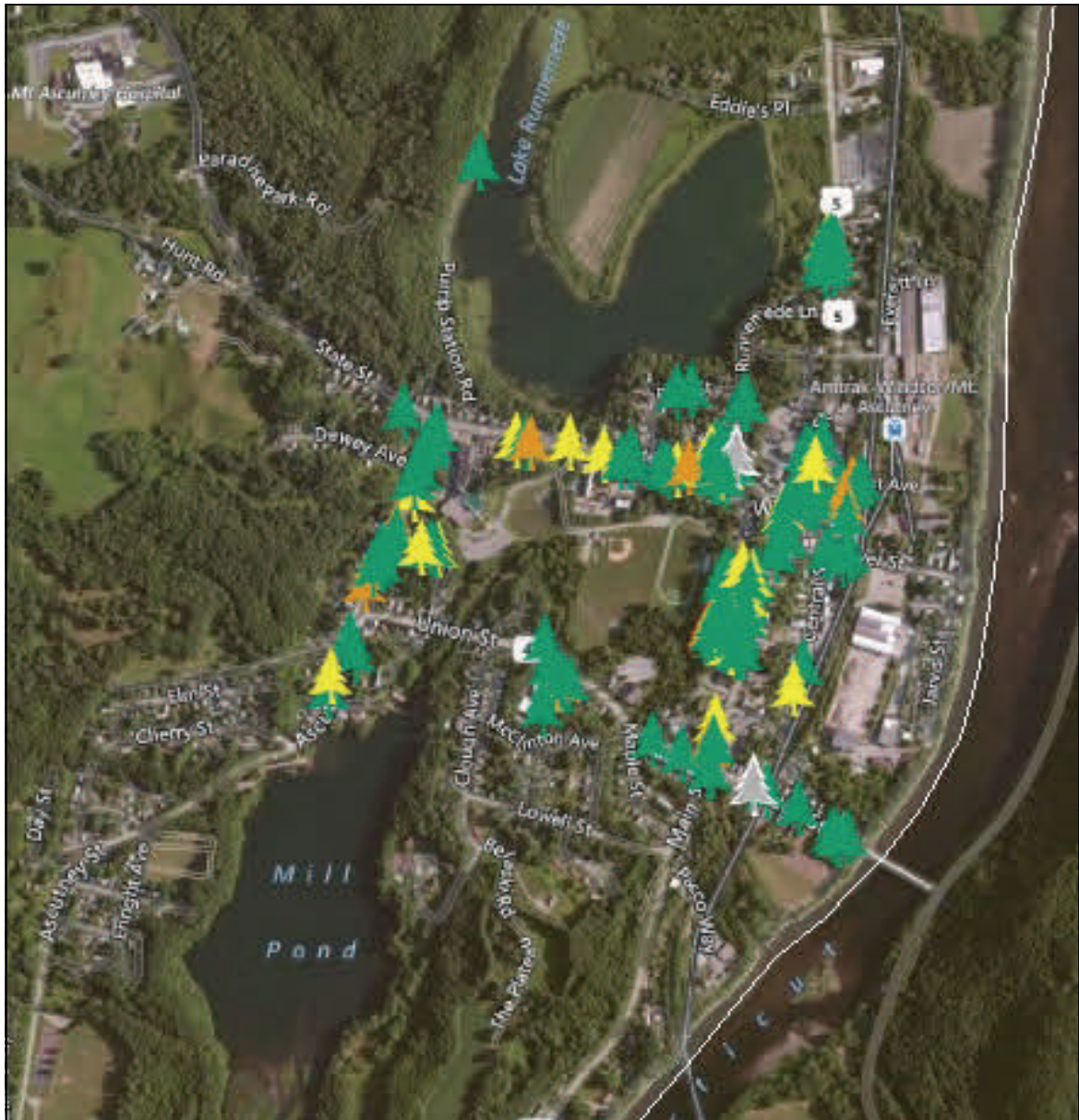


Windsor Public Tree Inventory Summary Report



*Prepared for the Windsor Conservation Commission
by the Vermont Urban & Community Forestry Program
November 2016*



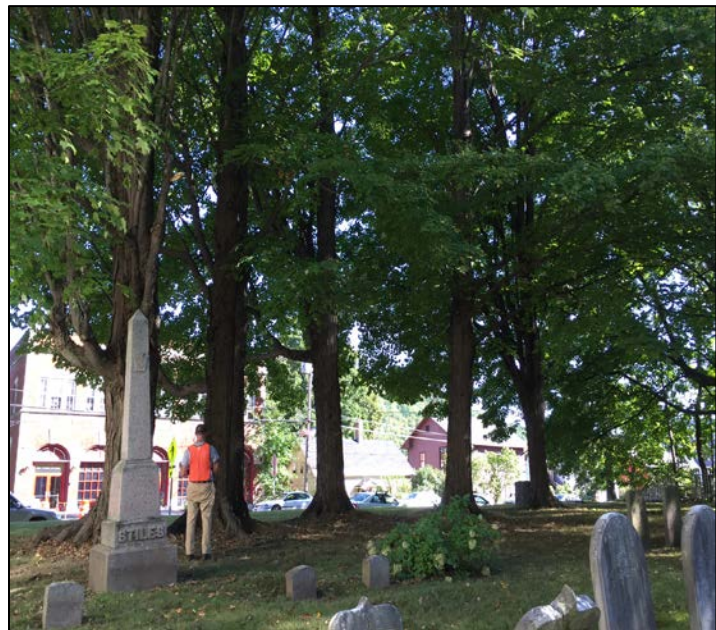
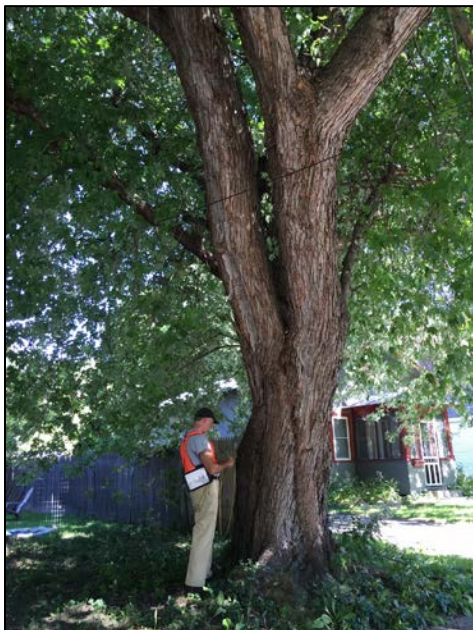
Acknowledgements

