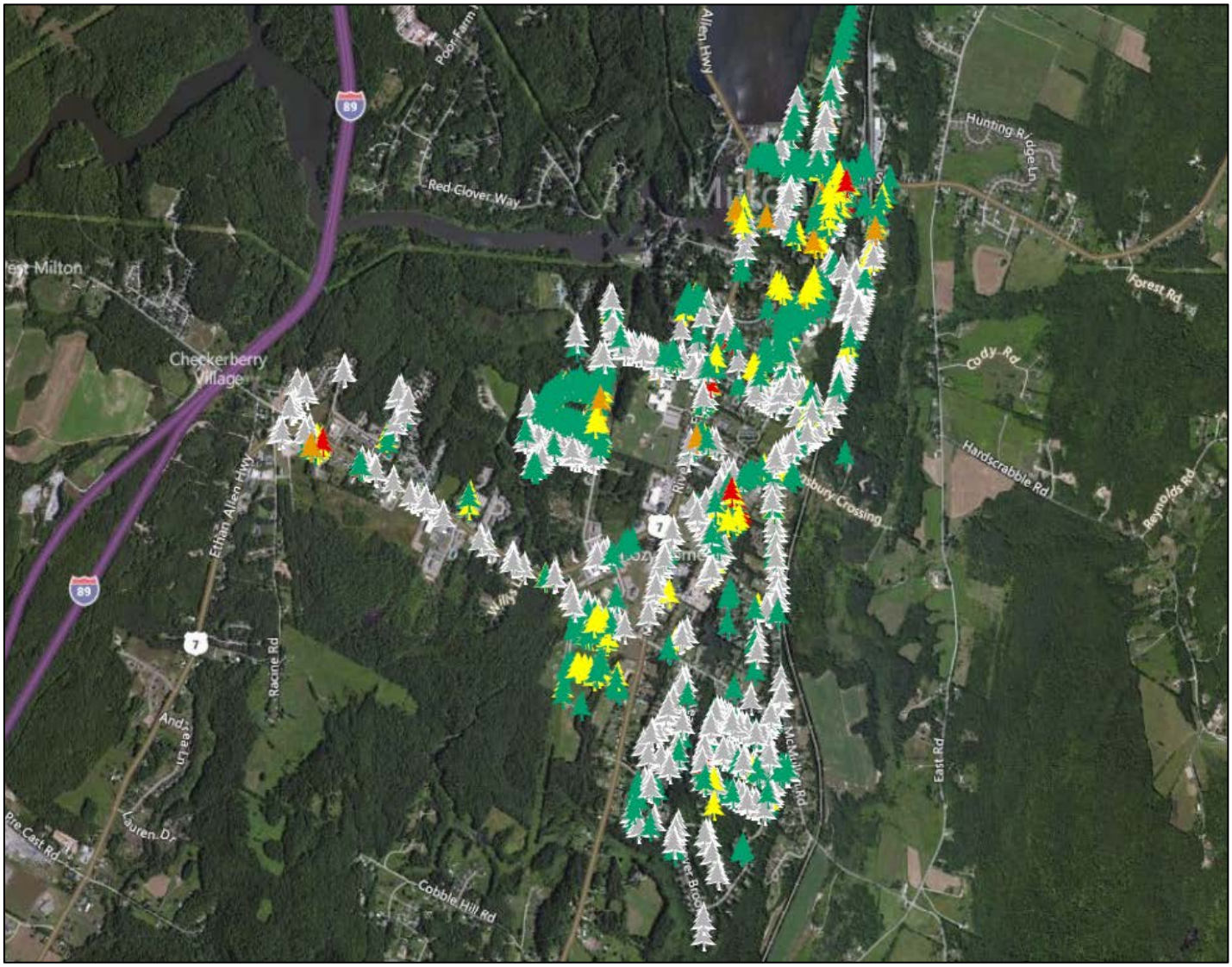
Milton Public Tree Inventory Report



Prepared for the Town of Milton by the
Vermont Urban & Community Forestry Program
December 2015

FORESTS, PARKS & RECREATION VERMONT

UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

PLANT LIVE GROW
VERMONT URBAN & COMMUNITY FORESTRY PROGRAM

FOREST SERVICE US DEPARTMENT OF AGRICULTURE

VT ANR GIS

Acknowledgements

This report was developed by Vermont Urban & Community Forestry Program (VT UCF) staff based on field work conducted by VT UCF staff and State Lands Foresters from the Vermont Department of Forests, Parks, & Recreation (VT FPR) for the Town of Milton, Vermont during the summer of 2015. We would like to thank Milton Selectboard for approving the Milton public tree inventory and the main contacts for the project for providing direction and context, particularly Executive Assistant to the Town Manager, Eric Wells; Town Planner, Jake Hemmerick; Public Works Department Director, Roger Hunt; and Public Works Department Supervisor, Dustin Kealty. This report was made possible with funding from the USDA Forest Service. Special thanks to Andrea Urbano, VT UCF intern, and Diana Jaramillo, ECO Americorps member with VT UCF, for their work in analyzing data and developing this inventory report.

About the Vermont Urban & Community Forestry Program

The field of forestry management is not confined to the natural areas and forests of Vermont, but extends to the populated urban and rural spaces where trees play important roles. The trees in public parks, along roadsides, on town greens, and in municipal forests compose our urban and community forests and merit careful stewardship. VT UCF is a collaborative effort between the Vermont Department of Forests, Parks, & Recreation, the University of Vermont (UVM) Extension, and the USDA Forest Service. The program provides technical and financial assistance as well as educational programs and resources for the management of trees and forests in and around Vermont communities. The mission of VT UCF is to ***lead citizens, businesses, and governments in understanding the value of urban and community forests and promote civic responsibility for and participation in the stewardship of these resources for this and future generations***. Since 1991, the program has been guided by a small staff and a twenty-member advisory council. The council meets quarterly to share information and advise the program; its members come from various professional associations, non-profits, educational institutions, municipal tree boards and committees, and state agencies.

The trees in our communities offer a wide variety of environmental, social, and economic benefits to the surrounding community, including but not limited to: stormwater mitigation, carbon dioxide (CO_2) sequestration, air quality improvement, shade, wildlife habitat, and aesthetic value. VT UCF seeks to maximize these benefits by working with state and municipal officials, as well as dedicated volunteers and local organizations, to steward the urban and community forest's ecological integrity and diversity. VT UCF's programming and support reaches 100 Vermont communities annually. More information about VT UCF and its programming can be found at www.vtcommunityforestry.org.

VT UCF staff collecting data for the Milton Public Tree Inventory.

Contents

Executive Summary

The goals of the Milton public tree inventory were to establish a foundational record of the public trees in the Town, accurately locate and assess Town-owned trees within the public right-of-way (ROW), assess health and maintenance needs of public trees, and identify potential future tree planting locations within the ROW. The information collected in the inventory and presented in this report provides residents and decisions-makers with a better understanding of the composition, health, and benefits of Milton's urban forest and will allow Milton leadership to plan for tree maintenance and future tree planting using a map-based tree inventory tool.

This project was initiated in the spring of 2015, was coordinated with key Town of Milton staff, including Executive Assistant to the Town Manager, Eric Wells; Town Planner, Jake Hemmerick; Public Works Department Director, Roger Hunt; and Public Works Department Supervisor, Dustin Kealty. The project was approved by the Milton Selectboard in April 2015. VT UFC and VT FPR staff completed an inventory of **1050 trees** located within the public ROW of **56 streets** and on **5 Town-owned properties,** and identified **535 potential tree planting locations**. The data collected in the inventory were checked for quality, analyzed, and interpreted by VT UCF staff. This report was prepared in December 2015, presents the results of an inventory, and provides a basic assessment of the trees and urban canopy cover in the Town of Milton.

Local government, town boards and committees, conservation agencies, and private landowners all play an important role in monitoring and maintaining urban forests. Urban trees provide a number of benefits to a community, including reducing stormwater runoff, reducing air pollution, providing shade, sequestering carbon dioxide (CO_2), enhancing property values, and improving the aesthetics of the community. The 1050 public trees that were inventoried provide an estimated $**111,552 in benefits annually** to the residents of Milton. In addition to the public trees inventoried, an aerial tree canopy assessment was completed for the land area included in the inventory project, which indicated an existing tree canopy cover of 44 % and an estimated long-term **stored CO_2 value of over $3.8 million.**

Summary of Findings

Forest Diversity

- Of the 1050 public trees, there are 53 different species in 29 different genera.
- The top five most common tree genera by number of trees are *Acer* (maple) at 35%, *Fraxinus* (ash) at 11%, *Gleditsia* (honeylocust) at 9%, *Malus* (apple) at 7%, and *Picea* (spruce) at 6%.
- *Acer* and *Fraxinus* species together represent 46% percent of Milton's public trees. Invasive tree pests currently threaten both of these genera: the Asian long horned beetle (ALB) and the emerald ash borer (EAB), respectively.
- The top five most common species are *Acer saccharinum* (sugar maple) at 20%, *Fraxinus pennsylvanica* (green ash) at 11%, *Gleditsia triacanthos* (honeylocust) at 9%, *Acer rubrum* (red maple) at 8%, and *Malus species* (crabapple) at 7%.

Forest Structure

- Over half of the inventoried public trees (54%) have a diameter at breast height (DBH) measurement between 6 and 18". 38% of inventoried public trees have a DBH within the 6-12" size class and 16% of the inventoried trees have DBH measurements in the 12-18" size class.
- The remaining 46% of inventoried trees were represented in the following size categories: 0-3" (5.6%), 3-6" (18%), 18-24" (10%), 24-30" (5%), 30-36" (3%), 36-42" (3%), and 42"+ (1%).

Forest Cover

- There is an existing urban tree canopy (UTC) cover of 44% within the full extent of the Milton public tree inventory. This analysis was done for both public and private land.
- Trees could potentially cover an additional 46% of the land surface; these "possible UTC" areas include grass, agricultural land, and impervious surfaces (e.g. parking lots, paved playgrounds, and the ROW).
- The remaining 10% of Milton's area is buildings, streets, water, and other permanent features and is generally unsuited to UTC improvement.

Forest Health

- More than three quarters (844, or 80%) of the trees inventoried were assessed as being in "Good" condition. Of the remaining trees, 160 (15%) were considered to be in "Fair" condition, 36 (3%) were in "Poor" condition and 13 (1%) were "Dead".
- 172 (16%) trees were flagged as in need of future monitoring by a Certified Arborist, the Milton Tree Warden, or another qualified individual.

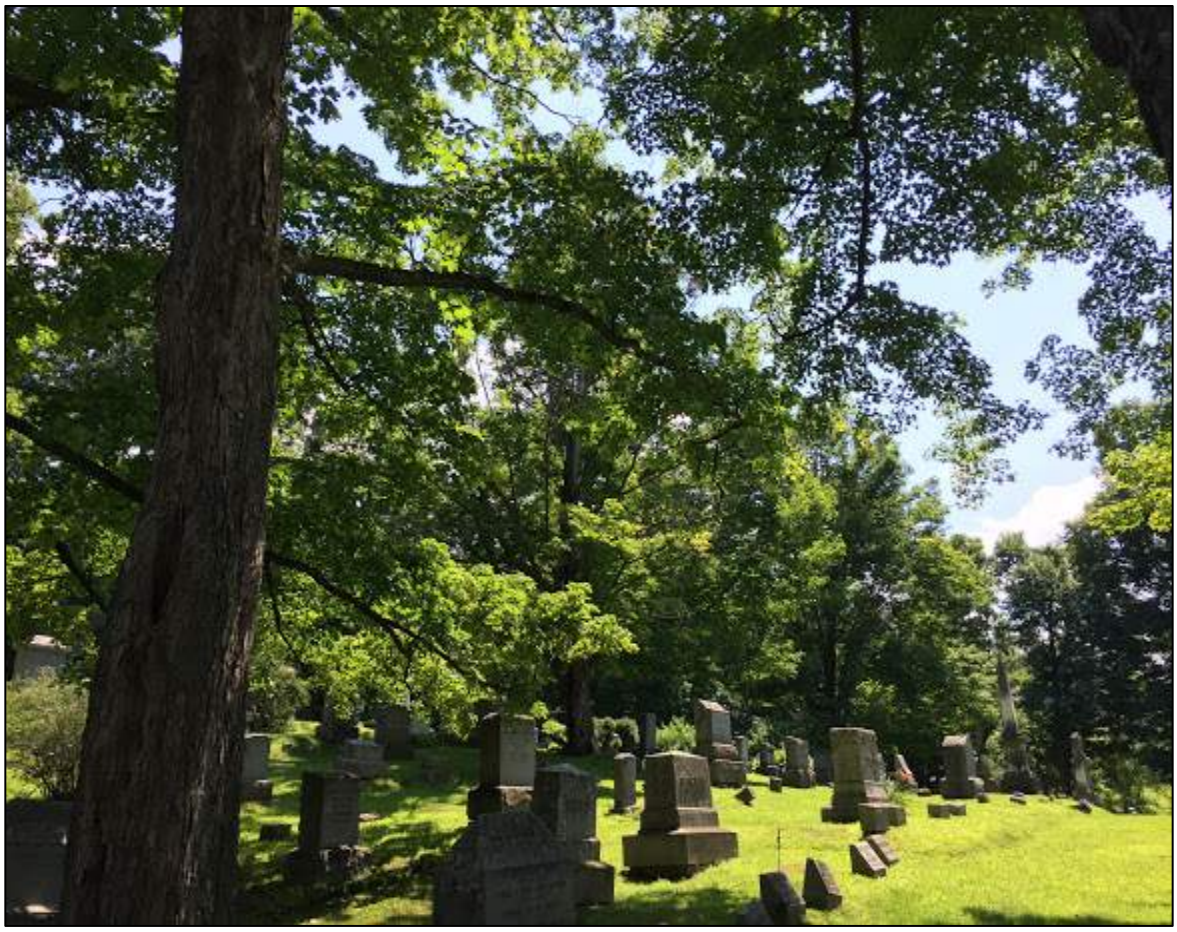
Tree Health and Maintenance Indicators

- As per request of the Town, the presence of the following health and maintenance indicators were assessed: root damage, mulch maintenance, and pruning needs.
- 8% (85 public trees) of Milton's urban forest was assessed as having root damage, which includes signs of stem girdling roots, compacted soil, and mechanical damage.
- 24% (248 public trees) of Milton's urban forest require mulch maintenance.
- It is recommended that 25% (261 public trees) of Milton's urban be pruned.

Summary of Recommendations

A healthy public tree population is contingent upon proper management, stewardship, and a municipality's commitment to understanding and maintaining its urban forest. A comprehensive public tree inventory is an important piece of a vibrant community tree program, along with other components described in the Discussion and Recommendations section of this report. Based on the results of the Milton public tree inventory, our priority recommendations for the Town of Milton are:

- Enhance and promote longevity and structural integrity of Milton's relatively young public tree population by establishing a systematic and routine structural pruning program.
- Prioritize the timely assessment and, if needed, maintenance of the 172 trees that were identified as in need of monitoring by a Certified Arborist or the Milton Tree Warden.
- Consider establishing a tree planting program within the public ROW; refer to the list of 525 identified locations to plant public trees in Milton to prioritize that would most benefit from trees.



