windshield inspection work. This number is $0 under the assumption that it will be covered in the responsibilities of the hired arborist.
Cyclical Pruning and PHC	Routine	$72,900	$72,900	$72,900	$72,900	$72,900	$72,900	Annual average cost and quantity specified in the "adjustable data" table below.
	Priority/Safety or Storm Response	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	Funds to be set aside each year for storm damage or emergency care. Funds not used should be banked in a rainy-day response fund.
Removals	Removals	$14,800	$9,800	$9,800	$9,800	$9,800	$9,800	Annual average cost and quantity specified in the "adjustable data" table below.
	Stump Removal	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	Annual average cost and quantity specified in the "adjustable data" table below.
PHC	Plant Health Care	$0	$0	$0	$0	$0	$0	If decision is made to treat ash, that cost would be entered here.
Tree Succession	Planting (50 trees per year)	$15,250	$15,250	$15,250	$15,250	$15,250	$15,250	Annual average cost and quantity specified in the "adjustable data" table below.
	Young Tree Care/Training	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	Amount is currently based on new tree care performed by hired staff and watering truck. This is an opportunity for public engagement, which if implemented could lower these costs.
Subtotal		$117,450	$112,450	$112,450	$112,450	$112,450	$112,450	
Staffing Scenarios								
Dedicated Arborist Staff Addition (choice of one)	Scenario 1 (FT arborist city employee)	$65,000	$65,000	$65,000	$65,000	$65,000	$65,000	This is an estimate.
	Scenario 2 (PT consultant 40 hrs./month at $75/hr.)	$36,000	$36,000	$36,000	$36,000	$36,000	$36,000	Does not include any travel expenses if needed
	Scenario 3 (train existing staff)	$2,500	$2,500	$2,500	$0	$0	25$0	Training could consist of Year 1 ISA certification, Year 2 Partners Conference, Year 3 TRAQ qualification.
Total								
YEARLY TOTAL (using staff scenario 1)		$182,450	$177,450	$177,450	$177,450	$177,450	$177,450	
YEARLY TOTAL (using PT consultant scenario 2)		$153,450	$148,450	$148,450	$148,450	$148,450	$148,450	
YEARLY TOTAL (using trained staff scenario 3)		$119,950	$114,950	$114,950	$114,950	$114,950	$114,950	

2016 UF Annual Budget for Village:	
Planting	$54,000
Pruning/Removal/Other Care	$71,000
Total	$125,000

The previous table was based on the the following projected workload and cost estimates.

ADJUSTABLE DATA		
Total Public Trees	2,976	Notes
Per Sector (6)	496	
Sectors	6	
Average Cost Per Removal	$980	Based on average cost of recent Almstead bid (average of all 42 removals)
Average Removals per Year	10	This is just an estimate
Average Cost per Prune:	$150	Based on average cost of recent Almstead bid (average of 9 prunes)
Resulting Yearly Pruning Qty	486	Total trees per sector minus removals
Resulting Pruning Cost	$72,900	
Average Cost per Stump Grinding	$250	Per village
Stumps per Year	10	Based on removals
Plantings per Year	50	
Average Cost per Planting	$305	$185 for tree, $120 to plant

This budget working document has been delivered also in an Excel™ file so numbers can be adjusted as necessary to reach the most accurate budget.

APPENDIX F
FULL I-TREE CANOPY RESULTS/METHODOLOGY

To calculate tree canopy cover for VOM, the shapefile of VOM was downloaded from the Westchester County, NY GIS website. The shapefile was then uploaded into the i-Tree Canopy application, where it generates random points inside the boundary of the shapefile. The numbers of points generated are based on the user; in this case 2,000 were used. The more points that are used, the better the accuracy of the analysis. The analyses performed were based on five classes: Tree Canopy, Grass, Bare Soil, Impervious, and Open Water. After each point has been randomly generated, each point can be zoomed to individually. This allows the user to see each point in Google Earth using 2016 aerial imagery. A determination was then made on each point as to which one of the five classes it would fall under.