This summary report was developed by Vermont Urban & Community Forestry Program (VT UCF) staff based on field work conducted by VT UCF staff and citizen volunteers for the Town of Windsor and the Windsor Conservation Commission in September 2016. We would like to thank the members of the Windsor Conservation Commission and specifically Dia Ballou, as well as Michael Quinn, for their assistance in initiating and coordinating this effort. We would also like to thank the dedicated Windsor citizen volunteers and Rick White from the VT Department of Forests, Parks, & Recreation for participating in the inventory.

About the Vermont Urban & Community Forestry Program

The field of forest 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 of the Vermont Department of Forests, Parks, & Recreation and University of Vermont (UVM) Extension. 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. VT UCF works with state and municipal officials, as well as dedicated volunteers and local organizations, to steward the urban forest's ecological integrity and diversity. More information about VT UCF and its programming can be found at www.vtcommunityforestry.org.

Photographs of the Windsor Public Tree Inventory: September 2016



Importance of Inventory and Community Forestry in Vermont

A public tree inventory establishes a record of the City-owned trees present in a municipality. An inventory can provide information about the species, size, health, maintenance needs, and location of each tree. This detailed information allows community leaders to estimate the numerous contributions and management requirements of the trees of which it is in charge. In the event of a disease outbreak or invasive insect infestation, data from an inventory may assist in monitoring and preventing spread, as well as supporting the response to the disease or infestation. An inventory can also help build public support for expanding community forests and to guide future urban planning.

Urban and community 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 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 and community forests create opportunities for education, community engagement, and in some instances can be related to crime reduction. Trees are an integral part of the green infrastructure of a place and contribute to keeping our communities healthier and our everyday lives more fulfilling.

Project Summary & Methodology

The goal of the Windsor public tree inventory was to accurately locate and assess Town-owned trees within the public right-of-way (ROW) on streets, parks, and cemeteries in the downtown area to establish and maintain a record of the location and the maintenance needs of public trees, and to support future community forest planning. The information collected in the inventory and presented in this summary report should provide local decision makers – and citizens – a better understanding of the composition, condition, and benefits of Windsor’s downtown public trees and will allow the Windsor Conservation Commission to plan for tree maintenance and future tree planting using a map-based tree inventory tool.

This project was initiated in the spring of 2016. To plan for the public tree inventory, VT UCF staff coordinated with Dia Ballou of the Windsor Conservation Commission in order to decide what streets and properties should be included in the inventory, and to determine the public right-of-way (ROW) boundaries for the streets. VT UCF has developed a tree inventory tool in collaboration with the Vermont Agency of Natural Resources’ (ANR) GIS team. The map-based tool uses the free application *Collector for ArcGIS*, developed by Esri (<http://doc.arcgis.com/en/collector/>), for data collection and is linked to the publicly-accessible ANR Atlas online mapping website (<http://anr.vermont.gov/maps/nr-atlas>).

On September 22nd, 2016 VT UCF staff worked with citizen volunteers and staff from the VT Dept. of Forests, Parks, & Recreation to complete an inventory of **169 trees** located within the public ROW of **16 streets** and on **3 town green spaces**. In total, the inventoried land area was less than 1 square mile, a small fraction of the Town of Windsor’s 19 square mile total land area, but encompassed the concentrated center and most densely populated portion of town. A list of streets and sites with ROW boundaries and number of trees inventoried is found in Table 1 below. A series of GIS maps highlighting the tree inventory results can be found in Appendix C.

Table 1: Windsor streets and sites included in the public tree inventory.

| Street Name/Site Name | What was Surveyed | Right-of-Way Extent | Number of Trees Inventoried |
|---------------------------|--|---------------------|-----------------------------|
| Ascutney Street | From State Street (N) to Cherry Street/Windsor Swim Area (S) | 50' | 23 |
| Bridge Street | From river (E) to end (turns to Union Street) | 50' | 5 |
| Central Street | Full road | 37.5' | 2 |
| Court Street | Full road | 31.25' | 3 |
| Depot Avenue | Full road | 50' | 7 |
| Dewey Avenue* | Full road | 20' | 0 |
| Durkee Street* | Full road | 31.25' | 0 |
| Everett Lane* | Full road | 37.5' | 0 |
| Fitch Court | Full road | 28' | 4 |
| Ice House Road | Full road (runs parallel to Union Street) | 12' | 1 |
| Jacob Street* | Full road | 25' | 0 |
| Main Street (Rt 5) | From Dollar General parking lot (N) to Lowell Street (S) | 50' | 35 |
| Maple Street* | Full road | 37.5' | 0 |
| Pine Street | Full road | 31.25' | 2 |
| Pump Station Road | Full road | 50' | 2 |
| Railroad Avenue | Full road (continuation of Depot) | 50' | 1 |
| River Street | Full road | 50' | 3 |
| Runnemedede Lane* | Full road | 37.25' | 0 |
| State Street | From Ascutney Street (E) to end (intersection with Main) | 50' | 14 |
| Union Street/Rt 44 | Full road | 50' | 2 |
| Windsor Municipal Offices | All planted, managed landscape trees | n/a | 6 |

| | | | |
|--|--------------------------------------|--------|----|
| Windsor Village Green (use "Windsor - Greenspace - Park" as site and put "Windsor Green" in comments) | All planted, managed landscape trees | n/a | 9 |
| Windsor Public Library (across the street from Village Green)* | All planted, managed landscape trees | n/a | 0 |
| Well Street | Full road | 18.75' | 1 |
| Old South Church Cemetery (off of Main Street) | All planted, managed landscape trees | n/a | 45 |
| Memorial Square | All planted, managed landscape trees | n/a | 4 |
| *No trees were found within the public right-of-way on these streets and sites. | | | |

Each public tree identified to be within the ROW 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 map to allow the user to input information about a tree, linking it to a particular geographic location. Data recorded for each public tree in Windsor, outlined in Table 2 below, included street name, overall condition, species, diameter class (using a measurement for diameter at breast height, or DBH), a recommendation for monitoring (yes/no), if the tree needed to be pruned (yes/no), additional comments, and the nearest house or building address. In most cases, a picture was also taken of each tree. All inventory data collected on public trees in Windsor is available for viewing on the ANR Atlas website and instructions for accessing that tool are included in Appendix A.