Large sugar maples fill the Milton Village Cemetery with a dense and green canopy.

Introduction

Project Description

In 2013 VT UCF received a multi-year grant from the USDA Forest Service to assist twenty priority communities in Vermont in moving their municipal tree programs forward. The project, *Care of the Urban Forest*, is an effort that aims to support these communities in three specific ways, by: (1) conducting a public tree inventory to assess urban forest structure, diversity, and health; (2) helping the community in the development of an urban forest management plan or strategic action plan, using information from the inventory; and (3) providing technical training for municipal employees and key volunteers to increase in-house capacity to manage, and promote the proper care, of public trees.

Leadership from the Town of Milton was interested in partnering with VT UCF on the *Care of the Urban Forest Project* to conduct a full public tree inventory of the most populated areas of the town that would be map-based and manageable in a spreadsheet. The intent of the public tree inventory is to enable Milton to better understand, steward, and manage its public trees. The goals of the Milton public tree inventory were to establish a foundational record of the public trees in town, accurately locate and assess Town-owned trees within the public ROW, assess health and maintenance needs of public trees, and identify potential future tree planting locations within the ROW. The complete public tree inventory will provide a baseline for future management decisions and improvements to the urban forest. Additionally, benefits of urban forests, such as enhancement of air and water quality and reduced stormwater runoff, will increase when the Town of Milton is able to better manage and support healthy public trees.

Town Profile

The Town of Milton is located in northern Chittenden County, approximately 14 miles north of Burlington and bordered by Franklin County to the north and Lake Champlain to the west. Milton covers a land area of approximately 60.9 square miles, and has a population of 10,352 people, making it the 8th largest community in Vermont. Originally settled as a mill town, by the early twentieth century most of the town's land was used for farming. Now, only a handful of dairies remain in town, and Milton is a largely residential community, owing in part to the proximity to Essex's IBM complex. The town has invested in the infrastructure, such as the new municipal building that also houses the Milton Library, to support residential and commercial growth (Town of Milton, 2013[1]).

Methodology

Prior to the public tree inventory, VT UCF staff met numerous times with the main contacts in Milton to plan for the inventory. Originally 71 streets and a number of priority Town-owned properties in Milton were selected to be included in the inventory, encompassing the full extent of the Milton Downtown District. In total, the land area of the public tree inventory was about 3.32 square

[1] Town of Milton. 2013. http://www.miltonvt.org/.

Importance of Inventory and Urban Forestry in Vermont

An inventory of urban trees provides a record of the trees present in a community. An inventory can provide information about the species, size, health, and location of each tree and future management needs. This detailed information allows municipal planners to estimate the monetary contributions of their community's green infrastructure. In the event of a disease outbreak or insect infestation, data from an inventory may assist in monitoring and preventing the spread of a forest health epidemic. An inventory can also help build public support for expanding community forests and to guide future urban planning.

Urban trees improve the quality of life for Vermont communities in a variety of ways. The most readily apparent benefit is the aesthetic value that trees provide a street, home, or public space. Along with this beauty is the functional benefit of providing shade along the streets in the summertime and blocking wind to reduce heating costs in the wintertime. The presence of trees has been shown to positively affect property values and boosts foot traffic in commercial areas. Parks and tree-lined sidewalks promote physical activity by creating shaded, comfortable outdoor spaces. Many types of urban wildlife depend on trees as sources of food and shelter. Unseen environmental benefits of urban trees include improvements in air quality and temperature regulation through reduction of the heat island effect. Trees can mitigate noise pollution common in an urban environment and can clean and conserve water by controlling run-off. Additionally, urban forests create opportunities for environmental education, community engagement and in some instances can be related to crime reduction. Trees are an integral part of the green infrastructure of a community and contribute to keeping our families healthier and our everyday lives more fulfilling.

miles, representing less than 5% of the total land area of Milton, but including the most densely populated sections of town. The ROW boundaries for all streets were provided by the Milton Department of Planning and Economic and by the Milton Public Works Department. The list of streets and sites with ROW boundaries is found in Appendix A and GIS maps of the inventoried trees are in Appendix E.

VT UCF has developed an inventory tool in collaboration with the VT Agency of Natural Resources' (ANR) GIS team. The map-based tool uses the free application *Collector for ArcGIS*, developed by Esri, for data collection and is linked to the ANR Atlas online mapping website. All inventory data collected on public trees in Milton is available for viewing on the ANR Atlas tool and instructions are included in Appendix D.

Throughout July 2015, VT UCF staff and VT FPR State Lands Foresters walked along predetermined streets and on Town-owned sites in downtown Milton, recording specific data on the public trees and identifying appropriate potential planting locations (recorded as "Vacant"). To ensure that only public trees were inventoried (as opposed to trees on private property) each inventory team had a list of the ROW boundaries for every street included in the inventory area. Upon reaching a new street, the team first determined the extent of the ROW from each curb; they measured the road width, subtracted that number from the full ROW boundary, and then divided the number in half to determine the ROW extent behind the curb on each side of the street. The following equation demonstrates this process:

ROW distance from curb = (ROW extent for specific road - road width)/2

Each public tree identified was recorded into the *Collector for ArcGIS* application using an iPad, provided by VT UCF. The application is map-based and uses GPS and a base layer maps to allow the user to input information about a tree, linking it to a particular geographic location. Data recorded for each public tree in Milton included street name, overall condition, species, diameter class (using a measurement for diameter at breast height, or DBH), a recommendation for monitoring, the presence of root damage, mulch maintenance, pruning needs, additional

comments, and nearest house or building address. In most cases, a picture was also taken of each tree inventoried. A full list and description of the parameters used in data collection can be found in Table 1.

The data were compiled and subsequently checked for quality, analyzed, and summarized using Microsoft Excel and QGIS, a free and open source geographic information system (http://www.qgis.org/en/site/). Data were also analyzed through i-Tree, a free software suite developed by the USDA Forest Service (www.itreetools.org). VT UCF staff used two applications in the i-Tree suite of tools to further assess Milton's urban forest. i-Tree Streets uses sophisticated models to determine the monetary value and ecological benefits of trees. i-Tree Canopy uses aerial imagery and random point locations to produce an estimate of land cover of a defined area - including tree canopy cover - that encompasses both public and private property.

Data collection for the Milton public tree inventory.

Table 1. Data collection parameters for the Milton public tree inventory

Data Parameters	Description
Site ID	Street name or property name.
Tree Number	Count starts at 1 for each street/site. Unique to tree.
Species	Common name. Include in comments box if not listed.
Tree Condition	● *Good:* full canopy (75-100%), no dieback of branches over 2" in diameter, no significant defects, minimal mechanical damage ● *Fair:* thinning canopy (50-75%), medium to low new growth, significant mechanical damage, obvious defects/insects/disease, foliage off-color and/or sparse ● *Poor:* declining (25-50%), visible dead branches over 2" in diameter, significant dieback, severe mechanical damage or decay (over 40% of stem affected) ● *Dead:* no signs of life, bark peeling; scratch test on twigs for signs of life (green) ● *Vacant:* potential spot for a tree within the public ROW. Add "small", "medium", or "large" in the comments box - Small= max 30' at maturity, presence of overhead wires, minimum planting space 4' x 4' - Medium= 30-50' at maturity, green belts over 6' wide, no overhead wires - Large= 50'+ at maturity, parks and open space
Diameter (DBH)	Diameter taken at 4.5' above ground in classes of 0-3", 3-6", 6-12", 12-18", 18-24", 24-36", 36-42", 42"+. If on slope, uphill side measured. If abnormal growth, measured above or below growth. If multi-stemmed, each stem's DBH is squared, all squares summed, and the square root taken; indicate "multi-stemmed" in comments box.
Monitor	● *Yes:* any one defect is affecting >40% of the tree, posing a hazard to people/infrastructure/cars, growing into utility wires, dead or poor condition, ash tree showing evidence of woodpecker flecking, blonding, epicormic branching/water sprouts, and/or suspicious exit holes ● *No:* no major defects, tree in good or fair condition
Comments	Notes, elaborate on any existing conditions; max 255 characters.
Mulch	Yes: tree is struggling, there is bare and compacted ground beneath the tree and/or there is mechanical damage from weed-wacker/mower. No: The tree roots are not exposed and adequately covered by mulch.
Remove Mulch	Yes: mulch is mounded around base of tree, applied too thick, or is of an inorganic material that could be detrimental to the health of the tree. No: The mulch is adequately applied, or there is no mulch present.
Prune	Yes: Flag trees for pruning if any of the following signs are present: broken branches, branches are overlapping /touching/growing on each other, the tree is overcrowded, branches are interfering with utility lines or other built infrastructures, the branches can interfere with pedestrians/vehicles/bikes, etc. No: No branch needs to the trimmed
Roots	Yes: The presence of root issues, including stem-girdling roots, compacted soil, exposed roots, or mechanical damage to roots. No: No visible root issues.
House Number	Corresponding house address, numerical field. If a corner lot house is on a different street, enter house number and write "House located on X Street; corner tree" in comments box.
Collection Date/Time	Date and time.
Photo	Photo of full tree. Additional photos of any significant defects.

Inventory Results

Urban Forest Diversity

Of the 1050 trees inventoried within the public ROW or on Town-owned land, there were a total of 53 different species in 29 different genera. The top five most common tree genera by number of trees are *Acer* (maple) at 35%, *Fraxinus* (ash) at 11%, *Gleditsia* (honeylocust) at 9%, *Malus* (apple) at 7%, and *Picea* (spruce) at 6%; together these genera compromise 68% of the urban forest (Figure 1). The top five most common species are *Acer saccharinum* (sugar maple) at 20%, *Fraxinus pennsylvanica* (green ash) at 11%, *Gleditsia triacanthos* (honeylocust) at 9%, *Acer rubrum* (red maple) at 8%, and *Malus species* (crabapple) at 7% (Figure 2). Complete species and genera lists can be found in Appendix B.

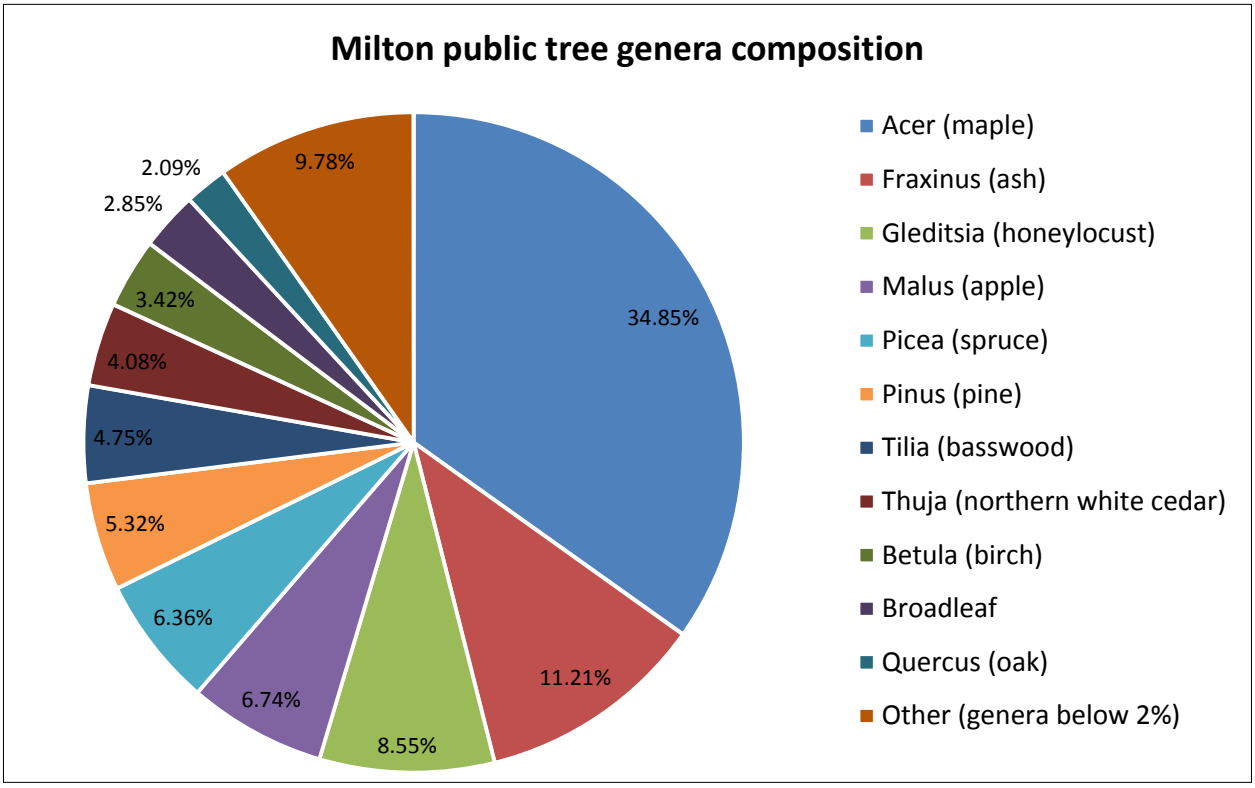


Figure 1. Most common tree genera by percent within the public ROW in Milton.

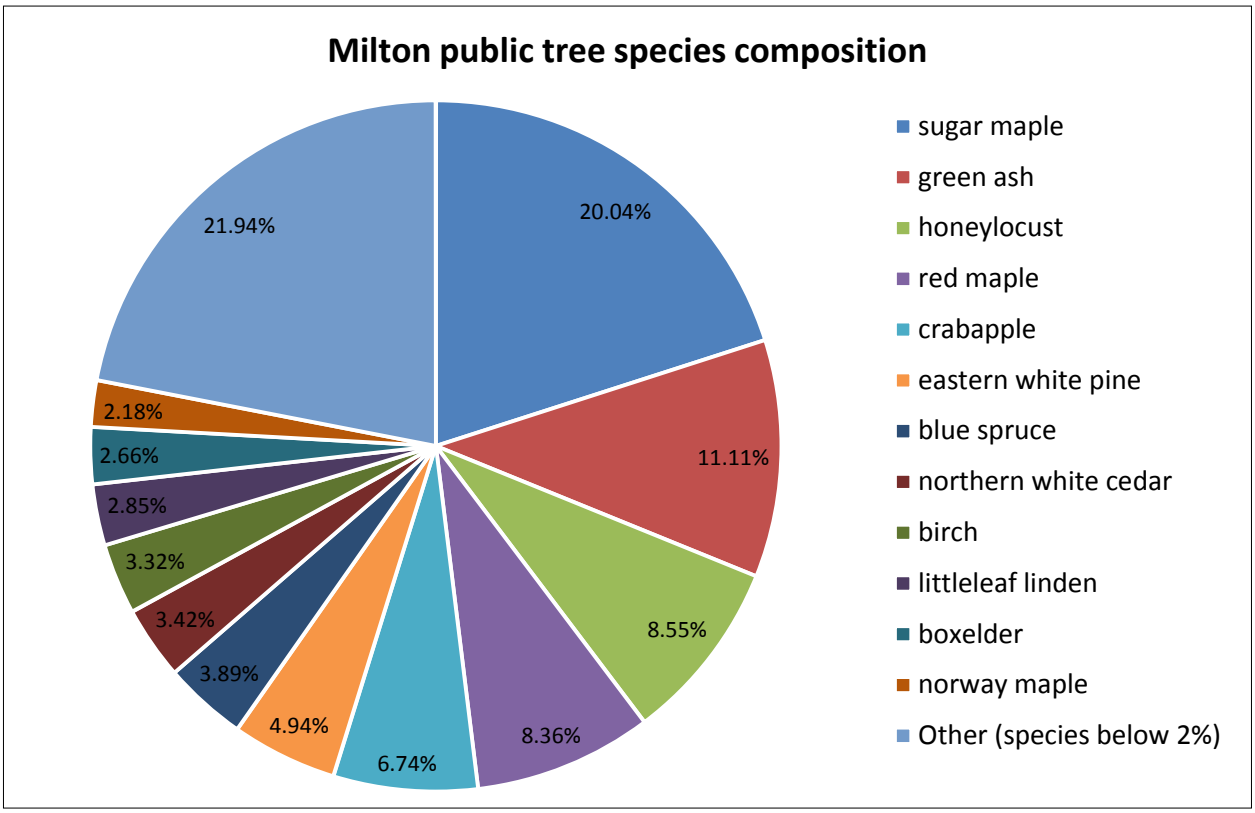


Figure 2. Most common species by percent within the public ROW of Milton.