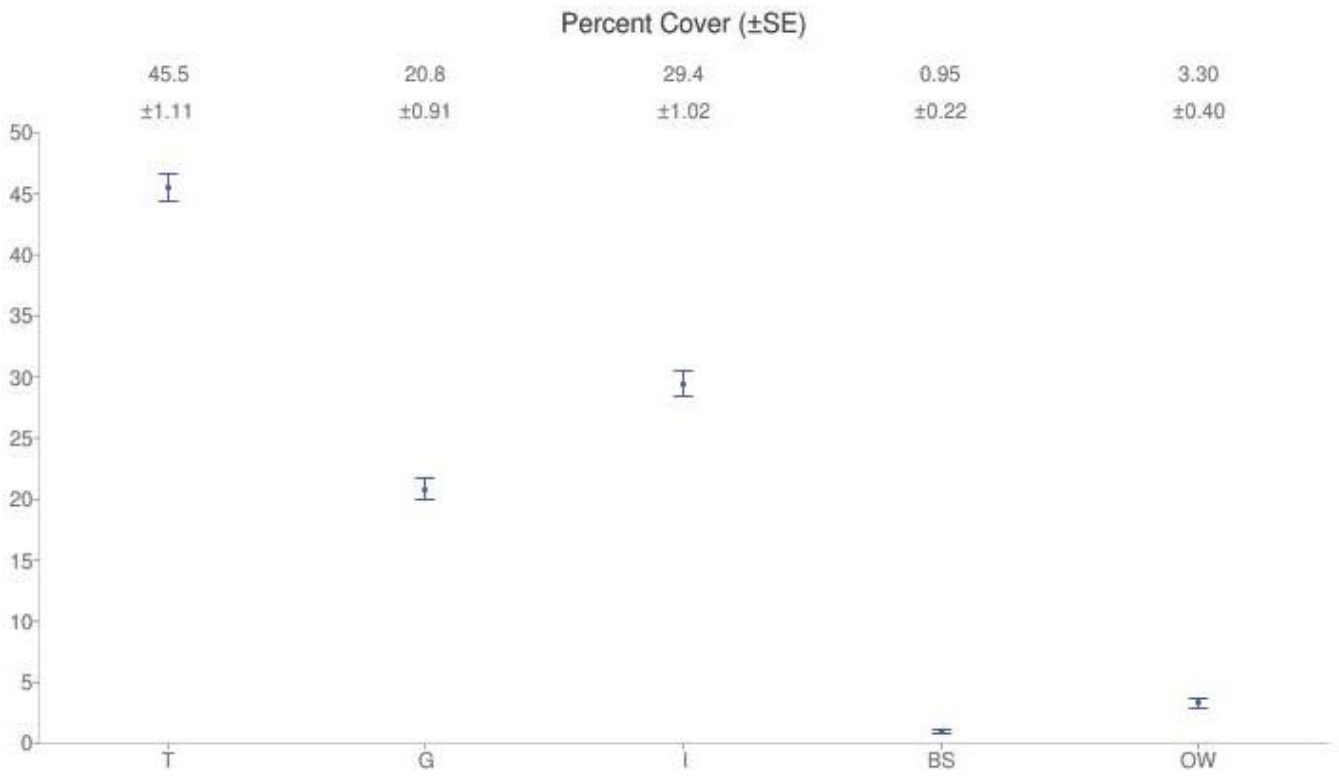
The benefits of the i-Tree Canopy tool are that it allows users to use Google Earth aerial imagery for the area of interest and produce a statistical estimate of tree cover and other land coverage types. The tool also allows the user to re-import the analysis and produce an estimate of land cover over time, and to perform future monitoring and set goals for improving tree canopy. VOM had an overall tree canopy of 45.5%, grass and low-lying vegetation were at 20.8%, impervious cover was at 29.4%, bare soil was at 0.95%, and open water was at 3.3%.

The full report generated by i-Tree follows:

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 8/16/16



Cover Class	Description	Abbr.	Points	% Cover
Tree	Tree, non-shrub	T	910	45.5 ±1.11
Grass		G	416	20.8 ±0.91
Impervious		I	589	29.4 ±1.02
Bare Soil		BS	19	0.95 ±0.22
Open Water		OW	66	3.30 ±0.40