Table 2: Data collection parameters for the Windsor public tree inventory.

| Data Parameters | Description |
|-----------------|--|
| Site ID | Street name or property name. |
| Species | Common name. Include in comments box if not listed. |
| Tree Condition | <ul style="list-style-type: none"> ● <i>Good</i>: full canopy (75-100%), no dieback of branches over 2" in diameter, no significant defects, minimal mechanical damage ● <i>Fair</i>: thinning canopy (50-75%), medium to low new growth, significant mechanical damage, obvious defects/insects/disease, foliage off-color and/or sparse ● <i>Poor</i>: declining (25-50%), visible dead branches over 2" in diameter, significant dieback, severe mechanical damage or decay (over 40% of stem affected) ● <i>Dead</i>: no signs of life, bark peeling; scratch test on twigs for signs of life (green) ● <i>Vacant</i>: potential spot for a tree within the public ROW. Add "small", "medium", or "large" in the comments box <ul style="list-style-type: none"> - Small= max 30' at maturity, presence of overhead wires, minimum planting |

| | |
|-----------------------------|--|
| | <p>space 4' x 4'</p> <ul style="list-style-type: none"> - 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 | <p>Yes: any one visible defect is affecting >40% of the tree, the tree poses a hazard to people/infrastructure/cars, the trunk or branches are growing into utility wires, the tree is dead or in poor condition, or the tree is an ash tree showing evidence of woodpecker flecking, blonding, epicormic branching/water sprouts, and/or suspicious exit holes</p> <p>No: no major defects, tree in good or fair condition</p> |
| Prune? | <p>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.</p> <p>No: No branch needs to be trimmed</p> |
| Comments | Notes, elaborate on any existing conditions; max 255 characters. |
| 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. |

Summary of Findings

Community Forest Diversity

- Of the 169 public trees, there are 31 different species in 24 different genera.
- The five most common tree genera by number of trees are *Acer* (maple) at 40%, *Malus* (apple) at 14%, *Gleditsia* (honeylocust) at 8%, *Carya* (hickory) at 4%, and *Tsuga* (hemlock) at 4%. See Figure 1 below.
- Invasive tree pests currently threaten both trees in the *Acer*, *Fraxinus*, and *Tsuga* genera: the Asian long horned beetle (ALB), the emerald ash borer (EAB), and the hemlock woolly adelgid (HWA), respectively. Combined, these three genera represent nearly half (45%) of Windsor's downtown public tree population. It is recommended that one genus not represent more than 20% of a public tree population.
- The five most common species are sugar maple (*Acer saccharum*) at 24%, crabapple (*Malus* species) at 14%, Norway maple (*Acer platanoides*) at 9%, thornless honeylocust (*Gleditsia*

triacanthos) at 8%, and bitternut hickory (*Carya cordiformis*) at 4%. See figure 2 below. It is recommended that one species not represent more than 10% of a public tree population; in this respect, other than the high sugar maple and crabapple populations, Windsor’s public tree population has good species diversity. A full species list is included in Appendix B.

- Only 1 green ash (*Fraxinus pennsylvanica*) and 1 white ash (*Fraxinus Americana*) were inventoried in downtown Windsor; as communities in Vermont are encouraged to plan for the arrival of the EAB, the locations and conditions of these ash trees should be monitored. See Appendix C for a map indicating the location of these ash trees.