Urban Forest Structure

In descending order by percent size class, the diameter distribution of the 1050 public trees represented by Milton's public trees is: 38% (398) at 6-12", 18% (185) at 3-6", 16% (170) at 12-18", 10% (104) at 18-24", 6% (59) at 0-3", 5% (55) at 24-30", 3% (36) at 30-36", 3% (32) at 36-42", and 1% (10) at 42"+ (Figure 3).

The composition of genera and species within each of these size classes (Figures 4 and 5) indicate that *Acer* (maple) is most commonly represented in all size classes. The three largest size classes represented, 30-36", 36-42", and >42" contain a total of 78 trees, dominated by *Acer* (maple). These trees are growing within the public ROW or on Town-owned land – the majority in the Milton Village Cemetery – and likely were not planted as street trees but left as remnants as the town grew.

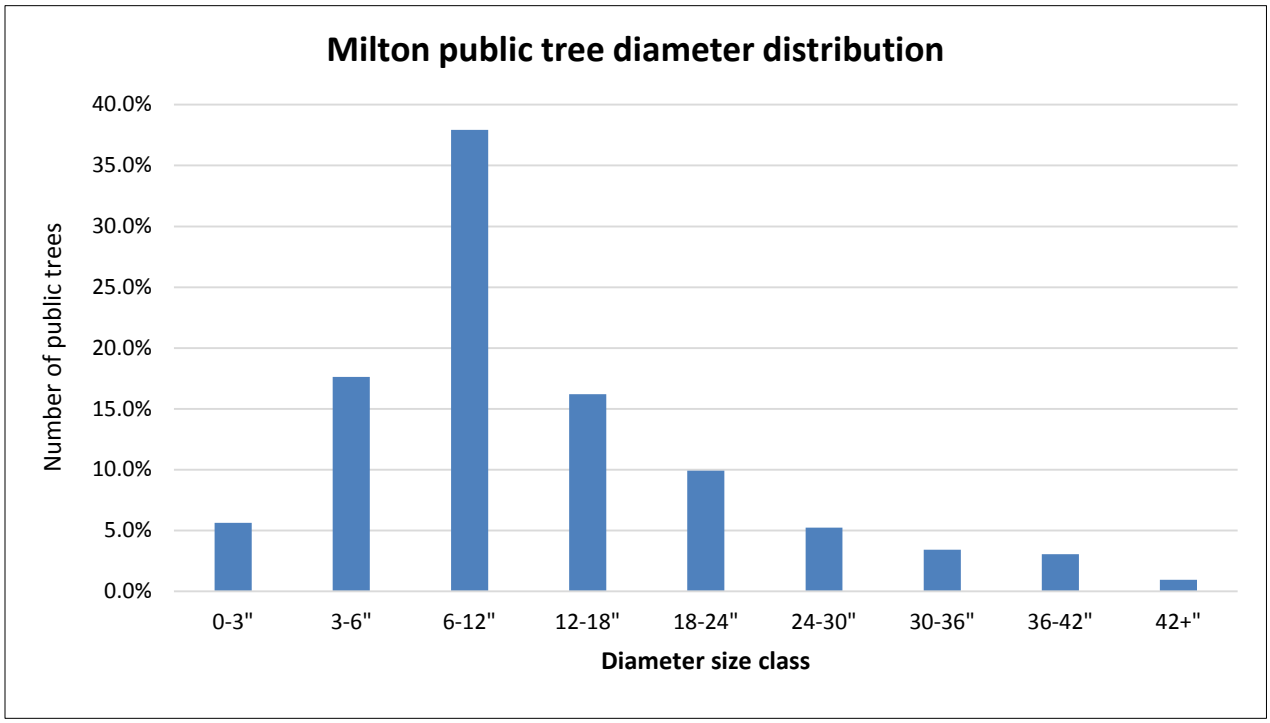


Figure 3. Percentage of trees represented in each diameter class (inches) in Milton's urban forest.

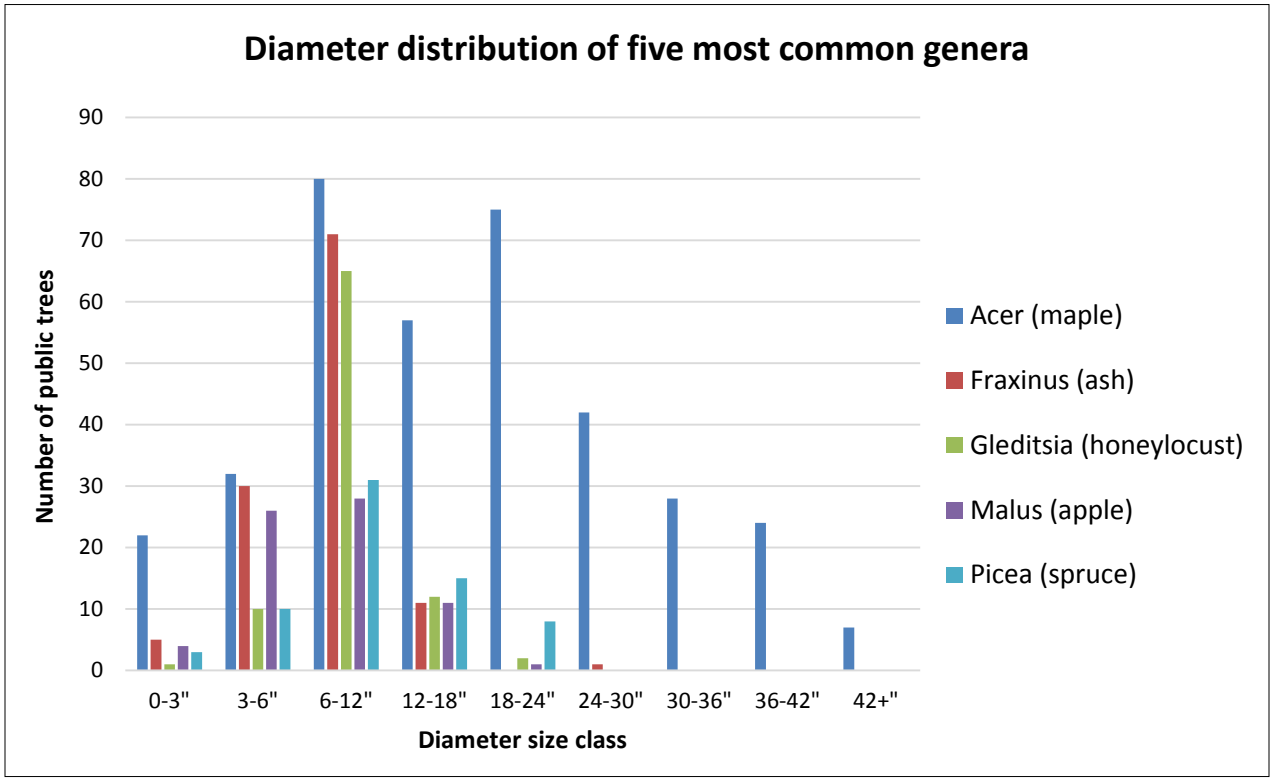


Figure 4. Diameter distribution for the five most common genera of Milton's public trees.

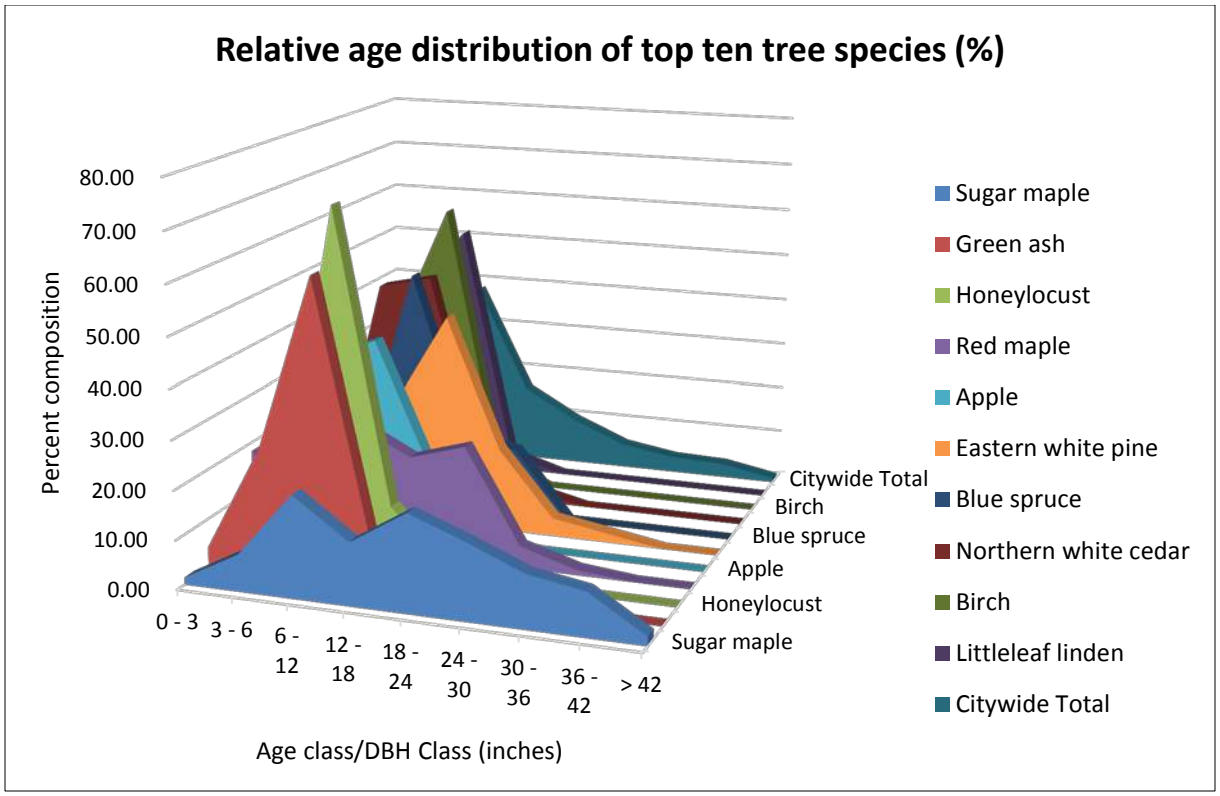


Figure 5. Diameter (and age) distribution of the ten most common species in Milton's urban forest. Data from this figure were derived from i-Tree Streets urban canopy structure output.

There were 535 potential tree planting locations or strips identified within the public ROW (recorded as "Vacant"); Appendix A breaks down these locations by street. Of the inventoried streets and sites, Railroad Street and Woodcrest Circle offer the most potential spots for tree planting. Additional consultation of these sites is necessary to plant a tree of appropriate size and species.

Urban Forest Health

More than three quarters (80%, or 844) of Milton's inventoried public trees were assessed as being in "Good" condition; of the remaining trees, (15%, or 160) were considered in "Fair" condition, (3%, or 36) were in "Poor" condition, and (1% or 13) were "Dead" (Figure 6). The trees in genera *Acer* (maple), *Fraxinus* (ash), and *Gleditsia* (honeylocust) had the most trees in fair or poor condition; however, these genera also comprise the highest percentage of overall trees inventoried. The dead trees that were identifiable were primarily *Acer* (maple) (Figure 7). Five of the dead trees are small and are located on Hilary

Lane; they were planted as part of a new housing development and did not survive their first season in the ground. Appendix D includes maps detailing the location of inventoried trees by condition.

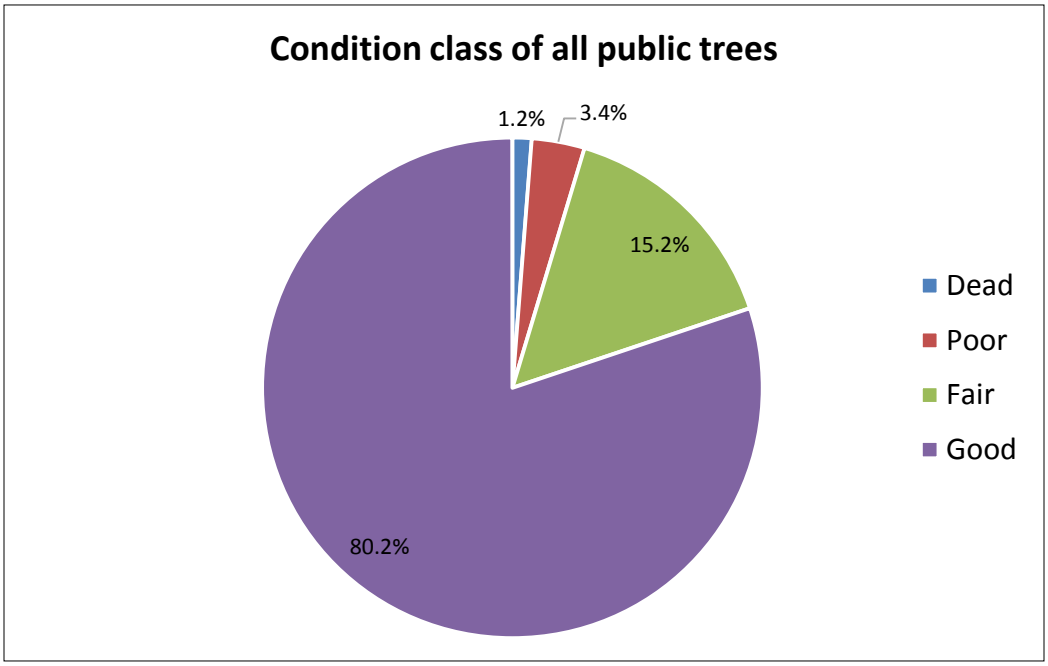


Figure 6. Milton public tree condition class distribution, by percent.