Tree Benefit Estimates

Abbr.	Benefit Description	Value	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$1,370.06	±33.53	1.03 T	±0.03
NO2	Nitrogen Dioxide removed annually	$5,282.87	±129.28	8.81 T	±0.22
O3	Ozone removed annually	$106,726.74	±2,611.87	25.34 T	±0.62
PM2.5	Particulate Matter less than 2.5 microns removed annually	$270,781.21	±6,626.68	1.37 T	±0.03
SO2	Sulfur Dioxide removed annually	$642.93	±15.73	3.04 T	±0.07
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$28,149.51	±688.89	4.51 T	±0.11
CO2seq	Carbon Dioxide sequestered annually in trees	$178,170.67	±4,360.27	4,927.37 T	±120.58
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$5,708,885.21	±139,710.44	157,881.26 T	±3,863.74

i-Tree Canopy Annual Tree Benefit Estimates based on these values in lbs/acre/yr and $/T/yr: CO 1.642 @ $1,333.50 | NO2 14.020 @ $602.10 | O3 40.349 @ $4,226.70 | PM2.5 2.184 @ $198,123.12 | SO2 4.837 @ $212.42 | PM10 7.176 @ $6,268.44 | CO2seq 7,845.889 @ $36.29 | CO2stor is a total biomass amount of 251,395.359 @ $36.29*
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company).

Limitations of i-Tree Canopy

The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard error will be too high to have any real certainty of the estimate.

A Cooperative Initiative Between:

www.itreetools.org

APPENDIX G
BEYOND RIGHT-OF-WAY (BROW) RESOURCES

Several resources are included in this appendix to assist VOM in creating and rolling out a BROW ordinance, such as sample ordinance language, an ordinance from Massachussetts, a factsheet from Massachussetts that explains the ordinance to the public, and a property owner agreement form.

Sample language for Village of Mamaroneck beyond right-of-way tree planting resolution:

> *The Village of Mamaroneck may plant shade trees acquired with state, local, or private funds upon adjoining land at a distance not exceeding ten feet from the edge of a right-of-way; however, the written consent of the owner of such adjoining land shall first be obtained.*

The following is an example of the state ordinance in Massachusetts that allows for planting beyond the right-of-way:

PART I ADMINISTRATION OF THE GOVERNMENT
(Chapters 1 through 182)

TITLE XIV PUBLIC WAYS AND WORKS

CHAPTER 87 SHADE TREES

Section 7 Planting of shade trees

Section 7. Cities and towns may appropriate money for the purpose of acquiring and planting shade trees in public ways. The tree warden, or a private organization acting with the written consent of the tree warden, may plant shade trees acquired with public or private funds in a public way, or if he deems it expedient, upon adjoining land at a distance not exceeding 20 feet from the layout of such public way for the purpose of improving, protecting, shading or ornamenting the same; provided, however, that the written consent of the owner of such adjoining land shall first be obtained.

One of the challenges to instituting a BROW policy is conveying the concept and purpose to both the public and elected officials that are considering it., To help explain BROW, VOM should consider creating a factsheet similar to the one from Massachusetts below, which explains community planting beyond the right-of-way:

Urban and Community Forestry Program

FACT SHEET

SETBACK TREE PLANTING
One Tool for Improving Management of Your Urban and Community Forest

What is setback planting? Setback planting refers to the practice of planting public trees, for the common good, beyond the public right-of-way and on private property.

What laws govern setback planting, and are setback trees "public shade trees?"
Massachusetts General Law (MGL) Chapter 87, Section 7 specifically allows towns to plant trees within 20 feet of the public right-of-way, provided that written permission from the adjoining property owner is obtained first. MGL Chapter 87, Section 1 states that trees planted under this provision are defined as "public shade trees" and thus protected by all sections of MGL Chapter 87.

Why consider setback plantings?
The public right-of-way often contains various obstructions and hazards for trees. Limited soil volume, compacted soils, overhead wires, underground utilities, sidewalks, road salt, and passing vehicles all significantly hinder a tree's ability to thrive and survive, and limit the selection of trees that can be safely and appropriately planted within these zones.

Setback plantings allow public tree managers more flexibility in working with residents to plant "the right tree in the right place" and can provide trees with more "growing space" and better conditions under which to survive, thrive and achieve their full potential.

According to the experiences of Tree Wardens around Massachusetts who have been engaging in setback plantings within their communities, setback trees tend to be healthier, more vigorous, develop better canopies and root areas, and receive better care by adjacent property owners than trees planted in similar situations within the right-of-way.

Additional advantages to setback planting include:
- Setback planting can allow for a partnership between municipal tree managers and private owners and help make the most of public tree care tax dollars and resources.
- It is an effective way to work with residents in selecting and planting the "right tree for the right place." Resident commitment to take pride and care for "their" trees is therefore amplified.
- There is less chance for tree disfigurement as a result of fewer conflicts with utilities.
- This also results in potentially improved electrical and other utility reliability.