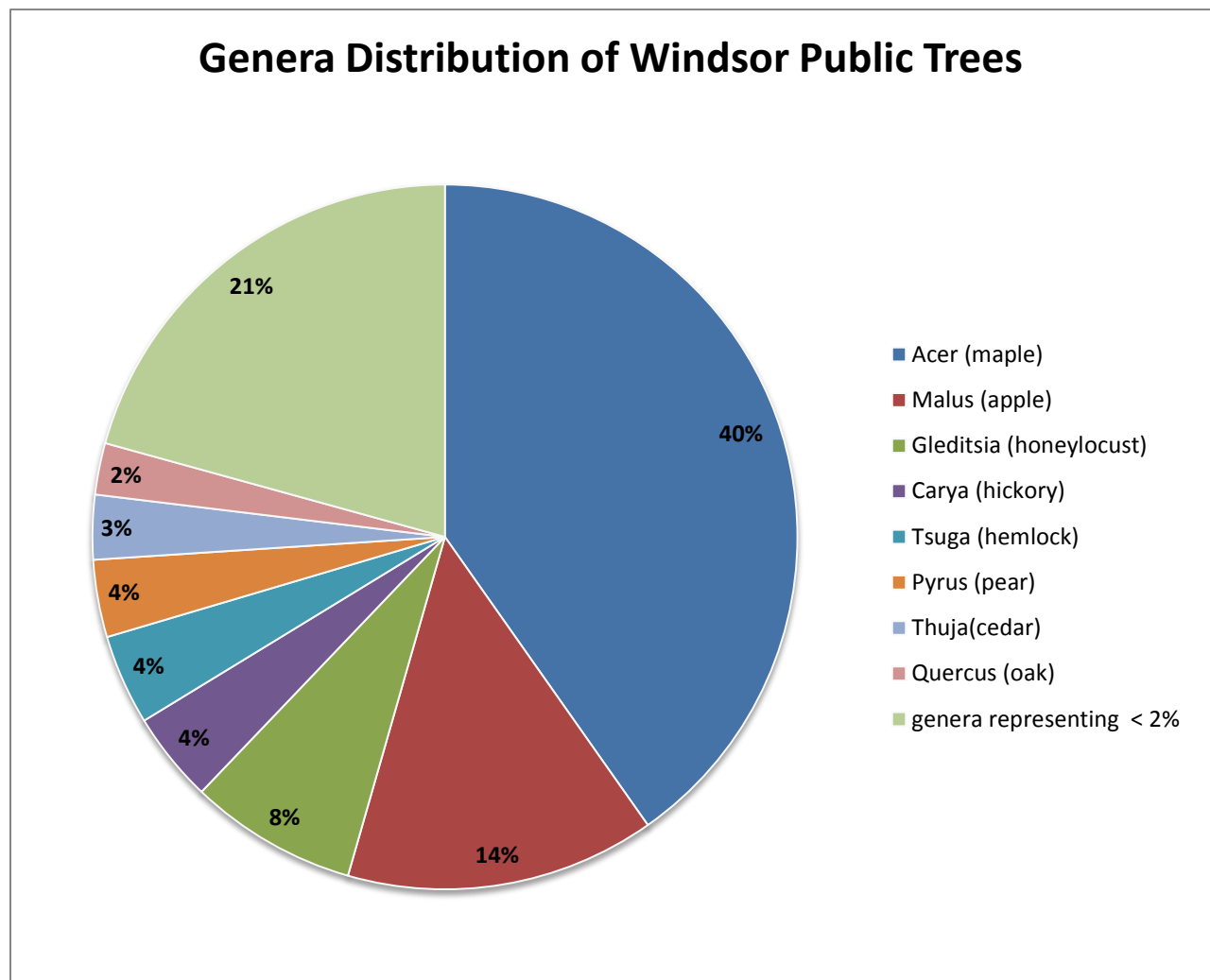


Figure 1: Genera distribution of Windsor’s public trees.

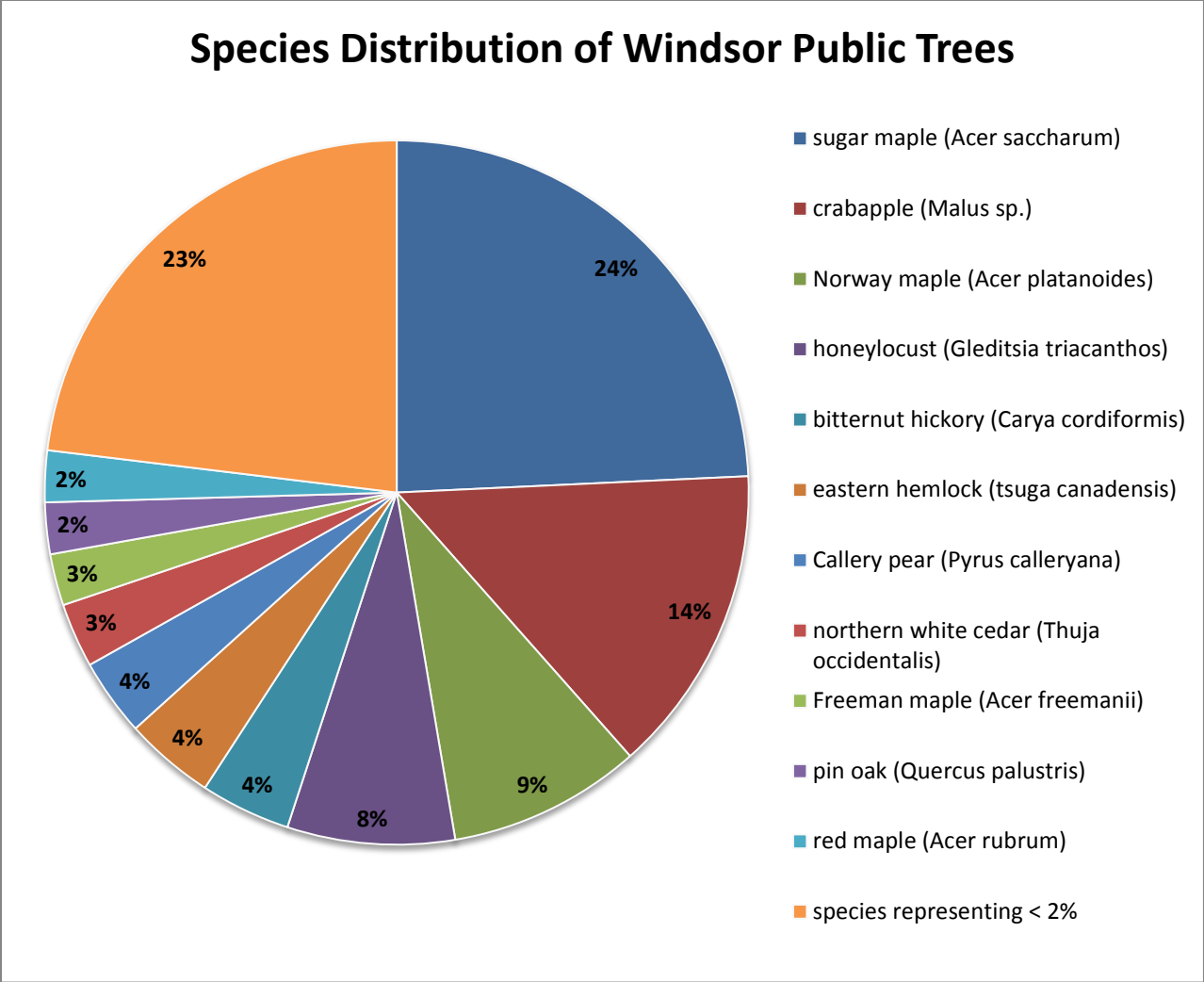


Figure 2: Species distribution of Windsor's public trees.