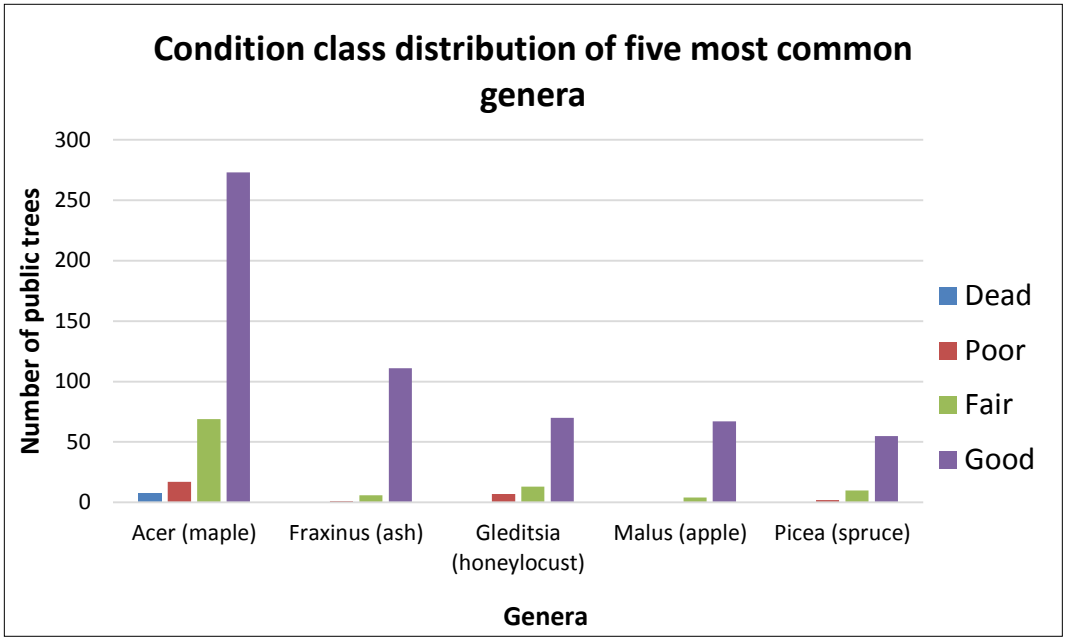


Figure 7. Number of trees within the five most common genera displayed according to condition.

There were 172 trees (16%) that were flagged to be monitored during the inventory and should be reassessed by Certified Arborist, the Milton Tree Warden, or another qualified individual in a timely matter. Trees that were flagged for monitoring expressed one or more of the following conditions:

- The tree had a visible defect affecting >40% of the tree,
- The tree posed a hazard to people/infrastructure/cars,
- The tree was growing into utility wires,
- The tree was dead or in poor condition, or
- The tree was an ash (*Fraxinus*) and was showing evidence of a sign or symptom of infestation by the emerald ash borer (extensive woodpecker flecking, bark blonding, epicormic branching/water sprouts, and/or suspicious exit holes).

Tree Health and Maintenance Indicators

Although Milton's public trees are generally healthy (80% assessed as in "good' condition), proper maintenance and monitoring is required to promote the health, longevity, and benefits of Milton's urban forest. To better understand the specific maintenance and monitoring needs of Milton's trees, VT UCF staff assessed the presence (or absence) of root issues and damage, mulch maintenance, and pruning needs (Figure 8).

Of the assessed health and maintenance characteristics, the need for pruning was most prevalent in Milton's urban forest, as it was observed in a quarter (25% or 261) of inventoried public trees. The second most prevalent health assessment in Milton's public trees was mulch maintenance (either removing mulch that was applied too heavily or against the trunk, or adding mulch to young trees) with 24% (248) presence. Finally, 8% (85) of Milton's public trees were observed to have root damage, which included mechanical damage, soil compaction, and stem girdling roots.

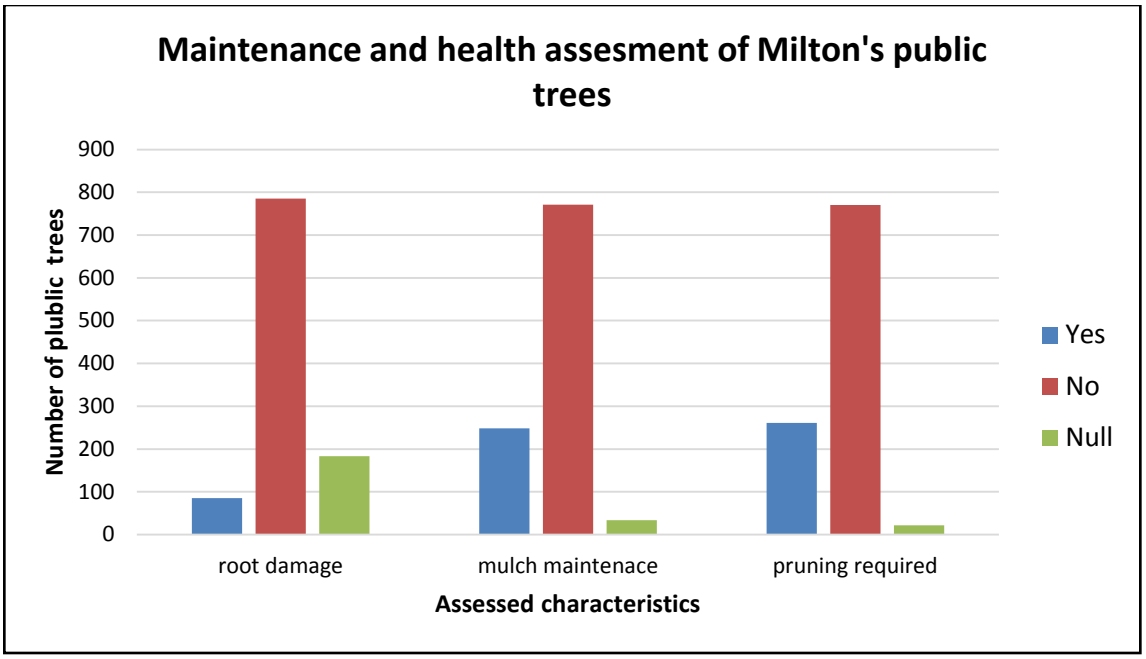


Figure 8. The number of Milton's inventoried public trees assessed as having presence or absence of town-specific maintenance and health characteristics. Null values represent the number of unassessed trees, and thus indicate user error. Refer to Table 1 for descriptions of each assessed characteristic.

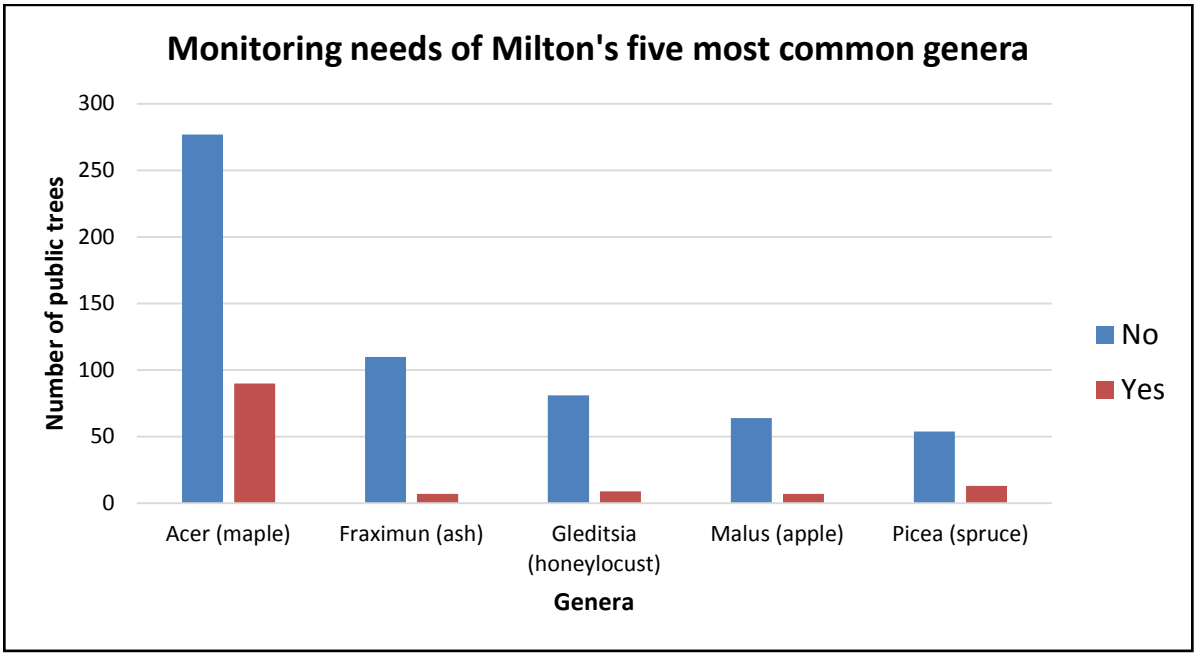


Figure 9. The number of Milton's inventoried public trees assessed to require monitoring (yes) within the town's five most common genera.

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Economic Benefit and Ecosystem Services

Milton's public tree inventory data was analyzed using the online tool i-Tree Streets to determine the monetary value of the ecosystem services provided by Milton's trees. The 1050 trees provide a total of $111,552 in annual benefits by filtering air pollutants, mitigating stormwater runoff, sequestering carbon dioxide (CO_2), conserving energy, and increasing property values. On average, each public tree offers $106 annually in savings or services.

Figure 10 and Table 2 provide an overview of each ecosystem service provided by Milton's public trees. Energy conservation and property value increase are the most significant services provided by these trees in terms of their monetary value. The full reports produced through the i- Tree Streets program for Milton are available from VT UCF upon request.

It is important to recognize that the trees inventoried through this project are located on approximately 3.3 square mile of Milton's 60.9 square miles of total land area; expanding the inventory to all Milton's roads would increase these figures dramatically. It is also noteworthy that larger and long-living trees provide substantially more benefits than young, small trees. Regular maintenance and care are needed to provide for public tree health, longevity, and maximized urban forest benefits.

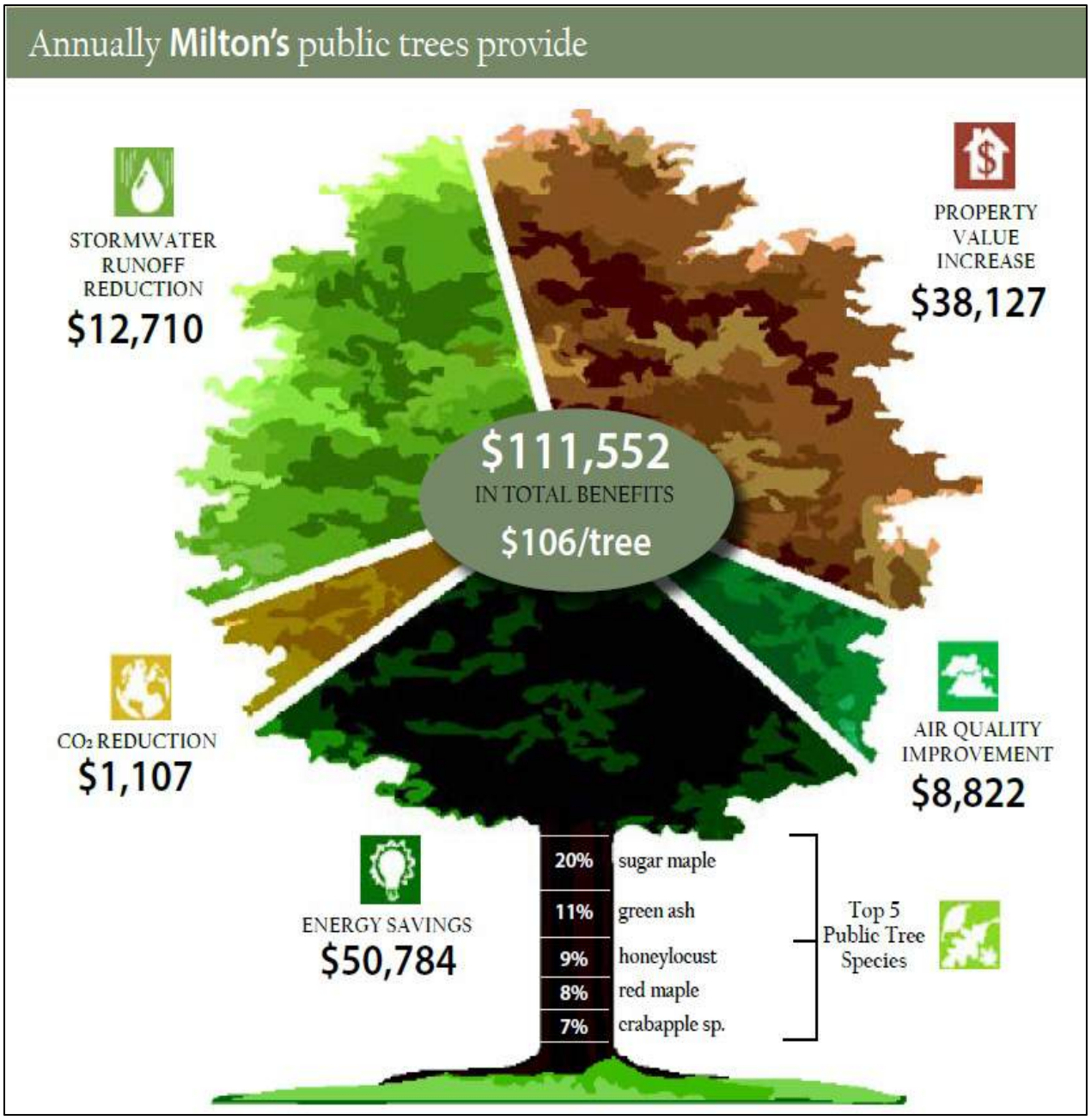


Figure 10. Summary of the benefits provided by Milton's public trees inventoried through this project, according to the i-Tree Streets assessment. Tree graphic concept courtesy of City of New York Department of Parks & Recreation.

Table 2. Annual environmental and monetary benefits provided by Milton's public trees.