Commonwealth of Massachusetts
Department of Environmental Management
Urban and Community Forestry Program
251 Causeway Street, 6th Floor
Boston, MA 02114-1250
Tel: 617 626-1250
www.mass.gov/dem/programs

What are the potential disadvantages of setback planting?
Tree Wardens engaged in setback plantings cite few disadvantages to the practice. However, some of the potential disadvantages may include:

- Loss of some streetscape design opportunities such as traffic calming, creating a barrier between pedestrian and vehicular traffic, and creating a tunnel-like design.
- Some loss of municipal control or protection of setback trees.
- The challenges of educating property owners in proper tree care.
- The potential to favor planting in neighborhoods where setbacks are possible and over-look neighborhoods or areas where setbacks are not possible.

How does setback planting work in practice in different communities?
Concord: The Town of Concord engages in setback planting under most circumstances. Town tree managers have found that in most cases, the area beyond the public right-of-way provides the best conditions for trees to thrive. They approach property owners in target areas to gain verbal permission for planting, or respond to requests from property owners, and together, town tree managers and property owners select the appropriate location and species for tree plantings. The town then maintains these trees for two years with proper watering and mulching. After two years, the town sends the property owner educational materials on proper tree care, pruning standards, tips on hiring an arborist, and other issues regarding the tree care including avoiding mulch volcanoes, weed whip and lawn mower damage, problems with compaction, etc. After two years, the tree is considered a private tree, property owners are expected to take on the ownership and stewardship of the tree, and they do not need any town permission to trim or remove the tree for any reason.

Brookline: The Town of Brookline is in the process of improving, formalizing and expanding its setback planting program. Brookline actively advertises their "Back-of-Sidewalk" program. Property owners interested in a setback tree, apply for a tree and sign a formal agreement. Under this program the town (with input from the owner) will select, plant and maintain the tree as a public tree for a period of five years. The property owner agrees to water their new tree, and after the initial five-year period, assume full ownership and stewardship of the tree. The town provides property owners with information on tree care during this initial period. The town also keeps a database of setback trees and is considering developing an ordinance to further protect them.

East Bridgewater: The Town of East Bridgewater has been doing setback planting for over 50 years in combination with planting in public ways. The top priorities for setback plantings in East Bridgewater are replacement trees. East Bridgewater obtains verbal permission from adjacent property owners to plant a tree as a setback, and encourages property owners to water, mulch and maintain these trees. The town helps maintain newly planted trees and performs mature tree pruning and removal when requested **and** warranted. Town tree managers will allow private owners to prune or remove trees if they wish.

For more information on setback planting or other urban and community forestry issues, please contact DEM's Urban and Community Forestry Program at:

- Eric Seaborn, Acting Program Coordinator, 617-626-1468, eric.seaborn@state.ma.us
- Jane Calvin, Community Action Forester, Eastern Mass, 617-626-1456
- Paul Jahnige, Community Action Forester, Western and Central Mass, 413-577-2966
- www.state.ma.us/dem/programs/forestry/urban/index.htm

The following Property Owner Agreement from Massachussetts can be used to create a similar BROW document for VOM:

Town of Brookline
Tree Planting Committee

Tree Planting and Maintenance Agreement

I/We _____, owner of the property situated at _____, Brookline, Massachusetts, hereby give permission to officers and employees of Brookline, or their duly authorized representatives, to enter upon said property for the purpose of planting a tree or trees thereon, within twenty feet of the adjoining public way, without cost to me.

I/We agree to hold said Town of Brookline, its officers or employees, harmless from all claims, liability, loss or damage to person or property arising from the said planting of said tree or trees. In giving this consent, I/We recognize that any tree planted on my/our property under this agreement shall be, for a period of five years from date of planting, a public shade tree as defined by Mass. General Laws, Chapter 87, Section 7 or any amendments or additions thereto.

In Witness whereof, I/we hereunto set my/our hand(s) and Seal(s) this _____ day of _____, 20__.

_____

_____

Witness (notary not needed):

_____

Block/Lot _____ Tree Identification Number _____

Date Planted _____ Email: _____

Telephone - Home: _____ Work: _____

Return form to:
Tom Brady, Tree Warden
Department of Public Works
Town Hall, 333 Washington St.
Brookline, MA 02445

Indicate the footprint of your house, any power/water lines (--------), the proposed location for the new tree (⊗), and other trees, plants and fences between your house and the street. Approximate distances in feet would also be helpful.