Community Forest Structure

- The inventoried public trees in Windsor are represented in the following size classes: 0-3" (2), 3-6" (20), 6-12" (27), 12-18" (37), 18-24" (27), 24-30" (27), 30-36" (14), 36-42" (8), and 42"+ (5) (Figure 3).
- In general, Windsor's public tree population could be considered middle-aged. Half (55%) of the public trees are between 12" and 30" in diameter. However, there are only 2 public trees with a diameter of less than 3", perhaps indicative of lack of recent young tree planting.
- Of note is the high number of large shade trees in Windsor's public tree population; there are 27 public trees larger than 30" in diameter – concentrated at the Old South Church

Cemetery on Main Street – which is a high number for a community relative to the other 26 towns that have used the VT UCF inventory tool. Large shade trees provide increased environmental benefits (stormwater mitigation, oxygen production, etc.) and efforts should be made to protect and maintain these large trees.

- The largest public trees inventoried in Windsor are a 50” silver maple on Bridge Street and a 58” eastern hemlock at the Old South Church Cemetery; both should be monitored for regular assessment of their condition.

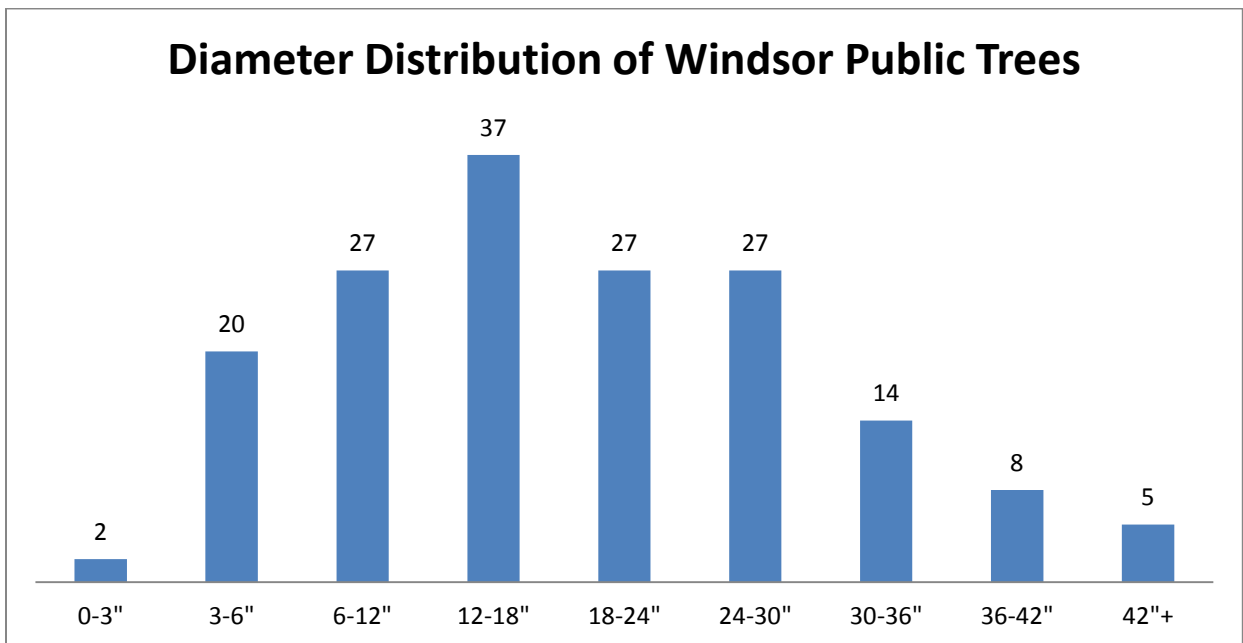


Figure 3: Diameter distribution of Windsor’s public trees.

Community Forest Health

- The vast majority of Windsor’s public trees (138, or 82%) were assessed as being in “Good” condition. Of the remaining trees, 19 (11%) were considered to be in “Fair” condition, 11 (6%) were in “Poor” condition, and 1 tree (<1%) were found to be “Dead”. (Figure 4). The one dead tree is a 18-24” larch at the southwestern corner of the Old South Church Cemetery.

- 32 (19%) public trees were assessed to be in need of monitoring by a Certified Arborist, the Windsor Tree Warden, or another qualified individual (Figure 5). Trees that were flagged as in need of monitoring expressed one or more of the following conditions:
 - The tree has a visible defect affecting >40% of the tree,
 - The tree poses a risk to people/infrastructure/vehicles or other property,
 - The tree is growing into utility wires, or
 - The tree is dead or in poor condition.
- 41 (24%) of the public trees were assessed to be in need of pruning (Figure 5).
- Maps of both the trees in need of monitoring and the trees recommended to be pruned are included in Appendix C.