Benefit Type	Benefit Description	Total Value of Trees Inventoried	Average Value/Tree
Energy conservation	Reduced natural gas use in winter and reduced electricity use for air conditioning in summer	$50,784	$ 48.00
Carbon dioxide	Annual reductions in atmospheric CO2 due to sequestration by trees and reduced emissions from power plants due to reduced energy use. The model accounts for CO2 released as trees die and decompose and CO2 released during the care and maintenance of trees.	$1,107	$ 1.05
Air quality	Quantifies the air pollutants (O3, NO2, SO2, PM10) deposited on tree surfaces and reduced emissions from power plants (NO2, PM10, VOCs, SO2) due to reduced electricity use. Also reported are the potential negative effects of trees on air quality due to BVOC emissions.	$8,822	$ 8.40
Stormwater	Reductions in annual stormwater run-off due to rainfall interception by trees.	$12,710	$ 12.10
Aesthetic/other	Tangible and intangible benefits of trees reflected in increases in property values.	$38,127	$ 36.31
Stored carbon dioxide	Tallies all of the carbon dioxide stored in the urban forest over the life of the trees as a result of sequestration; *not an annual benefit but a cumulative benefit.	$ 14,059*	$ 13.31*

Saving the Town an average of $50,784 annually in energy costs, Milton's urban forest's most significant analyzed economic benefit is energy conservation (Figure 10). The greatest energy cost savings from the Town's public trees is in the form of natural gas (versus electricity). Of all Milton's inventoried species, white ash and silver maple provide the greatest net annual reduction in energy costs (Figure 11). This is likely because, based on their size class representation in Milton, per tree these species have the greatest leaf area (ft^2, Appendix C) of all inventoried species, and thus provide the most shade and temperature regulation. Furthermore, the ten most beneficial energy conservation species are broad leaved (Figure 11), as their leaf area likely maximizes shade and energy regulation compared to needle-leaved species. It is important to note, however, that these values are derived from species, diameter class (inches), and condition class inventory data. White ash and silver maple are not represented in great numbers in Milton (1 and 13 inventoried, respectively) but per tree, their energy savings potential is great and should be noted for future tree planting projects.

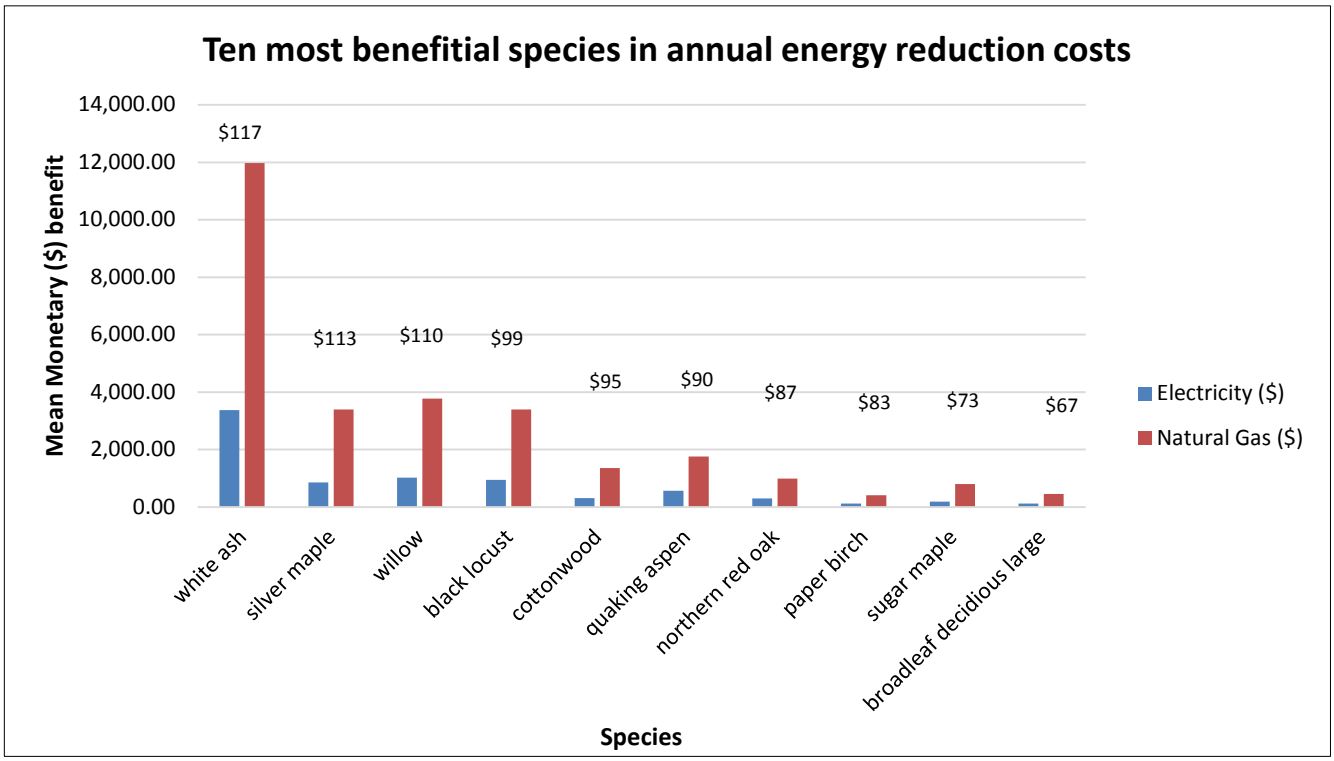


Figure 11. The average monetary value of the ten most beneficial species in annual energy reduction costs in Milton's urban forest. The monetary values located above each species' bar represents the average annual energy reduction benefit ($) per tree. Monetary values were derived from tree species, diameter (inches), and condition inventory data through i-Tree Streets' urban canopy benefits output.

Of all the species inventoried in Milton's urban forest, silver maple trees provide the greatest net annual reduction in stormwater costs of about $38 per tree (Figure 12). Only 13 silver maple trees were included in Milton's public tree inventory, so this relatively high monetary stormwater reduction benefit is attributable to their large size, 70% (9) trees (24-42+" in diameter) and healthy condition. Broadleaved evergreen species of large mature character and willow, the second and third most beneficial species in annual stormwater reduction costs, save about $34 and $32 per tree each year. Of the ten most beneficial species to reducing Milton's annual stormwater runoff, seven are deciduous trees and only three are coniferous (Figure 12).

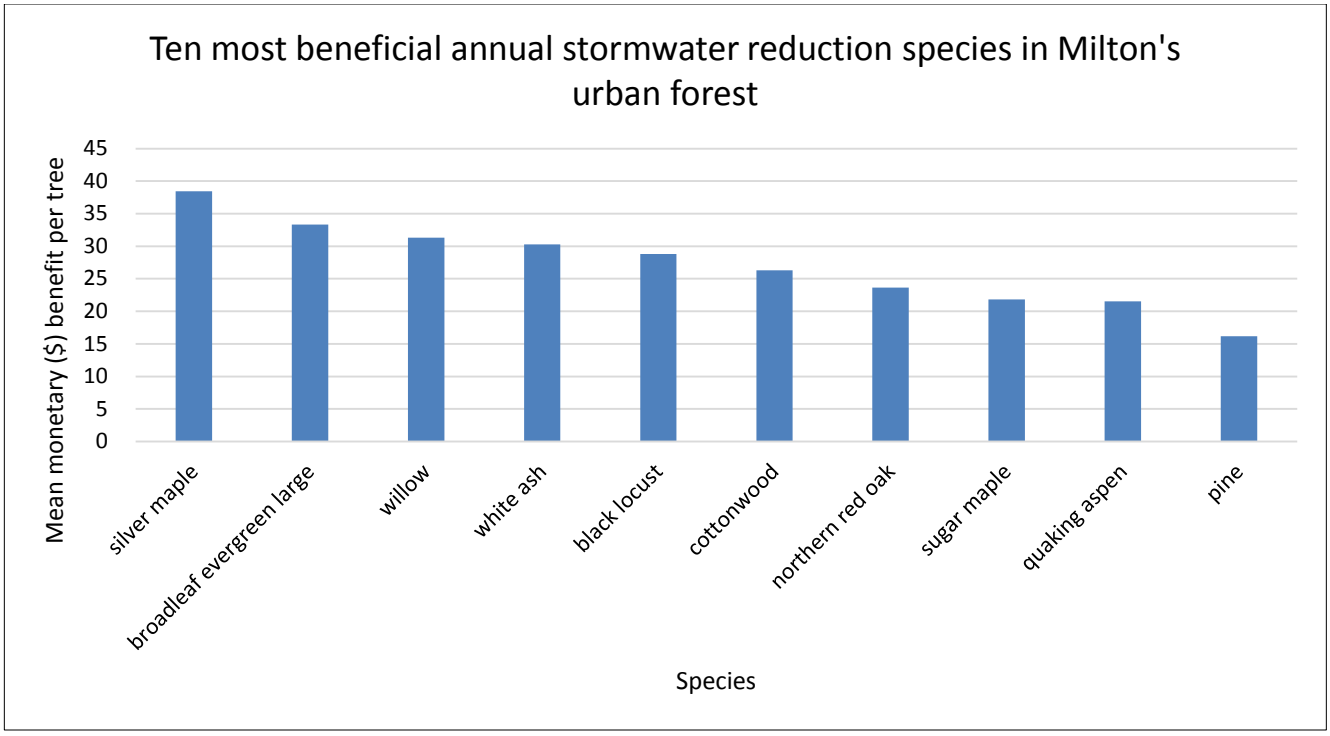


Figure 12. The average annual monetary value of the ten most beneficial stormwater reduction tree species in Milton's urban forest. Monetary values were derived from tree species, diameter (inches), and condition inventory data through i-Tree Streets' urban canopy benefits output.

Milton Full Canopy Assessment

As a complement to the public tree inventory, an i-Tree Canopy assessment for Milton was completed. i-Tree Canopy is a free, easy-to-use online application that allows users to assess

total tree cover over an area based on randomly generated map points and user-defined land cover types. The tool also assigns dollar values to the benefits associated with the overall tree canopy cover. The aim of this type of assessment is to help citizens and decision-makers better understand the existing and potential tree canopy in their community. Based on the Milton's i-Tree Canopy assessment, approximately 44% of the public tree inventory area of Milton is currently occupied by tree canopy (Figures 13 and 14). Currently 7% of the total area is occupied by buildings, and is not suitable for tree planting. In consideration of the other land cover types present, Milton could potentially increase its total tree canopy cover by an additional 31% on open lands of low-lying vegetation, and 4% on agricultural lands. The remaining 11% is impervious surface (parking lots, playgrounds, roads, sidewalks), but with strategic planning initiative, some of this could be converted to canopy. In total, there is currently potential to increase overall tree canopy cover in Milton by 46%, though a portion of this land is privately-owned and/or used for other purposes such as agriculture (Figure 13).

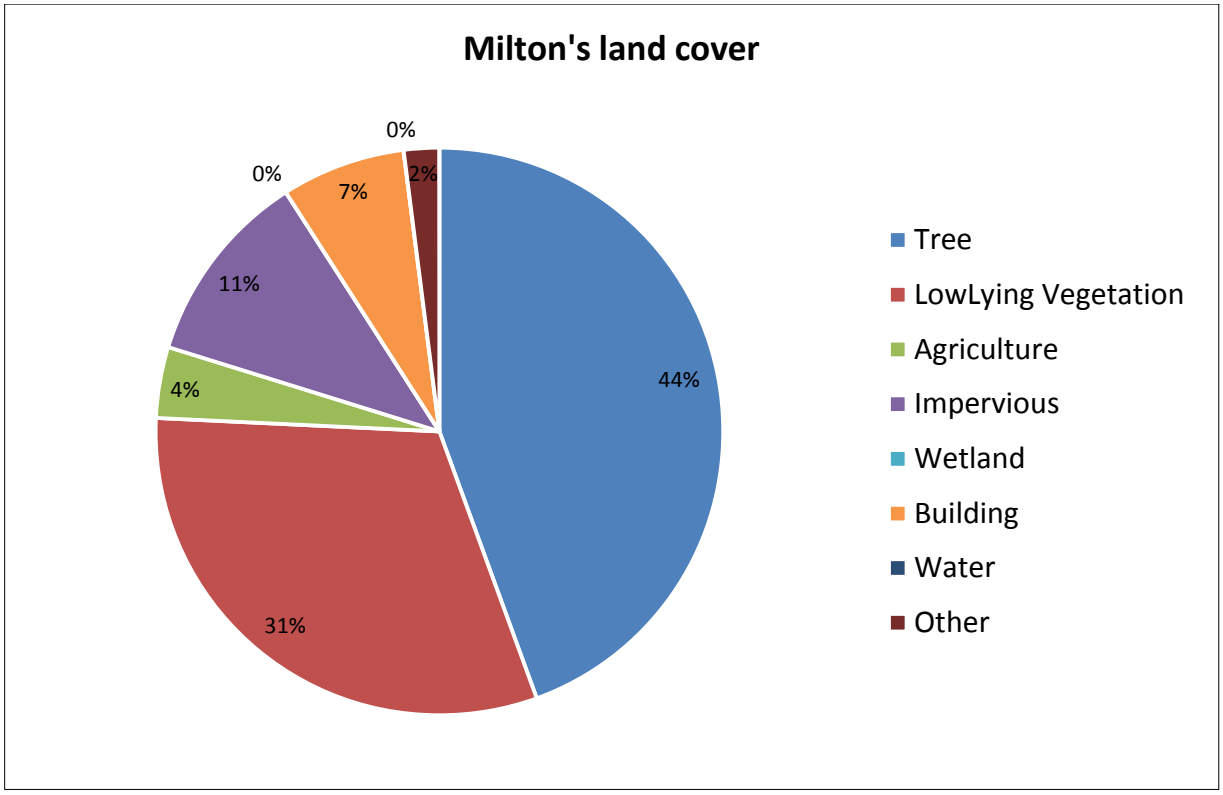
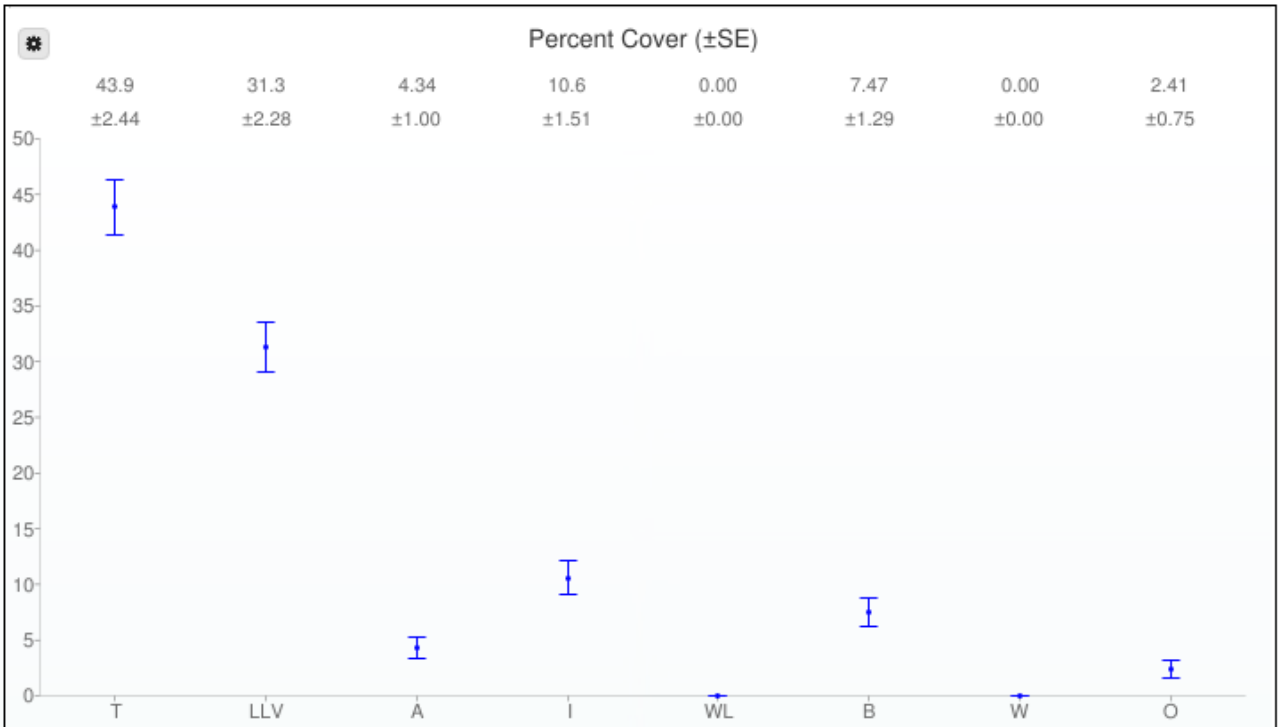


Figure 13. Land cover of Milton (includes public and private land).