If you have any questions, please call any one of us.
Tree Planting Committee:
Hugh Mattison (617-232-6083)
Margie Greville (617-731-1014)

Property Diagram (please complete)
Located at:
_____

_____ Street

APPENDIX H
UTILITY AGREEMENT SAMPLE

The following text is to be used as a starting place to forming an MOU with Con Edison.

October 25, 2006

Memorandum of Understanding
between
Society of Municipal Arborists & Utility Arborist Association

We share the common goal of improving the quality of life for all of our citizens by enhancing the extent and condition of the urban forest and by delivering safe, reliable electric power. We are committed to ongoing communication, cooperation, and collaboration to meet this goal at all levels of community.

We recognize and endorse ANSI A300 Tree Care Performance Standards, the ANSI Z133.1 Safety Standard, and ISA Best Management Practices. We support the ISA Certified Arborist/Municipal Specialist and Utility Specialist certification programs. We encourage attainment of the National Arbor Day Foundation's Tree Line USA and Tree City USA recognitions and fully support the concept of "Right Tree, Right Place."

APPENDIX I
GREEN INFRASTRUCTURE/STORMWATER MANAGEMENT OPTIONS

Green Infrastructure helps to intercept, infiltrate, and evaporate stormwater runoff through an integrated soil-water-plant system (City of Philadelphia 2014). The key to green infrastructure is decreasing impervious surfaces, which water cannot permeate, and increase permeable surfaces. Listed below are some key interventions to address stormwater management issues:

- Planting more trees, shrubs, and flowers
- Tree trenches
- Stormwater tree
- Green gutter
- Stormwater drainage well
- Vegetated curb extensions
- Rain gardens
- Stormwater planters
- Downspout planters
- Green roofs
- Green walls
- Rain barrels and cisterns
- Pervious pavement
- Stormwater wetlands
- Vegetative strips
- Bioswales

For examples of interventions, please reference the list below. These guides have clear graphical depictions of GI tactics, along with helpful insights into funding and implementation.

City of Philadelphia Green Streets Design Manual is a great resource full of useful information from renderings of GI interventions, to how to implement it through policy recommendations, and lists several grant programs to fund projects. (http://www.phillywatersheds.org/img/GSDM/GSDM_FINAL_20140211.pdf)

The City of Philadelphia's *Green City, Clean Waters* has good recommendations for implementation. This guides lays out what interventions are appropriate for different land use types. (http://www.phillywatersheds.org/img/GSDM/GSDM_FINAL_20140211.pdf)

The Chicago Green Alley Handbook is a user-friendly guide that clearly depicts different GI techniques and highlights important do's and don'ts. (http://nacto.org/docs/usdg/green_alley_handbook_chicago.pdf)

APPENDIX J
I-TREE STREETS METHODOLOGY

i-Tree Streets, a component of i-Tree Tools, analyzes an inventoried tree population's structure to estimate the costs and benefits of that tree population. The assessment tool creates an annual benefit report that demonstrates the value street trees provide to a community:

These quantified benefits and the reports generated are described below.

- **Aesthetic/Other Benefits:** Shows the tangible and intangible benefits of trees reflected by increases in property values (in dollars).
- **Stormwater:** Presents reductions in annual stormwater runoff due to rainfall interception by trees measured in gallons.
- **Energy:** Presents the contribution of the urban forest towards conserving energy in terms of reduced natural gas use in the winter (measured in therms [thm]) and reduced electricity use for air conditioning in the summer (measured in Megawatt-hours ([MWh]).
- **Carbon Sequestered:** Presents annual reductions in atmospheric CO_2 due to sequestration by trees and reduced emissions from power plants due to reductions in energy use measured in pounds. The model accounts for CO_2 released as trees die and decompose and CO_2 released during the care and maintenance of trees. The i-Tree Streets calculation takes into account the carbon emissions that are *not* released from power stations due to the heating and cooling effect of trees (i.e., conserved energy in buildings and homes). It also calculates emissions released during tree care and maintenance, such as driving to the site and operating equipment.
- **Air Quality:** Quantifies the air pollutants (ozone [O_3], nitrogen dioxide [NO_2], sulfur dioxide [SO_2], particulate matter less than 10 micrometers in diameter [PM_{10}]) deposited on tree surfaces, and reduced emissions from power plants (NO_2, PM_{10}, volatile organic compounds [VOCs], SO_2) due to reduced electricity use in pounds. The potential negative effects of trees on air quality due to biogenic volatile organic compounds (BVOC) emissions is also reported.