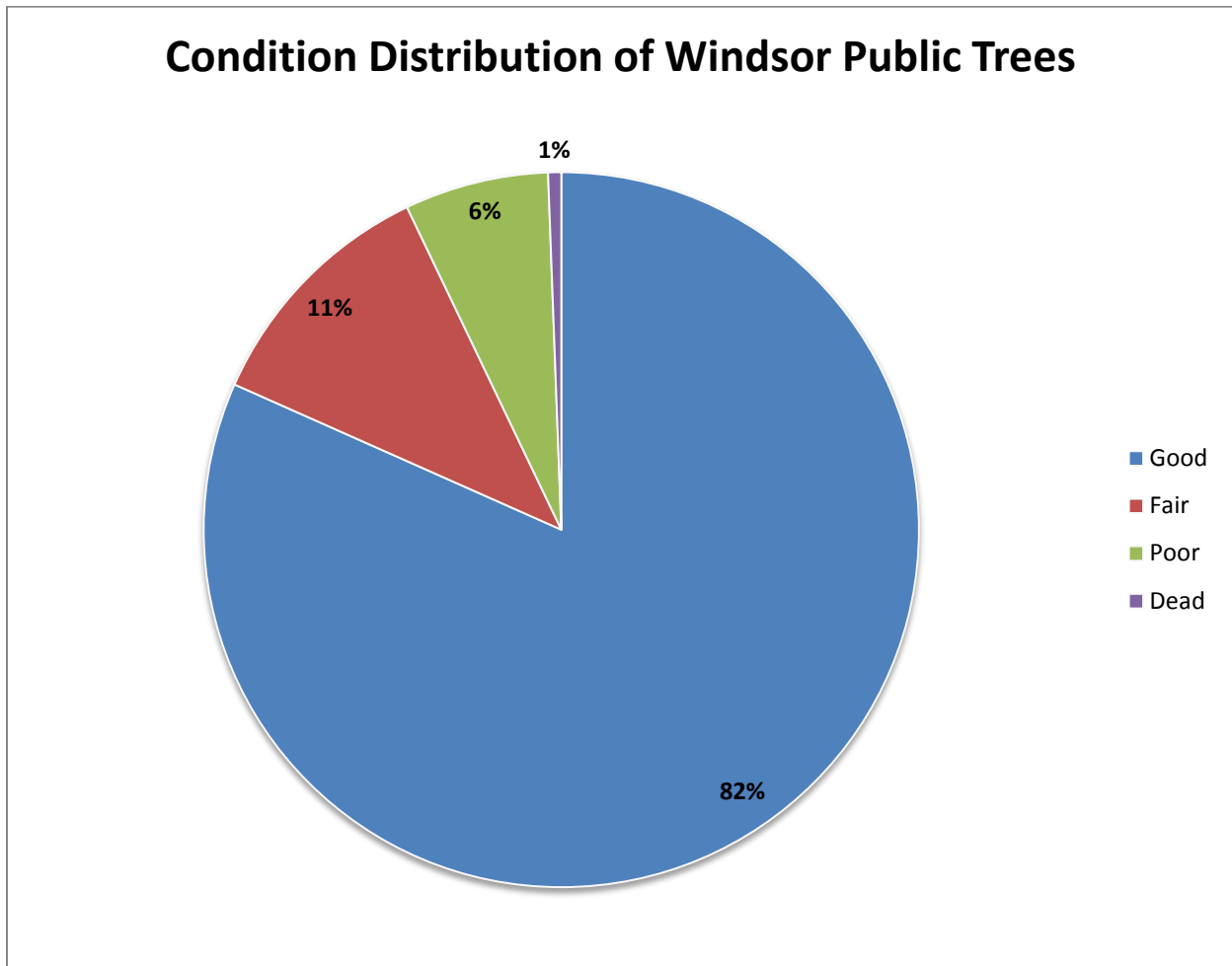


Figure 4: Condition class distribution of Windsor's public trees.

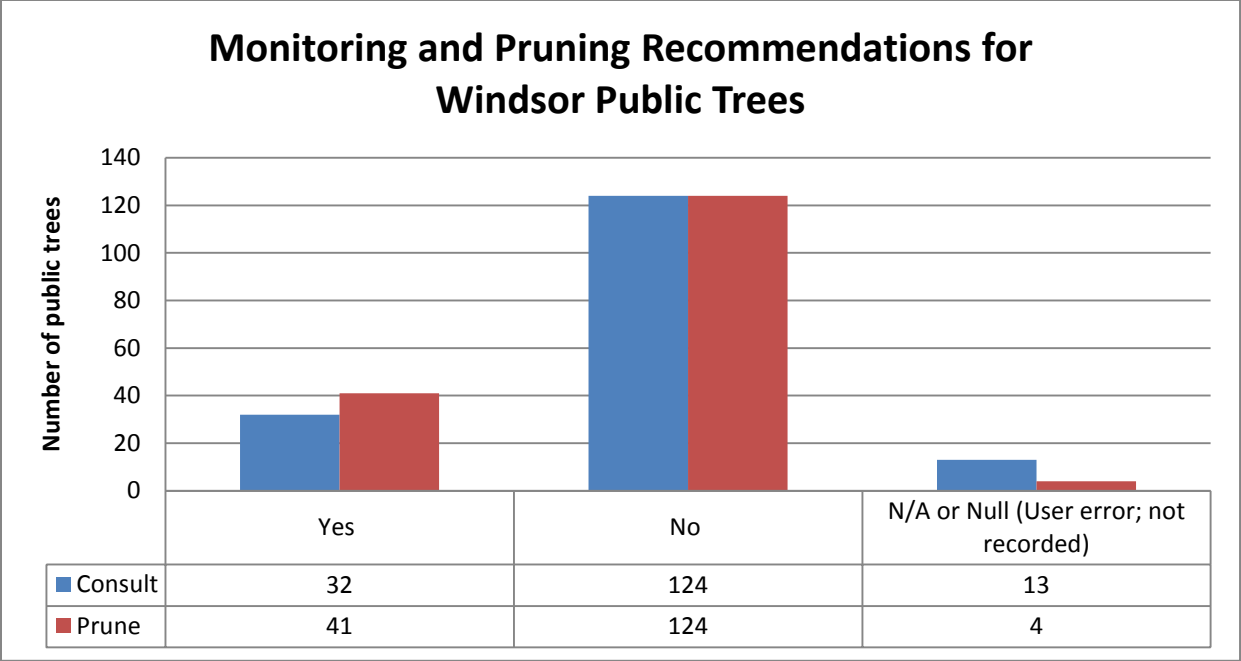


Figure 5: Maintenance needs and health indicators of Windsor's inventoried public trees.

Future Tree Planting

There three specific potential tree planting locations identified through the Windsor public tree inventory: two on the village green and one on Bridge Street. It is important to note that the priority goal of this inventory effort was to record the existing public trees in downtown Windsor (and not to identify potential tree planting locations). However, in future planning efforts, these sites may be considered as priority locations.

