

URBAN FOREST MANAGEMENT PLAN FOR THE CITY OF PORT COLBORNE

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2024



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PORT COLBORNE



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Executive Summary

Port Colborne is a dynamic city of 20,000 people on the north shore of Lake Erie, at the mouth of the Welland Canal. It shares its boundaries with the Township of Wainfleet to the west, the Town of Fort Erie to the east, and the City of Welland and City of Niagara Falls to the north. The urban area of Port Colborne is located at the southern end of the municipality, centered on the Welland Canal, and consists of a variety of residential neighbourhoods, a downtown/historic core area, and various commercial and industrial areas. The urban area makes up less than one-quarter of the municipality's geographic area. The rural area consists of active agricultural lands, hamlet areas, aggregate resource areas, and a handful of estate residential developments.

The urban forest can be defined as "the sum of all woody and associated vegetation in and around dense human settlements. The concept of an urban forest is best understood when viewing cities from the air" (Miller, 2015) this helps visualize the 'tree canopy' – the 'footprint' of trees when viewed from above.

The management of this increasingly valuable resource is called *urban forestry*.

Urban Forestry is defined as: The sustained planning, planting, protection, maintenance, and care of trees, forests, greenspace, and related resources in and around cities and communities for the economic, environmental, social, and public health benefits for people (Jorgensen, 1970).

Urban Forest Canopy Cover (CC) is comprised of: Tree canopy cover plus Shrub/Thicket canopy cover plus Woodlot canopy cover.

The Urban Forest Management Plan ("the Plan") identifies needs and priorities for the City of Port Colborne to the year 2044 and provides the City with a long-term direction with regards to the provision of tree maintenance and planting.

This Plan provides Staff, Council and the public with a framework informed by the City's community values, operational needs and financial realities. The plan provides an assessment and progress tool to ensure that the Public Works Department achieves success towards providing high quality services and facilities that meet the needs of the community.

The plan provides an opportunity to tell the story of Port Colborne, the current state of the urban forest, what is being done well, and where there is need for direction to provide high quality ecological services. The plan reflects the community's values and goals for Port Colborne's park and recreation and demonstrates how recreation can support and enhance the City's vision as a vibrant, healthy, and connected community.

Vision Statement for the Port Colborne's Urban Forest and its Management

“The City of Port Colborne recognizes and values the environmental, social, cultural, and economic contribution of the urban forest to our community. The City will, in partnership with its residents, businesses and stakeholders work to promote and increase urban forest coverage that is diverse, healthy and a sustained asset for future generations.”

Goals of the City of Port Colborne's Urban Forest Management Plan

1. To protect existing public trees and encourage the retention of private trees.
2. To increase the canopy cover over 10 years, to help mitigate climate change, through tree protection, planting, and maintenance.
3. To increase tree planting with native species to enhance biodiversity and connectivity.
4. To ensure the creation of beautiful treed and healthy places for people to enjoy.
5. To enable the urban forest to help increase the education and awareness opportunities.
6. To use more trees to improve economic opportunities and tourism through greater canopy.
7. To manage the risk that trees pose to an acceptable level for residents and visitors alike.

Key Project Findings:

- Urban forest canopy cover is very important to Port Colborne
- Port Colborne's total urban forest canopy cover compares favourably to peer municipalities but its tree canopy cover (i.e., individual and small groups) of trees is lower.
- The majority of the community's canopy is on private property.
- Port Colborne is losing urban tree canopy cover at a higher rate than other municipalities.
- Tree species diversity and suitability require attention.
- Staffing and resource levels may need to be increased to provide sufficient support to Port Colborne's public tree care management needs.
- The city compares favourably to some other municipalities with its annual tree maintenance budget.
- *Tree canopy gaps* on the public road allowance remain unplanted.
- Well-defined corporate policies are needed to plant, preserve and protect trees.
- Port Colborne has strengths to build upon.
- The Community strongly supports its urban forest.

- The Tree By-law and the Tree Installation Policy require a more comprehensive approach to the protection and enhancement of the urban forest compared to peer cities.

Existing and Future Community Challenges

- Based on 2018 data, the City's tree canopy in the urban area is 10%. This is lower than peer cities sampled such as St. Catharines, Hamilton, and Kitchener.
- Excessive historical loss of the Urban Tree Canopy cover has been declining in Port Colborne. Between 2006-2018, the municipal tree canopy declined at an annual rate that exceeded the rate of decline in other communities by about 3 times.
- Port Colborne has a *Vulnerable Urban Forest* due to lack of Species Diversity and Canopy Quality Issues. Based on the 2022 Inventory of 2,065 street and park trees conducted by Williams & Associates (W&A), it was found that the City has a tree diversity problem. It was identified that 42% of public trees are of a single genus, the maple. This relatively high proportion of maples increases the risk of catastrophic tree population loss from threats like climate change impacts and Asian long-horned beetles. It is important to include more native, Carolinian species (e.g., Kentucky coffee-tree, tulip tree) in planting programs.
- It is anticipated that there will be increasing future stressors on Port Colborne's urban forest as our climate changes.

Benefits

The trees and woodlands of Port Colborne's urban forest will be maintained and enhanced for the long term, in recognition of the valued environmental, social and economic services they provide. The City will work with its partners and the community in the urban and rural areas to ensure that this essential resource is managed effectively to maximize tree cover and health, increase native biodiversity, minimize risks to public property and contribute to the environmental sustainability and quality of life in the City of Port Colborne.

This plan will provide a road map of strategic priorities for years 2024-2028, inclusive of timelines, staffing and resource needs. The 5-year Operational Plan, in accordance with the UFMP, will guide the municipality to implement recommendations and funding for park and street side planting and maintenance.

Purpose and Scope

The Urban Forest Assessment together with the Urban Forest Management Plan (UFMP) will aim to increase, protect, and maintain the City of Port Colborne's urban forest, develop community interest in urban trees and further public health and safety. The UFMP will satisfy other goals and priorities of the City of Port Colborne including community awareness and education on the importance of urban trees, tree canopy and greenhouse gas reduction and increased development of the tree canopy in disadvantaged community areas.

Over the last decade, the City's urban forest has been affected by several factors ranging from tree loss due to the Emerald Ash Borer (EAB), changes in legislation, technological improvements, increased development pressures and climate change to name a few. As a result, the City requires an Urban Forest Assessment and an Urban Forest Management Plan to provide the City with a strategic framework to proactively manage and guide the growth of the urban forests.

The UFMP will proactively guide the preservation, management, and enhancement of the City's trees and forests on public owned lands in the urban area for a 20-year period as well as a focused 5-year operational plan. It is intended that the recommendations over time will transition the City from a reactive to a proactive urban forest management, thereby increasing operational efficiency and effectiveness, improving tree health and diversity, reducing risk to the public and increasing the wide-ranging benefits provided by a healthy and sustainable urban forest.

Plan Development Process

Nine supporting tasks were conducted for the UFMP that investigated many aspects of Port Colborne's Urban Forest, the infrastructure and policies supporting its management, and the opinions of the various communities that have an interest in it. Individual reports for each project were developed. These Reports are provided as individual Tasks in the UFMP as listed in the Table of Contents. The Vision Statement and Goals for Port Colborne's Urban Forest Management was highlighted above and the timeline for when Tasks were conducted is provided below.

Project Timeline

- August 2022: The Project began in August 2022 with a Windshield Survey, Tree Inventory of Zone 1 and Staff Interviews.
- Sept-December 2022; W&A Team conducted a Tree Canopy Analysis and a Canopy Cover/Plantable Spaces Assessment
- Jan-May 2023: Over the winter, the City initiated a UFMP Project Public Survey. The W&A Team completed a Tree By-law and Tree Planting Policy Review, Staff

Interviews, Canopy Cover/Plantable Spaces Assessment, SWOT Analysis, Communications, and a Criteria & Indicators Assessment

- June-August 2023: In the early summer the next round of Public Consultation occurred with a PIC Meeting and UFMP preparation.
- August 2023: Municipal Tree inventory completed for the Urban Area of Port Colborne
- November 2023 – February 2024: Draft UFMP was reviewed with City staff.
- Spring 2024: The UFMP is scheduled to go to City Council for approval.

Project Reporting

Descriptions of how the tasks were conducted and their findings are described in the following sections. Recommendations developed from each Task are listed in the respective Task Report and all Recommendations were compiled by task and provided in Appendix B.

For the purpose of this project, the City's four urban Operational Zones were used as Forestry Zones 1-4, and two additional Zones added. The two additional Zones were Rural Settlement and Rural Areas. Municipal trees in the Urban Zones, including rural settlement areas, (i.e, 1 to 5), were assessed for the Inventory. The City's tree management practices, tree policy, and planning processes were examined and input from the public considered were considered for the trees in the five Urban Forestry Zones (Figure 1.1). Because municipal trees in the Rural Area are not managed by the City, they were not included in the inventory or included in the Urban Forestry considerations.

The task Reports:

- Task 1: Municipal Tree Inventory
- Task 2: Review of City Tree By-Law 6175-01-15 and Tree Installation Policy (2007)
- Task 3: Tree Canopy Change Analysis – Zone 1
- Task 4: Staff interviews and discussions in preparation for the Urban Forest Management Plan
- Task 5: Canopy Cover/Plantable Spaces Assessment
- Task 6: Windshield Survey of Port Colborne's Street and Park Trees
- Task 7: Strengths, Weaknesses, Opportunities and Threats (SWOT)

- Task 8: Criteria and Indicators for Sustainable Urban Forest Management
- Task 9: Communication/Engagement Update

Appendix A. 5-year Operating Plan for Port Colborne's Urban Forest.

Appendix B. Recommendations Compilation

Appendix C1 Tree protection, planting guidelines

Appendix C2 Tree species recommendations

Task 1: Port Colborne Municipal Tree Inventory



1.1 Introduction

A primary component of this project required that W&A conduct an inventory of 5,683 of Port Colborne's municipal trees. Figure 1.1 shows the 6 Forestry Zones for the tree inventory and management planning.

The City requires the Inventory of its existing urban tree canopy to increase its understanding of its tree canopy cover and support the development of an Urban Forest Management Plan (UFMP) and to include its municipal trees in its Asset Management Program.

W&A used Treeplotter TM inventory program/Work Order Management System to collect the data on public trees in the City of Port Colborne between mid-August 2022 to the end of September 2022. The tree assessment included estimates of tree size, vigour, structure, and hazard potential with the findings being described in this Report. In most areas, planted trees smaller than the 20-cm diameter were also inventoried.

1.2 Tree Inventory Methodology

Port Colborne delineated 6 Forestry Zones. Zones 1-4 were Urban Forestry Zones, Zone 5 – Settlement Areas included rural-residential areas and hamlets outside of urban Port Colborne, and Zone 6 was Rural, the rest of Port Colborne comprised of mostly agricultural and natural areas where municipal trees are not actively managed (Figure 1.1). The Inventory assessed 5,683 of Port Colborne’s municipal trees including all trees in Zones 1-5, and also identified potentially hazardous municipal trees in Zone 6.

City of Port Colborne Proposed Forestry Zones

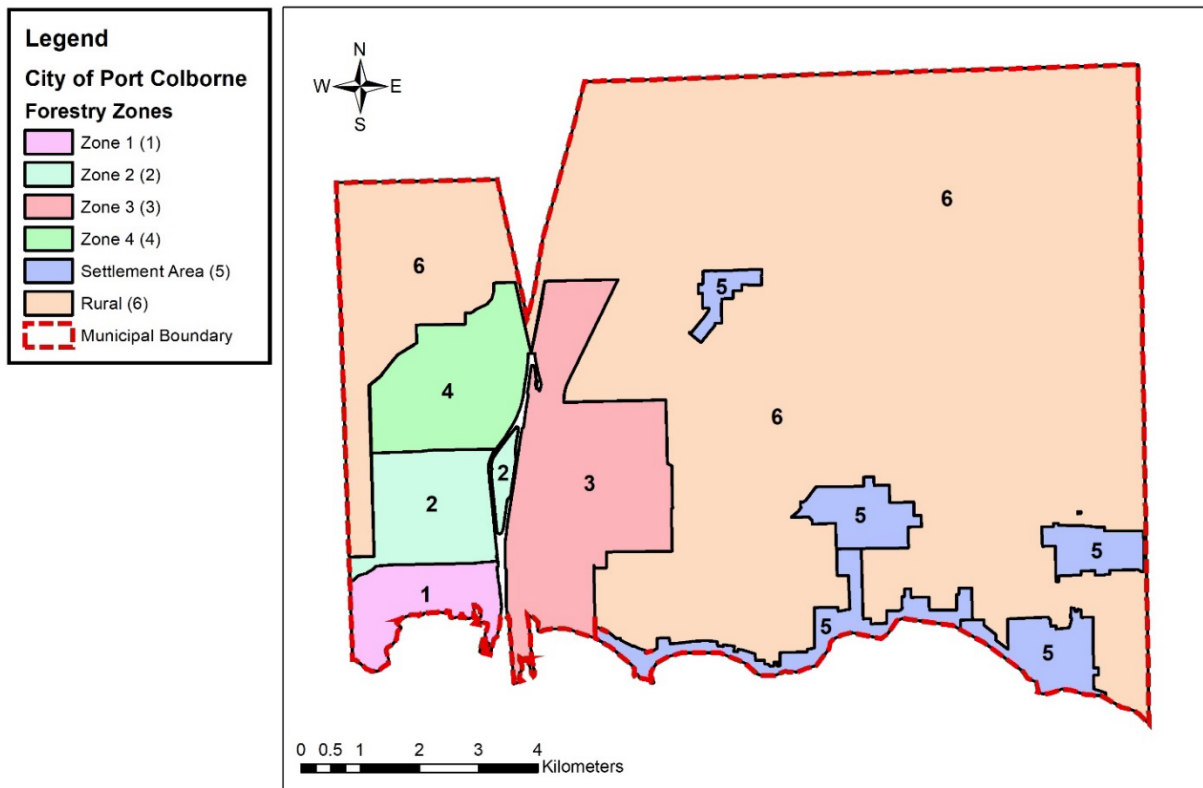


Figure 1.1 – Map of Port Colborne showing the 6 Forestry Zones

Figure 1.2 shows the locations of the inventoried trees. lists the variables collected for each tree including details about the variables collected. W&A used the current nomenclature for woody plant species. A few examples of data collected included DBH GPS coordinates, species, condition, and maintenance needs.

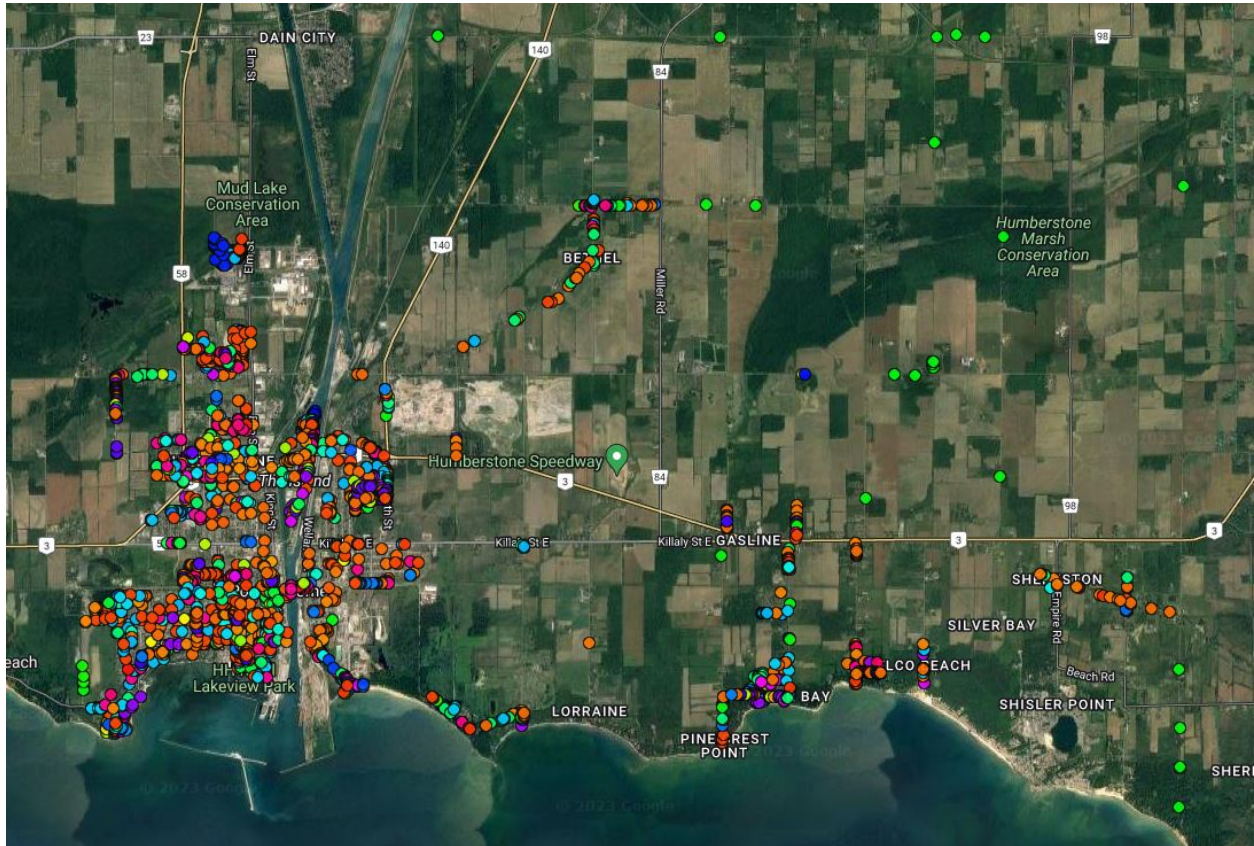


Figure 1.2 - Locations of trees assessed in the Inventory

Table 1.1 Data Fields Collected for Port Colborne Tree Inventory

| | Variable | Entry Method | Details |
|----|---------------------------------|---------------------|---|
| 1 | Plot ID | Auto populated | |
| 2 | Forestry Zone | Auto populated | Community, Hamlet, Rural Area, Settlement Area |
| 3 | Tree Number | Entered | Numeric |
| 4 | Ownership | List | Private, Neighbour, Town, Shared |
| 5 | Tree Category | Choice | Tree, Stump |
| 6 | Common Name | Auto populated | Auto populated if chosen scientific; otherwise, by list |
| 7 | Scientific Name | Auto populated | Auto populated if chosen common; otherwise, by list |
| 8 | DBH (cm) | Entered | Numeric |
| 9 | DBH 2 (cm) | Entered | Numeric - Multi-stemmed trees |
| 10 | DBH 3 (cm) | Entered | Numeric - Multi-stemmed trees |
| 11 | Number of Stems | Auto populated | 1, entered if more |
| 12 | Total Height (m) | Entered | Numeric |
| 13 | Base of Crown (m) | Entered | Numeric |
| 14 | Crown Health (% Foliage) | Entered | Numeric |
| 15 | Health | List | Good, Fair, Poor, Dead |
| 16 | Structure | List | Good, Fair, Poor |
| 17 | Condition | List | Good, Fair, Poor, Dead |
| 18 | Hydro Conflict | List | Conflicting, No-Conflict, Potentially Conflicting |
| 19 | Utility Lines | List | None, Primary Line, Secondary Line, Service Line |
| 20 | Maintenance Priority | List | Critical, Immediate, Routine, Low |
| 21 | Actions | List | Deceased, Monitor, None, Other Maintenance, Plant, Prune Aerial, Prune Ground, Remove Full, Remove Partial, Stump |
| 22 | Tree Comments | Entered | Notes on tree health or other comments |

| | Variable | Entry Method | Details |
|----|---|---------------------|--|
| 23 | <i>Tree Maintenance Comments</i> | Entered | Notes on tree maintenance |
| 24 | <i>Date Last Inspected</i> | Auto populated | |
| 25 | <i>Address Number</i> | Auto populated | Checked for accuracy |
| 26 | <i>Street</i> | Auto populated | |
| 27 | <i>Tree Location</i> | List | Back, Boulevard, Cemetery, Facility, Front, Natural Area, Park, Roadside, Side, Streetscape, Trail |
| 28 | <i>City</i> | Auto populated | |
| 29 | <i>Longitude</i> | Auto populated | |
| 30 | <i>Latitude</i> | Auto populated | |

The project inventoried 5,683 trees of 105 species in 50 genera, although most species had only a few individuals. Figure 1.3 shows that *Acer* (maples) were the dominant genus (42%), and that Norway maple was the dominant tree species inventoried. (Clark, 1997) recommend that no species should comprise more than 10% of the population in an urban forest. The data in Figure 1.3 and in Figure 1.4 show that Norway, and silver maple exceed 10% of the inventoried trees. This suggests that Port Colborne has a tree species diversity problem.

This represents a snapshot in time as the tree population is dynamic and changes as trees are maintained, removed, or planted. For example, some trees inventoried early in the project were removed by the time a final review of the work was conducted and the database updated.

This suggests that in general, planting programs should place more emphasis on non-maple species. However, sugar maples should be considered in appropriate site conditions. Freeman maple should also be considered for planting if Port Colborne implements a tree management program that includes corrective pruning for the life of the tree. Corrective pruning is especially important when they are young to keep them from developing significant structural problems when they are large. Freeman maple grows well in Port Colborne soil conditions and does not have the same level of structural problems as silver maple.

Table 1.2 Summary of Tree Species Representation by genus from Tree Inventory

| Genus | Common Name | # Trees | % Composition |
|----------------|-------------|---------|---------------|
| <i>Acer</i> | Maple | 2381 | 41.8 |
| <i>Picea</i> | Spruce | 539 | 9.5 |
| <i>Quercus</i> | Oak | 400 | 7.0 |
| <i>Juglans</i> | Walnut | 251 | 4.4 |
| <i>Pinus</i> | Pine | 245 | 4.2 |
| <i>Thuja</i> | Cedar | 211 | 3.7 |
| <i>Tilia</i> | Basswood | 173 | 3.0 |
| <i>Carya</i> | Hickory | 163 | 2.9 |
| <i>Malus</i> | Apple | 155 | 2.7 |
| <i>Other</i> | 41 Genera | 1181 | 20.7 |

Recommendation 1.1 - *Prioritize planting non-maples to improve species diversity.*

Recommendation 1.2 - *Norway maple should not be considered for planting.*

Recommendation 1.3 - *Freeman maple should be considered for planting with implementation of a maintenance-pruning program for the life of a trees.*

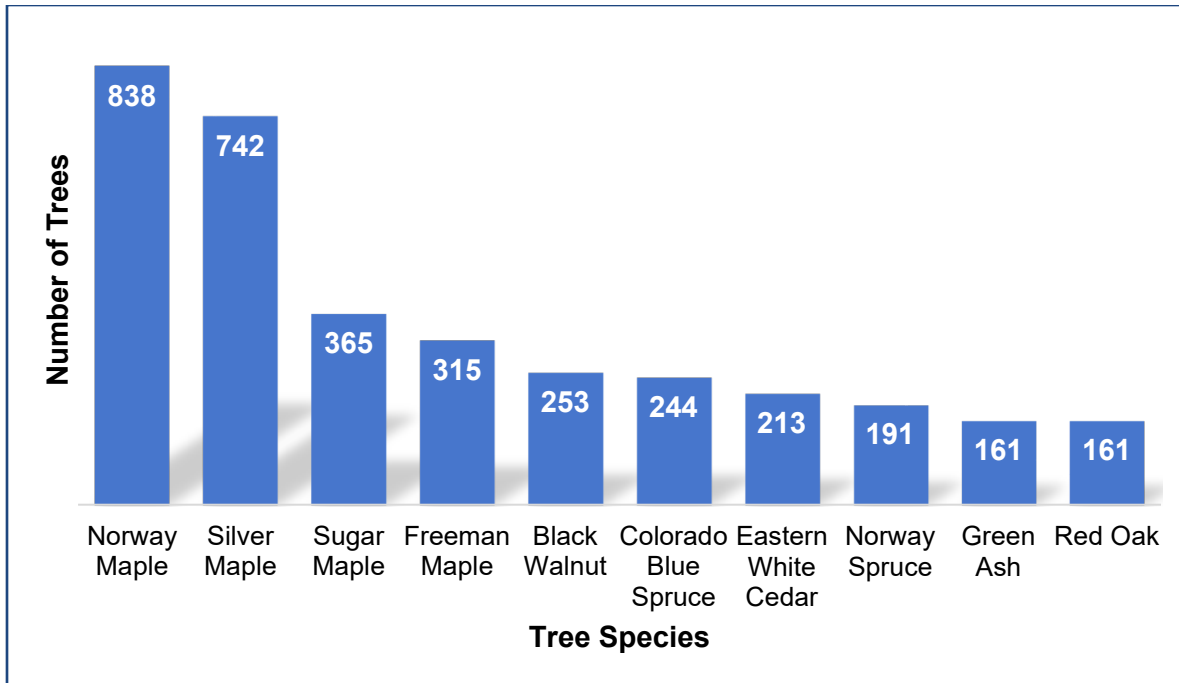


Figure 1.3 - Ten Most Common Species in Port Colborne's Tree Inventory

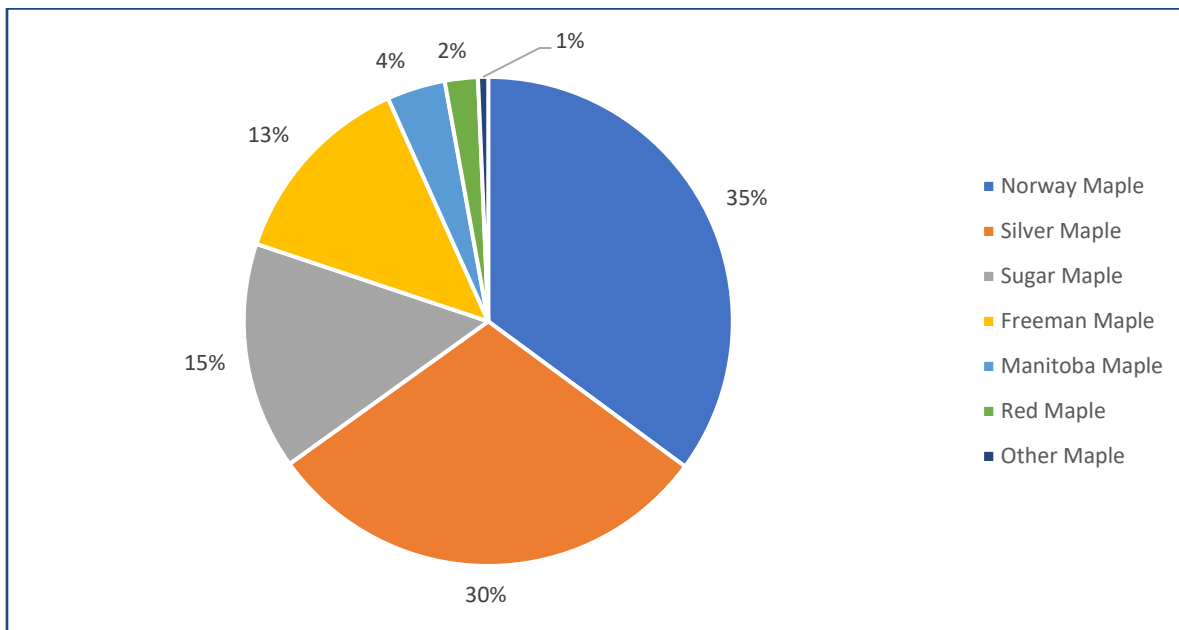


Figure 1.4 - Proportion of Tree Species in Maple Genus for Port Colborne's Inventory

1.2.1 Tree Condition

As part of the inventory, W&A staff visually assessed the condition of each tree. Each tree was rated Good, Fair, Poor, or Dead with associated notes regarding the reasons for the rating. Tree health ratings provide important information on individual trees and the population as a whole, helping to plan for maintenance and replanting efforts.