Cover Class	Description	Abbr.	Points	% Cover
Tree	Tree, non-shrub	T	182	43.9 ±2.44
Low Lying Vegetation		LLV	130	31.3 ±2.28
Agriculture		A	18	4.34 ±1.00
Impervious		I	44	10.6 ±1.51
Wetland		WL	0	0.00 ±0.00
Building		B	31	7.47 ±1.29
Water		W	0	0.00 ±0.00
Other		O	10	2.41 ±0.75

Figure 14. i-Tree Canopy assessment for the area of Milton, Vermont, including both public and private land. The above image shows the ground cover composition distribution.

Figure 15 (below) compliments the i-Tree Streets analysis of the monetary value of benefits provided by Milton's public trees by estimating the air quality benefits and corresponding monetary value for the full urban forest canopy. Of note is an estimated $3,777,315.44 in long-term CO_2 storage and $149,797.55 in annual CO_2 sequestration value.

Tree Benefit Estimates

Abbr.	Benefit Description	Value	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$31.74	±1.76	748.81 lb	±41.59
NO2	Nitrogen Dioxide removed annually	$54.65	±3.04	2.04 T	±0.11
O3	Ozone removed annually	$2,845.97	±158.07	20.33 T	±1.13
PM2.5	Particulate Matter less than 2.5 microns removed annually	$5,883.14	±326.76	1,976.00 lb	±109.75
SO2	Sulfur Dioxide removed annually	$9.55	±0.53	1.29 T	±0.07
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$2,066.10	±114.75	6.81 T	±0.38
CO2seq	Carbon Dioxide sequestered annually in trees	$149,797.55	±8,319.99	4,140.10 T	±229.95
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,777,315.44	±209,798.06	104,384.72 T	±5,797.69

Figure 15. i-Tree Canopy assessment estimates for air quality benefits of Milton full canopy.

Discussion and Recommendations

Milton's Public Tree Program

Milton's participation in the *Care of the Urban Forest* demonstrates that there is local capacity and desire to enhance the community's public tree program. Milton's Selectboard has been supportive of the Town's participation in the *Care of the Urban Forest Project* and the involvement of key Town staff from the Planning and Economic Development Department demonstrate that there is capacity to enhance the community's public tree program. The 2015 public tree inventory and this report lay a foundation for better understanding the management needs and value of Milton's public trees, as well as the ways in which residents and town leadership can be engaged for tree stewardship.

Recommendations

We recommend that Milton consider the following points to continue to develop its public tree program:

- Develop a public tree management plan or action plan based on this inventory report to prioritize goals and establish a timeline for Milton's public tree program.
- Encourage the formation a Milton Tree Committee or Board to coordinate and implement the town's tree program

- Advocate for an explicit and regular annual budget for maintenance, planting, and removal of Milton public trees.
- Encourage citizens to participate in tree planting and other stewardship activities; particularly because of the significant populations of trees in the *Acer* (maple) and *Fraxinus* (ash) genera, residents should be aware of the signs and symptoms of emerald ash borer (EAB) and Asian long horned beetle (ALB) and empowered to monitor for these invasive forest pests.
- Plan for the arrival of EAB by developing a community invasive forest pest preparedness plan; this process will inform future planning efforts for other threats to the urban forest.
- Ensure that those who are caring for Milton's public trees are trained in best tree care practices. All public trees should be structurally pruned to promote long-term integrity, newly-planted trees should be irrigated to promote proper establishment, mulch should be applied properly, and mechanical and compaction damage should be minimized during any construction or regular maintenance activities.
- Establish a routine and systematic pruning cycle (multi-year) for all public trees to reduce the occurrence of branch failures due to poor structure, minimize conflicts with people and infrastructure, improve lines of sight, reduce storm damage, and protect public safety.
- Communicate about the benefits of Milton's public trees at local events and to local leadership, and encourage citizen participation in VT UCF educational programming, such as the Stewardship of the Urban Landscape course, our winter webinar series, the annual VT Tree Stewards Conference, and the Forest Pest First Detector trainings.
- Encourage residents to plant trees on their private property to increase diversity, overall canopy cover, and the benefits provided by trees in Milton.

Urban Forest Diversity and Structure

An important best management practice in urban forestry is to maintain a diverse range of species. It is recommended that communities work towards a goal of no more than 20%

representation of a single genus (for example, *Acer*) in a tree population and no more than 10% of one species (for example, *Acer saccharinum*). Resistance to disease and insect infestation is one of the many reasons that diversity of public trees is of paramount concern. A more diverse urban forest is more resistant to environmental stressors, and can therefore remain healthy and resilient in the face of change. Furthermore, by maintaining a greater diversity a community can prevent a rapid loss of canopy due to insect and disease issues.

In Milton, 35% of public trees inventoried were in the maple (*Acer*) genus, which is almost double the recommended representation within the community's urban forest. Specifically, sugar maple, red maple, and Norway maple – all members of the *Acer* genus - represent 20%, 8%, and 2% of the species diversity respectively. Ash trees (*Fraxinus*) make up 11% of the public tree canopy of Milton. Both ash and maple trees are currently threatened by invasive tree pests; EAB and ALB, respectively.

Components of a Managed, Vibrant, and Resilient Public Tree Program

A successful urban forestry program requires a combination of organized leadership, comprehensive information about the tree population, dedicated personnel, and effective public relations. We recommend the following components for successful urban forest management.

Public Policies: A tree ordinance or policy provides authority for conducting forestry programs, defining municipal responsibility for public and private trees, passing regulations and setting minimum standards for urban forestry management.

Leadership: Define who is responsible for the oversight of the urban forest, including formulating policies, advising, administration, management, representation and/or advocacy.

Partnerships: A well-managed urban forest takes the work of many. Seek strategic partnership to meet a shared vision. At a minimum the tree warden, a local advisory committee like a tree board or conservation commission and municipal staff (parks, roads, planning) should collaborate.

Responsibility: A clear understanding of which trees and areas will be managed is an important first step. Street trees, parks and village greens, cemeteries and schools are typical areas of municipal responsibility.

Assessment: A complete public tree inventory, including tree locations, species, condition, and management needs provides the necessary information to manage the resource. An inventory is the foundation to developing a strategic management plan.

Management Plan: A management plan provides a vision for the long-term management of the urban forest. It should include strategies, budgets, and responsibilities for meeting that vision.

Staffing: The care of urban forest requires a certain skill set that can be found in-house with professional staff or through consultants. Whether creating a staff position for a certified arborist or urban forester, or contracting with them on an as-needed basis, professional assistance will have some of the greatest and most immediate impacts on a community forestry program.

Tree Canopy Goals: Consider a community's entire tree canopy to reduce loss and maximize gains over time by protecting undeveloped forest and impacts of land development, enhance the health condition and function of forests, and reforest through active replanting or allowing regeneration

While neither of these pests has been discovered to-date in Vermont, the largest ALB infestation in North America is just over 50 miles to our south in Worcester, MA and with the discovery of EAB in New Hampshire in 2013, Vermont is now surrounded on all sides by states or provinces with isolated infestations of EAB. High density stands of *Acer* (maple) species were found particularly at the Milton Village Cemetery, the elementary school, and Bombardier Road. A map of the distribution of *Fraxinus* (ash) trees is included in Appendix E; most are located on Main Street, Stacy Street, and Ellison Street.

Over 70% of the inventoried public trees are 3-18" in diameter, indicating an overwhelmingly young tree population. The context of Milton's rural, farming history and the recent decades of increased development in town may provide insights as to the absence of large, mature shade trees; those that do exist in town are concentrated in the Milton Village Cemetery, on Main Street, and in parks or schoolyards in town. There have been street tree plantings in conjunction with new housing developments in Milton, such as on Hilary Lane, Ellison Street, and Stacy Street, but it is important to note that these areas also have high concentrations of monocultures, such as on Edward Street where nearly every tree is either a honeylocust or a green ash.

Recommendations:

We recommend that Milton continues to develop and promote the species and structural diversity of its urban forest by:

- Planting new species and increasing the number of lesser represented species in order to promote long-term health and resilience of individual trees and Milton's overall tree population. Refer to VT UCF's online Tree Selection Guide at vtcommunityforestry.org/resources/tree-care/tree-selection.
- Selecting non-maple trees for future plantings, due to the high number of existing maple (*Acer*) trees in Milton.
- Regularly monitor existing ash (*Fraxinus*) trees for signs and symptoms of EAB. Further, do not plant any new ash trees.
- In new residential and commercial developments in Milton, focus on species diversity.

- Acknowledge that there is no lack of available space within the public ROW in Milton to plant trees, and that potential to increase overall canopy cover is great. Refer to the list of 535 identified potential tree planting locations ("vacant" spots) within the public ROW in Appendix A to strategically increase tree species and structural diversity in Milton.
- Promote the health and long-term structural integrity of Milton's young urban forest by adopting a plan to structurally prune public trees before they reach maturity.
- Plan for the arrival of EAB by using the Community Preparedness Toolbox, available at http://www.vtinvasives.org/tree-pests/community-preparedness.
- Encourage citizens to participate in the Vermont Forest Pest First Detector Training to expand local capacity to identify and monitor for invasive forest pests.
- In planning for future tree plantings, consider obstructions above ground (power lines) and below ground, grey infrastructure conflicts (sidewalks, streets, buildings, etc.) available soil volume, species mature size (height and spread), branching patterns, environmental tolerances (exposure, salt, and drought), and desired function when choosing species.
- Encourage residents to plant trees on their private properties to increase species diversity, age structure, and overall tree canopy benefits to the community.

Urban Forest Health

Overall, Milton appears to have a healthy population of public trees, and dedicated maintenance and care would further increase the health of the urban forest. Approximately 18% (196) of Milton's public trees were either considered to be in "Fair" or "Poor" condition and 13 trees were designated to be "Dead". There were 172 trees flagged to be revisited and monitored by a Certified Arborist, the Milton Tree Warden, or another qualified individual. Many of these trees overlap those designated to be in "Poor" condition or "Dead", and others were likely noted because of conflict with utility wires or other infrastructure. See Appendix D for a map detailing the locations of trees in Milton by condition and a map indicating the location of the 172 trees in need of monitoring.

Low soil volume and fertility, exposure to road salt spray, root damage, mechanical damage to the stem, poor pruning, and improper planting are some of the contributing factors that may lead to decreased tree health in an urban setting. The full inventory data spreadsheet, with specific comments associated with the 172 trees requiring monitoring will be given to the main contacts for this project; some recurring themes from these comments are presented in the recommendations below.

Recommendations:

In order to ensure the long-term health and vibrancy of Milton's public trees, we recommend the following activities:

- Prioritize the monitoring of the 172 trees (which include the 13 dead trees) that are in need of monitoring by a Certified Arborist or the Milton Tree Warden.
- Develop a plan to remove – and replace, if appropriate – the 13 dead public trees in Milton in a timely fashion.
- Work with Public Works employees and other staff who are regularly working within the public ROW and on Town-owned properties in Milton to encourage a culture of continual monitoring of the public trees.
- Assign one Milton staff member to be in charge of updating the tree inventory spreadsheet as necessary as regular tree maintenance and monitoring occurs in Milton.
- Establish and implement a consistent pruning cycle, with special attention to trees growing around power lines.
- Address the maintenance needs identified in this inventory report: remove mulch that has been mounded against the trunk of trees or applied too deep, apply mulch for young trees or trees with evidence of repeated mechanical trunk injuries, and address pruning needs and recommendations.
- Connect Milton residents with trees in their yards to VT UCF or other organizations that educate about proper tree and plant care.

Assessment Tools

Using free i-Tree software developed by the USDA Forest Service, we were able to assess the value and potential expansion of Milton's urban tree canopy. i-Tree Streets allowed us to determine the economic value of the ecosystem services provided by the 1050 inventoried trees in Milton. Milton's urban forest generates about $111,552 annually through the benefits of air quality improvement, carbon storage, electricity and natural gas, aesthetics, and storm water control; on average, each tree offers approximately $106 in service or savings every year. The trees of Milton provide services to the town in the following ways:

- **Aesthetics**: Urban trees can make an urban or suburban environment a more pleasant and satisfying place to live, work, and spend leisure time (Dwyer et al. 1991[2]). In monetary terms, presence of shade trees can significantly increase property value. There are also numerous health benefits to trees. For example, hospital patients with window views of trees have been shown to recover faster than patients without such views (Ulrich 1984[3]).
- **Air quality**: Trees improve air quality by removing air pollutants through their leaves, altering emissions from building energy use, and by lowering air temperature.
- **Energy use**: Trees influence thermal comfort and energy use by providing shade, transpiring moisture, and reducing wind speeds, mitigating the need for heating of buildings in the winter and cooling in the summer.
- **Stored Carbon Dioxide**: Trees store carbon in their tissues as they accumulate biomass over time; an estimated 770 million tons of carbon, valued at $14.3 billion, is stored in the public forests in the contiguous United States store 770 million tons of carbon, (Nowak and Crane 2002[4]). Trees also mitigate greenhouse gas emissions by sequestering

[2] Dwyer, J.F., H. W. Schroeder, and P. H. Gobster. (1991). The significance of urban trees and forests: toward a deeper understanding of values. *Journal of Arboriculture,* 17: 276-284.

[3] Ulrich, R.S. (1984). View through a window may influence recovery from surgery. *Science*, 224:420-421.

[4] Nowak, D.J.; D. E. Crane. (2002). Carbon storage and sequestration by urban trees in the USA. *Environmental Pollution* 116(3): 381-389.

carbon dioxide through the process of photosynthesis.

- **Storm water run-off**: Trees and soil improve water quality and reduce costs associated with stormwater treatment by retaining or slowing flow of precipitation.

Using a random sample method and based on assessing land cover types, i-Tree Canopy allowed us to measure the overall tree canopy cover within the boundaries of the inventory area, capturing both private and public tree canopy.

Recommendations:

We recommend that Milton explore the results of the two i-Tree assessments detailed in this report and:

- Use the information generated through i-Tree Streets and i-Tree Canopy to promote the understanding of tree benefits and the investment in urban forest management and local stewardship.
- Explore the other free assessment tools in the i-Tree tools suite (www.itreetools.org).