Recommendations

A healthy public tree population is contingent upon proper management, stewardship, and a municipality’s commitment to understanding and maintaining its urban and community forest. A comprehensive public tree inventory is an important piece of a sustainable community tree program. Based on the results of the Windsor public tree inventory, our priority recommendations are:

- Prioritize the timely assessment and, if needed, maintenance or removal of the 32 public trees that were identified as in need of monitoring by a Certified Arborist or the Windsor Tree Warden.

- Specifically, assess the pruning needs of the 41 public trees identified. Many of these trees have deadwood or broken branches in their crown, some are in need of structural pruning, and some merely need corrective pruning, as they have been improperly pruned in the past. Ensure that whomever performs structural pruning is properly trained; to access a list of ISA Certified Arborists in the area, visit www.isa-arbor.com/findanarborist/arboristsearch.aspx
- Promote species and age diversity in Windsor’s public tree population. Planting new species and increasing the number of lesser represented species will promote long-term health and resilience of individual trees and Windsor’s overall tree population. Refer to VT UCF’s Tree Selection Guide at www.vtcommunityforestry.org/resources/tree-care/tree-selection.
- Many of the trees in Windsor’s public tree population are reaching maturity; promote their health and integrity with a systematic inspection program and advocate for explicit municipal funds to ensure their continued health.
- Engage municipal leadership, such as the members of the Selectboard, in a discussion about the results of the public tree inventory and potential next steps.
- Prepare for the arrival of EAB, HWA, and ALB by developing a strategic invasive forest pest community preparedness plan. Refer to the VT UCF website’s community preparedness page at <http://vtcommunityforestry.org/community-planning/tree-pests> for resources and guidance in the community preparedness process and considerations.
- Continue to engage citizens in Windsor that care about trees; promote educational opportunities, such as VT UCF’s Stewardship of the Urban Landscape and Forest Pest First Detector trainings, and consider organizing tree maintenance opportunities for volunteers.

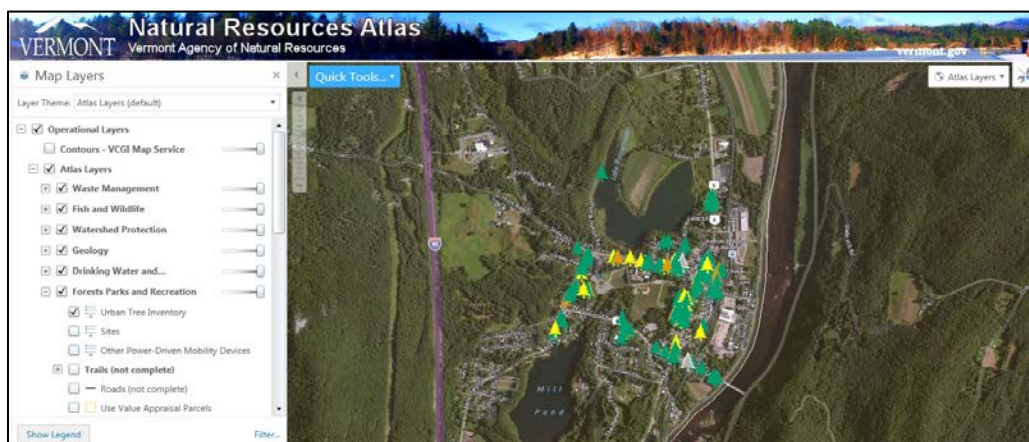
Conclusion

Trees in our downtowns and densely populated landscapes contribute to environmental integrity, social cohesiveness, economic activity, cultural heritage, and overall well-being. This summary report should help the leaders and citizens of Windsor to understand, manage, and steward Windsor's public tree population. The recommendations outlined in this report should be considered by members of the Windsor Conservation Commission based on long-term vision and capacity. With improved monitoring, regular maintenance, and an engaged and informed citizenry, the potential for a healthy, sustainable community forest is possible.

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

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

1. Set your web browser (Internet Explorer works best, Chrome does not work) to <http://anr.vermont.gov/maps/nr-atlas> (or search "VT ANR Atlas").
2. Zoom in to Windsor using the +/- scale navigation tool or the "Search by Location" function in the upper left portion of the map (the tree data layer won't show up unless you are zoomed in to the city-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.
 - o 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.
 - o 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.



Appendix B: Full Species List of Windsor Public Trees

| Species: common and scientific name | Number of trees inventoried in Windsor | Percent of total public tree population |
|--|--|---|
| sugar maple (<i>Acer saccharum</i>) | 41 | 24.3% |
| crabapple (<i>Malus sp.</i>) | 24 | 14.2% |
| Norway maple (<i>Acer platanoides</i>) | 15 | 8.9% |
| honeylocust (<i>Gleditsia triacanthos</i>) | 13 | 7.7% |
| bitternut hickory (<i>Carya cordiformis</i>) | 7 | 4.1% |
| eastern hemlock (<i>tsuga canadensis</i>) | 7 | 4.1% |
| Callery pear (<i>Pyrus calleryana</i>) | 6 | 3.6% |
| northern white cedar (<i>Thuja occidentalis</i>) | 5 | 3.0% |
| broadleaf deciduous species | 4 | 2.4% |
| Freeman maple (<i>Acer freemanii</i>) | 4 | 2.4% |
| pin oak (<i>Quercus palustris</i>) | 4 | 2.4% |
| red maple (<i>Acer rubrum</i>) | 4 | 2.4% |
| boxelder (<i>Acer negundo</i>) | 3 | 1.8% |
| eastern larch (<i>larix laricina</i>) | 3 | 1.8% |
| eastern red cedar (<i>Juniperus virginiana</i>) | 3 | 1.8% |
| katsura (<i>Cercidiphyllum japonicum</i>) | 3 | 1.8% |
| littleleaf linden (<i>Tilia cordata</i>) | 3 | 1.8% |
| American elm (<i>Ulmus americana</i>) | 2 | 1.2% |
| black walnut (<i>Juglans nigra</i>) | 2 | 1.2% |
| eastern redbud (<i>Cercis canadensis</i>) | 2 | 1.2% |
| gingko (<i>Gingko biloba</i>) | 2 | 1.2% |
| mountain ash (<i>Sorbus americana</i>) | 2 | 1.2% |
| northern hackberry (<i>Celtis occidentalis</i>) | 2 | 1.2% |
| broadleaf evergreen species | 1 | 0.6% |
| butternut (<i>Juglans cinerea</i>) | 1 | 0.6% |
| green ash (<i>Fraxinus pennsylvanica</i>) | 1 | 0.6% |
| horsechestnut (<i>Aesculus hippocastanum</i>) | 1 | 0.6% |
| Norway spruce (<i>Picea abies</i>) | 1 | 0.6% |
| paper birch (<i>Betula papyrifera</i>) | 1 | 0.6% |
| silver maple (<i>Acer saccharinum</i>) | 1 | 0.6% |
| white ash (<i>Fraxinus americana</i>) | 1 | 0.6% |
| | 169 | 100% |