Figure 1.5 shows the condition rating summary and that 86% of the trees inventoried were in good, 10% were in fair and 4% were in poor condition or dead. To be rated in poor condition, a tree may have had significant crown die-back, wounds or seams, or other structural problems.

The dominance of trees in the good category suggests the public trees are generally healthy. *Establishing a pro-active maintenance program would be important in maintaining this good health condition and safety of the trees.*

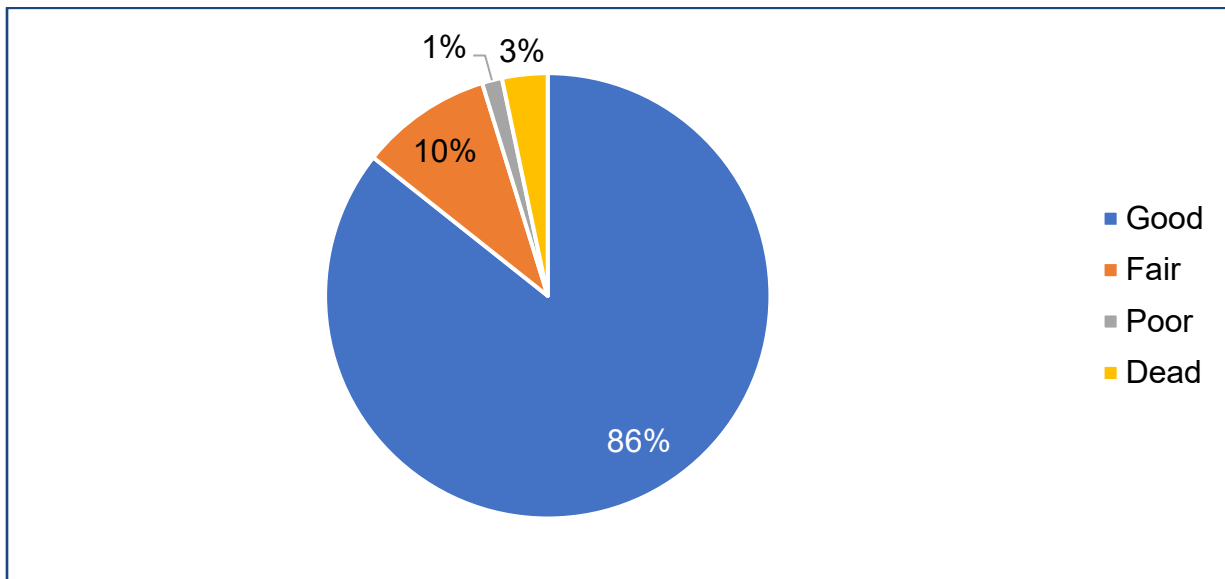


Figure 1.5 - Proportion of Tree Condition in Port Colborne's Inventory

1.2.2 Age Class

A healthy urban forest is characterized by an uneven-aged distribution with an inverse J-shape curve, as seen in Figure 1.6. An uneven-aged distribution will have a large amount of its population present in small trees and as the tree sizes increase, the population decreases. This is because as trees grow and mature, they become more susceptible to disease, weathering, damage and defects. Greater numbers of younger trees are necessary to grow into the larger/older age classes as they are diminished over time. Large/mature trees provide the most benefits and maintaining that population helps provide the most community and environmental benefits.

Because the actual ages of the inventoried trees are unknown, their trunk diameter was used as a proxy for age, because tree trunks grow in diameter as they get older. It was found that the diameter distribution of Port Colborne’s municipal trees has fewer small and large trees, with more mid-sized trees. Figure 1.6 compares the diameter distribution in Port Colborne with an uneven aged distribution.

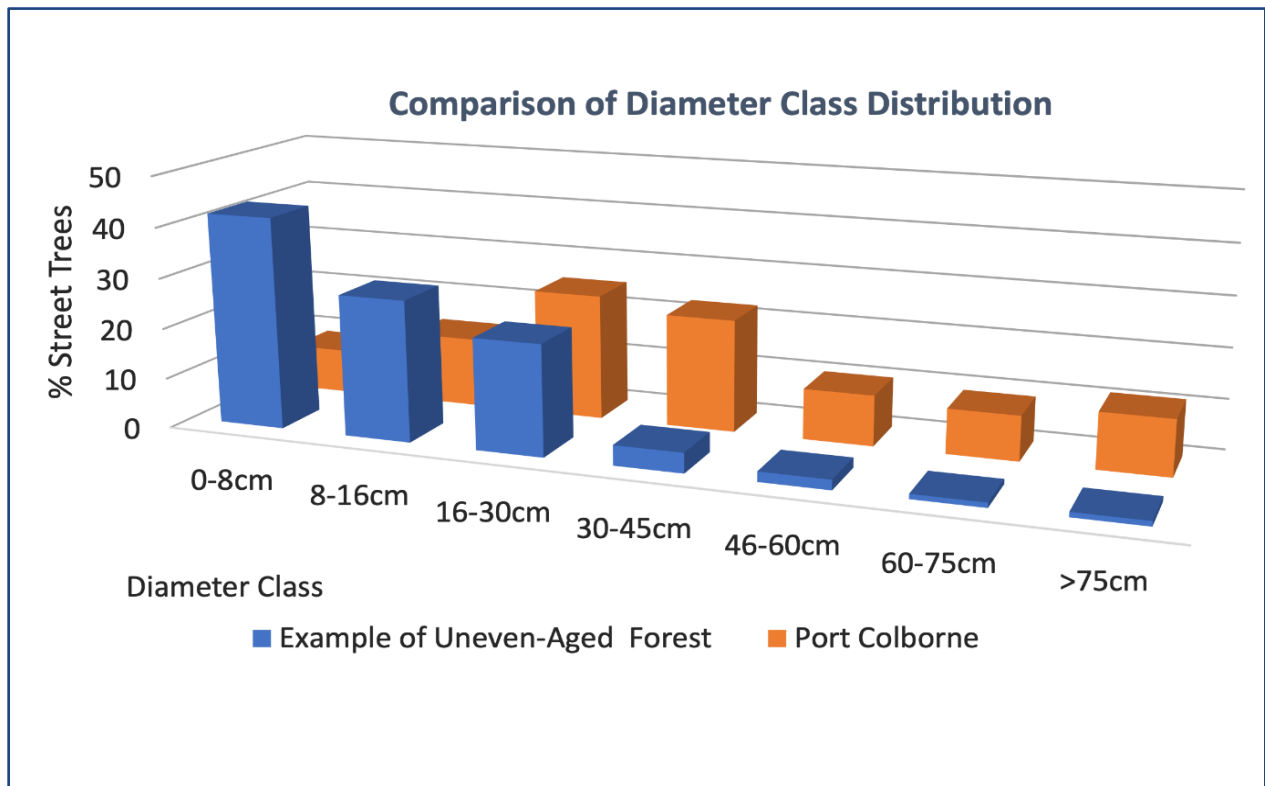


Figure 1.6 - Comparison of diameter class distribution of Port Colborne's Municipal tree and an example of a recommended, uneven-aged distribution

The shortage of young trees in Port Colborne's municipal trees is worse than it appears because that group is largely dominated by small-stature trees (e.g., white cedar), likely planted as screens or hedges by private owners. These small stature trees will not become the large street trees that provide the greatest number of benefits from the urban forest. This provides more of a case to increase the planting of large-stature trees in Port Colborne.

Recommendation 1.4 - Plant more juvenile trees on municipal property to off-set losses to declining and aging canopy

1.2.3 Tree Maintenance

Table 1.3 shows that the most frequently recommended maintenance actions were Aerial Pruning (20%) and Monitoring (13%). Tree Maintenance Assessments should be considered with the Maintenance Priority (Section 2.3) for operational planning. *Before* tree maintenance is conducted, the items should be reviewed/updated with a more rigorous inspection by a qualified/Certified Arborist or Professional Forester.

The Maintenance Assessment and Priority findings, suggest that the general health and condition of the public trees inventoried was good and that corrective pruning would be the primary activity that would improve the health and safety of Port Colborne's trees.

Table 1.3 shows the number and percentage of trees per maintenance recommendation. Aerial pruning was the most recommended action with 1122 trees and ground pruning was recommended for 311 trees (20% and 5% respectively). Assessment recommending the removal of 128 trees was noted. However, before tree removal is contracted or conducted, the items should be reviewed through a more rigorous inspection by a qualified/Certified Arborist or Professional Forester and the adjacent landowner be notified if recommendation for removal is confirmed.

These assessments show that most of Port Colborne's municipal trees are healthy and safe, a regular pruning schedule of juvenile and mature trees will help reduce the amount of tree problems that could be carried into the future.

Table 1.3 - Primary Maintenance Recommendations in Port Colborne's Inventory

| Maintenance Recommendation 1 | Count | Percent |
|---|-------|---------|
| Prune Aerial – climbing or aerial | 1,122 | 19.7% |
| Monitor condition of tree | 737 | 12.9% |
| Prune Ground-corrective pruning from the ground | 311 | 5.4% |
| Remove Full – including stump | 124 | 2.2% |
| Tree Risk Assessment Needed for trees with Imminent and High Maintenance Priority | 68 | 1.1% |
| Other Maintenance | 33 | 0.6% |
| Stump Removal | 12 | 0.2% |
| Remove Partial** | 4 | 0.1% |

Recommendation 1.5 - *Implement a maintenance pruning program for all ages of municipal trees to reduce tree structural problems and stability and improve public safety canopy.*

1.2.4 Tree Maintenance Priority

A Level 1 Tree Risk Assessment was conducted on each inventoried tree. The Level 1 Assessment consists of quick visual observations of maintenance needs of each tree and assigning a priority of their urgency. The categories are listed below.

- 1 - **Imminent priority (Critical)** – Immediate Level 2 Tree Risk Assessment by a qualified Arborist to prescribe specific treatment to reduce current high-risk.
- 2 - **High Priority (Urgent)** – Level 2 Tree Risk Assessment should be conducted soon (i.e., within 3 months) to prescribe maintenance to reduce potential risk.
- 3 - **Medium Priority** – Moderate level hazard structural or health problem that should be corrected during regular maintenance.
- 4 - **Low Priority** – minor structural or health problem that should be corrected during regular maintenance (often on smaller trees).

Table 1.4 shows the percentage of each maintenance priority rating given in the survey. Medium and Low priority ratings were the most common ratings with, respectively, 22% and 77%. Imminent and High ratings account for approximately 1% of the total ratings (i.e., 0.14%, 1.14% respectively).

Table 1.4 - Percentage of Maintenance Priority Ratings

| Percentage of Maintenance Priority Rating | Percentage (%) |
|---|----------------|
| Imminent – Immediate Risk Assessment recommended | <1% |
| High – Risk/Maintenance assessment & treatment soon. | 1.1% |
| Medium – some structural problem that should be considered for regular maintenance | 21.5% |
| Low – structural maintenance pruning | 77.1% |
| Tree Risk Assessment Needed | <1% |

Table 1.4 shows the recommended Maintenance Action and Maintenance Priority for the inventoried trees. Only 73 inventoried trees received Imminent and High Maintenance Priority ratings. The City was immediately notified of 1 tree that had an Imminent Maintenance Priority and the problem was rectified by the City. Recommended hazard mitigation regarding 4 trees was forwarded to the City. All other trees received a Medium or Low Maintenance Priority rating.

These results agree with the observation that the City has a low proportion of trees with higher risk or maintenance requirements. This may be from the City's removal of larger trees (i.e., trees with higher maintenance needs) from road allowances since 2006 (see Task 2).

It is recommended that the City implement a grid-pruning system or other cyclical maintenance plan for corrective pruning of juvenile and mature trees to minimize future risk from tree health and safety problems in the future.

Recommendation 1.6 – *Employ/retain Tree Risk Assessment Qualified (TRAQ) professional to assess trees with High or Imminent Maintenance needs and prescribe mitigation treatment.*

Recommendation 1.7 - *Implement tree maintenance program. For example, a program could include a grid-pruning approach for tree maintenance where designated blocks of trees within Zones where maintenance pruning would be conducted on a cycle.*

1.2.5 Public Comments

While assessing trees for the inventory, people would ask surveyors about what they were doing. W&A staff would explain the inventory and tree assessment process and mention that it was part of the Urban Forest Management Plan Project.

Everyone was pleased that the work was being done and a number expressed concerns that the City was removing too many of the trees. Many of those who approached the surveyors expressed that the process of prescribing tree maintenance, communications with affected adjacent landowner, and the requirement to plant replacement trees were repeated concerns.

Recommendation 1.8 – Develop Communications protocols for advance landowner notification regarding as part of a Work Order Management System so affected landowners are notified of impending tree maintenance (e.g., planting, pruning or removals.

1.3 Summary

The inventory provides a critical tool in understanding and managing the urban forest and will support the development and implementation of tree management programs. A good starting point would be the implementation of a grid-pruning approach for tree maintenance, where blocks of trees within Zones would receive maintenance pruning on a cycle. A grid-pruning cycle would schedule years when all street and park trees in all or part of a grid are pruned on a cycle.

The Tree inventory would be kept current by updating individual tree information when maintenance is conducted or in response to community and staff concerns through a Work Order Management System (WO) (Section 1.3.1). Staff could create appropriate work orders regarding tree maintenance issues identified by the public or staff; close out WOs as work is completed and update the inventory with new information as soon as it happens.

An important aspect of managing the urban forest is having a consistent tree planting program. This program builds the population younger/smaller to enable the development of the larger/older trees over time as suggested in Recommendation 4. Mature medium to large stature trees are the foundation of the Urban Forest.

1.3.1 Work Order Management and Inventory Update

Considering that Port Colborne is planning on developing infrastructure to manage their urban forest more effectively, an effective Work Order Management System (WOMS) should be developed. A WOMS includes all elements of the process from:

- Service Request - notification from staff or the public that Tree Maintenance should be considered,
- assessment by qualified staff, a resulting Work Order (i.e., prescription for work to be done)
- Work Order creation to conduct prescribed work,
- Communication with affected landowners, including tree replacement discussion,
- Completing the work,
- Closing the Work Order, and
- Updating the Tree Inventory data and new tree conditions

Work Order Management Systems range from manual/paper methods with no tracking or inventory update, to semi-automated systems with spreadsheets and perhaps manual updating of the tree inventory, to automated systems that track service requests through process and automatically update the inventory.

An example of an automated WOMS is a module of the Tree Plotter platform that was used to collect and manage the tree data for the inventory in Port Colborne. While the Tree Inventory data resides in a Port Colborne's GIS system, the automated system can track the steps in WO management and be set to automatically update the municipal Tree Inventory.

Recommendation 1.9 – *Optimize a Work Order Management System that enables Port Colborne to track its Tree Maintenance activities and reflected those changes in the Tree Inventory.*

Task 2: Review of City Tree By-law 6175-01-15 & Tree Installation Policy (2007)

2.1 Introduction

This review of Port Colborne's By-law 6175-01-15 and Tree Installation Policy (2007) is part of the City's Urban Forest Assessment and Management Plan Project (UFMP). The objective of this Report is to review Tree by-law 6175-01-15 and Tree Installation Policy (2007) and assess whether they support:

- Good Urban Forest Management Practices,
- Canopy Cover Goals and
- are in accordance with the Municipal Act, Port Colborne's Official Plan

2.2 Background

It is our understanding that before 2006, Port Colborne's street tree population has been dominated by larger-sized maples and green ash. Since 2006, the street-tree population and Canopy Cover in developed municipal and private lands in Port Colborne have dropped significantly (Task 3).

As was common throughout municipalities in southern Ontario, it is likely that many of these trees had been planted to replace elms that had been killed in the 1950's by the Dutch elm disease. Elms were dominant at the time because of their fast growth and tolerance to urban conditions. Since 2000, most ash trees, in the absence of a treatment program, have been killed by emerald ash borers (EAB).

After most ash trees were killed by emerald ash borers in Port Colborne, many remaining street trees were aging silver maple trees – trees that have well-known structural problems and need a high level of maintenance. The structural problems with the older silver maples were worsened by the historically limited tree maintenance in Port Colborne. This resulted in a higher than necessary level of structural problems and tree risk associated with the City's street and park tree population. This manifested itself in higher than necessary tree structural damage during high windstorm events and accelerated removal of many old, large trees by the City.

Combined with the ash tree mortality, the City's Tree Installation Policy, and removal of larger silver maples has lowered the street tree population and will continue to do so over time. From the *Windshield Survey Report* and *Zone 1 Canopy Change Analysis* conducted as part of this Project, the Stocking level and proportion of available space for a street tree is 32% in Zone 1. Generally, the stocking level for most other municipalities that the authors are familiar with is closer to 70-80%. The tree canopy

decline of the municipal trees will be investigated through the Project's *Zone 1 Canopy Change Analysis*.

2.3 Tree Installation Policy 2007 – Review

The Tree Installation Policy sets out guidelines and financial support for the replacement of municipal trees removed, or if a homeowner has asked for a tree to be supplied under its *Greening Port Colborne* Initiative. Based on annual funding and on request of a resident, replacement of trees removed by the City or because of storm events will be supported first. In the fall of each year, the remaining funding will be made available to residents to plant a tree in their front yard.

The policy requires that the trees shall be planted on the private property adjacent to municipal property; within 1.5 and 9.0 meters from the municipally owned property where it cannot interfere with utilities or power lines. It provides information on the purchase and installation of the replacement tree, contact information, and other details. In recent years, the funding allocated for tree planting by the City averages \$5,600 (Staff Interviews).

While the Policy provides support for planting replacement trees for municipal trees that were removed on adjacent private property at the resident's request, it does not suggest that the City, on its own, will replace trees removed from municipal property or plant any trees on municipal property. It does provide for planting replacement trees on adjacent private property at the resident's request.

It appears that the intent of the policy is to reduce the population of public trees. This may be to reduce the costs and perceived burden of managing those trees.

2.4 Policy Conformance with the City's Official Plan

Section 5.3.6 of Port Colborne's Official Plan (OP), states "Elements of the streetscape, which can really be termed the 'public realm' [...] can be used in establishing neighbourhood identity." They also add "Street tree plantings offer another means of creating a consistent public realm image. Selections should be consistent; whether using a single species or a patterned mix. This again will form lasting impressions as a point of reference for residents and travelling public". By directing trees to be planted on private property and not on public property, the Tree Installation Policy does not conform to the City's OP that expresses a vision to plant trees on the public realm.

2.5 Does the Policy Support Good Urban Forest Management?

Since the policy is one dimensional; it only addresses tree planting on private property which is only a fraction of a municipal Program based on good urban forest management. A much broader urban forest policy is needed to guide urban forest management at the City.

“Assuming that the community is interested in a good street tree management program, the overall goal of a program is to provide the highest-value street tree population for the costs incurred. With this objective, three management goals will probably (but not always) emerge:

- 1 - Maximum stocking of street trees. To provide an optimum-value population, the plan should attempt to achieve full stocking of street trees in the community at some realistic point in the future.
- 2 - Low maintenance costs and public safety. Maintenance costs should be balanced against needs for public safety, a high-value tree population, and budgetary constraints. In the short run, cutting maintenance expenses will save money, but in the long run this will result in public hazards and trees that are a liability rather than an asset to the community.
- 3 - Stability. A stable street tree population is one that is not threatened by catastrophic losses due to poor management. Poor management includes overreliance on a few species, a uniform city-wide age structure, and minimal or no scheduled tree maintenance.” (Miller, 2015).

2.6 Bylaw 6175.01/15 – Summary

Port Colborne’s By-law 6175-01-15 is enabled by the Ontario Municipal Act (2001). The By-law defines an “Adjacent Tree” as one that directly abuts and/or impacts City Property. The By-law describes an administrative structure for the By-law and lists:

Section 3

- Tree management activities to manage and protect trees on municipal property.
- Manage trees in adjacent area that threaten City Streets.
- Protect damage to trees on City property by others.

Section 4

- Protect Municipal Trees from damage, destruction, or interference.
- Plant Trees on City property without Permission.

Section 5

- No person shall Plant a Tree on City Property.
- Disallows the planting of poplars, willows, ash, conifers, Manitoba maple and silver maple within 4.5 meters of City property.

Section 6

- Describes process for resident to request a removal of adjacent municipal tree.
- Describes fees for resident to pay for removal and replacement of tree.
- Describes process for resident to request replacement of tree removed by City (i.e., on adjacent private property) (see Tree Installation Policy).

Section 7

- Describes the maintenance, trimming and/or removal of adjacent trees that are a danger to persons using City property.

Section 8

- Requires notice of intent of resident to remove adjacent tree, and permission of the Director.

2.7 By-law 6175.01/15 – Review

By-law 6175-01-15 is enabled by the Ontario Municipal Act (2001). The focus of the By-law is the management and planting of trees on municipal road allowances (e.g., highways), and adjacent hazardous trees.

Most of Sections 3, 5, 6, 7 and 8 provide guidelines and regulate for activities associated with the management of trees on municipal land and road allowances, and along highways. These activities are specifically enabled by the Municipal Act and no By-law is necessary. Most municipalities have this information in a policy for/by the administrative unit responsible for tree management in the municipality, often Public Works or Parks.

Section 4 provides guidelines for the protection and penalties for damage to, or the removal of, municipal trees and prohibits the planting of trees on municipal property without permission.

2.7.1 Discussion regarding the By-law

In the authors' opinion, some elements of the By-law are unenforceable. These would include Section 5(2) which restricts the planting of certain species & genera of trees within 4.5 meters of municipal property. While some of these species may be undesirable near roads or structures, the authors do not believe there is a legal

authority to limit planting certain species. From the *City of Port Colborne: Staff Interviews/Discussions for the UFMP Project Report*, By-law staff advised that there have been no charges laid under this By-law to date.

Elements in the *Municipal Act* authorize the maintenance and removal of trees on adjacent private land that may be a hazard to public land, but do not refer to tree planting. The definition of “Adjacent Tree” is ambiguous and should be split into 2 definitions – “Shared Tree” and “Private Tree”. A shared tree would be one where portions of the stump or major part of the root flare cross the property line between the municipal and private land. A Private Tree would be one that is entirely on private land. The authors are unsure if the By-law 6175.01/15 could be used to enforce Section 8. This section requires that written notice and approval is required to remove an “adjacent tree”.