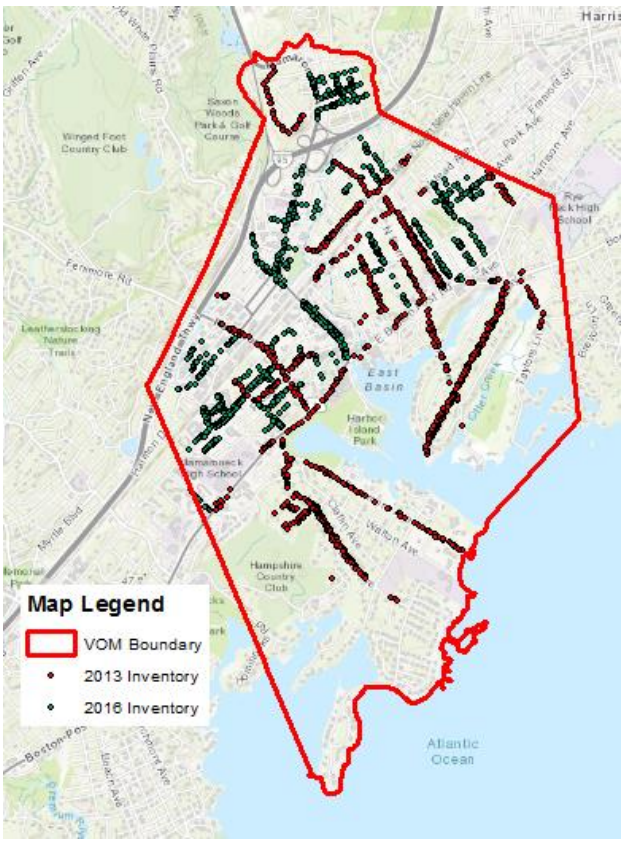
In order to identify the dollar value provided and returned to the community, VOM's street tree inventory data (920 trees with a tree condition rating) were formatted for use in the i-Tree Streets benefit-cost assessment tool.

In addition to tree inventory data, i-Tree Streets requires cost-specific information to manage a community's tree management program—including administrative costs and costs for tree pruning, removal, and planting. Regional data, including energy prices, property values, and stormwater costs, are required inputs to generate the environmental and economic benefits trees provide. If community program costs or local economic data are not available, i-Tree Streets uses default economic inputs from a reference city selected by USDA FS for the climate zone in which the community is located. Any default value can be adjusted for local conditions.

APPENDIX K
INVENTORY HISTORY

Inventory of the public trees in the Village of Mamaroneck has been performed in a piecemeal fashion over a number of years. It is detailed here to aid in recording of past activiities as well as to provide a methodology behind the finding of this report that approximately 58% of all public trees have been inventoried - 88% of all street trees and 0% of all park trees.

Phase I: Cornell Cooperative Extension Survey (2013). The Hudson Valley Specialized Weekday Arborist Team (SWAT) of Cornell Cooperative Extension of Dutchess County conducted an inventory of street trees in the Village of Mamaroneck (Village) in October 2013. 856 trees and 207 future planting sites were inventoried by a team of volunteers, funded by USDA Forest Service & DEC Urban and Community Forestry. Data were collected on location, size (DBH), condition, and species.



Phase II: Student Inventory (2016). This inventory was continued in 2016 by one volunteer with an additional 882 trees inventoried, but more focused on just the tree location without size and species data.

Estimation of Street Trees Not Yet Inventoried. Of the 58 street miles in Mamaroneck, 51 miles (or 88%) have been inventoried to-date in the two phases described above. Using the density of 34 street trees per mile and 7 miles left to inventory, it can be assumed that there are another 238 street trees yet to be inventoried.

Estimate of Park Trees Not Yet Inventoried. In addition to the sites described above, trees within parks have also not yet been inventoried. There are approximate 110 acres of park land in VOM. Using an average of 10 trees per acre, it can be said there are likely an estimated 1,000 trees in VOM parks.

SUMMARY	Tree Qty
2013 Inventory	856
2016 Inventory	882
Remaining Street Trees to Inventory	238
Remaining Park Trees to Inventory	1,000
Total Public Trees in VOM	**2,976**
Percent Inventoried To-Date	**58%**

APPENDIX L
ITHACA TREE ORDINANCE

Chapter 306: Trees and Shrubs

[HISTORY: Adopted by the Common Council of the City of Ithaca 12-5-1990 as part of Ord. No. 90-18 (Ch. 71 of the 1975 Municipal Code). Amendments noted where applicable.]