Appendix C: Maps

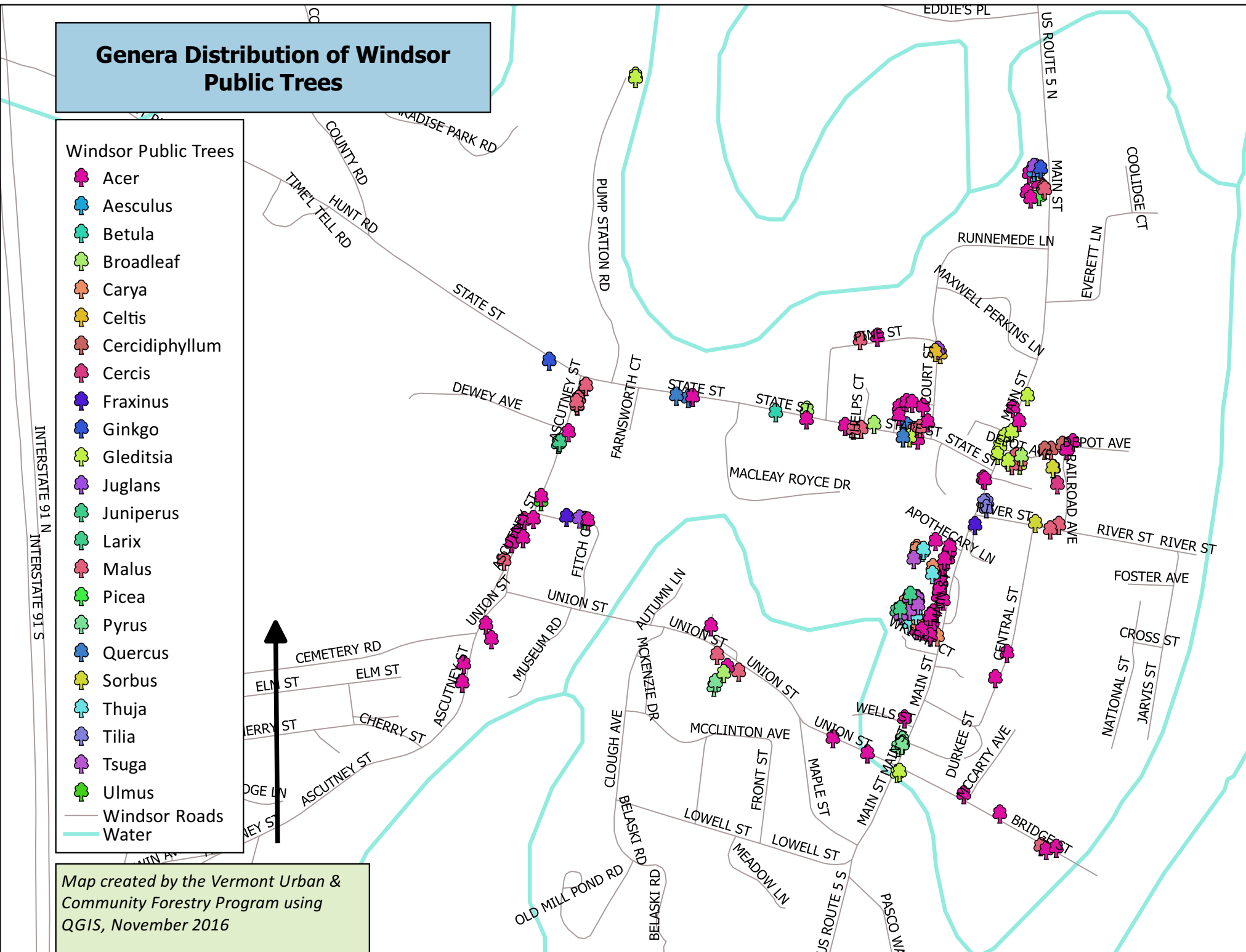
1. Windsor public trees by genera
2. Windsor public trees by condition class
3. Windsor public trees by diameter distribution
4. All ash (*Fraxinus*), maple (*Acer*), and hemlock (*Tsuga*) public trees inventoried in Windsor
5. All Windsor public trees identified to be in need of monitoring
6. All Windsor public trees identified to be in need of pruning

General Distribution of Windsor Public Trees

Windsor Public Trees




-  Acer
-  Aesculus
-  Betula
-  Broadleaf
-  Carya
-  Celtis
-  Cercidiphyllum
-  Cercis
-  Fraxinus
-  Ginkgo
-  Gleditsia
-  Juglans
-  Juniperus
-  Larix
-  Malus
-  Picea
-  Pyrus
-  Quercus
-  Sorbus
-  Thuja
-  Tilia
-  Tsuga
-  Ulmus
-  Windsor Roads
-  Water

Map created by the Vermont Urban & Community Forestry Program using QGIS, November 2016



INTERSTATE 91 N
INTERSTATE 91 S

Windsor Public Trees in Need of Monitoring

-  Windsor Public Trees in Need of Monitoring
-  Windsor Roads
-  Water

Map created by the Vermont Urban & Community Forestry Program using QGIS, November 2016