Most of the By-law directs the maintenance, removal, and replacement of trees on or adjacent to roadways. These activities are specifically enabled by the Municipal Act and are described in Policy documents for the administrative unit that is responsible for tree maintenance. This function should be fulfilled by staff or consultants who are qualified (e.g., experienced Certified Arborist or Professional Forester).

The above aspects of the By-law are unnecessary (i.e., as a component of the By-law) and do not contribute to good Urban Forest Management or positive goals.

Most Municipalities have Public Tree By-laws that protect municipal trees (e.g., street and park trees) from damage and specify penalties for such events. Such damage typically occurs from activities by other parties such as utility construction that unnecessarily damages the above- or below-ground portions of municipal trees.

Table 2.1 how the City of Port Colborne’s Tree By-law and Corporate Tree Installation Policy compare to a sample of some of the other municipalities within Niagara Region.

Compared to these other municipalities the City’s Tree By-law lacks a comprehensive approach to the protection of its urban forest that is reflected in other municipal tree by-laws. Most other municipalities sampled have more clear and more comprehensive protection for City trees.

Compared to these other municipalities the City’s Tree Installation Policy is the only one that does not support the public tree. In addition, most other municipalities sampled have policies that provide guidance in many aspects of public tree management- this is something Port Colborne does not currently have.

Table 2.1 – Municipal Comparison

| Public Tree By-law | Corporate Urban Forest Policies | Private Tree By-law |
|--|--|--|
| <p>Port Colborne</p> | | |
| <p>By-law 6175-01-15 Regulates the maintenance, protection, preservation, and removal of all City Trees. Also includes trimming and removing of adjacent trees.</p> <p>Conclusion: Some elements of the By-law may be unenforceable; not sufficiently comprehensive. (Source- Review of City Tree By-law 6175-01-15 and Tree Installation Policy (2007), November 2022)</p> | <p>Tree Installation Policy (2017) The policy requires that the trees shall be planted on private property adjacent to municipal property.</p> <p>Conclusion: Does not support “Good Urban Forest Management” on public property.</p> <p>(Source- Review of City Tree By-law 6175-01-15 and Tree Installation Policy (2007), November 2022)</p> | <p>No</p> |
| <p>Niagara-on-the-Lake</p> | | |
| <p>By-law 4571-12 Authorizes & regulates the planting, care, maintenance, and removal of trees on municipal property.</p> <p>Conclusion: Clear and comprehensive protection for town trees</p> | <p>Tree Planting Policy PW-RDS-005</p> <ul style="list-style-type: none"> Objective “to enhance street landscape.” <p>Tree Trimming Policy, PW-RDS-014 – purpose:</p> <ul style="list-style-type: none"> “...maintain structural integrity and safety.” <p>Tree Removal Policy PW-RDS-013</p> <ul style="list-style-type: none"> Purpose: ...” protect the travelling public and property owners from possible injury or damages.” <p>Climate Change Adaptation Plan, 2022</p> <p>Conclusion: Supports the urban forest: Includes a Goal called “Urban Forest Resiliency” containing 6</p> | <p>By-law 5139-19</p> <p>A By-law to Regulate the Destruction or Injuring of Trees on Private Property in the Urban Areas. Protects public trees.</p> <p>Conclusion: Supports the urban forest. As of March 11, 2019, property owners must apply for a Tree Removal Permit before removing any tree that has a trunk measuring 12.5 cm or larger in diameter</p> |

| Public Tree By-law | Corporate Urban Forest Policies | Private Tree By-law |
|--------------------|---|--|
| | Indicators such as 'percentage of total tree canopy' | |
| Thorold | | |
| No | <p>Policy No: 900-02 Tree Management Policy (2002) This Policy Statement (2002) provides guidance in many aspects of public tree management. It “recognizes the value of urban and rural trees and the role they play in sustaining a healthy community. In addition, this Policy also includes:</p> <p>(a) Specification #1 “Pruning of Trees” Provides rationale for pruning but limited guidelines.</p> <p>(b) Specification #2 “Tree Protection” Provides basic rationale and principles of tree protection.</p> <p>(c) Specification #3 “Planting Guidelines” Provides basic guidelines for tree planting and tending.</p> <p>Conclusion: Thorold should amend this policy by updating its municipal Tree Guidelines with reference to ANSI A300 Standards developed by the Tree Care Industry Association. These are the generally accepted industry standards for tree care practice</p> | No |
| Region of Niagara | | |
| No | No | <p>By-law 2020-79 Woodlands By-law (not an individual tree by-law) Governs protection and preservation of</p> |

| Public Tree By-law | Corporate Urban Forest Policies | Private Tree By-law |
|--|---|--|
| | | woodlands in Niagara. Grimsby, Niagara-on-the-Lake, Niagara Falls, St. Catharines, West Lincoln have delegated authority to the Region to deal with woodlands less than 1 hectare in size: Conclusion: Port Colborne should delegate authority to Region to regulate woodlands less than 1 hectare in size |
| Niagara Falls | | |
| By-law No. 2004-173 as amended by By-law 2013-69, By-law 2015-58 <i>Prohibits or regulates the destruction, injury, and planting of trees on municipal property.</i> Conclusion: Clear and comprehensive protection for City trees | <p>“Niagara Falls to look at tree protection policies.”</p> <p><i>(Source: Niagara Falls Review, Nov. 18,2021)</i></p> | No |
| St. Catharines | | |
| Tree Protection Bylaw 2019 No. 5478 Amendment Bylaw 2021 No. 5712 Conclusion: “A key change to the Bylaw is the introduction of a Tree Permit review for Building Permits K.1 - Page 7 Review of Tree Protection Bylaw Page 8... that have not resulted from a recent development | 2011 Urban Forest Management Plan commits to increasing its tree canopy cover from 17% to 30%. Conclusion: The City’s Climate Action Strategy calls for: <ul style="list-style-type: none"> • Creating resilient natural systems • under Green Space & Ecosystems many of the 18 | No |

| Public Tree By-law | Corporate Urban Forest Policies | Private Tree By-law |
|---|---|---------------------|
| <p>application (i.e., Rezoning, Subdivision, Development Permit) and is anticipated to increase demand on staff resources. Additional staff resources will be required for the administration of the Tree Protection Bylaw, as amended, subject to Council direction, related to matters such as clerical support for permit issuance and inquiries, certified arborist for site inspections, and officers for bylaw enforcement.” (Source: Tree protection advisory committee report to mayor and council. June 14, 2021.)</p> | <p>action areas relate directly to trees:</p> <ul style="list-style-type: none"> ○ Complete a Tree Canopy Study/Strategy ○ Develop a tree voucher program for private properties. ○ Develop a Biodiversity Conservation Strategy ○ Update preferred planting list of trees and shrubs to ensure plants can adapt to future climate conditions | |

2.7.2 Recommendations regarding Tree By-law

According to the U.S. Forest Service, large trees provide 70 times more environmental and economic benefits than small trees (Nowak D. J., Urban Forests and their ecosystem services, 2015). While the policy may provide for some increase in canopy cover on private land, it will not offset the loss of canopy cover from the removal of large stature municipal trees such as ash and silver maple.

It is advised that Port Colborne change the direction of City tree management and develop a policy that follows good urban forest management recommendations to re-populate and maintain trees on municipal lands. This will enhance the community, improve the canopy cover, and provide numerous other benefits (e.g., reduced carbon use, increased carbon storage and a more livable community).

Recommendation 2.1 – *Prepare a policy that provides guidelines for the planting and management of municipal trees, including those on and along road allowances, and in parks.*

Recommendation 2.2 - *Prepare a replacement of By-law 6175-01-15 that protects public trees and municipal areas. This would restrict the planting of trees or damage to municipal trees.*

Recommendation 2.3 – *Withdraw By-law 6175-01-15 and the Tree Installation Policy (2007)*

Recommendation 2.4 – *Port Colborne should delegate authority to regulate woodlands less than 1 hectare in size to the Region of Niagara.*

Task 3: Tree Canopy Change Analysis – Zone 1

3.1 Introduction

The concept of an urban forest is best understood when viewed from the air. From this perspective, a pattern emerges: the density of the urban forest varies with patterns of land use in urban areas. The *Tree Inventory*, found in Task 1, assessed all municipal trees in Forestry Zone 1 (Figure 1.1) which includes Port Colborne's Heritage District. Observations made during the Tree Inventory suggested that looking at Tree Canopy change over time in Zone 1 would inform the development of a Canopy Cover Goal for the City of Port Colborne.

During the Tree Inventory (Task 1) it was observed that many plantable areas of municipal road allowances were vacant of trees and that there were few young trees. Inventory field staff also observed that many trees present in the 2018 imagery used during the inventory process had been removed by 2022. This concern was expressed by several residents who spoke with inventory staff. During *The Port Colborne Tree Installation Policy and Tree Bylaw Review* (Task 2), it was found that these policies supported removing trees from road allowances and planting replacement trees on adjacent private property.

Because of these observations, the Consulting Team suggested that an evaluation of Tree Canopy over time in developed areas of municipal and private ownership would provide valuable insight into the effects of these policies.

W&A conducted a *Tree Canopy Cover Change Analysis* of municipal and residential lands in Zone 1 of Port Colborne, using an online tool used by communities around the globe called *i-Tree Canopy 7.0* (Nowak D. J., *Understanding i-Tree: 2021 summary of programs and methods*, 2021)

Methodology

i-Tree Canopy was created through a partnership lead by the United States Forest Service. It provides a peer reviewed science-based methodology for users to measure tree canopy cover in communities and help establish base line data for goal setting. A detailed description of how *i-Tree Canopy* works is provided in the Task 5: Canopy Cover and Planting Area Study for Port Colborne.

i-Tree Canopy starts by generating randomly located points in the Study area using images from Google Earth for the year selected by the user. The user assesses the land cover at each point. Each point is assessed by the User and categorized into one of the defined Cover Classes. W&A staff assessed the Cover Classes at 300 points in Zone 1 (Table 3.1). Tree Canopy coverage percentage for Municipal and Private Canopy was estimated from these values. The assessment used Google Earth Pro imagery (2018), provided by *i-Tree*.

Table 3.1 - Zone 1 Cover Classes

| Cover Class | Description |
|--------------------|---|
| Municipal Canopy | Tree Canopy over municipal property – parks, road allowance, street trees, etc. |
| Private Canopy | Tree Canopy within private land in residential and commercial areas. |
| Other | All other surfaces including natural areas |

76 points out of 300 were within Municipal Property.

174 points out of 300 are within private residential and commercial property.

The City of Port Colborne's Tree Installation Policy was approved in 2007 and Tree By-law was approved in 2015. To assess how the Tree Canopy changed between these dates and 2018, and possibly been affected by these policies, the same points were assessed using imagery from 2006 and 2015.

To conduct the change analysis, the 300 points from the initial survey in were exported to Google Earth Pro. The points were re-assessed using the same process in Google Earth using imagery for 2006 and 2015, providing the Tree Canopy in Municipal and Private areas for the years 2015 and 2006. This enabled the comparison of Tree Canopy in those areas in three periods; 2006-2015; 2015-2018 and the total change from 2006 to 2018.

The percent Tree Canopy TC over Municipal and developed Private Property in residential and commercial areas in Zone 1 dropped substantially in all three time periods (Table 3.2). The TC over municipal property started at 17.1% in 2006, dropped 15% by 2015, and another 9% between 2015 and 2018. Private Tree Canopy started at 34.5 in 2006, dropped 7% by 2015 and another 14% between 2015 and 2018. The change between 2006 and 2015 was -23% and 20% for Municipal and Private Tree Canopy respectively.

Table 3.2 - Percent tree canopy over municipal property (i.e., road allowances and parks) and developed private property (i.e., residential and commercial) in Zone 1

| Years | Municipal Canopy | | Private Canopy | |
|-------------------------------------|-------------------------|------------------|-----------------------|------------------|
| | Canopy (%) | % change* | Canopy (%) | % change* |
| 2006 | 17.1 | | 34.5 | |
| 2015 | 14.5 | -15.0% | 32.2 | - 7.0% |
| 2018 | 13.2 | -9.0% | 27.6 | -14.0% |
| * % change from previous assessment | | | | |
| Total Canopy Change | | | | |
| 2006 – 2018 | | -23.0% | | -20.0% |

3.2 Summary – Tree Canopy Cover Change

Zone 1 was used as a proxy for the upper end of the City's total Tree Canopy for urban areas of Port Colborne because it includes the heritage district near Lake Erie, more recent subdivisions (i.e., 1950's), commercial areas and industrial areas.

The findings of the Change Analysis (Table 3.2) shows that the relative percent change in tree canopy cover for municipal lands was reduced by 15% between 2006 and 2015, and by another 9% between 2015 and 2018. The percent change in Tree Canopy cover decreased on Private lands in both periods as well; it dropped by 7% in the first period and 14% in the second period.

Period 1: 2006-2015

It is expected that tree canopy cover would decline during Period 1 because ash tree mortality caused by Emerald Ash Borer (EAB) began around that time in the Niagara Region. As ash was commonly planted as street and ornamental trees after the elms died, ash's abundance and mortality likely contributed to the tree canopy cover decline in Period 1. Likely an effort to support replanting in response to the mortality and removal of municipal ash trees, Port Colborne passed the Tree Installation Policy (2007) that supported planting trees on private property adjacent to municipal property rather than on municipal property.

It is suggested that the cost of ash tree removals brought scrutiny of tree management costs at the City. The ash mortality followed by the Tree Installation Policy might have been the first steps in reducing the numbers of municipal trees on the public road allowance.

Tree maintenance/removal costs were also under pressure from the many large silver maples that had likely been planted as street trees following the demise of elm trees from Dutch elm disease. Silver maple is a rapidly growing tree that would grow well in the clayey soils that predominate in the Port Colborne areas. Unfortunately, they have soft wood and long branches that are subject to breakage from wind and ice. If not regularly maintained, the species can cause tree failure issues. The manifestation of this problem is assumed to have incited the development and implementation of the Tree By-law that was approved in 2015. The By-law supports the apparent strategy of the Installation policy to remove trees from the municipal road allowance.

Period 2: 2015-2018

The Municipal and Private Tree Canopy dropped again between 2015 and 2018 (Table 3.2), with a much larger reduction in Private Property compared to the Municipal Property (i.e., -17% and -10% respectively). During this period, many larger silver maples were removed because of real or perceived risk. The decline in tree canopy cover over residential properties may have been associated with the removal of silver maple on the boulevards as the large canopies these large trees on municipal boulevards often extended over the adjacent residential properties.

Period 3: 2006-2018 (change for entire time frame)

Tree Canopy in developed areas of Zone 1 had a relative dropped by 30% for Municipal and 25% for Private Property between 2006 to 2018 (Table 3.2). Expressed as the absolute change in Tree Canopy, in developed areas of Zone 1 dropped 3.95 percentage points (i.e., 30% relative change) for Municipal and 6.89 percentage points (i.e., 25% relative change) for Private Property between 2006 to 2018 (Table 3.2).

The drop of 3.95 percent and 6.89 percent over the 12-year study period was found and an annual drop of 0.33%/year for Municipal and 0.57%/year for Private property. This rate of canopy cover decline is dramatic, considering that Nowak and Greenfield (2018) found an average net loss off 0.12 percentage points/year of Canopy Cover (i.e., Tree Canopy + Shrub Canopy) in municipalities throughout the US.

This rate of Tree Canopy loss over Municipal and Private Property in Zone 1 suggests that a variety of strategies will be required to stop and to reverse this rate of decline. Strategies to help achieve Canopy Cover Goals will be included in the Urban Forest Management Plan.

Summary

The relative decline in the Tree Canopy Cover in Municipal and Private areas of Zone 1 was found to be 23% and 20%, starting at 17.1% and 34.5% respectively during the 12-year study period. The decline most likely resulted from the removal of dying ash trees, the removal of many larger silver maples, and the corporate policy of not replacing trees on the public road allowance.

The ash mortality was because of EAB. The removal of many large silver maple was likely because of the high costs of maintenance requirements associated with and the management of risk associated with silver maple's susceptibility to damage from high winds and ice. Port Colborne's Tree Installation Policy (2007) and Tree By-Law (2015) directed that new replacement trees be planted adjacent private lands rather than on the public road allowances.

It seems likely that this downward trend in Tree Canopy will continue unless there is some change in City policy regarding the planting and management of municipal trees which would include the introduction of a scheduled tree maintenance Program. While existing policies provide some support for tree planting on adjacent residential property, this strategy has led to a significant decrease in tree canopy cover in Zone 1 between 2006 and 2018.

Canopy cover is directly related to the environmental and human health benefits that the urban forest provides. It is important to set an achievable canopy cover goal so community and staff can understand and support the enhanced tree maintenance, tree planting programs and policy development required to achieving the goal. Municipal policies like the Official Plan, Urban Design Manual and Engineering Road Cross Section will need to be revised to better support canopy cover growth and retention.

The 2006 canopy cover percentage of 22% is suggested as a realistic midterm goal for developed urban areas of Port Colborne. The City could aspire to return its 2006 tree canopy cover in these areas through strategies recommended in the Urban Forest Management Plan. This is an achievable goal that will require 2 or more decades of tree planting and the retention of large-stature trees over the 20-year period. Getting started with, and then building on, updated tree planting and maintenance procedures are the path to sustainability.

These findings apply to the developed urban areas of Zone 1 and can be extended to the developed parts the other Urban Zones and the results and recommendations should be considered with the results of the Canopy Cover/Plantable Areas Study (Task 5) to develop Canopy Cover Goals for Port Colborne's Urban Zones that that should be incorporated into the Official Plan and other planning documents.

3.3 Recommendations

Recommendation 3.1. *The City should establish a midterm Tree Canopy Cover Goal for Municipal + Residential/Commercial property of 2006 levels to be attained through the strategies outlined in the Urban Forest Management Plan.*

Recommendation 3.2. *The City should consider these findings with the results of the Canopy Cover/Plantable Areas Study (Task 5) to develop Canopy Cover Goals with measurable timelines that should be incorporated into the Official Plan and other planning documents.*

Task 4: Staff Interviews and Discussions in Preparation for the Urban Forest Management Plan (UFMP)

4.1 Introduction

Staff at the City of Port Colborne are concerned about the present and future state of the urban forest. These concerns include:

- A tree bylaw which amongst other things, does not favour the planting or maintenance of public trees;
- Canopy losses due to tree removals because of urban development and intense storm events;
- Lack of a consistent, annual tree planting program;
- A reactive rather than proactive strategy for tree work/backlogged tree work orders;
- Insufficient resources and a lack of tree maintenance;
- Lack of more defined policies and procedures for tree care;
- Shallow depth to bedrock as a physical constraint to planting, and;
- Concerns over potential liability issues arising from poorly maintained public trees.

4.2 Methodology

Two members of the Consultant Team (John McNeil and Peter Simon) conducted interviews and discussions with 11 staff members and one external member (Supervisor for *Canada Niagara Power Inc.*) to better understand the issues facing the City's urban forest.

Eleven staff interviews and discussions took place on September 7th and 14th, 2022 following the schedule developed by the Project Manager. These interviews followed the distribution of a questionnaire the week before, prior to the interviews. McNeil and Simon attended all staff interviews as face-to-face meetings. McNeil also attended a remote interview on September 30th with the Roads Supervisor for *Canada Niagara Power Inc.*, who maintain the electricity lines within the City. A total of twelve people were interviewed.

4.3 Key Findings

- **Bylaw 6175/01/15 – the City of Port Colborne Tree Bylaw.** There was considerable concern about the effectiveness of the bylaw in that it did little to protect trees and facilitated their removal. Despite the bylaw, some departments have occasionally planted trees in the boulevard to address individual, citizen complaints which has created public confusion.
- It was surmised that the bylaw was written primarily for Public Works and the City's insurer, because of individual claims where public trees caused vehicle damage or sidewalk upheaval, becoming a tripping hazard. The bylaw included planting restrictions on certain species ostensibly to reduce upheaval of sidewalks, visibility issues and sewer-service blockages.

Infrastructure standards for Port Colborne were not available at the time of writing (from preliminary observations, trees may not be the primary cause of infrastructure repair costs, that inadequate infrastructure design/overdue replacement practises may be contributing factors). Staff are open to more education on this topic and if a new bylaw is being considered, to be provided with the knowledge to defend it and promote it to Council (more people need to know that the condition of sewer/sanitary lines may be the problem, not the tree and that with good construction/timely replacement, conflicts can be minimized). The Consultant's Windshield Survey Report documents some of the challenges posed by the creation of the new Lancaster St. Subdivision. This project included approved developer-created tree planting plans which will have future maintenance problems. The costs of this maintenance will be borne by the property owners because the City approved the planting on private property in accordance with the Tree Bylaw.

Before the Consultant Team developed recommendations regarding the Tree Bylaw, tree policies, and procedures, they needed to know the answers to the following key questions:

1. *Are there a unique set of geomorphological and meteorological conditions present in the City and where may they exist which creates unacceptable instability for urban trees?*
2. *Are the City's as-built engineering and construction standards for its underground infrastructure & sidewalks sufficiently robust and resilient to provide for large stature trees in proximity?*
3. *Are the City's existing street and park tree management programs adequately serving the needs of the community?*
4. *Are the Tree policy and Tree by-law consistent with the objectives in the City's Strategic Plan, 2020-2023 and policies in the Official Plan?*

-
- **Public safety.** There is a need to establish adequate pruning cycles for public trees - that trees (particularly the big, old silver maples) need maintenance to mitigate safety concerns.
 - **Shallow soils to bedrock.** Staff is concerned that there is insufficient depth of soil to bedrock in many places which is making trees “unstable,” particularly given the (now) perennial severe windstorm events. There is also the belief that tree roots are interfering with sanitary, sewer and water mains.
 - **Canopy loss.** Canopy cover is waning throughout the City due to tree removals because of new developments, storms, and limited space to plant trees.
 - **The urban forest management program is poor.** Staff concerns include that public trees are not being properly maintained so that there are:
 - a lack of a sustainable and consistent tree replanting program;
 - a reactive vs. proactive approach to public tree problems whereby actions such as large limbs falling initiate pruning actions;
 - backlogged tree work orders (three to four years); and
 - inadequate budgets to support sustainable urban forest management (e.g., \$5,600/year for tree planting and \$168,000 for tree work).
 - **Lack of documentation.** With high staff turnover, there is a strong need to have better documentation for: responses to requests for tree planting specifications, tree protection policies and guidelines for City capital projects, tree policies and procedure, standards for the size of tree to plant, tree pruning cycles, tree pruning standards for contractors, and updated lists of approved native species to plant.
 - **Climate change impacts.** A missed opportunity exists to demonstrate how climate change impacts can be mitigated through trees, specifically public trees.
 - **Asset Management Planning.** Trees need to be included – Public Sector Accounting Board is expected to bring in new rules for municipalities to add green infrastructure to their (accounting) books.
 - **Size of the municipality.** Some staff believe that Port Colborne can only do “what is required by the Province” due to its small size. This attitude tends to ignore any focus on trees as the *Municipal Act* does not contain regulations specifying minimum maintenance practices for the public tree.

4.4 Recommendations

Recommendation 4.1. *Establish Urban Forest Management working group to guide tree establishment, removal and management.*

Recommendation 4.2. *Establish interdepartmental Urban Forest Advisory working group including all departments involved with planning for trees and management.*

Task 5: Canopy Cover/Plantable Spaces Assessment

5.1 Introduction

The view from the air helps provide a better understanding of an urban forest. From this perspective, a pattern emerges: the density of the urban forest varies with patterns of land use in urban areas.

One component of this Urban Forest Management Plan project is an evaluation of Port Colborne's Canopy Cover to help meet provincial guidelines for municipalities and to aid in planting and managing trees to manage the City's urban forest and canopy. Canopy Cover (CC) includes tree canopy and shrub canopy, including natural areas. W&A conducted a *Canopy Cover/Plantable Spaces Assessment* of the City using an online tool used by communities around the globe called *i-Tree Canopy 7.0* (Nowak D. J., Understanding i-Tree: 2021 summary of programs and methods, 2021)

This assessment had several major components. The first was a CC assessment within the municipal boundary (Figure 1.1), including the rural areas (Zone 6); the second stage was a CC assessment of the Urban Forestry Zones (i.e., Zones 1-5) (Figure 1.1); and the third aspect was an analysis of the CC and Plantable Spaces within each of the Urban Zones.

5.2 Methodology

i-Tree Canopy was created through a partnership lead by the United States Forest Service. It provides a peer reviewed science-based methodology for users to measure tree canopy cover in communities. This will establish baseline data for goal setting. It can also compare tree canopy cover between neighbourhoods, school districts, political wards, communities, and determine priority tree planting areas. It also monitors changes over time due to impacts like emerald ash borers and land development.