§ 306-1 Purpose.

This chapter regulates the planting, maintenance, protection and removal of trees and shrubs on public streets, parks and other city-owned property; provides for a Shade Tree Advisory Committee;[1] and establishes the office of a City Forester in the Department of Public Works. This chapter also provides for the issuing of permits for the planting, maintenance, protection and removal of trees and shrubs in city-owned places.

§ 306-2 Title.

This chapter shall be known and may be cited as the "City Tree Ordinance."

§ 306-3 Definitions.

The following terms shall have the meanings provided in this section unless their context requires otherwise:

CALIPER. The diameter in inches of the tree trunk 12 inches above the base of the tree.

CITY AGENCY. Any department, board, commission, committee or other entity within the government of the City of Ithaca.

DBH (diameter at breast height). The diameter of tree trunks at a height of four feet six inches from the finished grade at the base of the tree.

PERSON. Any corporation, firm, partnership, association, trust, estate, one or more individuals and any unit of government or agency or subdivision thereof, except for a city agency.

TREES AND SHRUBS. Any woody plants which have self-supporting, aboveground parts which are viable year round.

§ 306-4 City Forester.

A. The office of the City Forester is hereby established in the Department of Public Works.

B. The City Forester, in consultation with the Shade Tree Advisory Committee (STAC) and the Board of Public Works, shall have the authority to implement and enforce the provisions of this chapter.

C. In furtherance of the purposes of this chapter, the Board of Public Works, in consultation with the City Forester and the STAC, shall have the authority to adopt rules and regulations regarding arboricultural specifications and standards of practice and such additional rules and regulations as the Board determines are necessary. These regulations shall govern the planting, maintenance, removal, fertilization, pruning and protection of trees and shrubs on public streets, parks or other city property.

D. In the absence of the City Forester, the duties of that office shall be the responsibility of the Supervisor of Parks and Forestry within the Department of Public Works.

§ 306-5 Planting, maintenance and removal regulations.

A. No person or city agency shall plant, spray, fertilize, prune, remove, replace or otherwise disturb any tree or shrub on any public street, park or other city-owned property without first submitting a written request therefor and obtaining written permission from the City Forester. Requests for written permission shall be acted on within five business days of filing the written request with the City Forester. All work for which such permission is given shall be done in accordance with the Department of Public Works rules and regulations adopted pursuant to § 306-4 of this chapter.

B. Persons or city agencies conducting regular maintenance work on trees or shrubs may be granted general permits to cover their work on a yearly basis.

C. Except as provided in Subsection D, whenever a person or city agency obtains written permission pursuant to Subsection A of this section to remove a tree or shrub from any city-owned land for the purpose of construction or for any other reason, such person or agency shall subsequently replace the tree or shrub within one year of the issuance of the tree-removal permit in a location to be determined by the City Forester somewhere in the city or have the city replace such tree or shrub at the expense of the person who obtained such permission. Such replacement shall meet the standards of size, species and placement as provided for in the tree removal permit issued by the City Forester. Unless the City Forester, for good cause, determines otherwise, trees shall be replaced by the caliper inch, such that for every inch of diameter (DBH) removed, an equal number of caliper inches shall be replaced (e.g., the removal of one twelve-inch DBH tree shall necessitate the planting of six two-inch caliper trees or four three-inch caliper trees, etc.).

D. It is the responsibility of the City Forester to determine if trees or shrubs on city-owned property are hazardous and to remove dead or hazardous trees or shrubs from city-owned property. If replacement is recommended by the City Forester, the city shall replace the tree or shrub within one year of removal.

E. Wherever it is necessary to remove a tree or shrub from a public right-of-way in connection with the paving of a sidewalk or the paving or widening of a street, the city or responsible agency or person shall replant such tree or shrub or replace it. If conditions prevent planting in the right-of-way, this requirement may be satisfied by planting on the adjoining property if the property owner agrees.

F. Requests from private citizens that new street trees be planted near their property shall be accommodated in accordance with planting priorities set by the City Forester in consultation with the STAC and the Board of Public Works.

G. Specifications governing tree species, size, spacing and method and location of planting shall be approved by the City Forester. Inspection of the trees by the City Forester shall be carried out, whenever possible, prior to planting in order to ensure tree health and quality. Whenever any person is required to replace a tree pursuant to this chapter, a one-year guaranty of the tree's health shall be provided for such replacement trees.