Conclusion

Trees in our urban landscapes contribute to environmental integrity, social cohesiveness, economic activity, cultural heritage, and overall well-being. This report is one component of a long-term effort by the Town of Milton to understand, manage, and steward its urban forest. The recommendations outlined in this report are based on observations and data analysis combined with the experience and evaluation of VT UCF staff; they should considered by Milton Selectboard, Town leadership, and Town staff based on long-term vision and current capacity. Looking ahead, the Town of Milton should focus efforts on maintaining the quality of the urban trees. With improved monitoring, the potential for a healthy, sustainable urban forest is attainable.

Appendices

Appendix A: Full Street and Site List for the Milton's Public Tree Inventory

Street/site name	ROW Extent (feet)	Number of Trees	Number of Vacant Spots or Strips
Arrowhead Avenue	49.5	20	4
Baker Lane	49.5	5	0
Barnum Street	49.5	0	7
Beaver Brook Road	60	2	6
Birch Lane	60	8	3
Bombardier Road	49.5	66	14
Bradley Street	60	30	29
Brandy Lane	60	4	2
Center Drive	60	2	0
Checkerberry Square	60	0	2
Cherry Street	49.5	8	3
Chrisemily Lane	60	4	3
Country Lane	60	0	3
Doris Drive	60	4	3
Duck Court	60	2	8
Edward Street	60	63	0
Ellison Street	60	69	2
Emile Drive	60	3	3
Field Ridge Drive	60	0	5
Greenspace	n/a	281	8
Griswold Drive	60	1	7
Hemlock Road	60	26	18
Herrick Avenue	49.5	4	2
Hilary Lane	60	22	0
Hobbs Road	49.5	1	1
Johnsons Court	49.5	3	2
Kienle Road	49.5	10	0
Kingsbury Crossing	49.5	8	0
Kingburry Road	49.5	8	0
Kingswood Drive	60	0	6
Lamoille Terrace	From end (W) to intersection with Riveside Drive: 49.5';from Riverside Drive to River Street (E) 60'	19	33
Landfill Road	49.5	6	0
Mackey Street	49.5	13	1
Main Street	66	50	0
Maplewood Avenue	60	34	11
McMullen Road	49.5	14	19

Meadow Lane	60	4	23
Middle Road	66	2	13
Pinewood Lane	60	6	0
Railroad Street	66	46	60
Raspberry Ct	60	16	15
Riverside Drive	49.5	7	13
Route 7	66	41	41
Rugg Avenue	49.5	18	10
Russell Circle	60	11	8
Sammanikki Circle	60	0	3
School Street	49.5	2	13
Shirly avenue	49.5	1	1
Stacy Street	60	56	4
Strawberry Lane	60	6	32
Turner Avenue	49.5	1	23
Vernon Circuit	60	3	1
Village Drive	60	1	0
Villemaire Lane	60	5	2
Whisper Lane	60	4	13
Woodcrest Circle	60	28	54
Woods Court	49.5	5	1
The following streets were either inventoried and had zero trees located within its public ROW, or were not inventoried due to time restraints and should be revisited in future inventories: Middle Road, Moss End Drive, Sawmill Road, Barlett Road, W. Milton Road/Mayo Road, Legion Rd., Racine Rd., Nancy Drive, Haydenberry Lane, Rebecca Lander Drive, Ritchie Avenue, Sunset Avenue, North Road, Quarry Lane, East Road, and Winter Lane.			

Appendix B: Full Species and Genera List for Milton's Public Trees

Common Name	Scientific Name	Number of Trees	Percent of Total Population
Sugar maple	*Acer saccharum*	211	20.04%
Green ash	*Fraxinus pennsylvanica*	117	11.11%
Honeylocust	*Gleditsia triacanthos*	90	8.55%
Red maple	*Acer rubrum*	88	8.36%
Crabapple	*Malus sp.*	71	6.74%
Eastern white pine	*Pinus strobus*	52	4.94%
Blue spruce	*Picea pungens*	41	3.89%
Northern White Cedar	*Thuja occidentalis*	44	4.18%
Birch	*Betula sp.*	35	3.32%
Littleleaf linden	*Tilia cordata*	30	2.85%
Boxelder	*Acer negundo*	28	2.66%
Norway maple	*Acer platanoides*	23	2.18%
Serviceberry	*Amelanchier canadensis*	20	1.90%
Norway spruce	*Picea abies*	20	1.90%
American basswood	*Tilia americana*	20	1.90%
Black locust	*Robinia pseudoacacia*	19	1.80%
Northern red oak	*Quercus rubra*	16	1.52%
Silver maple	*Acer saccharinum*	13	1.23%
Quaking Aspen	*Populus tremuloides*	11	1.04%
Broadleaf Deciduous Large	Broadleaf	11	1.04%
American elm	*Ulmus americana*	10	0.95%
Broadleaf Deciduous Medium	Broadleaf	7	0.66%
Cottonwood	*Populus deltoides*	7	0.66%
Pine oak	*Quercus sp.*	6	0.57%
Japanese tree lilac	*Syringa reticulata*	6	0.57%
Conifer Evergreen Large	*Conifer sp.*	5	0.47%
Maple	*Acer sp.*	4	0.38%
Cherry Plum	*Prunus cerasifera*	3	0.28%
Pine	*Pinus sp.*	3	0.28%
Broadleaf Deciduous Small	Broadleaf	3	0.28%
Black walnut	*Juglans nigra*	3	0.28%
Red spruce	*Picea rubens*	3	0.28%
Juniper	*Juniperus sp.*	3	0.28%
Pear	*Pyrus sp.*	3	0.28%
Spruce	*Picea sp.*	2	0.19%
Ginkgo	*Ginkgo sp.*	2	0.19%
Red cedar	*Juniperus virginiana*	2	0.19%
Broadleaf Evergreen Large	Broadleaf	2	0.19%

Willow	*Salix sp.*	2	0.19%
Plum	*Prunus sp.*	2	0.19%
Balsam fir	*Abies balsamea*	2	0.19%
Elm	*Ulmus sp.*	2	0.19%
Austrian pine	*Pinus nigra*	1	0.09%
White spruce	*Picea glauca*	1	0.09%
Paper birch	*Betula papyrifera*	1	0.09%
White ash	*Fraxinus americana*	1	0.09%
Common chokecherry	*Prunus virginiana*	1	0.09%
Sumac	*Rhus sp.*	1	0.09%
Horsechestnut	*Aesculus hippocastanum*	1	0.09%
Catalpa	*Catalpa sp.*	1	0.09%
Northern hackberry	*Celtis occidentalis*	1	0.09%
Hawthorn	*Crataegus sp.*	1	0.09%

Appendix C: Leaf Area and Canopy Cover by Species Comprising Milton's Urban Forest

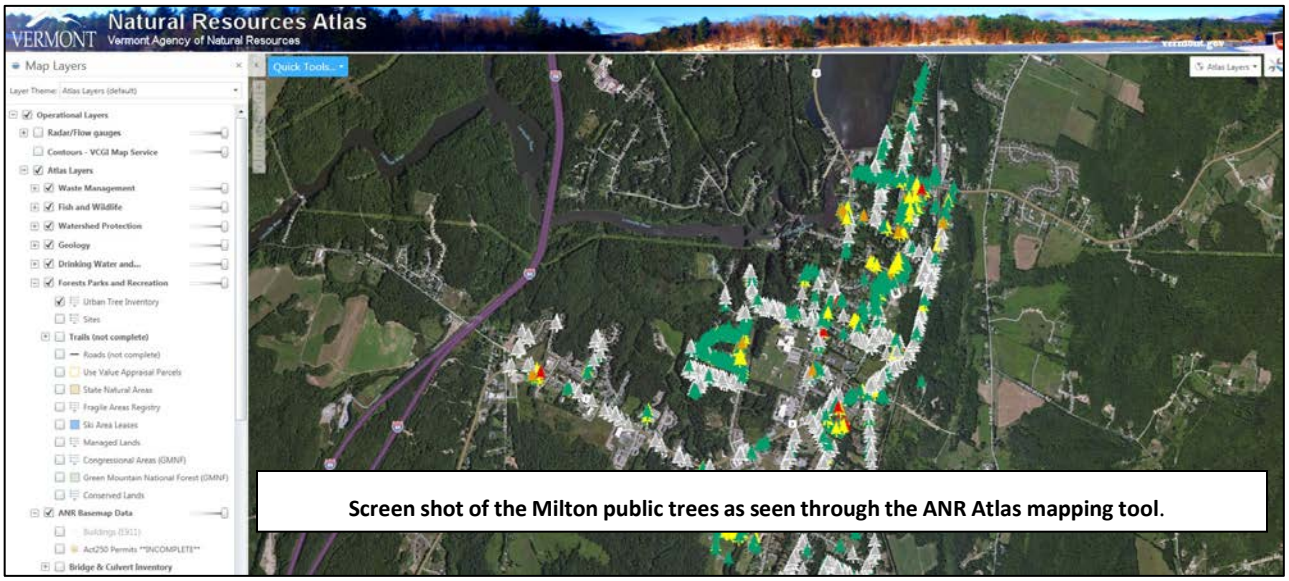
Species	Number of Trees	% of Total Trees	Leaf Area (ft2)	% of Total Leaf Area	Canopy Cover (ft2)	% of Total Canopy Cover
Sugar maple	211	19.98	1,070,059.55	41.75	236,248.36	31.39
Green ash	117	11.08	153,531.76	5.99	53,806.85	7.15
Honeylocust	90	8.52	152,662.34	5.96	67,167.61	8.92
Red maple	88	8.33	205,843.98	8.03	62,031.42	8.24
Apple	71	6.72	42,608.63	1.66	19,583.00	2.6
Eastern white pine	52	4.92	84,491.20	3.3	34,776.96	4.62
Blue spruce	41	3.98	49,227.92	1.92	19,302.96	2.56
Northern white cedar	44	3.6	10,054.34	0.39	7,333.73	0.97
Birch	35	3.31	49,369.30	1.93	12,144.52	1.61
Littleleaf linden	30	2.84	22,627.70	0.88	7,073.89	0.94
Boxelder	28	2.65	75,769.80	2.96	28,930.71	3.84
Norway maple	23	2.18	29,456.03	1.15	14,018.08	1.86
American basswood	20	1.89	56,094.75	2.19	15,364.93	2.04
Serviceberry	20	1.89	3,556.32	0.14	2,464.45	0.33
Norway spruce	20	1.89	26,605.89	1.04	10,618.16	1.41
Black locust	19	1.8	120,769.36	4.71	32,857.80	4.37
Northern red oak	16	1.52	69,703.79	2.72	25,140.27	3.34
Silver maple	13	1.23	107,332.13	4.19	27,171.13	3.61
American elm	11	1.04	21,515.37	0.84	5,842.61	0.78
BDL OTHER	11	1.04	26,745.35	1.04	9,100.70	1.21
Quaking aspen	11	1.04	50,115.57	1.96	15,016.94	2
BDM OTHER	10	0.95	16,225.91	0.63	4,364.35	0.58
Cottonwood	7	0.66	40,467.51	1.58	11,133.83	1.48
BEM OTHER	7	0.66	6,573.67	0.26	2,808.73	0.37
Pin oak	6	0.57	14,281.60	0.56	4,808.61	0.64
Japanese tree lilac	6	0.57	905.61	0.04	585.42	0.08
Eastern red cedar	5	0.47	894.54	0.03	674.99	0.09
CEL OTHER	5	0.47	5,280.21	0.21	2,106.29	0.28
Spruce	2	0.38	2,673.90	0.1	861.33	0.11
Maple	4	0.38	858.55	0.03	448.95	0.06
Callery pear	3	0.28	1,742.66	0.07	662.75	0.09
Pine	3	0.28	6,190.50	0.24	2,595.69	0.34
Black walnut	3	0.28	1,678.46	0.07	552.75	0.07
BDS OTHER	2	0.28	319.48	0.01	215.47	0.03
Plum	2	0.19	667.66	0.03	449.51	0.06
BEL OTHER	2	0.19	7,233.91	0.28	4,231.28	0.56
Ginkgo	2	0.19	46.47	0	16.03	0
Balsam fir	2	0.19	838.29	0.03	196.46	0.03

Cherry plum	2	0.19	667.66	0.03	449.51	0.06
Willow	2	0.19	12,106.15	0.47	3,893.15	0.52
Austrian pine	1	0.09	917.81	0.04	332.44	0.04
Northern catalpa	1	0.09	1,629.58	0.06	419.32	0.06
Elm	1	0.09	234.49	0.01	38.38	0.01
Staghorn sumac	1	0.09	59.49	0	33.98	0
Hawthorn	1	0.09	925.57	0.04	474.12	0.06
Common chokecherry	1	0.09	467.16	0.02	302	0.04
White ash	1	0.09	5,910.21	0.23	2,069.83	0.27
Black cherry	1	0.09	59.49	0	33.98	0
Northern hackberry	1	0.09	559.49	0.02	184.25	0.02
Horsechestnut	1	0.09	683.44	0.03	338.05	0.04
Paper birch	1	0.09	3,117.36	0.12	1,110.60	0.15
White spruce	1	0.09	917.81	0.04	332.44	0.04
Total	**1,050**	**100**	**2,563,275.72**	**100**	**752,719.57**	**100**

Appendix D: Instructions for Accessing Public Tree Data in ANR Atlas

Anyone with internet access can view all of the inventoried Milton public trees by using the Vermont Agency of Natural Resources' (ANR) Atlas mapping tool. Follow these simple steps:

1. Set your web browser to http://anrmaps.vermont.gov/websites/anra/ (or search "VT ANR Atlas"). Use Internet Explorer, Mozilla Firefox, or Safari; Google Chrome is not compatible.
2. Zoom in to Milton using the +/- scale navigation tool in the upper left portion of the map (the tree data layer won't show up unless you are zoomed in to the town-level so that you can see the street names on the map).
3. In the information pane on the left of the screen switch to the "map layers" tab at the bottom.
4. Expand the "Forests, Parks, & Recreation" heading,
5. Click on the box to the left of "Urban Tree Inventory" to load public tree data (it might take a moment for the layer to load).
6. Once you see all the trees on the map, you can zoom in and right-click on any individual tree and click on "What's here"; when you do this, the left information pane will change to give you the basic details for that specific tree.
    - To access all of the information collected on that specific tree, click on the grey text title of the tree in the left pane and a new window will open with the inventory data.
    - In this new window there are three tabs: "Details" and "Attributes" display the same information in different formats and if a photo was taken of the tree, it will show up in the "Attachments" tab.