Users must follow three steps to configure the tool:

Step 1- *define the study area you want to survey; for the purposes of this Project the shape file for example the City's Road Patrol Zone 1 was used and it is called Forestry Zone 1.*

Step 2- *define the Cover Classes; for the purposes of this Project, the cover classes dictated for this project are shown in Table 5.1 below.*

Step 3- *Set Regional Settings and begin the photo interpretation.*

i-Tree Canopy starts by generating randomly located points in the Study area using images from Google Earth for the year selected by the User. The User assesses the land cover at each point. The more points surveyed, the lower the standard error (SE) of the estimate of Land Cover across the Study area. Each point is assessed by the User and categorized into one of the defined Cover Classes.

i-Tree Canopy then estimates the economic and environmental benefits of the tree canopy. This includes estimates of air pollution reduction, runoff avoided, and carbon storage, based on regional average conditions of urban and/or rural communities and then translates them into monetary value. Ecological services and benefits were calculated using the weighted average of canopy cover.

Using the i-Tree Canopy software, W&A staff performed a canopy analysis of the City of Port Colborne to assess CC over the entire municipality using 2018 aerial images. A similar analysis was then conducted for the Urban Forest areas combined (i.e., Zones 1-5) (Figure 1.1). In the third stage, separate more detailed analyses were conducted for each of the five Urban Forest Management zones to assess the CC within each zone and the amount and types of area that could be planted to trees. Figure 5.1 shows all the points assessed in the CC analysis and the CC/Plantable Spaces analysis of the 5 urban zones.

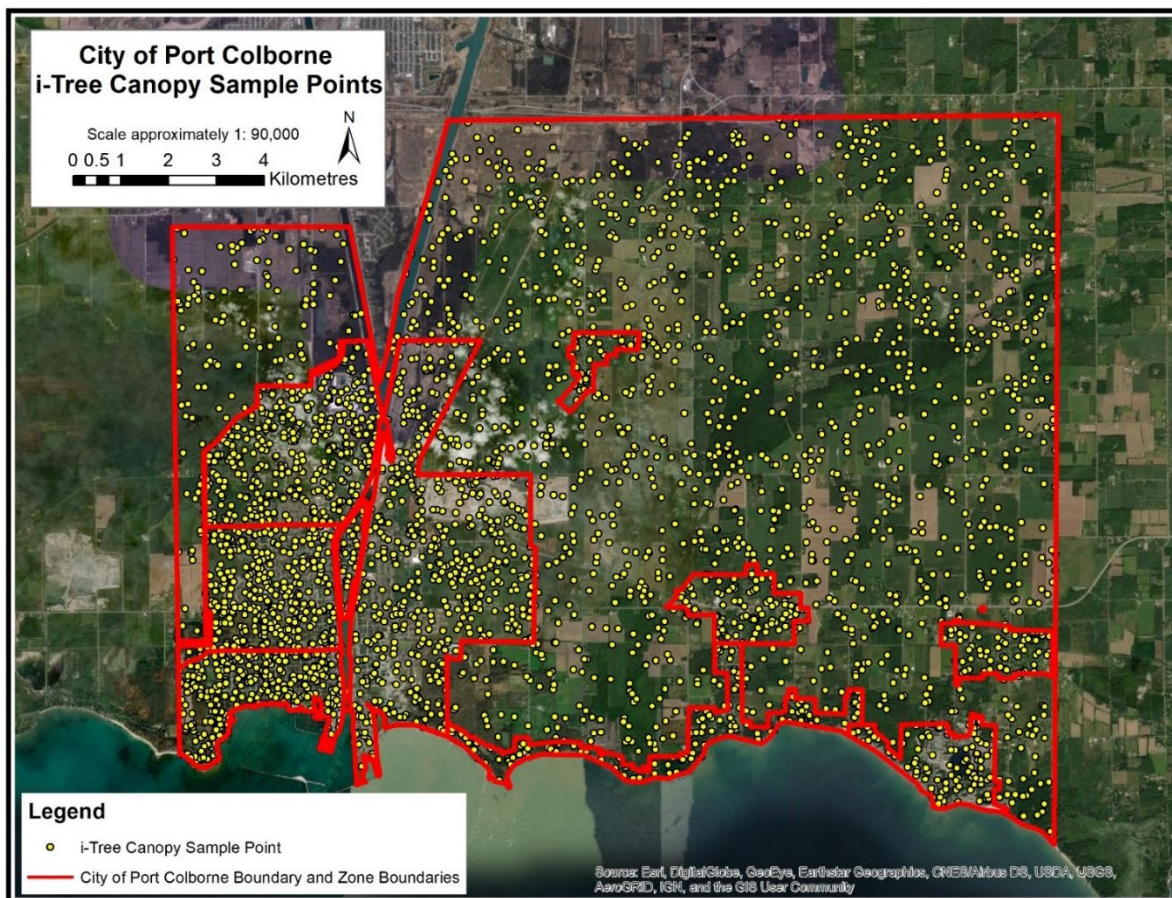


Figure 5.1 - Points sampled using i-Tree Canopy. The 3490 included 2000 points sampled for the CC analysis to determine Tree Canopy within the municipal boundary of Port Colborne and 1490 points that were added in urban zones as described in sections 2.1

5.3 Canopy Cover Assessment Methodology – Entire Municipality

The Port Colborne Canopy Cover study assessed the Canopy Coverage (CC) within the municipal boundary using 2000 randomly distributed points. The cover class of each point was assessed according to the criteria in Table 5.1 below.

Table 5.1 - Cover Class categories and descriptions for 2000 points assessed for CC study of the entire municipality boundary

| Category | Cover Class | Description |
|---------------|---------------------------------|--|
| Canopy | Canopy – Tree | Single or small group of trees on residential lots, street trees or middle of field |
| | Canopy – Shrub or Thicket | Shrub, thicket, or early successional forest |
| | Canopy – Woodlot | Woodlots and forests |
| Plantable | Plantable – Grass/ Herbaceous | Residential lawn, open park, open space, municipal right of ways, schools, hospitals, regenerating meadow, grassy strips in parking lots or gravel boulevards |
| Non-Plantable | Non-Plantable Permeable Surface | Cultivated agriculture, sports fields, cemetery, golf course fairway, driving range, open water, wetlands, gravel parking, waste management/disposal area, quarry, other areas meant to be devoid of trees |
| | Impervious Surfaces | Buildings, roads, concrete, structures, sidewalks, driveways |

5.4 Canopy Cover Analysis – Results

The results of the Cover Class analysis (i.e., assessment of points) is provided in Table 5.2. This study estimated that the CC in Port Colborne's municipal boundary to be 37.0% when including individual trees (4.5%), shrubs and thickets (6.3%), and woodlots (26.2%). The greatest amount of CC was found in woodlands, mostly in the rural areas (Zone 6).

The Non-Plantable category included Impervious surfaces (5.3%) and non-plantable space (45.8%) which made up more than half of the municipality. A significant proportion of the Non-Plantable spaces are used for agricultural purposes.

An estimated 11.9% of Port Colborne was assessed to be available as Plantable space. This included turf, road allowances and other open space.

Table 5.2 - Cover Class percentages by weighted average for the entire municipal boundary

| Cover Classes | Weighted average | ± Standard Error |
|---------------------------------|------------------|------------------|
| Canopy – shrub or Thicket | 6.3 | 0.3 |
| Canopy – Tree | 4.5 | 0.1 |
| Canopy – Woodlot | 26.2 | 0.8 |
| Impervious – Surface | 5.3 | 0.1 |
| Non-Plantable Permeable Surface | 45.8 | 1.0 |
| Plantable-Grass/Herbaceous | 11.9 | 0.4 |

5.5 Ecological Services and Benefits – Port Colborne Municipal Boundary

The total annual value of the ecological services generated from i-Tree Canopy for Port Colborne was estimated to be \$3,748,957.14, with an additional \$88,959,776.83 of added cumulative carbon sequestration value. Table 5.3 provides the i-Tree Canopy outputs that estimate ecological services from Port Colborne's CC and estimates of the annual monetary value they provide.

Table 5.3 - Ecological services and economic benefits from Port Colborne's trees and urban forest within the municipal boundary

| Air Pollution | Removal Rate (g/m ² /yr) | \$/t/yr | \$ |
|------------------------------------|-------------------------------------|------------|-------------|
| CO (carbon monoxide) | 0.127 | \$125.35 | \$720.31 |
| NO ₂ (nitrogen dioxide) | 0.551 | \$39.43 | \$988.28 |
| O ₃ (ozone) | 5.489 | \$238.86 | \$59,323.85 |
| Particulate Matter (10 µm) | 1.838 | \$561.43 | \$46,691.07 |
| Particulate Matter (≤10 µm) | 0.267 | \$8,078.29 | \$97,594.06 |

| | | | |
|-----------------|--|---------|------------|
| SO ₂ | 0.347 | \$13.10 | \$205.68 |
| Hydrological | Tree effects (L/m ² /yr) | \$/t/yr | \$ |
| Avoided Run-off | 0.008 | \$3.21 | \$1,161.95 |

| Carbon | Carbon Rate (t/ha/yr) | Carbon price (\$/t) | \$ |
|--------------------------------------|--------------------------|------------------------|-----------------------|
| Carbon Sequestered Annually | 3.060 | \$255.84 | \$3,542,277.18 |
| Stored in Trees (not annual rate) | 76.848 | \$255.84 | \$88,959,776.83 |
| | | Total Annual | \$3,748,957.14 |

5.6 Urban Forest Canopy Cover

The Rural Area (Zone 6) of Port Colborne is much larger than the Urban Area (Zones 1-5). This resulted in insufficient points within each Urban Zone to develop meaningful estimates of the Urban Forest Canopy analysis and subsequent analysis for Canopy Cover/Plantable Spaces analysis for each Zone. To effectively assess the CC of Port Colborne's urban forest, the number of points in each urban Zone (i.e., Zones 1-5) were increased by 300 +/- points/Zone (1490 points). These new points were in addition to the points in each zone from the Port Colborne CC analysis (Section 2.1).

A total of 1992 points in the Urban Forest Zones were assessed for this analysis, using the Categories and Cover Classes in Table 5.1.

The canopy coverage of the urbanized zones of Port Colborne (Zones 1 – 5) is estimated to be 31.8% as an unweighted average, which includes single or small groups of trees, shrubs, and woodlots. Single or small-grouped tree canopy coverage is 10.2% out of the 31.8%.

19.9% of the urban area is estimated to be consisted of impervious surfaces, 25.9% is non-plantable permeable surfaces and the remaining 22.5% is estimated to be Plantable Space.

Table 5.4 Cover Class percentages by average for all Urban Zones (Zones 1-5)

| Cover Classes | Weighted average | ± Standard Error |
|---------------------------------|------------------|------------------|
| Canopy – shrub or Thicket | 5.2 | 0.5 |
| Canopy – Tree | 10.2 | 0.7 |
| Canopy – Woodlot | 16.4 | 0.8 |
| Impervious – Surface | 19.9 | 0.9 |
| Non-Plantable Permeable Surface | 25.9 | 1.0 |
| Plantable-Grass/Herbaceous | 22.5 | 0.9 |

5.7 Ecological Services and Benefits – Port Colborne Urban Zones

The total annual value of the ecological services generated from the urban areas of Port Colborne was estimated to be \$1,309,147 with an additional \$18,732,103 of added cumulative carbon sequestration value. Table 5.5 provides the *i*-Tree Canopy outputs that estimate ecological services from Port Colborne's urban zones' CC and estimates of the annual monetary value they provide. In urban environments, the monetary benefits are greater than rural environments due to providing greater benefits to a greater density of population in the area (Hirabayashi, 2014).

Table 5.5 - Air pollution, hydrological services, and carbon sequestration for Port Colborne's Urban Zones (Zones 1-5)

| Air Pollution Removed Annually | Removal Rate (g/m ² /yr) | \$/t/yr | \$ CAD |
|------------------------------------|-------------------------------------|-----------------------|-----------------|
| CO ₂ | 0.127 | \$2,000.35 | \$2,420.45 |
| NO ₂ | 0.700 | \$509.08 | \$3,395.23 |
| O ₃ | 5.404 | \$2,893.37 | \$148,972.06 |
| Particulate Matter (10 µm) | 1.534 | \$9,403.12 | \$137,430.42 |
| Particulate Matter (10 µm or less) | 0.276 | \$102,786.59 | \$270,290.67 |
| SO ₂ | 0.344 | \$153.21 | \$502.15 |
| Hydrological | Tree effects (L/m ² /yr) | \$/m ³ /yr | \$ CAD |
| Avoided Run-off | 0.008 | \$3.21 | \$244.67 |
| Carbon | Carbon Rate (t/ha/yr) | Carbon price (\$/t) | \$ |
| | 3.060 | \$255.84 | \$745,891.05 |
| Stored in Trees (not annual rate) | 76.848 | \$255.84 | \$18,732,103.00 |
| | | Total Annual | \$1,309,146.70 |

5.8 Canopy Cover/Plantable Areas by Urban Zone

To provide reliable information on the amount and types of Plantable Space in each zone, additional points were added to the five urban zones (i.e., Zones 1-5) as described in Section 3.1. Table 5.6 shows the number of points assessed in each Zone for the CC/Plantable Spaces Analysis.

Within each zone, the area of Cover Class percentage was estimated based on Zone area (ha). The number of points assessed per zone is shown in Table 5.6. Zones with larger superficial areas have more points to provide the similar levels of accuracy for each Zone.

The points were assessed using the Categories and Cover Classes shown in Table 5.7. Table 5.7 illustrates that the Plantable Category was divided into four Cover Classes by land use and ownership: Road Allowances, Municipal Parks and Facilities, Private Grass and Other Plantable.

Table 5.6 - Number of points assessed for each Zone in the CC/Plantable Spaces analysis for Port Colborne by Urban Forest Management Zone

| Zone | Hectares (ha) | Points Assessed |
|------|---------------|-----------------|
| 1 | 285 | 336 |
| 2 | 343 | 367 |
| 3 | 1069 | 492 |
| 4 | 540 | 382 |
| 5 | 761 | 415 |

Table 5.7 - Updated Cover Class categories to reflect Plantable Area and descriptions for canopy assessment

| Category | Cover Class | Description |
|-----------|---------------------------|---|
| Canopy | Canopy – Tree | Single or small group of trees on residential lots, street trees or middle of field |
| | Canopy – Shrub or Thicket | Shrub, thicket, or early successional forest |
| | Canopy – Woodlot | Woodlots and forests |
| Plantable | Road Allowance | Adjacent lands to roads owned by the City |
| | Parks & Facilities | Parks and facilities owned by the City with grassy or open spaces not used for a specific use like sports fields, also unopened road allowances |
| | Private Grass | Plantable spaces not owned by the municipality – residential lawns, business property lawns, hospital property, schools |

| Category | Cover Class | Description |
|---------------|---------------------------------|--|
| | Other Plantable | Spaces that could have trees planted but ownership could be disputed such as parking islands, riverbanks, agriculture field edges, vacant lots, abandoned quarry |
| Non-Plantable | Non-Plantable Permeable Surface | Cultivated agriculture, sports fields, cemetery, golf course fairway, driving range, open water, wetlands, gravel parking, waste management/disposal area, quarry, other areas meant to be devoid of trees |
| | Impervious Surfaces | Buildings, roads, concrete, structures, sidewalks, driveways |

The Canopy Category for Each Urban Forestry Zone is provided in Table 5.7, with the proportion of each Cover Class. Canopy percentages are shown in table 5.8. Notable observations regarding Table 5. are listed below.

- 1 - Zone 5 had the highest CC (48%) because it included more Woodlot, and Tree Canopy. This is largely because it is rural residential, with larger lots and woodlands that extend into the zone from the Rural Area.
- 2 - CC in Zone 4 was also high (37.4%) because it included woodlands mostly associated with wetland in its perimeter to the north.
- 3 - Tree Canopy in Zone 1 was higher as well, mostly because of an observed higher tree density in the older neighbourhood along Lake Erie.

Table 5.8 - Canopy percentage of each Zone separated by canopy type

| Zone | Canopy Tree (%) | Canopy Tree (\pm SE) * | Canopy Shrub (%) | Canopy Shrub (\pm SE) | Canopy Woodlot (%) | Canopy Woodlot (\pm SE) | Canopy Total (%) |
|----------|-----------------|---------------------------|------------------|--------------------------|--------------------|----------------------------|------------------|
| 1 | 18.5 | +/- 2.1 | 2.4 | +/- 0.8 | 8.3 | +/- 1.5 | 29.2 |
| 2 | 9.3 | +/- 1.5 | 5.2 | +/- 1.2 | 4.9 | +/- 1.1 | 19.4 |
| 3 | 4.3 | +/- 0.9 | 7.3 | +/- 1.2 | 13.2 | +/- 1.5 | 24.8 |
| 4 | 5.2 | +/- 1.1 | 6.0 | +/- 1.2 | 26.2 | +/- 2.2 | 37.4 |
| 5 | 15.9 | +/- 1.8 | 4.1 | +/- 1.0 | 28.0 | +/- 2.2 | 48.0 |

+/- SE means that the average is significant within standard + Standard error (average within standard error plus or minus the number)

5.8.1 Plantable Area Analysis – By Zone

The proportion of Plantable Areas in each Zone is provided in Table 5.9. It was found that the estimated percent of Plantable Area in each Zone varies from 21 to 27%.

Table 5.9 - Percent Plantable Areas for each Urban Forestry Zone

| Zone | Plantable % | Standard Error % |
|------|-------------|------------------|
| 1 | 21.4 | ± 2.2 |
| 2 | 27.5 | ± 2.3 |
| 3 | 21.3 | ± 1.8 |
| 4 | 21.2 | ± 2.1 |
| 5 | 21.4 | ± 2.0 |

To identify the types of Plantable Areas available in each Zone, sample points in the Plantable Category were assessed using 4 Cover Classes, 2 of which were municipal property and 2 as private property. The findings, as seen in Table 5.9, show that there are significant opportunities to plant trees in all Zones. Most Zones have about 21% Plantable Areas, except Zone 2 which had the highest proportion of Plantable Areas (27%).

Table 5.10 - Plantable Areas Cover Class percentage* for each urban zone

| Planting Space Cover Class | Zone 1 (%) | Zone 2 (%) | Zone 3 (%) | Zone 4 (%) | Zone 5 (%) |
|------------------------------|------------|------------|------------|------------|------------|
| Municipal Road Allowance | 20.8 | 17.8 | 17.3 | 8.8 | 2.2 |
| Municipal Parks & Facilities | 9.7 | 25.7 | 7.6 | 3.8 | 5.6 |
| Private Grass | 56.9 | 50.5 | 65.7 | 82.8 | 92.2 |
| Private Other Plantable | 12.5 | 5.9 | 12.4 | 3.8 | 0.0 |

*As a percentage of each zone

5.9 Planting Opportunities

Task 3 (Tree Canopy Change Analysis for Zone 1) found a dramatic reduction in Tree Canopy in developed Municipal and Private property, suggesting that Port Colborne should develop tree-planting programs to improve Tree Canopy in those areas.

Data provided in Table 5.10 was examined to identify planting opportunities in urban Port Colborne with consideration for the CC in each Zone (Table 5.7). Considering the recent (2006 – 2018) reduction in Tree Canopy in developed parts of Zone 1, identified in Task 3, the data in the Tables was examined to identify areas where tree-planting programs could be developed to reverse this trend in Tree Canopy loss.

5.9.1 Municipal Ownership – Tree Planting Opportunities

Port Colborne has direct control over Municipal property and can implement tree planting initiatives based on its priorities and budget allocations, as soon as approved by Council.

Table 5.10 illustrates the proportion of Planting Spaces in each of the 4 Cover Classes for each Zone. Zone 2 contains the highest amount of Plantable Spaces in Municipal Parks & Facilities. Zones 1 and 3 have the most Plantable Space on municipal road allowances. Municipal grassy areas in Parks & Facilities (e.g. in a park or in front of a municipal facility) also provide planting opportunities, and while these open grassy areas are important, observations by W&A staff (i.e., during the Sample Inventory development -Task 1) note that there were significant grassy areas in parks that could receive trees.

Zones 1, 2 and 3 were found to have the highest estimated proportion (e.g., 17 to 21%) of Plantable Spaces on Road Allowances. Road allowances in these Zones should be prioritized in long-term and opportunistic tree-planting initiatives to increase Tree Canopy over time.

Zones 2 and 1 were estimated to have the highest proportions of Plantable Spaces in Municipal Parks & Facilities (25.7% and 9.7% respectively). This was supported by observations by W&A staff conducting the Sample Tree Inventory (Task 1). These areas are under direct control of the City and portions could be planted with supporting policies and resources. Costs per tree may be lower for planting in Parks & Facilities than Road Allowances because of greater flexibility with appropriate tree sizes and species.

5.9.2 Private Ownership – Tree Planting Opportunities

Tree Planting on private lands can be supported by encouraging and enabling tree planting with communications, financial and logistical support, as well as through policies. Communications about the value of tree planting and Tree Canopy to the community, supporting landowners with technical and material support, and supplying trees will encourage landowners to plant and maintain more trees.

Municipal policy can require new and replacement tree planting as part of development, building permits, municipal consent, or other processes. Tree-planting requirements can be required through policy during the approvals process. Tree planting through this approach can result in more trees being planted or replaced on municipal or private property.

5.10 Summary

5.10.1 Canopy Cover withing Municipal Boundary

The results of the CC analysis, using 2018 imagery, suggest that while there is a relatively high CC% within the municipal boundary (37%). The high CC is primarily because woodlots contribute 26.2% of the 37%. It was also observed that most of the woodlot canopy cover was in the rural portion of the City's boundaries, in Zone 6.

5.10.2 Urban Forest Canopy Cover

The Urban Forest Canopy Cover analysis estimated 22.5% of Plantable Area in the Urban Zones of Port Colborne (Table 5.4), which is relatively high. Zone 5 had the highest amount of CC in Woodlots (48%). This is likely because Zone 5 is rural residential and spread along the lake in rural areas. Within this area, there are larger lots with more single trees and patches of woodland.

This CC analysis suggests that there is plenty of Plantable Area in Port Colborne and that urban CC could be increased with the development of progressive tree planting and maintenance programs.

5.10.3 Canopy Cover/Plantable Area by Zone

This analysis found that the Urban Zones of Port Colborne had high proportions of Plantable Space (i.e., 19-28%, Table 5.9). That, combined with CC levels that have been declining since 2006 (Tree Canopy Change analysis for Zone 1 - Task 2). The Change Analysis suggests that Canopy Cover in developed urban areas can be increased by up to 11.9 % with progressive tree planting and maintenance programs. While it would be very challenging to attain this level, bringing CC in urban areas up to where they were in 2006 could be achievable in a reasonable time frame.

The two municipal Cover Classes, Road Allowance and Parks & Facilities, had 17.8 and 25.7% respectively of the Plantable Area in Zone 2. Because the City has direct control of the planting and maintenance of trees on their property, this suggests that municipal lands should be the focal point for tree planting and management. The two Private Cover Classes (Private Grass and Other Plantable) would require incentivizing or forming partnerships with other owners to increase tree canopy cover.

The City could focus efforts on replanting road allowances and designing new road allowances to accommodate and plant new trees, especially in Zones 1, 2, and 3. The City could also use their parks and facilities to plant new trees and increase canopy cover. As a starting direction, this study suggests that the City put efforts on planting new trees in Zone 2 as more municipally owned space is estimated to be available.

5.10.4 Conclusions and Recommendations

Trees are the only assets where the value appreciates in time and offer an array of benefits that aren't measured monetarily. Increasing the canopy cover will also increase the value of ecological services. Many other benefits are also derived from an increased canopy cover such as "promoting health and social well-being by removing air pollution, reducing stress, encouraging physical activity, and promoting social ties and community" (Turner, 2019).

As development pressures increase in Port Colborne, it will be important to prioritize woodland retention in development proposals to maintain CC in developed areas. As Tree Canopy has dropped in developed parts of Port Colborne (Task 3), policies such as tree planting and tree/forest retention to restore CC in urban areas should be developed and implemented.

5.10.5 Recommendations

Recommendation 5.1. *Establish Urban Forest Management working group to guide tree establishment, removal and management.*

Recommendation 5.2. *Establish interdepartmental Urban Forest Advisory working group including all departments involved with planning for trees and management.*

Recommendation 5.3. *The City should amend its Official Plan, Section 11.6.3 Indicators for Monitoring and Measuring Success to include a Tree Canopy Cover metric.*

Recommendation 5.4. *The City should consider establishing a Tree Canopy Cover of 24% attained through the strategies outlined in the Urban Forest Management Plan until such time as Recommendation #3. (The canopy coverage of the urbanized zones of Port Colborne (Zones 1 – 5) is estimated to be 31.8%, which includes single or small groups of trees, shrubs, and woodlots. Currently, single or small-grouped tree canopy coverage is 10.2% out of the 31.8%.)*

Recommendation 5.5. *The City should collaborate with appropriate partners such as the Region of Niagara and the Niagara Peninsula Conservation Authority to undertake an i-Tree Eco Project to calculate a SMART goal(s) for Tree Canopy Cover.*

Task 6: Windshield Survey of the City of Port Colborne's Street & Park Trees

6.1 Introduction

To help characterize the condition of public trees in the urban forest, a Windshield Survey of Port Colborne was conducted on August 24th and August 30th of 2022. The focus was municipal street trees; some park trees were included.