H. Excavation within the street right-of-way for the purpose of compliance with this section shall not be undertaken without a permit from the City Engineer.

§ 306-6 Damage prohibited.

Unless specifically authorized in writing by the City Forester, no person or city agency shall intentionally damage, cut, carve, transplant or remove any tree or shrub on city-owned property; attach any rope, wire, nails, advertising posters or other contrivance to any such tree or shrub; allow any gas, liquid or solid substance which is harmful to any such tree or shrub to come in contact with it; or set fire or permit any fire to burn when such fire or heat thereof will injure any portion of any tree or shrub on city property. Written authorization for any action governed by this section may be obtained in the same manner as provided in § 306-5 of this chapter.

§ 306-7 Protection.

A. Without written permission from the City Forester, no person or city agency shall:

(1) Undertake any construction or development activity (including but not limited to the excavation of any ditches, tunnels, or trenches or the laying of pavement) within the dripline of any city tree or shrub.

(2) Move or park vehicles associated with any construction or development activity which may affect any tree or shrub on city property.

B. Guarding during construction or excavation.

(1) Unless the City Forester, for good cause, determines otherwise, all trees or shrubs on any public street or other city-owned property directly impinging on any excavation or construction of any building, structure or street work shall be guarded as follows:

(a) For trees or shrubs with a crown spread of eight feet or less, a substantial fence, frame or box not less than four feet high and eight feet square shall surround the tree or shrub.

(b) For a tree or shrub with a crown spread over eight feet, a fence not less than four feet high shall be placed at least at the tree or shrub's dripline or at a distance prescribed by the City Forester.

(2) All building material, soil or debris shall be kept outside these barriers.

C. No person or city agency shall deposit, place, store or maintain upon any public place of the city any stone, brick, sand, concrete or other materials which may impede the free passage of water, air and fertilizer to the roots on any tree or shrub growing thereon, except by written permit of the City Forester.

D. Any written permission required by this section may be obtained in the same manner as provided for in § 306-5.

§ 306-8 Obstruction of streets.

A. It shall be the duty of any person owning real property bordering on a public street to ensure that trees and shrubs on that property are pruned in a manner that will not obstruct or shade streetlights, obstruct the passage of pedestrians on sidewalks, obstruct vision of traffic signs or obstruct the view of any street or alley intersection. If trees are interfering with utility wires, it is the obligation of the appropriate utility company to correct the situation.

B. Should any person owning real property bordering on any public street fail to comply as hereinabove provided, the City Forester shall order the owner to take corrective action within 15 days after receipt of written notice. The order required herein shall be served by mailing a copy of it to the last known address of the property owner.

C. When a person to whom an order it directed shall fail to comply within the specified time, it shall be lawful for the city to prune such trees or shrubs or to pay for such pruning, and the cost thereof shall be assessed to the owner.

§ 306-9 Coordination of review.

When plantings are to be done on projects that also require site development plan review (Chapter 276), the City Forester and the site development plan review officer shall coordinate review of the proposed planting plan.

§ 306-10 Emergency work.

A. This chapter shall not govern any emergency activity immediately necessary to protect life, safety or property or to maintain access to any property. Any such activity shall incorporate reasonable efforts to protect trees and shrubs on city property from unnecessary damage.

B. Any person or city agency engaged in any action covered by Subsection A shall make a reasonable effort to notify the City Forester prior to commencing that action and shall, in any event, provide written notice of the emergency and the work done to the City Forester within three calendar days of commencing that work.

§ 306-11 Appeals.

Should a dispute arise in the administering of this chapter, an appeal can be requested by petitioning, in writing, the City Forester. The City Forester will have five working days to reply in writing. Should this provide an unsatisfactory resolution, a second appeal can be requested by petitioning the Superintendent of Public Works. In such event, the Superintendent of Public Works shall consult with the City Forester. The Superintendent will have 10 working days from the filing of the second appeal to reply in writing. Should this also provide an unsatisfactory resolution, a third appeal can be requested by petitioning the Board of Public Works. The Board of Public Works will act upon the petition within 30 days from the date of receiving the petition.

§ 306-12 Penalties for offenses.

Any person who violates or fails to comply with any of the provisions of this chapter shall be guilty of a violation and, upon conviction thereof, shall be fined a sum not more than $250 plus the cost of rectifying damage to any tree or shrub on city-owned property.