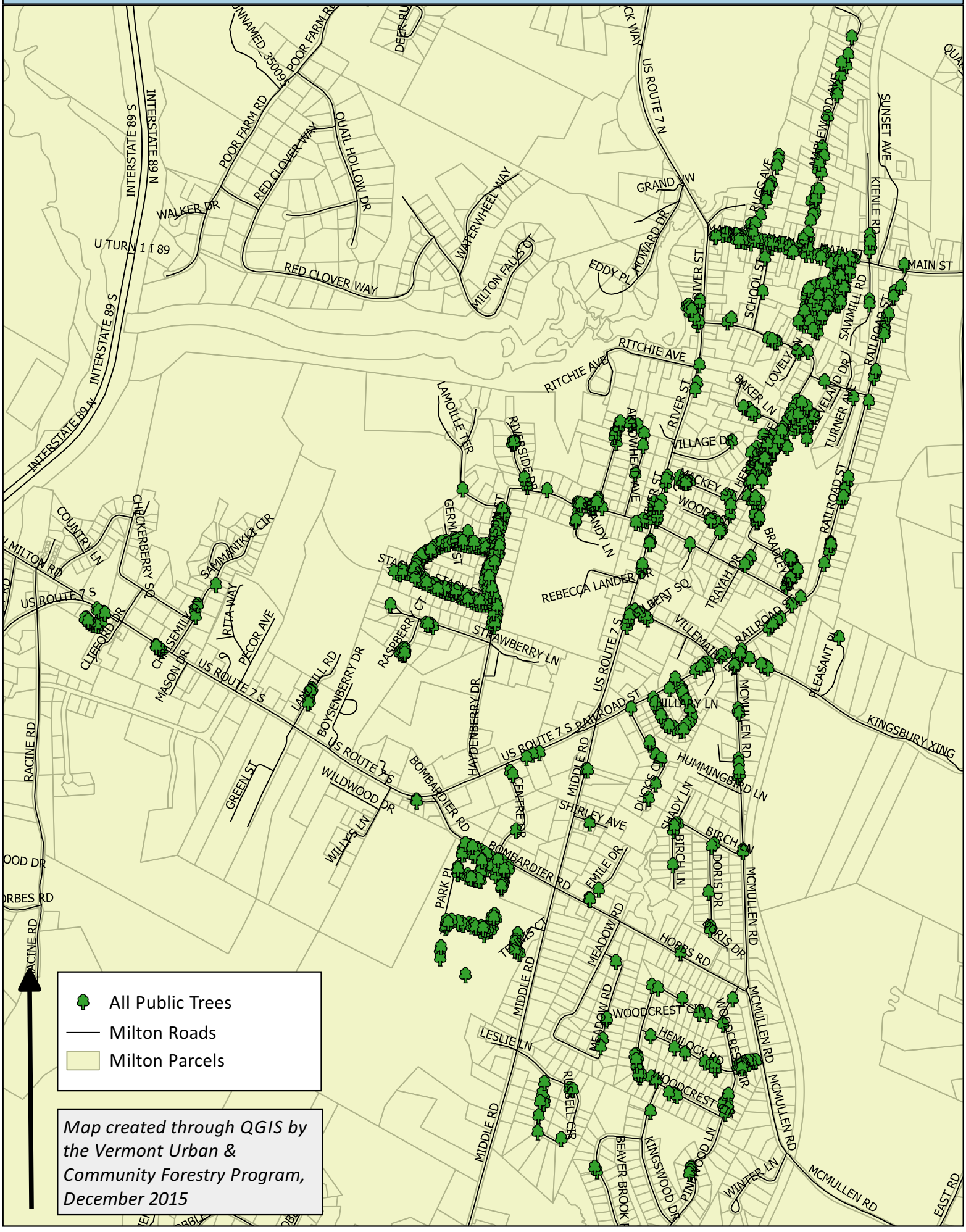


Screen shot of the Milton public trees as seen through the ANR Atlas mapping tool.

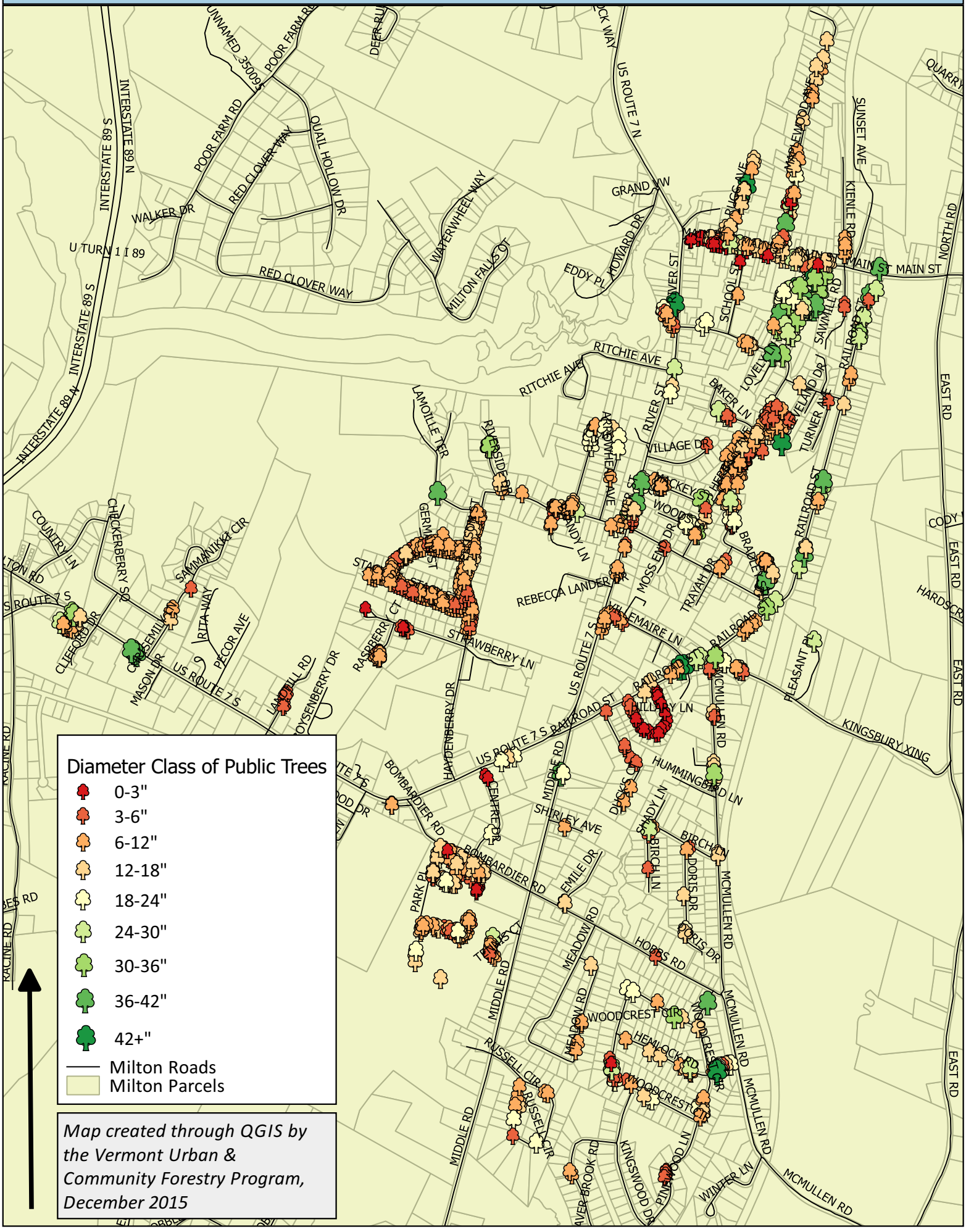
Appendix E. Maps

1. Milton Public Tree Inventory: All Trees
2. Milton Public Tree Inventory: All Trees by Diameter Class
3. Milton Public Trees by Condition Class
4. Milton Public Trees in Need of Monitoring
5. Potential Public Tree Planting Locations (“Vacant”) in Milton
6. Public Ash (Fraxinus) Trees in Milton

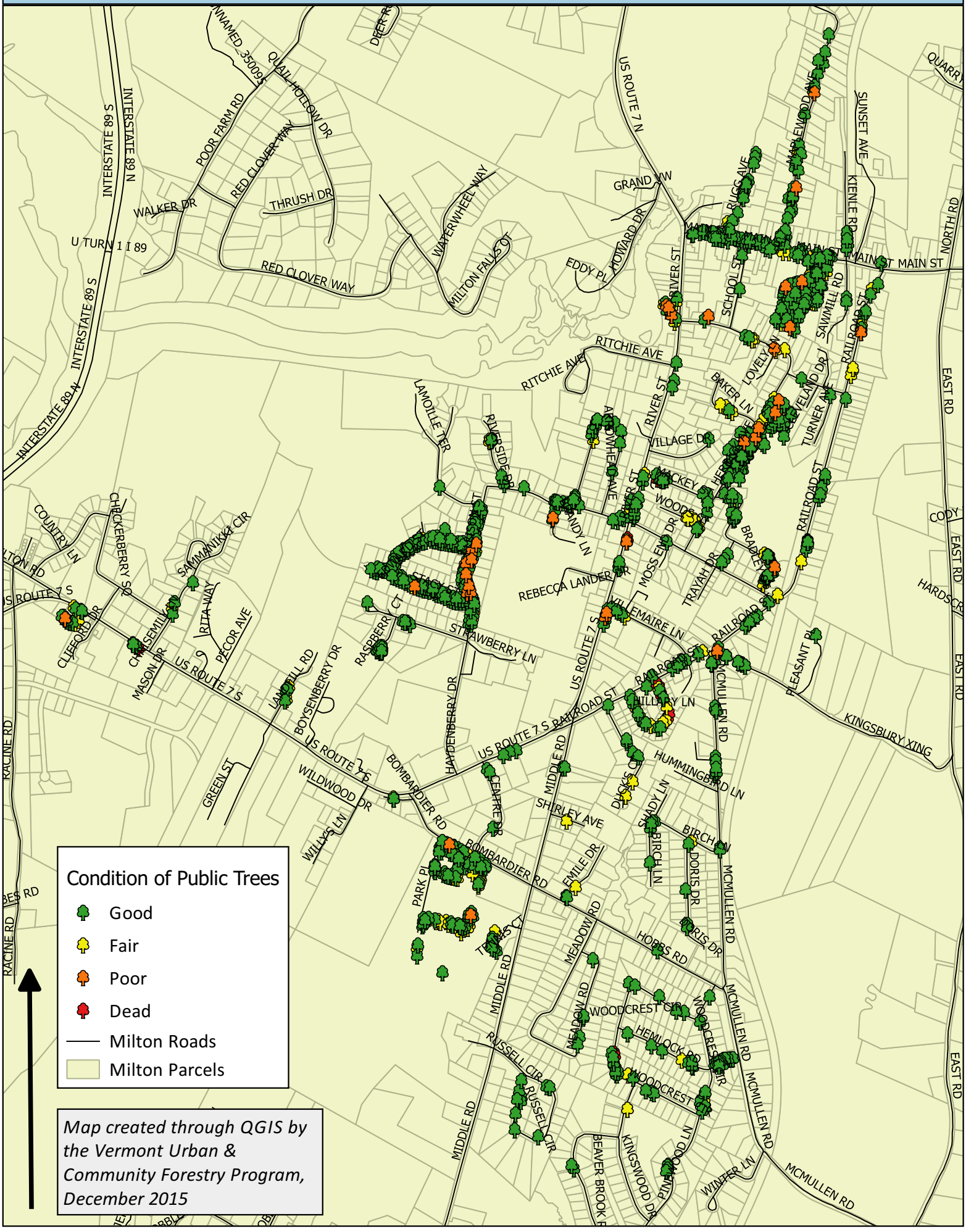
All Public Trees in Milton



Milton Public Trees by Diameter Class

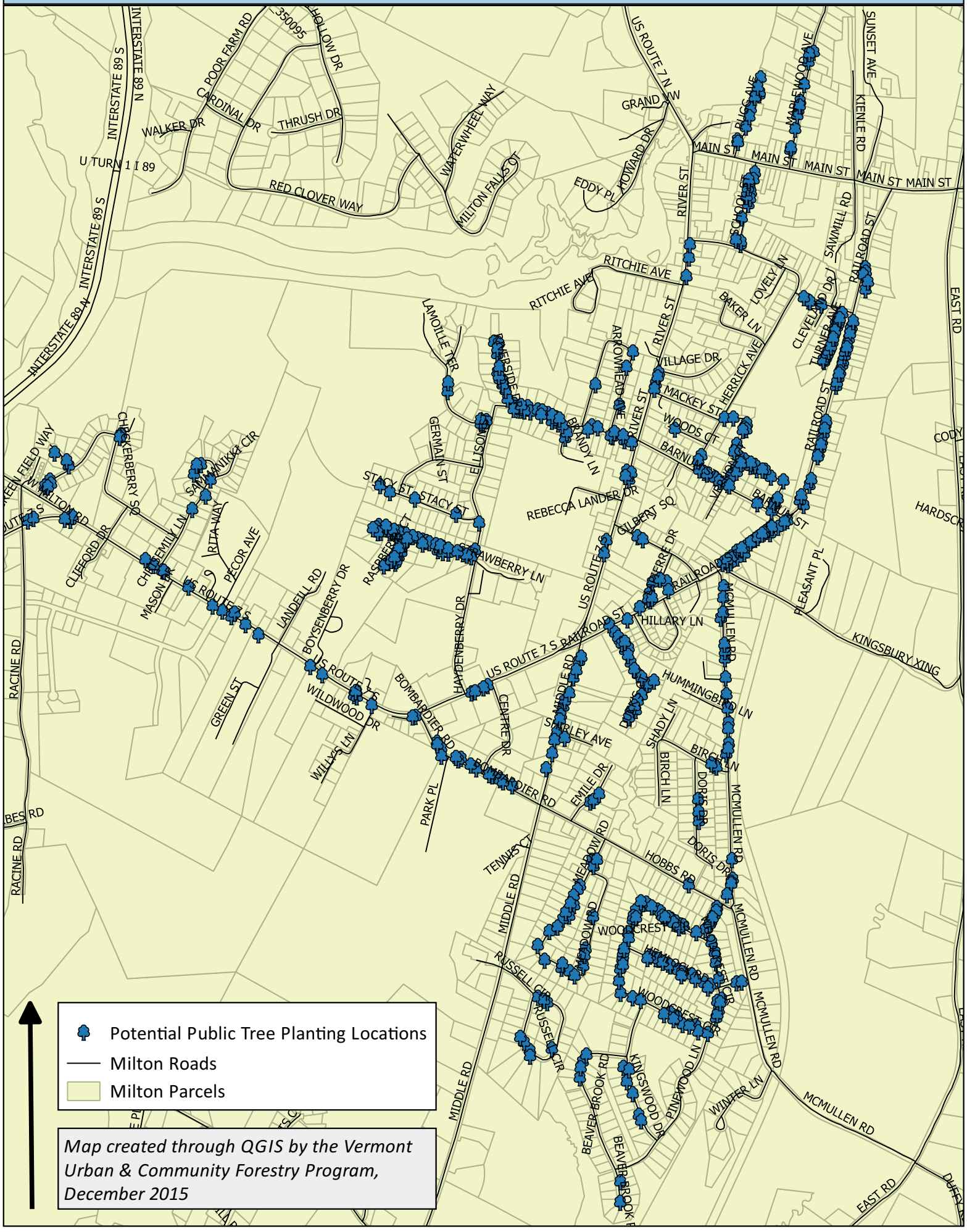


Milton Public Trees by Condition Class



Milton Public Trees In Need of Monitoring

Potential Public Tree Planting Locations in Milton



Milton Public Ash Trees