Port Colborne's urban road network was sampled to include three (3) estimated age categories: pre-1945, 1946-1990 and post 1990. Land use types such as residential, commercial, and industrial areas were used as well. A Windshield Survey is a cost-effective method to obtain general information about trees on the public road allowance as well as provide insight into Port Colborne's urban forest and City tree management.

The Windshield Survey was conducted by driving the City urban roads in Zones 1-4 and observing the trees growing on the road allowance while noting aspects about the trees in each area including species, size, health, condition, distribution, and maintenance needs. This is different from a Tree Inventory (TI) as a TI systematically collects information and recommendations for each tree.

The boundary of the Windshield Survey is the urban roads network; the urban roads are colour coded in yellow on the map in Addendum 2 of the RFP for this Project. Public Works shared that there are approximately 138 km of roads comprising the urban road network, as mapped in Addendum #2 of the City's Project RFP. The total estimated distance covered in the *Windshield Survey* was 66 km, which is 48% of the total urban road network.

Within each of the four Roads Patrol Zones, the three dominant trees species by distribution were noted and general observations were made of the trees such as the dominant age and the overall health and structure of the trees (i.e., Good, Fair, Poor). The amount of maintenance work necessary to meet the tree maintenance standards below was recorded by "diameter class" (0-20 cm, 21-50 cm, 50 cm+):

- 1 - City tree maintenance: a standard of 14.5' clearance over the travelled portion of the road and 8' clearance over the sidewalk was assumed.
- 2 - GAPP (Generally Acceptable Arboricultural Practices for the GTA as defined by the Consulting Team) including:
 - a. raise crown - (above a minimum clearance for vehicles and pedestrians)
 - b. deadwood removal - (to prevent injury to people or damage to property)
 - c. tree removal - (to prevent injury to people or damage to property)
 - d. (appropriate) clearance - to Hydro lines/ traffic signs/ vehicular site lines

- e. Stump removal - (to avoid tripping hazards)
- f. tree planting - (to improve stocking level of the street and increase tree canopy which has the additional benefit of improving public health through filtering more criteria pollutants and sequestering more carbon from the air)
- g. corrective pruning – (to improve tree’s health/condition rating and future tree structure which makes a tree more resilient to future severe weather events thereby reducing future tree maintenance costs during cleanup from wind and ice storms.)

Volume of Work was categorized as ‘Low’, ‘Moderate’, or ‘High’. No individual Tree Risk Assessment was conducted during the Windshield Survey. Tree Risk Assessment is done on individual trees, often while updating of the municipal tree inventory. Therefore, the windshield survey methodology only provides general indications regarding the volume and urgency of work.

The need for a municipality to manage municipal tree risk through a proactive maintenance system is fundamental to address corporate liability and public safety issues; and is an important component of a corporate asset management strategy. The Urban Forest Management Plan will address this need for the City of Port Colborne.

The outstanding Volume and Type of Forestry-related Work that was observed, combined with the consequences of not performing this work, was used as a proxy for the City’s relative *Tree Maintenance Needs*; Map(s) was generated by the consulting team to display the City’s relative *Tree Maintenance Needs*.

Tree maintenance needs were mostly for structural pruning, elevation pruning, dead wood removal and possible tree planting*; tree removal assessment is out of scope of this Survey.

Map(s) illustrating the relative tree maintenance needs were generated by W&A. The City’s relative *Tree Maintenance Needs* were categorized as ‘Low’, ‘Moderate’, or ‘High’. Based on a sample of the City’s road system driven, an inference about the categorization for the entire Roads Patrol Zones was made.

6.2 Key Findings

- Zone 1 contains a small pocket of ‘High’ Tree Maintenance needs- the Work Order Task recommended is “Deadwood Removal” (see 2 (b) GAPP above)

which applies mainly to some of the silver maple trees located on Lakeshore Road and Sugarloaf St.

- Zone 1 contains a small pocket of 'Medium' Tree Maintenance needs- the Work Order Tasks recommended are "Corrective Prune" and "Raise Crown" over the travelled portion of the road & sidewalk; see 2(a) and 2(g) GAPP above. Mainly Maple spp. The locations are Lancaster Dr. and Clarence St.
- Zone 2 contains a small pocket of 'Medium' Tree Maintenance needs- the Work Order Tasks recommended are "Corrective Prune" and "Raise Crown" over the travelled portion of the road & sidewalk- see 2(a) and 2(g) GAPP above, mainly Maple spp. The locations are Maple St, Elgin St – see photo below,



Figure 6.1 - Maple Street. Work Order Tasks requires are "Corrective Prune" to improve tree structure and "Riase Crown" over the travelled portion of the road & sidewalk for safe clearance

- Zone 3 contains a high percentage of tree canopy gaps; the level of Tree Maintenance was assessed as 'Low'- the Work Order Task recommended is "Tree Planting*" see 2(f) GAPP (above) subject to the City deciding that it wants to address the Canopy Gap issue.
- Zone 4 contains a small pocket of 'Medium' Tree Maintenance needs- the Work Order Tasks recommended are "Corrective Prune" and "Raise Crown" over the travelled portion of the road & sidewalk, see 2(a) and 2(g) GAPP above, mainly Maple spp. Examples of these locations are Bartok Cres and Fielden Ave.

- From a Public Works/Forestry Operations perspective, there are several areas assessed as having “Medium” and “High” levels of relative maintenance needs. These areas should receive priority for tree maintenance.
- There is a pattern observed throughout most of the City’s 4 Zones of a lack of tree species diversity at the neighbourhood level. This was documented in the Tree Inventory. An example of this pattern is Elgin Avenue (Figure 6.2).,



Figure 6.2 - Elgin Avenue. Example of a tree monoculture of Crimson King Norway maple - both sides of the street contain the same tree species

- There is a pattern observed in some Zones of tree species that have higher-than-normal pruning costs. For example, the high number of Freeman maple trees planted in the new subdivision on Lancaster Drive- see photos below (Figure 6.3) [By-law staff subsequently advised in the Staff Interview/Discussions that these trees, approved by the City, & planted by the developer are on private property].



Figure 6.3 - 258 Lancaster Drive. Freeman Maples: untrained trees are prone to large limb failure as is silver maple

While Freeman maple [i.e., a hybrid between silver and red maple] is known to tolerate many conditions and be disease resistance, this fast-growing tree often develops poor structure, and untrained trees are prone to large limb failure, as is silver maple. (Kessel 2013). In the author's opinion, this is not a good species to plant for a municipality without a Tree Maintenance Program.

Another example of inappropriate tree species for their location is the Crab apple trees located downtown. This species of tree periodically drops a fleshy fruit that can cause issues for nearby merchants and pedestrians such as attracting bothersome insects (Figure 6.4).



Figure 6.4 - Example of inappropriate tree species selection, Clarence St.

- There is a pattern observed throughout most of the 4 Zones of tree *Canopy Gaps* not restored and/or not resolved through tree planting either following a City tree removal and/or road and sidewalk upgrade/ re-construction.

This is in accordance with current corporate policy and by-law. From information obtained at the time of writing, this appears to be the result of a combination of: (1) the City's *Tree Installation Policy, 2007* and (2) the City's Tree By-law No. 6175/01/15. There is also a concern expressed by some staff, about the suspected shallow to bedrock soil conditions in various parts of the City and its influence on tree/underground (above ground) utility conflicts. This will be covered in more detail in the *Staff Interviews/Discussion Report*. See Figure 6.5 of a typical portion of sugarloaf Street.



Figure 6.5 - Sugarloaf Street. Canopy Gap created by removal of mature silver maple tree and site not replanted (in foreground) following a City tree removal

- The level of Tree Maintenance in the balance of the City was assessed as ‘Low’- the Work Order Task recommended is “Tree Planting*” see 2(f) GAPP (above), subject to the City deciding that it wants to address the Canopy Gap issue see Figure 6, a photo of Janet Street.

Addressing the Canopy Gap issue through the Tree Planting would be subject to consideration of technical design factors such as width of the tree lawn, height of overhead wires, the presence and location of other utilities, and the depth to bedrock. These factors provide information of structural constraints for each potential or actual tree location and must be considered when selecting a particular species for a given site with special consideration of the ultimate size and growth rate. (Miller, 2015).

However, before any possible changes to the City's technical engineering design standards can be considered to support the co-existence of grey infrastructure (i.e., utilities and sidewalks) with green infrastructure (i.e., public tree), the City must address the *Canopy Gap* issue through changes to the City's *Tree Installation Policy, 2007 and Tree By-law No. 6175/01/15*. There is no provision in these policies to support planting trees on the road allowances (EAC, 2019).

The Consulting Team has identified the Tree Canopy Gap Issue on the public road allowance as the key issue coming out of the Windshield Survey. The City's Strategic Plan, 2020-2023 sets a clear path forward to guide decision-making. Does the corporate tree policy and tree by-law accurately reflect the City's vision as expressed in its Strategic Plan and are they consistent with policies in the City's Official Plan?



Figure 6.6 - Janet Street: 2.2m wide tree lawn - example of a possible future tree planting opportunity subject to Corporate Tree Policy and Engineering Road Cross Section standards being amended***

Port Promenade is an example of a site that would benefit from *City Building*. City Building is when a new paradigm is applied in the design and building of our urban fabric (Figure 6.7). This allows the City to avoid issues like crown die-back by engineering the type of tree habitat that will support both a healthy tree canopy as well as the demands for public usage such as heavy volumes of pedestrian traffic.



Figure 6.7 - Port Promenade, near Clarence St.

- Port Promenade. Substantial die-back in the foliage of several of the Norway maple trees located near Clarence St. is a developing issue. From experience, this appears to be the result of a lack of oxygen in the soil due to inadequate tree growing conditions compounded by soil compaction, likely from high volume pedestrian foot traffic.

It appears that design aspects such as minimal soil depth, not considering concrete, or rubble. This limits the rooting space for trees. Other considerations such as hydro wires and flooding have not received sufficient consideration.

A map showing the maintenance needs for Port Colborne's Urban Zones 1-4 observed during the Windshield survey is provided in Figure 6.8.

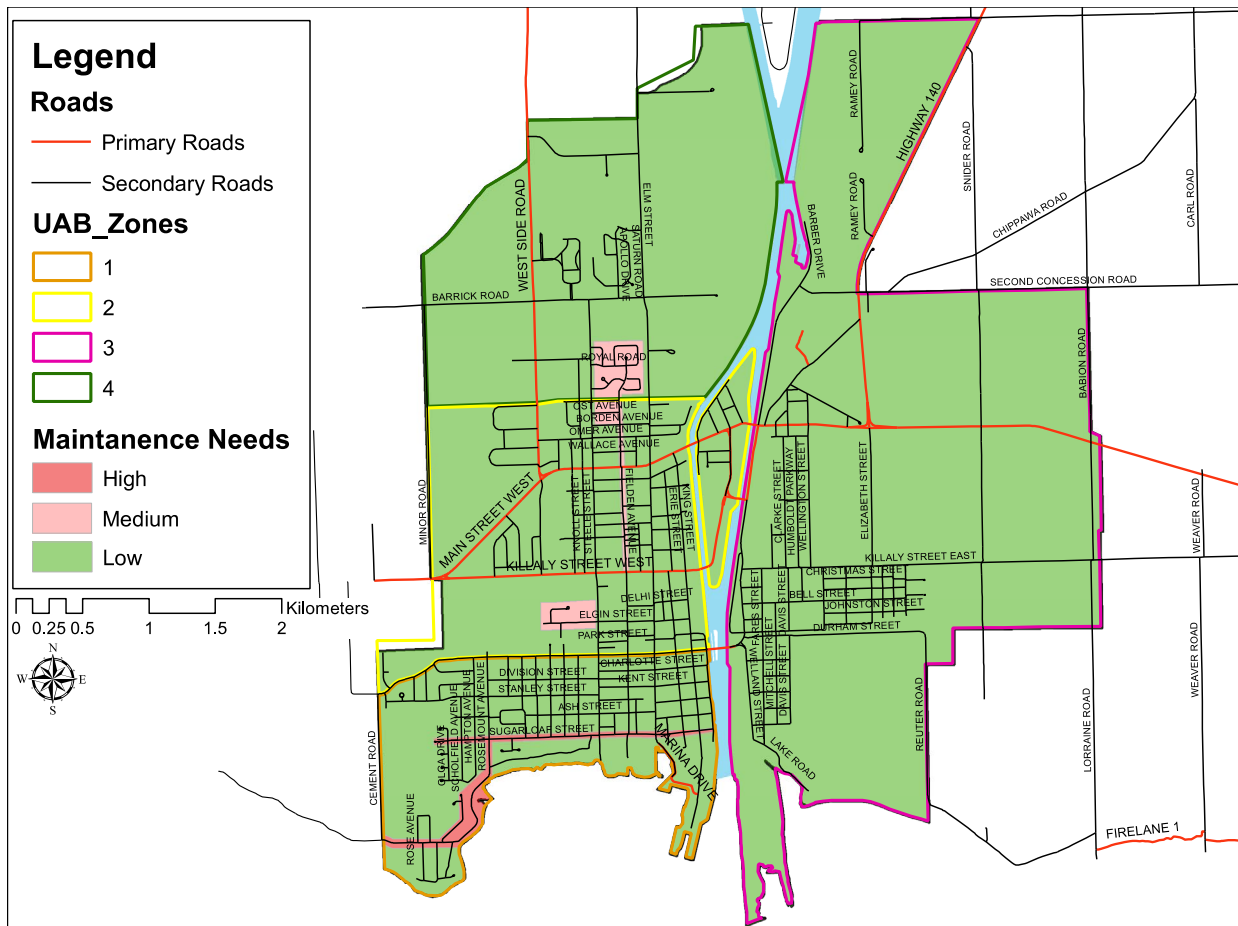


Figure 6.8 - Port Colborne's Tree Maintenance Needs by Zone

6.3 Recommendations

RECOMMENDATION 6.1: That the City prioritize tree maintenance in the “neighbourhoods” identified in the 2022 Windshield Survey with “Moderate” to “High” levels of Relative Tree Maintenance needs

RECOMMENDATION 6.2: The City continue to review “Vision and Goals” for the UFMP.

RECOMMENDATION 6.3: Host a Seminar*** on City Building & Green Infrastructure.

Notations as related to the above section:

(*) Tree Planting is identified because the *stocking level* – the proportion of available planting locations planted- for the public tree is low relative to the management objective of ‘full stocking’ (see below Notation**); the City’s municipal Tree Inventory indicates 1,626 trees (streets & parks) in Zone 1: this means that the *stocking level* in Zone 1 is **less than 50%****; this *stocking level* is generally considered Low compared to generally acceptable municipal *stocking levels* for the public tree on the public road allowance. From information obtained at the time of writing, the current *stocking level* is the result of the application of the City’s *Tree Installation Policy, 2007* and Tree By-law No. 6175/01/15.

The parks department has been planting trees year after year to replace ash trees, to increase the tree populations throughout the City, namely in Parks/green spaces, problem trees replaced some trimming and damage branches removed from time to time. The Public Works Department has no organized tree program per say, trees are planted as trees are removed due to age/storm damage/by-law issues and only replaced if requested by homeowner. -*Staff comment (during Staff interview Phase, September 2022)*

(**) there are approximately 30 km (from City) of City maintained roads in Zone 1 (also called Patrol 1 for the purposes of maintenance operations by Public Works) = 60 lane km = 60,000 m

Assuming 12m tree spacing = 5,000 potential trees

Assuming 15% is not plantable due to such design issues as setbacks for day-light triangles etc. = 4,250 potential street trees.

From the Inventory performed by W&A in August/September, there are 1350 street trees in Zone 1 (1600 total trees – 250 park trees= 1350 street trees).

Stocking Level is $1350/4250= 32\%$

‘Assuming that the community is interested in a good street tree management program, the overall goal of a program is to provide the highest-value street tree population for the costs incurred. With this objective, three management goals will probably (but not always) emerge:

- 1 - Maximum stocking of street trees. To provide an optimum-value population, the plan should attempt to achieve full stocking of street trees in the community at some realistic point in the future.
- 2 - Low maintenance costs and public safety. Maintenance costs should be balanced against needs for public safety, a high-value tree population, and budgetary constraints. In the short run, cutting maintenance expenses will save

money, but in the long run this will result in public hazards and trees that are a liability rather than an asset to the community.

- 3 - Stability. A stable street tree population is one that is not threatened by catastrophic losses due to poor management. Poor management includes overreliance on a few species, a uniform city-wide age structure, and minimal or no scheduled tree maintenance.' (Miller, 2015).

*(***) The City's current Engineering Road Cross Section Design Standards reflect that the watermain service is located under the boulevard (between curb and sidewalk) and the (main) sewer pipes and (main) sanitary pipes are located under the travelled portion of the road. It is our understanding that some staff do not currently support designs where trees are located overtop the watermain at least until such time as staff are satisfied that alternative designs such as 'co-trenching' – where street trees & utilities coexist by sharing the same vertical plane – can be a feasible option & reflected in new Council-approved Engineering Road Cross Section(s) Design Standards for the City; should this engineering design change occur then a possible future example of a tree planting opportunity is Janet Street.*

Task 7: Strengths, Weaknesses, Opportunities and Threats (SWOT)

7.1 Introduction

A SWOT analysis examines internal and external factors that impact the organization and its strategies. The internal factors are strengths and weaknesses; the external factors are opportunities and threats. A SWOT analysis is an assessment of the “situation” the organization operates in and helps identify which strategies to pursue.

7.2 Methodology

As adapted to the Public Sector, a SWOT analysis can be a useful tool to meet long-term targets. The stages of a SWOT analysis include:

- 1 - Describe the situations for assessment,
- 2 - Start to develop a strategy for meeting the targets while pointing out priorities.

A SWOT analysis generally summarizes current conditions and provides guidance for future directions.

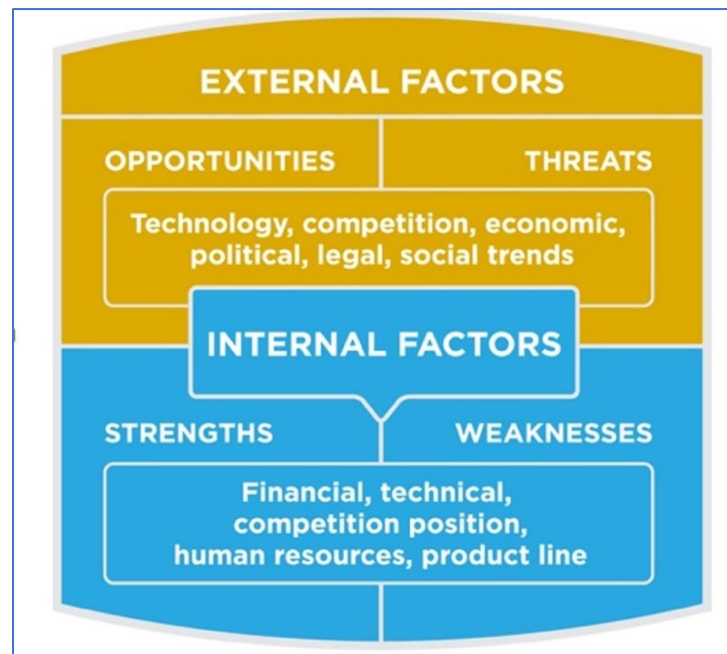


Figure 7. 1 - As a summary/indicator of the existing situation and potential directions a draft Strength, Weakness, Opportunities and Threats analysis was conducted with the Project Team

7.3 Summary of Findings

Table 7. 1 - City of Port Colborne SWOT Analysis. UFMP Project Team Exercise. October 18, 2022, as updated February 16,2023

| Strengths | Weaknesses |
|--|---|
| <ul style="list-style-type: none"> • Teamwork of the Project team members • Attitude & energy of the Project Team • Community interest in its urban forest: <i>Urban Forest Management Plan Project</i>, Public Survey, January 2023. | <ul style="list-style-type: none"> • Historically poor-quality City urban forest management Program • No Urban Forest Management Plan (UFMP) in place across the Corporation (in development) • Lack of a systematic tree inspection program increases the risk to public safety in neighbourhoods such as Zone 1 (Heritage District) during severe weather events |
| Opportunities | Threats |
| <ul style="list-style-type: none"> • New changing “tree attitude” at the City • Creation of corporate policies to recognize the public tree as green infrastructure. | <ul style="list-style-type: none"> • Not completing the City’s municipal tree Inventory to comply with <i>Infrastructure for Jobs and Prosperity Act, 2015: Asset Management Planning (AMP) requirements for Municipalities. O. Reg. 588/17</i>, the regulation on asset management planning requires that: Every municipality prepare an asset management plan, with current levels of service, in respect of its core municipal infrastructure assets by July 1, 2021, and in respect of all its other municipal infrastructure assets by July 1, 2023 (subsequently deferred to July 1, 2024- City Staff communication, Sept. 14/22) • Not in compliance with <i>Municipal Act, 2011</i>: On March 1, 2019, subsection 270 (1) of the Act is amended by adding the following paragraphs: (see: 2017, c. 10, Sched. 1, s.32): <i>The manner in which the municipality will protect and enhance the tree canopy and natural vegetation</i> |

7.4 Recommendations

Recommendation #1: Address the “Threats”, “Opportunities” and “Weaknesses” in the SWOT Analysis through:

1. *Creation of new Corporate Policies for the urban forest such as a Tree Canopy Conservation Policy*
2. *Revision of the Corporate Tree Installation Policy & Tree By-law*
3. *Completion of the City’s Tree Inventory*
4. *Render the Public tree in the new Engineering Road Cross Sections*
5. *Development of a systematic City tree inspection Program*

7.5 Addendum – Urban Forest Canopy and Budget for Southern Ontario Municipalities

Table 7.2 shows budgets for Urban Forestry/Tree Maintenance for the City of Port Colborne and other southern Ontario municipalities. Port Colborne has the lowest budget per capita for Tree planting than the other lower-tier municipalities. The Region of Niagara has a lower budget per capita than Towns and Cities, but it has a much larger rural area, it doesn’t manage urban street trees, and it includes the population of all the lower-tier municipalities in the Niagara Region. Port Colborne has the third highest budget per capita for tree maintenance, as seen in Table 7.2.

Table 7. 2 - Comparison of tree planting and tree maintenance dollars spent per capita between municipalities

| Municipality (population, year) | Tree Planting * \$/capita (Source: City website) | Tree Maintenance ** \$/capita (Source: City website) | Urban Tree Canopy Cover |
|--|--|---|---|
| Port Colborne (18,306; 2016) | \$0.31 (2023 Budget - \$5,700) | \$9.83 (2023 Budget - \$180,000) | 32% (Urban boundary, 2022) Source: Tree Canopy Cover/Plantable Spaces, March 2023 |
| Pelham (18,275; 2022) | \$1.77 (\$32,500) (65 trees: assuming avg. planting cost for a 50mm is \$500) | \$6.83 (\$125,000) | 33% (Target is currently up for debate) Source: 2022 Pelham Urban Tree Study |

| Municipality (population, year) | Tree Planting * \$/capita (Source: City website) | Tree Maintenance ** \$/capita (Source: City website) | Urban Tree Canopy Cover |
|--|--|--|--|
| Wainfleet (6,914; 2022) | \$4.34 (\$30,000) (60 trees; assuming avg. planting cost for a 50mm is \$500) | \$28.93 (\$200,000) | N/A |
| West Lincoln (16,458; 2022) | | \$1.21 (\$20,000) | |
| St. Catharines (140,370; 2017) | \$3.56 (\$500,000) (Based on 1,000 street trees/yr with \$500/tree) | N/A | 17% Source: Urban Forest Management Plan, 2011 |
| Niagara Falls (88,071; 2016) | \$0.91 (\$30,000) (160 trees; assuming avg. planting cost for a 50mm is \$500) | \$2.60 (\$228,770) | N/A (Undergoing an urban forestry review in 2023) |
| Region of Niagara (496,059; 2022) | \$0.30 (\$150,000) (300 trees; assuming avg. planting cost for a 50mm is \$500) | \$2.93 (\$1,400,000) | N/A (Currently working on a Greening Strategy including an Urban Canopy Study) |
| Collingwood (21,793; 2016) | \$0.57 (\$12,500) (Personal communication; City plants an average of 25 street trees/year) | \$12.62 (\$275,000 ³) (³ Pers. communication; incl. \$75,000 for Storm responses/ and hazard reduction) | 32% (Study area was the Municipal boundary) Source: Urban Forest Management Plan, 2020 |

* Annual budget for street & park tree planting by population

** Annual budget for street tree removal, stumping & pruning by population

The City's Urban Tree Canopy Cover in 2018 was 32%, including canopy in woodlots and natural areas. This compares well to other municipalities inside Niagara Region (Table 7.2) and lower to other municipalities outside Niagara Region (Table 7.3).

Table 7. 3 - Canopy Cover (CC) Targets set by Southern Ontario Cities

| City | Existing % Canopy Cover | Canopy Cover Target % | Timeframe |
|-----------|-------------------------|-----------------------|-----------|
| Toronto | 28.4 | 40 | 50 yrs |
| Oakville | 27.8 | 40 | 50 yrs |
| Kitchener | 27.3 | TBD | TBD |
| Cambridge | 27 | 30 | 20 yrs |
| London | 23.7 | 34 | 50 yrs |
| Guelph | 23.3 | 40 | - |
| Hamilton | 21.2 | 30 | - |

In terms of TC Targets that have been set, three of the communities (Toronto, Oakville, Guelph) have set targets of 40%, followed by London at 34% and Cambridge / Hamilton at 30% target. Timeframes to reach these targets varies from no defined time to fifty years." (Shea, 2021).

Task 8: Criteria and Indicators for Sustainable Urban Forest Management

8.1 Introduction

The Project Staff Team, in consultation with the Consulting Team, completed this self-assessment exercise on February 16, 2023, based on the Criteria and Indicators for Sustainable Urban Forest Management (C&I), (Kenney, 2011). On February 28th, the Consulting Team added 1 rating – *Relative Canopy Cover* Criteria based on their Report *Canopy Cover Change* Report for Forestry Zone 1, dated February 2023.

8.2 Methodology

The C&I process was first described by Clark et al. (1997) and modified in 2011 by Kenney et al. (2011) as a method to assess where a municipality fits within a model of urban forest sustainability. It provides a snapshot of the City's standing with regards to a set of 25 performance indicators. This is used as an indicator of where the City is doing well or could improve from the current situation, suggesting where improvement could be affected. This exercise can be used on an on-going basis (every 5 years is recommended) in implementing the urban forest management plan for the community. Three broad categories of Criteria & Indicators called "Frameworks" are measured:

- (a) the Vegetation Resource,
- (b) the Community Cooperation Around Sustainability of the Resource and
- (c) the Resource Management Approach.

The Performance Indicators measure progress towards the achievement of key objectives for each criterion used to assess each Framework. In general, a rating for most Performance Indicators at the 'Good' or 'Optimal' level of performance is considered desirable.

8.3 Summary of Findings

The results are provided in Tables 8.1, 8.2, 8.3.

Table 8. 1 - Criteria and performance indicators for the Vegetation Resource

| Criteria | Performance Indicators | | | | Key Objectives |
|--|---|--|---|--|--|
| | Low | Moderate | Good | Optimal | |
| Relative Canopy Cover <i>[Note: assume the 'potential' is 40% for the residential Land Use Type]</i> | The existing Canopy Cover equals 0-25% of the potential | The existing Canopy Cover equals 25-50% of the potential | The existing Canopy Cover equals 50-75% of the potential | The existing Canopy Cover equals 75-100% of the potential | Achieve climate-appropriate degree of tree cover, community-wide |
| Age distribution of trees in the community <i>[Note: from existing Tree Inventory ~25% complete]</i> | Any relative dbh (RDBH) class (0-25% RDBH, 26-50% RDBH, etc.) represents more than 75% of the tree population | Any RDBH class represents between 50% and 75% if the tree population | No RDBH class represents more than 50% of the tree population | 25% of the tree population is in each of four RDBH classes | Provides for uneven-aged distribution city-wide as well as at the neighbourhood level |
| Species suitability <i>[Note: from Zone 1. Tree Inventory ~25% complete]</i> | Less than 50% of trees are of species considered suitable for the area | 50% to 75% of trees are of species considered suitable for the area | More than 75% of trees are of species considered suitable for the area | All trees are of species considered suitable for the area | Establish a tree population suitable for the urban environment and adapted to the regional environment |
| Species distribution <i>[Note: from Zone 1. Tree Inventory ~25% complete]</i> | Fewer than 5 species dominate the entire tree population city-wide | No species represent more than 20% if the entire tree population city-wide | No species represent more than 10% if the entire tree population city-wide | No species represent more than 20% if the entire tree population at the neighbourhood level | Establish a genetically diverse tree population city-wide as well as at the neighbourhood level |
| Condition of Publicly owned Trees (trees managed intensively) | No tree maintenance or risk assessment. Request based/reactive system. The condition of the urban forest is unknown | Sample-based inventory indicating tree condition and risk level is in place | Complete tree inventory which includes detailed tree condition ratings | Complete tree inventory which includes detailed tree condition and risk ratings | Detailed understanding of the condition and risk potential of all publicly owned trees |
| Publicly owned natural areas (trees managed extensively, e.g. woodlands, ravine lands) | No information about publicly owned natural areas | Publicly owned natural areas identified in a "natural areas survey" or similar document | The level and type of public use in publicly owned natural areas is documented | The ecological structure and function of all publicly owned natural areas are documented and included in the city-wide GIS | Detailed understanding of the ecological structure and function of all publicly owned natural areas |
| Native vegetation | No program of integration | Voluntary use of native species on publicly and privately owned lands; invasive species are recognized | The use of native species is encouraged on a project-appropriate basis in both intensively and extensively managed areas; invasive species are recognized, and their use is discouraged | The use of native species is required on a project-appropriate basis in both intensively and extensively managed areas; invasive species are recognized and prohibited | Preservation and enhancement of local natural biodiversity |

Table 8. 2 - Criteria and performance indicators for Community Framework

| Criteria | Performance Indicators | | | | Key Objectives |
|--|---|---|--|---|---|
| | Low | Moderate | Good | Optimal | |
| Public agency cooperation | Conflicting goals among departments and or agencies | Common goals but no cooperation among departments and/or other agencies | Informal teams among departments and or agencies are functioning and implementing common goals on a project-specific basis | Municipal policy implemented by formal interdepartmental/ interagency working teams on all municipal projects | Ensure all city department cooperate with common goals and objectives |
| Involvement of large private and institutional land holders | Ignorance of issues | Educational materials and advice available to landholders | Clear goals for tree resource by landholders. Incentives for preservation of private trees | Landholders develop comprehensive tree management plans (including funding) | Large private landholders embrace city-wide goals and objectives through specific resource management plans |
| Green industry cooperation [Unknown at this time] | No cooperation among segments of the green industry (nurseries, tree care companies, etc.) No adherence to industry standards | General cooperation among nurseries, tree care companies, etc. | Specific cooperative arrangements such as purchase certificates for "right tree in the right place" | Shared vision and goals including the use of professional standards | Establish a tree population suitable for the urban environment and adapted to the regional environment |
| Neighbourhood action | No action | Isolated or limited number of active groups | City-wide coverage and interaction | All neighbourhoods organized and cooperating | At the neighbourhood level, citizens understand and cooperate in urban forest management |
| Citizen municipality business interaction | Conflicting goals among constituencies | No interaction among constituencies | Informal and/or general cooperation | Formal interaction e.g. Tree board with staff coordination | All constituencies in the community interact for the benefit of the urban forest |
| General awareness of trees as a community resource | Trees seen as a problem, a drain on budgets | Trees seen as important to the community | Trees acknowledged as providing environmental, social and economic services | Urban forest recognized as vital to the communities environmental, social, and economic well being | The general public understanding the role of the urban forest |
| Regional cooperation | Communities cooperate independently | Communities share similar policy vehicles | Regional planning is in effect | Regional planning, coordination and/or management plans | Provide for cooperation and interaction among neighbouring communities and regional groups |

Table 8.3 - Criteria and performance indicators for the Resource Management Approach

| Criteria | Performance Indicators | | | | Key Objectives |
|--|--|--|---|--|---|
| | Low | Moderate | Good | Optimal | |
| Tree Inventory <i>[Inventory ~25% complete – Zone 1 only, complete inventory in development]</i> | No Inventory | Complete or sample-based inventory of publicly owned trees | Complete inventory if publicly owned trees and sample-based inventory of privately owned trees | Complete inventory of publicly owned trees and sample-based inventory of privately owned trees included in city-wide GIS | Complete inventory of the tree resource to direct its management. This includes age distribution, species mix, tree condition, risk assessment |
| Canopy Cover Inventory <i>[Canopy Analysis for Zone 1 (heritage district) only]</i> | No inventory | Visual assessment | Sampling of tree cover using aerial photographs or satellite imagery | Sampling of tree cover using aerial photographs or satellite imagery included in city-wide GIS | High resolution assessments of the existing and potential canopy cover for the entire community |
| City-wide management plan <i>(UFMP in development)</i> | Plan in development / No plan | Existing plan limited in scope and implementation | Comprehensive plan for publicly owned intensively and extensively managed forest resources accepted and implemented | Strategic multi-tiered plan for public and private intensively and extensively managed forest resources accept and implemented with adaptive management mechanisms | Develop and implement a comprehensive UFMP for private and public property |
| Municipality-wide funding | Funding for reactive management | Funding to optimize existing urban forest | Funding to provide for net increase in urban forest benefits | Adequate private and public funding to sustain maximum urban forest benefits. | Develop and maintain adequate funding to implement a city-wide UFMP |
| City staffing <i>(in progress)</i> | No staff | No training of existing staff | Certified arborists and professional foresters on staff with regular professional development | Multi-disciplinary team within urban forestry unit | Employ and train adequate staff to implement city-wide urban forestry plan |
| Tree establishment planning and implementation | Tree establishment in <i>ad hoc</i> | Tree establishment occurs on an annual basis | Tree establishment is directed by needs derived from a tree inventory | Tree establishment is directed by needs derived from a tree inventory and is sufficient to meet canopy cover objectives | Urban Forest renewal is ensured through a comprehensive tree establishment program driven by canopy cover, species diversity, and species distribution objectives |
| Tree habitat suitability | Trees planted without consideration of site conditions | Tree species are considered in planting site selection | Community-wide guidelines are in place for the improvement of planting sites and the selection of suitable species | All trees planted in sites with adequate soil quality and quantity, and growing space to achieve their genetic potential | All publicly owned trees are planted in habitats which will maximize current and future benefits provided to the site |

8.4 Criteria and Indicators – Performance Indicator Summary

Table 8.4 - Summary of results of the ratings for all 25 Criteria and Indicators in the three tables

| Criteria | Total | Low | Moderate | Good | Optimal | No Date |
|------------------------------|-------|-----|----------|------|---------|---------|
| Vegetation resources | 7 | 4 | 1 | 2 | 0 | 0 |
| Community Framework | 7 | 2 | 4 | 0 | 0 | 1 |
| Resource Management Approach | 11 | 5 | 6 | 0 | 0 | 0 |
| Total | 25 | 11 | 11 | 2 | 0 | 1 |

Overall, Port Colborne's current situation is that 88%, 22 Performance Indicators of the 25 are either 'Low' or 'Moderate.' Only 8%, 2 Performance Indicators, of the Performance Indicators are in the desired category of either "Good" or "Optimal." This rating is not desirable; however, it does provide direction to the City on where it can focus resources to move towards achieving more sustainable urban forest management in the future. For example, most of the 'Low' Performance Indicators are in the *Vegetation Resource* framework; this suggests the City can improve its overall rating by focusing work over the next Forestry 5-Year Operating Plan on attaining a 'Good' performance indicator rating by working towards:

1. Complete the municipal tree inventory in Forestry Zones 2-4 to attain "complete tree inventory which includes detailed tree condition rating" for the *Condition of Publicly owned Trees* Criteria and
2. Plant more large-stature trees per year, especially on the public road allowance, subject to a change in the City's Tree Installation Policy, to aspire towards attaining "the existing canopy cover equals 50-75% of the potential" for the *Relative Canopy Cover* Criteria.

The City should strive to attain at least one Performance Indicator as "Good" in the *Resource Management Approach* framework over the next Forestry 5-Year Operating Plan by transitioning city tree maintenance from a reactive basis towards attaining "all publicly owned trees are systematically maintained on a cycle longer than 5 years" for the *Maintenance of publicly owned, intensively managed trees* Criteria; another term used to describe this is a Grid (Block) Pruning Program.

8.5 Recommendations

Recommendation 8.1: Complete the municipal tree inventory for Forestry Zones 2 to 4.

Recommendation 8.2: Increase the number of municipal trees planted annually subject to amending the Corporate Tree Installation Policy.

Recommendation 8.3: Transition the annual municipal tree maintenance program from reactive to proactive through funding a Grid (Block) Pruning Program

Task 9: Communications/Engagement

9.1 Introduction

From October 2022 on, community engagement was identified as being of prime importance in the planning process. This resulted in the writing and updating of a Communications Strategy in Support of the Development of Port Colborne's Urban Forest Management Plan (UFMP). The goals of this Strategy were to:

- Articulate the status of Port Colborne's urban forest and its management.
- Generate ideas about how to manage this forest going forward.
- Use those ideas to help choose a vision and strategies to improve the urban forest as Port Colborne continues to grow.

Williams & Associates have met with key municipal contacts on a constant basis, keeping them apprised regarding UFMP developments. This included the elaboration of a Windshield Survey (whereby a "gut feel" for the municipality's urban forest was obtained), a Team exercise with the municipality to look at the criteria & performance indicators for urban forest sustainability, and a SWOT (Strengths-Weaknesses-Opportunities-Threats) analysis of the municipality's existing urban forest program.

9.2 Indigenous Consultation

Williams & Associates met with Regional Municipality of Niagara staff to identify Indigenous groups that may have an interest in Port Colborne's urban forest. These groups include: The Mississaugas of the Credit First Nation, Haudenosaunee Confederacy of Chiefs Council, Six Nations of the Grand River, Fort Erie Native Friendship Centre and the Niagara Region Metis Council.

Port Colborne is within the traditional territory/treaty areas of the Mississaugas of the Credit First Nation and two Councils who represent the Haudenosaunee Confederacy/Six Nations. The Fort Erie Native Friendship is a social services agency that collaborates with the Indigenous community and is active in the promotion of Indigenous culture in the Niagara Region. The Niagara Region Metis Council is one of six southern-Ontario chapters of the Metis Council of Ontario.

The groups were contacted and some expressed an interest in participating at various levels. During these conversations, the objectives, processes, and communications aspects of the UFMP project were discussed. The discussions were productive and the Indigenous groups indicated that the UFMP project was very positive in nature and should result in many improvements to the way Port Colborne's urban forest is managed as well as many positive social and environmental benefits. The representatives of each participating group were asked if and how they would like to participate in the review of the UFMP project:

- The **Six Nations of the Grand River** requested that they receive the draft UFMP and that they may respond with comments and discussion.
- The **Mississaugas of the Credit** requested that they receive the draft UFMP and that they may respond with comments and discussion.
- The **Fort Erie Native Friendship Centre** requested that they receive the draft UMFP and that they would be interested in participating in the Public Information Centre session in June 2023.
- The **Niagara Region Metis Council** requested that they receive the Draft UMFP and that they may respond with comments and Discussion. They also asked if Williams & Associates could provide a virtual presentation to the Presidents of the six, southern Ontario Tasks of the Metis Council of Ontario.

The UFMP will be circulated to these organizations and the Fort Erie Friendship Centre was invited to attend the Public Open House.

The Six Nations of the Grand River provided editorial comments on the UFMP draft and appropriate changes were made. They also provided a list of important plants to consider for planting and these have been included on the planting list found in Appendix C2. This list (i.e., including herbaceous plants and shrubs) was also forwarded to Port Colborne's Parks Department to consider in their planting programs. A suggestion that archeological sites be identified before planting, especially along waterways, was brought up during the discussions. However, as the Welland River was excavated for the Welland Canal and it is unlikely that Indigenous sites remain in those areas.

A virtual presentation was made to the Presidents of the Niagara and other southern Ontario Tasks of the Metis Council as they have been receiving requests for input on various Urban Forest Management Projects and wanted to know more about the process. The Niagara Chapter provided a list of tree species important to them that was included in the planting list in Appendix C2.

9.3 Urban Forest Survey

An on-line urban forest survey of City of Colborne residents was planned for release in late 2022. A series of ten statements, asking participants to rate from "strongly agree" to "strongly disagree" were constructed. In addition, respondents were asked to prioritize the seven draft goals of the plan. Opportunities for additional comments were included as well. The survey was posted from December 20th, 2022, to January 20th, 2023, distributed online via the City of Colborne's social media platforms such as Facebook and Instagram as well as posted on the City of Colborne's website, complete with a link from the Welcome page. The total number of responses was 179, which is considered to be quite good by the Project Team. By comparison, the City of Windsor, with a population more than 20 times that of Port Colborne, had 300 responses in a similar

exercise. This may be attributable to the efforts of the City's communications team as well as an elevated interest in trees by the City's residents.

9.3.1 Part A: Survey Results from 10 Statements

Table 9.1 – 2023 Port Colborne Urban Forest Management Strategy Survey Data Summary. A total of 179 people responded

| Number of responses ⇒ Survey Question ↓ | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | No Response |
|---|----------------|-------|---------|----------|-------------------|-------------|
| 1) I believe that trees should be an essential feature of Port Colborne: | 158 | 15 | 3 | 1 | 1 | 1 |
| 2) A primary function of the municipality should be the protection of trees and the environment: | 128 | 38 | 7 | 2 | 3 | 1 |
| 3) Tree-lined streets are essential in creating aesthetically pleasing and welcoming neighborhoods: | 141 | 27 | 5 | 2 | 1 | 3 |
| 4) Currently, Port Colborne spends 31 cents per resident for tree planting. To achieve the goals of the new urban forestry management plan, would you support an increase in the tree planting budget? | 105 | 36 | 19 | 6 | 11 | 2 |
| 5) Would you agree that infrastructure improvements (e.g., road construction, water main enhancements, etc.) should include the planting of trees as part of that work? | 117 | 38 | 8 | 6 | 9 | 1 |
| 6) The maintenance of trees is an essential part of urban forest management. To achieve the goals of the Port Colborne Urban Forestry Management Plan. Would you support an increase in the tree maintenance budget for the City? | 104 | 46 | 10 | 8 | 8 | 3 |
| 7) A private property tree bylaw which controls excessive tree removals may be an effective tool to assist in the protection | 84 | 38 | 19 | 18 | 18 | 2 |

| Number of responses ⇒ Survey Question ↓ | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | No Response |
|--|----------------|--------------|----------------|-----------|-------------------|-------------|
| and management of the urban forest. Would you agree with the passing of such a bylaw? | | | | | | |
| 8) The City of Port Colborne’s Tree Installation Policy (2007) states that, “the location of any tree shall be on private property adjacent to municipal property.” Do you agree with this policy? | 22 | 22 | 59 | 27 | 29 | 20 |
| 9) Currently, the City does some promotion of tree planting during Earth Week. Do you feel other initiatives could be considered to promote the value of trees in Port Colborne? | 108 | 51 | 14 | 2 | 2 | 2 |
| 10) Would you consider becoming involved in a community program that promotes the stewardship of trees (early pruning, watering, insect/disease detection) in Port Colborne? | 61 | 49 | 41 | 9 | 7 | 12 |
| Do you in general agree with the Draft Vision and the Draft Goals as stated? Vision: The City of Port Colborne recognizes and values the environmental, social, cultural, and economic contribution of the urban forest to our community. The City will, in partnership with its residents, businesses and stakeholders work to promote and increase urban forest coverage that is diverse, healthy and a sustained asset for future generations | | “Yes” 160 | “Unsure” 16 | “No” 3 | | |

1) I believe that trees should be an essential feature of Port Colborne:

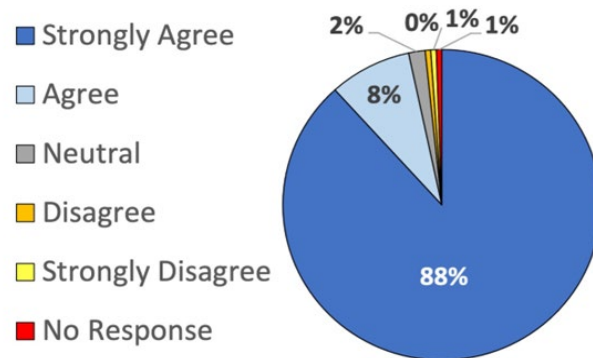


Figure 9. 1 – Survey Question 1

Interpretation of figure 9.1: **Almost unanimous agreement** that trees should be an essential part of Port Colborne.

2) A primary function of the municipality should be the protection of trees and the environment:

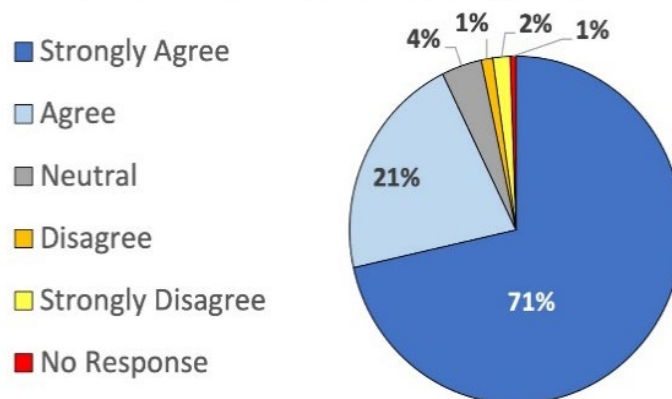


Figure 9. 2 – Survey Question 2

Interpretation of figure 9.2: **Near unanimous agreement** that the municipality has a key function in tree and environmental protection.

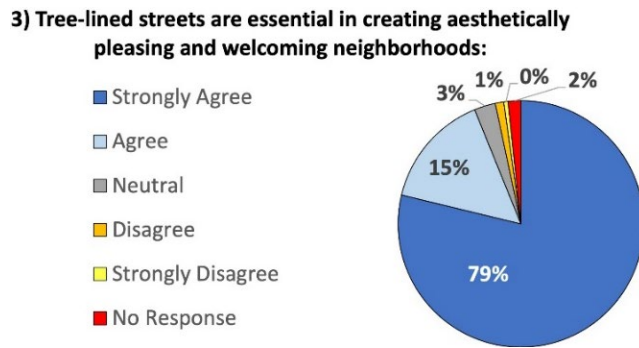


Figure 9.3 – Survey Question 3

Interpretation of figure 9.3: **Near unanimous agreement** that “tree-lined streets” are essential in creating pleasing and welcoming neighbourhoods.

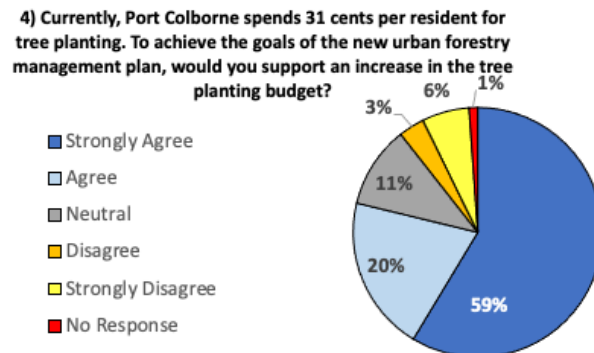


Figure 9.4 – Survey Question 4

Interpretation of figure 9.4: **Near unanimous agreement** that based on the information given, respondents support an increase in the City’s tree planting budget.

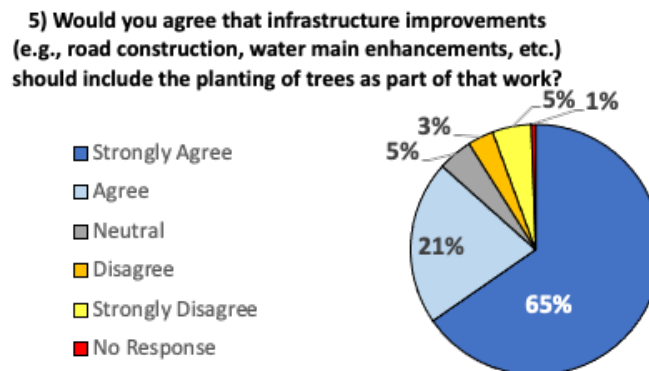


Figure 9.5 – Survey Question 5

Interpretation: of figure 9.5 **Very strong support** for including tree planting in infrastructure improvement work.

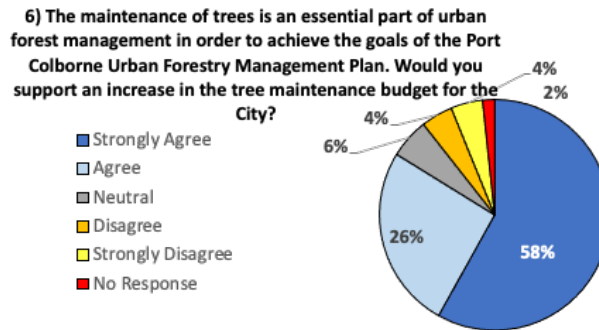


Figure 9. 6 – Survey Question 6

Interpretation of figure 9.6: **Very strong support** for an increase in the City’s tree maintenance budget

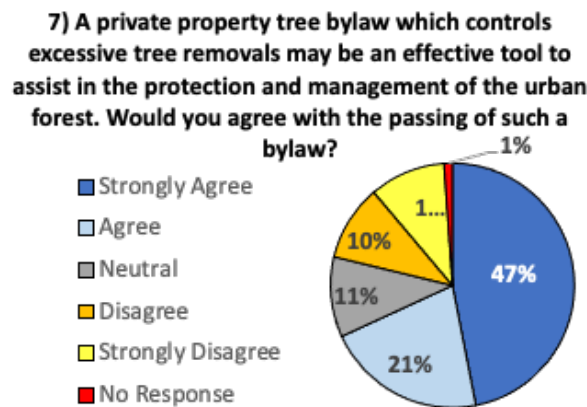


Figure 9. 7 – Survey Question 7

Interpretation of figure 9.7: **Strong support** for a private property tree bylaw (with 20% opposed).

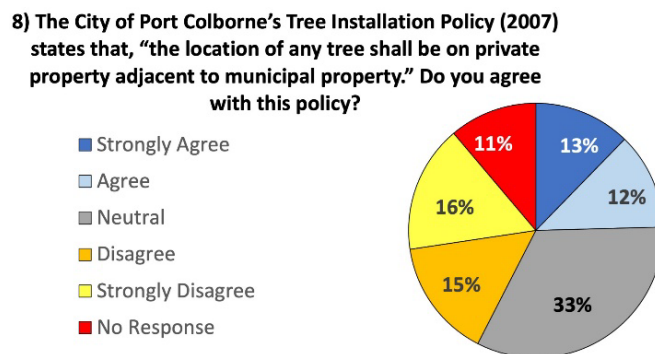


Figure 9. 8 – Survey Question 8

Interpretation of figure 9.8: **No real consensus** on present-day City policy of locating trees to plant on private property. It may not be completely understood.

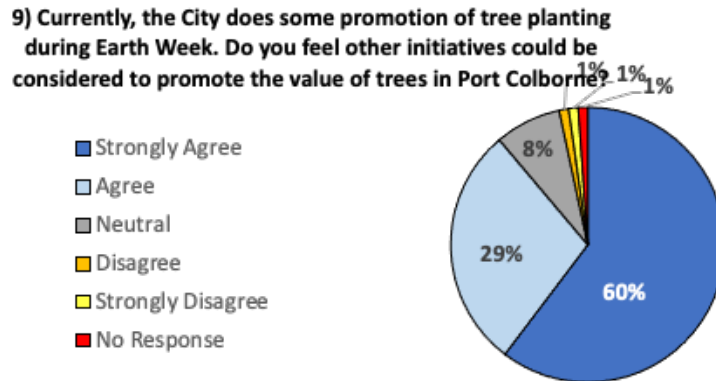


Figure 9. 9 – Survey Question 9

Interpretation of figure 9.9: **Near unanimous support** that other educational initiatives are needed to promote tree.

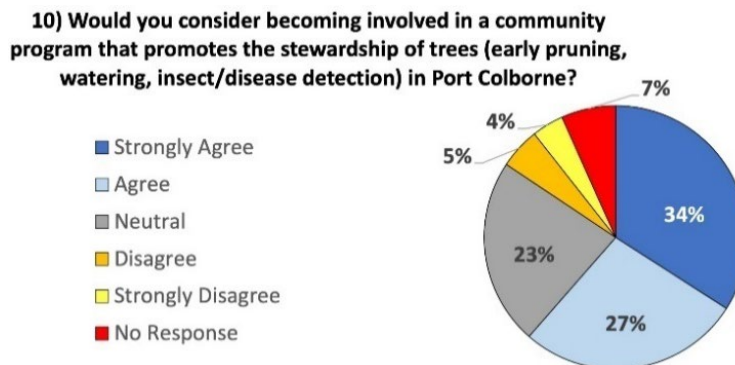


Figure 9. 10 – Survey Question 10

Interpretation of figure 9.10: **Strong support** for becoming involved in community programs to promote the stewardship of trees.

9.3.2 Part B: Goal Importance Rating

**Table 9. 2 – 2023 Port Colborne Urban Forest Management Strategy Survey
Summary of respondents rating goals**

| Rate the importance of each goal | Number of Respondents | | | | | Total Responses |
|--|-----------------------|----|----|----|------|-----------------|
| | Low | | | | High | |
| | 1 | 2 | 3 | 4 | 5 | |
| 1. To protect existing public trees and encourage the retention of private trees | 11 | 9 | 13 | 33 | 113 | 179 |
| 2. To increase the canopy cover over 10 years to help minimize climate change through tree protection, planting, and maintenance | 15 | 4 | 8 | 26 | 126 | 179 |
| 3. To increase tree planting with native species to enhance biodiversity and connectivity | 11 | 2 | 16 | 28 | 122 | 179 |
| 4. To ensure the creation of beautiful treed and healthy places for people to enjoy | 7 | 12 | 12 | 27 | 121 | 179 |
| 5. To enable the urban forest to help increase the education and awareness opportunities | 13 | 9 | 21 | 34 | 102 | 179 |
| 6. To use more trees to improve economic opportunities (tourism) through greater canopy | 19 | 8 | 24 | 37 | 91 | 179 |
| 7. To manage the risk that trees pose to an acceptable level for residents and visitors alike | 10 | 10 | 18 | 44 | 97 | 179 |

Interpretation: Over 80% of respondents felt the first five goals were important (just over 10% felt they were not important). Only 72% of respondents see “improving economic opportunities” through greater canopy cover as important. Just over ¾ of respondents felt using the urban forest for education and awareness opportunities was important.

9.3.3 Summary of Additional Comments

Table 9. 3 – A total of 76 people out of the 179 respondents offered additional comments- the following table shows these comments.

| Topic | Number of Related Comments | Percentage of Total Comments | Topic | Number of Related Comments | Percentage of Total Comments |
|---------------------------------|----------------------------|------------------------------|--------------------------------------|----------------------------|------------------------------|
| Plant more trees | 32 | 42% | Tree health needs attention | 7 | 9% |
| Plan Support | 27 | 36% | Use native species | 7 | 9% |
| Maintenance issues of trees | 24 | 32% | Human health/ well-being | 6 | 8% |
| Policy | 22 | 29% | Employ trained arborists @ City | 5 | 7% |
| Forest health | 21 | 28% | Climate | 5 | 7% |
| Thanks/ support | 17 | 22% | Beauty important | 4 | 5% |
| City budget | 13 | 17% | Food forests | 4 | 5% |
| Financial concerns | 13 | 17% | Shade importance | 4 | 5% |
| Development concerns | 13 | 17% | Green infrastructure/ sustainability | 4 | 5% |
| Retain mature trees | 12 | 15% | Don't need private land bylaws | 3 | 4% |
| Property rights /Liability | 11 | 14% | Connectivity | 3 | 4% |
| Education/use children to plant | 11 | 14% | Safety/risk | 3 | 4% |
| Tree Replacement | 9 | 12% | Tourism (1 pro, 1 con) | 2 | 3% |
| Planting issues | 9 | 12% | Other | 6 | 8% |
| Diversity/Plant native trees | 9 | 12% | | | |
| Collaboration important | 9 | 12% | | | |

9.3.4 Interpretation

1. 22% of respondents made a point of **expressing appreciation** for the opportunity to have input and/or express enthusiasm for this initiative.
2. People tended to **focus on the trees** mentioning the need for, and value of, trees in general and planting of many more trees. Several mentioned the challenge of maintenance given existing conditions and space limitations. Not many mentioned the need for policies that make the urban forest a valued and integral part of city planning so it can be environmentally and financially sustainable into the future.
3. **People are feeling financially pinched** with water, air conditioning, taxes, and the need for food trees on public land all mentioned.
4. Many concerns were raised directly or indirectly regarding **tree maintenance** including: the cost, who will pay, the current quality of city tree maintenance, possibility of planting and future maintenance costs being borne by developers, pre-emptive maintenance through “right-tree-in-the-right-place-planting” and maintaining the health and integrity of mature trees, desire for planned maintenance budget to keep pace with urban forest expansion, fears of ballooning costs or liability, how maintenance dollars get allocated, care of new plantings for increased survival, potential for collaborative land owner maintenance education projects, best practices for current and future maintenance; desire of integrative policies that prioritize the urban forest at the development stage to minimize future maintenance and optimize urban forest benefits (ex. Greenbelts around parks). One person mentioned the desire to retain and expand the Carolinian aspect of the City’s forests.
5. **Property rights and liability** came up several times from several directions. Some feel the City is downloading maintenance and liability costs onto residents with its policy of planting replacement boulevard trees onto private land. Some would like support (education, subsidized trees.) for putting trees on their property. Some want guidance regarding what to plant, and most want final say regarding trees coming and going on their property. Cutting restrictions were also mentioned.
6. Regarding **mature trees**, people generally love them and acknowledge the risks they pose, especially when not well maintained. Opinions differ regarding the level of risk posed. Concerns surfaced regarding future liability of trees planted on private property by the city. Everyone agrees a seedling does not offer the benefits of a mature tree and one-to-one replacement is insufficient.

7. Of the 32 comments that mentioned a desire for more tree planting, many offered **suggestions and qualifiers** to help with right-tree-right-place, connectivity, native species, collaborative planting opportunities.
8. **Other ideas and suggestions** brought forward included: a desire for inclusion of the Indigenous perspective (integrated, sustainable, holistic approach); a shift from “plastic” playgrounds to natural features; water permeable driveways, parking areas and sidewalks; rain gardens; green roofs; naturalized or vegetable gardens on boulevards and medians; fruit trees on public land to help ease grocery costs for those who need it (collaborative projects were part of this suggestion); revisiting of the keeping chickens by-law; establishment of a green belt around parks and existing urban areas; a policy of organic only maintenance products (herbicides, insecticides, fertilizers, etc.).
9. **Some distrust of the process** was expressed regarding the role of consultants, whether and how the plan would be acted upon, and the cost to taxpayers of implementation.

9.4 Opportunities for Further Consultation

There will be other opportunities for consultation. The City will be consulting with their own staff, External Stakeholders, and the Environmental Advisory Committee in separate one-on-one consultations. A Public Information Centre in June 2023 involved a series of presentations, participatory exercises, and opportunities for further comments to better hone the direction of the Plan for the public. The final plan will be brought to Council.

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Appendix A – 5-Year Operating Plan for Port Colborne’s Urban Forest Management Program (2024-2028)

A 5-Year Operating Plan was developed for Port Colborne’s Urban Forestry Program to help the City implement recommendations and scale up new and growing programs and develop new or revise existing policies. For example, the Tree Cover for Municipal trees in Zone 1 dropped 4% from since 2006 (Task 3). To reverse this trend, significant investments in tree maintenance and planting new municipal trees will be required. The 5-Year Operating plan provides for scaling up infrastructure and tree planting efforts to get Tree Canopy back to 2006 levels. This proposed Operating Plan is provided in Table A.1 below.

Table A.1 – 5-year Operating Plan Recommendations for Port Colborne’s UFM Program

| Action Items | Lead | Partners | 2024 | 2025 | 2026 | 2027 | 2028 | 2024-2028 Total |
|--|-------------------------|-------------------|-------------|-------------|--------------|--------------|--------------|-----------------|
| Operations/Urban Forest Management | | | | | | | | |
| Adopt a tree inventory work order management system | Public Works | | In house | In house | In house | In house | In house | \$ - |
| Develop an Urban Forestry Technical Manual | Public Works | | | In House | In House | | | \$ - |
| Establish Urban Forest Management working group to guide tree establish, removal and management | Public Works | Interdepartmental | In House | In House | In House | In House | In House | \$ - |
| Prepare an Annual Operating Plan for the upcoming fiscal year | Public Works | | In House | In House | In House | In House | In House | \$ - |
| Budget Urban Forester/Arborist consulting services to help plan Forestry Activities and help administer Tree By-law 2016-040 | Public Works | | \$15,000.00 | \$15,000.00 | \$15,000.00 | \$15,000.00 | \$15,000.00 | \$75,000 |
| Fund a proactive Tree Establishment Program | Public Works | | \$200,000 | \$200,000 | \$149,000.00 | \$149,000.00 | \$149,000.00 | \$847,000 |
| <i>Number of trees/year (6 cm caliper trees, wire basket/B&B)</i> | | | 260 | 260 | 200 | 200 | 200 | 1,120 |
| Transition to proactive tree maintenance program (6054 trees @\$150 ea. @ 10-yr cycle)* + service request & emergency | Public Works | Interdepartmental | \$90,810.00 | \$90,810.00 | \$90,810.00 | \$90,810.00 | \$90,810.00 | \$454,050 |
| Policy, Planning, & Development | | | | | | | | |
| Establish Urban Forest Management working group including all departments involved with planning for trees and management. | Public Works | Interdepartmental | In House | In House | In House | In House | In House | \$ - |
| Conduct comprehensive Policy Review regarding all aspects of trees, the Urban Forest, their management; through City and private development processes | Planning & Public Works | Public Works | In House | In House | In House | In House | In House | \$ - |
| Update Tree By-law 6175-01-15 and Tree Installation Policy (2007) | Public Works | | \$15,000.00 | | | | | \$15,000 |
| Review strategy on Private Tree Management | Public Works | Interdepartmental | | In House | In House | | | \$ - |
| Develop new procedures covering tree protection in the capital construction process | Public Works | Interdepartmental | | In House | | | | \$ - |
| Prior to assumption of development, require an arborist report confirming resolution of any hazard tree issues | Planning | Interdepartmental | | In House | | | | \$ - |
| Update the Subdivision Agreement to require a tree and woodland inventory to City standards as a condition of Approval | | | In House | | | | | \$ - |
| Update Asset Management Plan to include public trees | Asset Mgt. | | In House | | | | | \$ - |
| Monitoring Plan Progress | | | | | | | | |
| Conduct Urban Forest Canopy Cover Assessment every 5 years | Public Works | | | | | | \$10,000.00 | \$10,000 |
| Conduct a Criteria and Indicators (C&I) assessment every 5 years | Public Works | | | | | | In House | \$ - |
| Total Cost 2024-2028 | | | \$321,070 | \$306,070 | \$255,010 | \$255,010 | \$265,010 | \$1,402,170 |

Appendix B – Project Recommendations

This report provides recommendations from this Urban Forest Management Plan to strengthen its urban forest management program to ensure it and the Tree Canopy improves in health, increasing the benefits to the community and environment. Below is a summary of the recommendations from each task.

Task 1: Inventory

Recommendation 1.1 – *Prioritize planting non-maples to improve species diversity.*

Recommendation 1.2 – *Norway maple should not be considered for planting.*

Recommendation 1.3 – *Freeman maple should be considered for planting with implementation of a maintenance-pruning program for the life of a trees.*

Recommendation 1.4 – *Plant more juvenile trees on municipal property to off-set historic removals and losses to declining and aging canopy*

Recommendation 1.5 – *Implement a maintenance pruning program for all ages of municipal trees to reduce tree structural problems and stability and improve public safety.*

Recommendation 1.6 – *Employ/retain Tree Risk Assessment Qualified (TRAQ) professional to assess trees with High or Imminent Maintenance needs and prescribe mitigation treatment.*

Recommendation 1.7 – *Implement tree maintenance program. For example, a program could include a grid-pruning approach for tree maintenance where designated blocks of trees within Zones where maintenance pruning would be conducted on a cycle.*

Recommendation 1.8 – *Develop Communications protocols for advance landowner notification as part of a Work Order Management System so affected landowners are notified of impending tree maintenance (e.g., planting, pruning or removals).*

Recommendation 1.9 – *Optimize a Work Order Management System that enables Port Colborne to track its tree maintenance activities and reflect those changes in the Tree Inventory.*

Task 2: Review of bylaw

Recommendation 2.1 – *Prepare a policy that provides guidelines for the planting and management of municipal trees, including those on and along road allowances, and in parks.*

Recommendation 2.2 – *Prepare a replacement of By-law 6175-01-15 that protects public trees and municipal areas. This would restrict the planting of trees or damage to municipal trees.*

Recommendation 2.3 – *Withdraw By-law 6175-01-15 and the Tree Installation Policy (2007)*

Recommendation 2.4 – *Port Colborne should delegate authority to regulate woodlands less than 1 hectare in size to the Region of Niagara.*

Task 3: Tree Canopy Change Analysis – Zone 1

Recommendation 3.1. – *The City should establish a midterm Tree Canopy Cover Goal for Municipal + Residential/Commercial property of 2006 levels to be attained through the strategies outlined in the Urban Forest Management Plan.*

Recommendation 3.2. – *The City should consider these findings with the results of the Canopy Cover/Plantable Areas Study (Task 5) to develop Canopy Cover Goals with measurable timelines that should be incorporated into the Official Plan and other planning documents.*

Task 4: Staff Interviews and Discussions in Preparation for the Urban Forest Management Plan (UFMP)

Recommendation 4.1. – *Establish an Urban Forest Management working group to guide tree establishment, removal and management.*

Recommendation 4.2. – *Establish interdepartmental Urban Forest Advisory working group including all departments involved with planning for trees and management.*

Task 5: Canopy Cover/Plantable Spaces Assessment

Recommendation 5.1.- *Establish Urban Forest Management working group to guide tree establishment, removal and management.*

Recommendation 5.2. – *Establish interdepartmental Urban Forest Advisory working group including all departments involved with planning for trees and management.*

Recommendation 5.3 – *The City should amend its Official Plan, Section 11.6.3 Indicators for Monitoring and Measuring Success to include a Tree Canopy Cover metric.*

Recommendation 5.4. – *The City should consider establishing a Tree Canopy Cover of 24% attained through the strategies outlined in the Urban Forest Management Plan until such time as Recommendation #3,*

Recommendation 5.5. – *The City should collaborate with appropriate partners such as the Region of Niagara and the Niagara Peninsula Conservation Authority to undertake an i-Tree Eco Project to calculate a SMART goal(s) for Tree Canopy Cover.*

Task 6: Windshield Survey

Recommendation 6.1: - *The City prioritize tree maintenance in the “neighbourhoods” identified in the 2022 Windshield Survey with “Moderate” to “High” levels of Relative Tree Maintenance needs*

Recommendation 6.2: - *The City continue to review “Vision and Goals” for the UFMP.*

Recommendation 6.3: - *Host a Seminar**** on City Building & Green Infrastructure.*

Task 7: Strengths, Weaknesses, Opportunities and Threats (SWOT)

Recommendation 7.1: Address the “Threats”, “Opportunities” and “Weaknesses” in the SWOT Analysis through:

1. *Creation of new Corporate Policies for the urban forest such as a Tree Canopy Conservation Policy*
2. *Revision of the Corporate Tree Installation Policy & Tree By-law (See Task 2)*
3. *Completion of the City’s Tree Inventory (Completed, See Task 1)*

4. *Render the Public tree in the new Engineering Road Cross Sections*
5. *Development of a systematic City tree inspection Program*

Task 8: Criteria and Indicators for Sustainable Urban Forest Management

Recommendation 8.1: - *Complete the municipal tree inventory for Forestry Zones 2 to 4.*

Recommendation 8.2: - *Increase the number of municipal trees planted annually subject to amending the Corporate Tree Installation Policy.*

Recommendation 8.3: - *Transition the annual municipal tree maintenance program from reactive to proactive through funding a Grid (Block) Pruning Program*

Appendix C1: Tree Protection and Planting Guidelines

3.1 Protection of Existing Trees

The *Minimum Tree Protection Zone* (TPZ) is the minimum setback required to maintain the structural integrity of the tree’s anchor roots, based on generally accepted arboricultural principles. The *Root Protection Zone* (RPZ), also called *Critical Root Zone*, is defined as a circle on the ground corresponding to the dripline of the tree. While the TPZ (below) will protect a tree’s anchor root structure, the protected area should be larger to protect the soils surface and root integrity, protected through the construction project.

A TPZ for individual trees that are isolated from denser treed areas should be established using distances between the minimum MTPZ and the RPZ, both specified below. The appropriate Tree Protection Measures would protect the TPZ with similar hoarding/fencing as discussed above. RPZ is an area slightly larger than crown diameter, which includes the most important rooting area for the tree. Usually, the TPZ fencing is somewhere between the minimum TPZ and RPZ. The best is a larger area, but design specs, affected by construction requirements often encroach on those areas.

No unauthorized activities may take place within the TPZ of a tree covered under any municipal permit process or agreement. The following chart shows the TPZ (Niagara Parks). Some trees and site conditions may require a greater setback at the City’s discretion.

Table C. 1 - Minimum Tree Protection Zones

| Trunk Diameter (DBH) | Minimum Tree Protection Zone (MTPZ) Distances Required | Root Protection Zone (RPZ) Distances Required |
|----------------------|--|---|
| <10 cm | 1.8 m | 1.8 m |
| 11 – 40 cm | 2.4 m | 4.0 m |
| 41 – 50 cm | 3.0 m | 5.0 m |
| 51 – 60 cm | 3.6 m | 6.0 m |
| 61 – 70 cm | 4.2 m | 7.0 m |
| 71 – 80 cm | 4.8 m | 8.0 m |
| 81 – 90 cm | 5.4 m | 9.0 m |
| 91 – 100+ cm | 6.0 m | 10.0 m |

(Niagara Parks)

For trees over 100 cm. DBH, add 10 cm. to the TPZ for each centimeter of DBH.

1. Roots can extend from the trunk to 2-3 times the distance of the drip line.

2. Diameter at breast height (DBH) trunk diameter at 1.37 meters above ground.
3. Tree Protection Zone distances are to be measured from the outside edge of the tree base towards the drip line and may be limited by an existing paved surface, provided the existing paved surface remains intact throughout the construction work.

3.2 Planting Specifications

Archeological Consideration

An archeological assessment of potential tree planting sites should be considered, especially in new projects, with consideration for Indigenous archaeological importance/interest. This would be especially prudent in areas close to current or historical navigable water ways. However, as the Welland River was excavated and channelized for the Welland Canal, archeological sites in those areas and in developed areas would have likely been disturbed.

3.2.1 Locations Specifications

3.2.1.1 Soil Volume – New Projects

Adequate available soil volume is a critical factor for good tree growth and long-term viability. The soil volume available for root growth must be sufficient to support the expected tree size and, should the provided soil volumes be inadequate, design expectations for mature tree size and longevity must be appropriately reduced.

For new tree plantings, 30.0 m³ of good quality topsoil, with a minimum depth of 750 mm to a maximum depth of 900 mm, should be provided. Trees in common planting areas may share soil volume to a maximum of 15.0 m³ each.

3.2.1.2 Engineered Soils – CU Structural Soil

CU-Structural Soil™ is a planting medium consisting of 80 percent crushed limestone and 20 percent soil and has been designed for use in areas that need to or will be compacted. Because of the size of the aggregate, engineered soil always provides large soil pore space which is good for tree roots and allows for ready water drainage. Mycorrhizal or other inocula could also be used to enhance soil biology and help with tree establishment and growth.

Engineered soils can also be used with conventional planting techniques. If possible, pavement openings should be expandable (via removable pavers or using a mulched area) for the sake of the anticipated buttress roots of maturing trees. Engineered soils can be used right up to the surface grade down to a minimum of one meter depth. One problem that has been attributed to engineered soil is that it lacks real soil volume to sustain tree growth over an expected life span because it

is 20 percent soil and 80 percent crushed limestone by volume. However, engineered soil is also an option for creating break-out zones under pavement for trees in narrow tree lawns to allow roots to travel to adjacent soft landscapes. Anecdotal evidence suggests that coarse aggregate used as backfill around utility trenches or subdrains functions similarly to engineered soil in that it provides a rooting environment or allows roots to travel to other soil volumes. For these reasons, it would be appropriate to use under sidewalks to create a break-out zone for boulevard trees to access soil volumes in front yard areas. Due to the large amount of aggregate contained in engineered soil, only 20% of its total volume will be credited towards the minimum soil volume requirements.

3.2.1.3 Soil Cells

Soil cells is designed to secure adequate tree habitat, support sidewalks and other hard surface treatments and provide on-site stormwater management. Soil cell systems are installed below grade, backfilled with topsoil, and are capped with a hard surface. For example, a sidewalk becomes, in effect, a floating roof over the rooting space. The modular framework provides uncompacted soil volumes for large tree growth and (potentially) unlimited access to healthy soil - a critical component of tree growth in urban environments - allowing them to manage stormwater, reduce heat-island effect, and improve air quality. In some situations, "caged/PVC" structures (like Silva Cell) use may be prescribed for use only under sidewalks or driveways, as a bridge or link for tree roots to grow into 'breakout' areas with greater soil volumes such as lawns or other soft surface areas.



DeepRoot Canada Corp.
 #201 2425 Quebec Street
 Vancouver, BC V5T 4L6

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Gray, Meet Green: Silva Cell 2 Seminar

This seminar will review existing Silva Cell installations to demonstrate how the system can provide adequate volumes of soil for street trees and on-site stormwater management underneath sidewalks, plazas, parking lots, and parking lay-bys – all while meeting engineering requirements for vehicle loading and utilities infrastructure.

You need approx. 28 m³ (1,000 ft³) of soil to grow a 40cm (16" DBH-35' canopy) tree. Such a tree can provide significant environmental benefits and cost savings by cleaning the air, reducing heat-island effect, and shading buildings. The 28 m³ of soil in which the tree grows can also store 5.6 m³ of water, meaning that the Silva Cell system can be designed to treat all the stormwater from a 3.8 cm, 24 hour storm event directly on-site.

Silva Cell 2



→



At this seminar you will learn:

- How the Silva Cell system can be designed to treat water quality, retention, and detention
- Target soil volumes for mature tree growth and on-site stormwater management
- The importance of soil to healthy tree growth
- How to bring "green infrastructure" to your project using the Silva Cell
- Setting Performance Standards for Soil Cells

The TRCA has approved the Silva Cells as an equivalency to bioretention






Silva Cell installation at the Queensway in Toronto, ON.
 For more information visit www.deeprout.com

Figure C.1 - Silva Cell Caged/PVC Structures

3.2.1.4 Setbacks and Inter-Tree Spacing

Setbacks when siting plant material on streets and active parks should ensure adequate space be provided to accommodate normal long-term growth both above and below ground. Consider the potential negative impacts of providing insufficient space, such as injury to pedestrians, damage to property, increased maintenance expenses, and poor landscape performance.

Tree spacing should reflect the projected canopy size based on the species selected and its growing environment:

Table C.2

| Stature Size | Minimum Spacing (m) | Stature Adjacent |
|----------------|---------------------|------------------|
| Large Stature | 8m | Large Stature |
| Large Stature | 6m | Medium Stature |
| Large Stature | 6m | Small Stature |
| Medium Stature | 6m | Large Stature |
| Medium Stature | 6m | Medium Stature |
| Medium Stature | 6m | Small Stature |
| Small Stature | 6m | Large Stature |
| Small Stature | 6m | Medium Stature |
| Small Stature | 6m | Small Stature |

To accommodate the base of the tree, space should be provided for tree openings that are at least:

- A. 3.0 m wide for a large stature tree
- B. 2.5 m wide for a medium stature tree
- C. 2.0 m wide for a small stature tree

These minimums could be reduced if enhanced rooting techniques are employed that mitigate possible damage to the surrounding landscape while providing for the long-term growth of the tree.

Where underground services or utilities are present/proposed, consider the potential negative impacts to the base of the tree should future maintenance require soil excavation near the tree.

To mitigate this and other risks, trees should not be planted within:

- A. 1.0 m of the edge of a utility or service easement that is 3.0 m in width or greater.
- B. 2.5 m of any underground utility or service, where space permits. However, at a main and lateral intersection a 2.0 m setback should be maintained.
- C. 3.0 m of a transformer or hydrant

Local utility companies should be contacted for further information when planting, or proposing other works, near utilities.

To respect the crown of the tree, trees should not be planted:

- A. within 10 m of a stop sign
- B. where the growing canopy may contact buildings, structures, or fencing.
- C. where growing canopy may come within 3.0 m of a primary power line or within 1.0 m of a secondary power line or communication asset.
- D. overhanging pedestrian areas if it is a species that drop fruit or seed pods/nuts.

Table C.3 – Tree Setbacks

| TREE SETBACKS | |
|------------------------------------|---|
| Facility | Distance (m) |
| <i>Driveways</i> | <i>1.0 - 1.5</i> |
| <i>Storm/ Sanitary Connections</i> | <i>1</i> |
| <i>RLCB Leads</i> | <i>1</i> |
| <i>Curb or Walkway</i> | <i>1</i> |
| <i>Fire Hydrants</i> | <i>3</i> |
| <i>Pad Mounted Transformers</i> | <i>3</i> |
| <i>Streetlights</i> | <i>5 for large stature, 3 for small stature</i> |
| <i>Bus Stops</i> | <i>3</i> |
| <i>Regulatory Signs</i> | <i>3</i> |
| <i>Stop Signs</i> | <i>10</i> |

Daylight Triangle Maintain the 10m distance from corner of intersection to respect the Daylight Triangle and ensure proper clearance for traffic.

Hydro Lines Species selection under hydro lines is critical to avoid long term management challenges and higher than average pruning requirements. Refer to Appendix A for estimated heights at maturity per species.

Heights at maturity should leave at least a 1m buffer from lowest electrical line height, unless offset from under the line by half the mature canopy width.

3.2.2 Layout

The final planting location is to be marked on site for “field approval” by the City. With utility or development project, it is the Constructor’s responsibility to obtain utility locates prior to marking final planting locations.

3.3 Planting Materials Specifications

3.3.1 Species and Standards of Trees

Species and cultivars of trees, as well as the standard for that species and cultivar, should conform to the Canadian Standards for Nursery Stock, Canadian Nursery Landscape Association, as revised.

3.3.2 Species Selection (Diversity)

The amount of species variation will depend on the number of trees to be planted.

Utilize the 5-10-15 guideline to increase species diversity. No more than 5% of any one species, 10% of any one genus, or 15% of any family.

A minimum of 30% of the trees planted on a site should be native tree species. Refer to Appendix A. Locally rare native species may be accepted on a case-by-case basis. Cultivars of native trees should not be credited towards the minimum 30% requirement.

Invasive species should not be planted, especially near natural areas. Refer to Appendix A.

Species selection should reflect the site conditions, such as soil and light conditions, drainage, slope, aspect, moisture level and salt exposure. Use of locally sourced plant material is recommended.

Species selection and arrangement should consider ecosystem function and health, and provide visual interest through diversity and seasonal variety.

Artificial plant materials are not recommended.

3.3.3 Stature

Tree stature (i.e., small, medium, large) by species is based on projected canopy spread. This does not account for differing forms, such as columnar or fastigate,

that are being increasingly used on the landscape. This can result in an over- or under-estimate of potential canopy contribution, because of not fully recognizing the species characteristics.

Appendix A includes the stature value assigned to species and cultivars/varieties when appropriate. This value assigned is based on estimated canopy volume.

3.3.4 Origin and Hardiness Zones

The geographical origin (seed zone) of where seed or cuttings used to produce the trees should be considered when developing planting plans. If the plant material is from an area that is climatically different than Port Colborne, it should be refused.

3.3.5 Planting Specifications

Planting spots should be marked two-weeks in advance to allow for required locates.

Consideration for Indigenous archaeological importance/interest. This would be especially prudent in areas close to current or historical navigable water ways.

3.3.5.1 *Residential Street Trees*

Large-stature trees should not be planted in boulevards with less than 1.75 m between sidewalk and curb.

Trees should be planted house side of the road allowance, midway between the sidewalk and property line or 1-m from the property line.

Planting locations should be marked by the Project Manager or designate with spray paint in the form of a "T" or "T2" etc., on the sidewalk and an "X" where the tree is to be.

"T2" indicates a distance of 2.0 meters etc. from mark for tree planting.

- On streets without sidewalks, planting locations should be indicated with spray paint in the form of a "T" or "T2" etc. on the curb.
- If there is no sidewalk or curb, the planting locations should be marked with "T" indicates on the spot for the tree to be planted.

3.3.5.2 *Park Trees / Naturalization Planting*

Planting location maps to be supplied, and locations marked in the field with the appropriate method. Trees to be planted in the parks, pond and retention pond, woodlot rehabilitation plantings etc. should be on a GIS map and given to the

planting foreman planting. Planting locations of caliper stock should be spray painted with an “X” for each tree location.

3.3.5.3 Planting Holes

For residential street trees, the planting hole must be at least 30 cm from the edge of

of
the ball/container.

- The depth of the hole should be dependent not only on the depth of the ball/container, but also on soil conditions.
- For park trees / naturalization planting, the planting hole must be a least 60 cm from the edge of the ball/container.
- The depth of the hole should be dependent not only on the depth of the ball/container, but also on soil conditions.

Planting diagrams for conifer and broadleaf trees are in Figures 3.2 and 3.3.

3.3.5.4 Excavation

Remove subsoil, rocks, roots, debris, and toxic material from excavated material that should be used as planting soil for trees. Dispose of excess material. Scarify sides of planting hole to allow water flow and rooting access.

All Hydro-vac operations must be compliant with the safe practices prescribed for such equipment as published by the Electrical and Utilities Safety Association. The contractor is responsible for sub-contracting this function if required. The city may make an exception and allow for sub-contracting of the trenchless technology; however, the sub-contractor is not permitted to plant trees.

Note: Regardless of the method used to dig, under no circumstances should equipment be permitted to be set up on residential driveways and front lawns. Access to planting sites is to be from the public boulevard or road.

3.3.5.5 Tree Placement

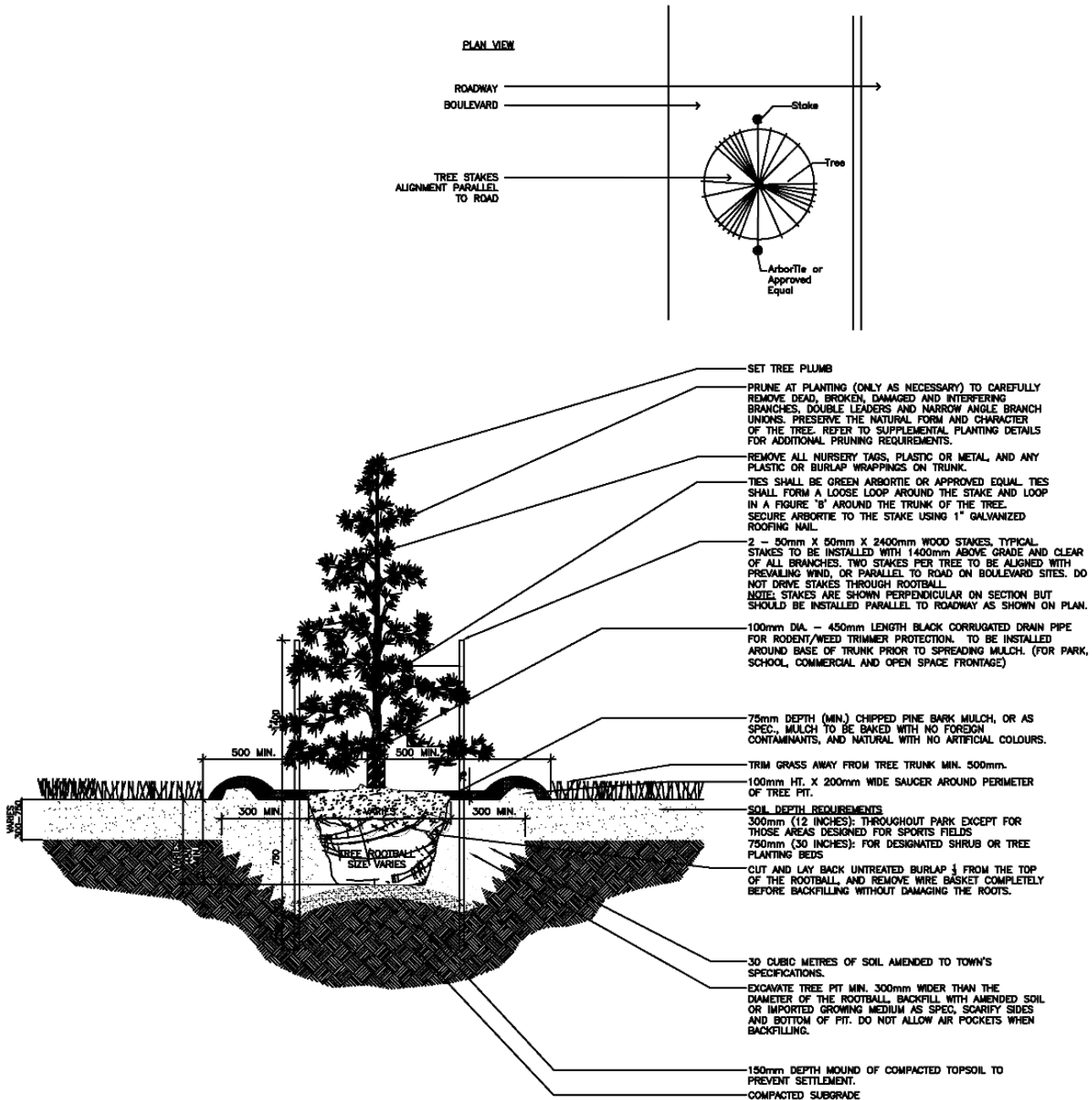
Place supplied trees within the excavated hole in the upright position.

- When clay subsoil or firmly packed subsoil (compacted and/or poorly drained) is encountered, at least 20 cm of excavated subsoil must be left between the bottom of the ball and the bottom of the planting hole.
- In moist, well-drained soils, set the root ball so that the root collar is exactly at finished grade. In sandy or droughty soils, set the root ball so that the root collar is slightly deeper than finished grade.
- The wire basket and burlap should be removed, unless otherwise approved in writing by the Project Manager or designate.

3.3.5.6 Backfilling and Initial Watering

Backfilled soil is to be placed to bring the top level of the root ball 8.0 cm higher than the existing surrounding grade to allow for settling.

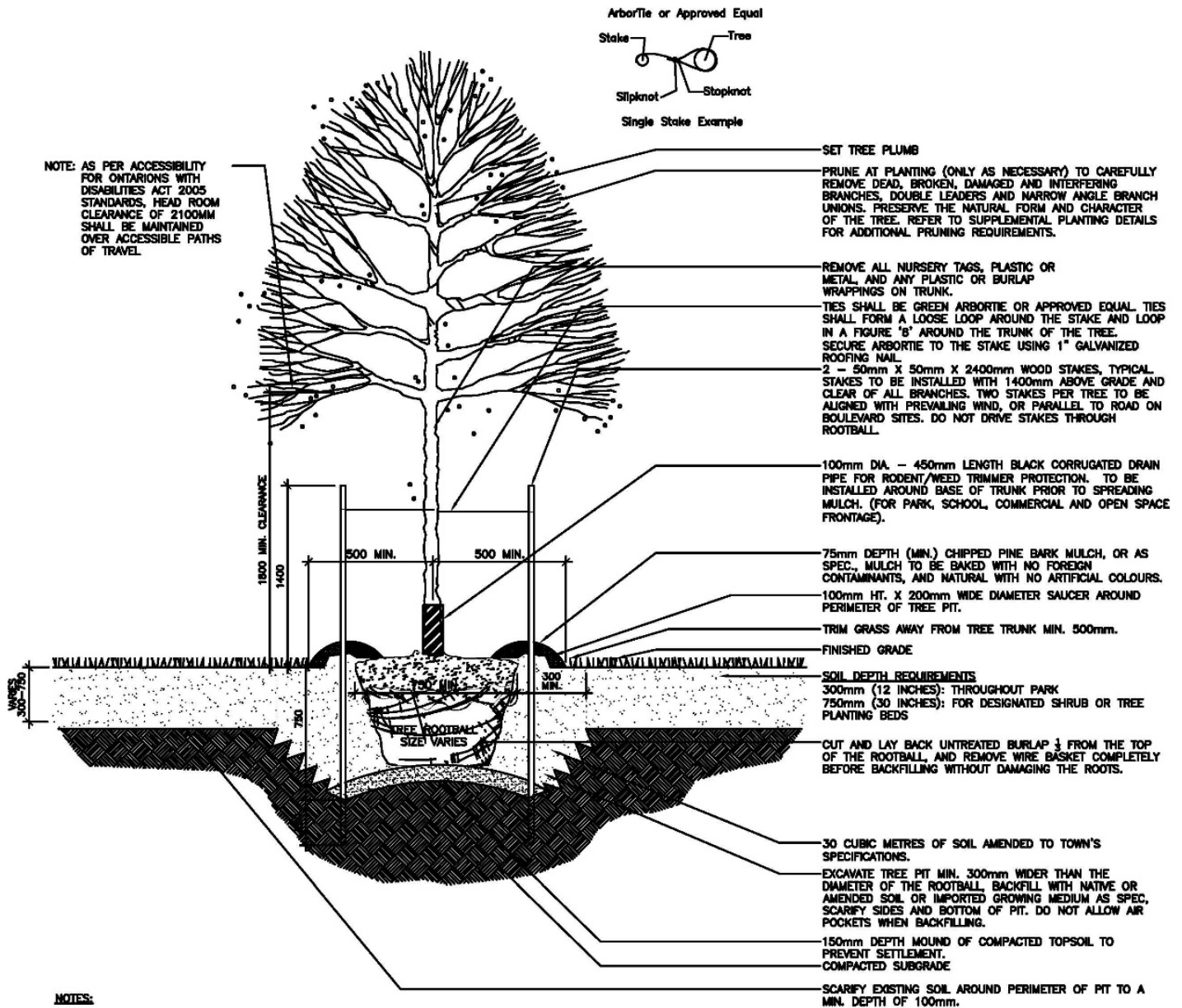
- Backfill is to be placed in layers approximately 15 cm in depth and firmly tamped in place in such a manner that the tree retains its vertical position without support.
- Particular care is to be taken to ensure that no air pockets remain under or around roots and that damage does not occur to the root system.
- The fill shall be thoroughly watered immediately after planting. Water plant material thoroughly and in such a way as to prevent surface erosion.



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. TOPSOIL IN PLANTING AREAS SHOULD BE COMPACTED TO 75-80% SPD OR 300 PSI (MAXIMUM 150mm LIFTS).
3. ALL PLANT MATERIAL TO BE COVERED DURING TRANSPORTATION AND AN ANTI-DESSICANT SHALL BE APPLIED PRIOR TO SHIPMENT TO PREVENT MOISTURE LOSS.
4. MAXIMUM ALLOWABLE DEGREE OF LEAN FOR A TREE IS <25 DEGREES.
5. DAMAGED PLANT MATERIAL WILL NOT BE ACCEPTABLE. ALL TREES NOT MEETING TOWN OF OAKVILLE PLANTING REQUIREMENTS WILL BE REMOVED AND REPLACED AT NO EXPENSE TO THE TOWN OF OAKVILLE.
6. CONTAINER GROWN STOCK SHALL HAVE AN INCREASED WATERING REGIMEN TO HELP PREVENT MOISTURE LOSS. CONTAINERS TO BE REMOVED IN FULL PRIOR TO INSTALLATION. SIDES TO BE LOOSENED UP SLIGHTLY PRIOR TO INSTALLATION TO ENCOURAGE ROOT GROWTH.
7. NO OPEN TREE PITS OR EXCAVATIONS, OR PLANT MATERIAL SHALL BE LEFT ON SITE OVERNIGHT.
8. ALL TREES 70mm CALIPER OR LESS SHALL BE STAKED. STAKES TO BE REMOVED AT THE CLOSE OF THE SECOND GROWING SEASON OR UPON THE EXPIRATION OF THE WARRANTY PERIOD.
9. SAUCER TO BE SOAKED WITH WATER AND MULCHED IMMEDIATELY FOLLOWING PLANTING.
10. CONTRACTOR TO TEST EXISTING AND EXCAVATED SOIL TO DETERMINE IF IT IS AN ACCEPTABLE GROWING MEDIUM, OR IF AMENDMENT IS REQUIRED PRIOR TO BACKFILLING, UNLESS OTHERWISE DIRECTED BY THE CONTRACT ADMINISTRATOR. REFER TO SPECIFICATIONS FOR FURTHER INFORMATION ON TESTING REQUIREMENTS.
11. SEE SPECIFICATIONS FOR FURTHER REQUIREMENTS RELATED TO THIS DETAIL.

Figure 3. 2 - Conifer Planting Diagram



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. DO NOT SCALE DRAWINGS.
3. TOPSOIL IN PLANTING AREAS SHOULD BE COMPACTED TO 75-80% SPD or 300 PSI (MAXIMUM 150mm LIFTS).
4. ALL PLANT MATERIAL TO BE COVERED DURING TRANSPORTATION AND AN ANTI-DESSICANT SHALL BE APPLIED PRIOR TO SHIPMENT TO PREVENT MOISTURE LOSS. ALL USE OF ANTI-DESSICANT IS SUBJECT TO TOWN APPROVAL.
5. MAXIMUM ALLOWABLE DEGREE OF LEAN FOR A TREE IS <25 DEGREES.
6. DAMAGED PLANT MATERIAL WILL NOT BE ACCEPTABLE. ALL TREES NOT MEETING TOWN OF OAKVILLE PLANTING REQUIREMENTS WILL BE REMOVED AND REPLACED AT NO EXPENSE TO THE TOWN OF OAKVILLE.
7. ALL TREATED OR SYNTHETIC BURLAP WRAPPINGS TO BE REMOVED COMPLETELY. ALL TWINE LEFT ON BURLAP TO BE BIODEGRADABLE.
8. CONTAINER GROWN STOCK SHALL HAVE AN INCREASED WATERING REGIMEN TO HELP PREVENT MOISTURE LOSS. CONTAINERS TO BE REMOVED IN FULL PRIOR TO INSTALLATION. SIDES TO BE LOOSENED UP SLIGHTLY PRIOR TO INSTALLATION TO ENCOURAGE ROOT GROWTH.
9. NO OPEN TREE PITS OR EXCAVATIONS, OR PLANT MATERIAL SHALL BE LEFT ON SITE OVERNIGHT.
10. ALL TREES 70mm CALIPER OR LESS SHALL BE STAKED. STAKES TO BE REMOVED AT THE CLOSE OF THE SECOND GROWING SEASON OR UPON THE EXPIRATION OF THE WARRANTY PERIOD.
11. SAUCER TO BE SOAKED WITH WATER AND MULCHED IMMEDIATELY FOLLOWING PLANTING.
12. CONTRACTOR TO TEST EXISTING AND EXCAVATED SOIL TO DETERMINE IF IT IS AN ACCEPTABLE GROWING MEDIUM, OR IF AMENDMENT IS REQUIRED PRIOR TO BACKFILLING, UNLESS OTHERWISE DIRECTED BY THE CONTRACT ADMINISTRATOR. REFER TO SPECIFICATIONS FOR FURTHER INFORMATION ON TESTING REQUIREMENTS.
13. ALL TREES REQUIRE A MINIMUM OF 30 CUBIC METRES OF PLANTING SOIL.
14. SEE SPECIFICATIONS FOR FURTHER REQUIREMENTS RELATED TO THIS DETAIL.

Figure 3. 3 - Planting Diagram

- When using backfill, choose the appropriate backfill for the sites soil conditions i.e., in clay soils backfill with the clay-loam specifications, in sandy soils backfill with the sandy-loam specifications as listed below.
- At grade, a ridge of soil located at the edge of the planting hole shall be formed to a height of 9 cm, to act as a catch basin for any subsequent watering's and to retain mulch.
- All non-porous containers shall be removed, including the entire wire basket. If a fiber or peat pot remains, it must not be left above the soil surface as this promotes "wick" evaporation.

Backfill composition specifications are as follows:

Table C. 4 - Backfill Composition Specifications

| Soil Texture | Sand% | Silt% | | Clay% |
|---------------------|--------------|--------------|--|--------------|
| Clay-loam | 20-46 | 20 - 50 | | 27- 40 |
| Sandy-loam | 55-80 | 5 - 28 | | 0- 20 |

Clay soil contains minimum 4% organic matter.

Sandy soil contains minimum 2% organic matter.

Acidity of topsoil mixture to range between 6.0pH to 7.5pH.

Topsoil mixture to be free of sub-soil, stones, roots, and any foreign objects.

3.3.5.7 Pruning

- The crown of the tree shall be pruned from the bottom up at the time of planting to remove all dead and damaged branches.
- The terminal or leader is not to be pruned unless broken, leader shall not be removed. All cuts shall be made using approved standards and Guidelines for pruning set out by the ANSI A300 pruning standards (2001 Edition) as updated from time to time, and the Illustrated Guide to Pruning, 2nd Edition (2002 ISA) as updated from time to time, leaving no stubs.
- On all cuts over 2 cm in diameter and bruises or scars on the bark, the injured cambium shall be traced back to living tissue and removed.

- Pruning wounds shall be smoothed and shaped so as not to retain water. Only clean, sharp tools shall be used. All cuts shall be clean. Branches should be cut at the branch-collar, leaving no stubs.
- Large wounds produced by any means other than branch pruning may render the tree unacceptable, requiring replacement subject to the directions of the Project Manager or designate.
- Planted material may be found unacceptable and require replacement upon inspection by Project Manager or designate.

3.3.5.8 Staking

All balled and burlapped trees shall, immediately after planting, be supported by two wooden stakes, pointed on one end 5 cm x 5 cm x 15 cm (2 in x 2 in x 6 in) driven outside the ball parallel to the road.

- When staking in parks they must be in line with the direction of the prevailing wind (**west to east**).
- For balled and burlap trees, this type of tree, B/B, the stakes are to be driven at least 70 cm below grade line.
- The stakes must be driven deep enough that there is at least 5 cm between the top of the stakes and the first branch.
- Stake placement shall be such that no main roots are severed by the stake being driven into the ground. Metal stakes are prohibited.

3.3.5.9 Tree Ties (Guying Material)

- Ties shall be made from a flat polypropylene material (tree guying cable), approved by the Project Manager, or designate prior to the contract commencing.
- The guying must be intertwined around the tree and must be firmly secured to the wooden stake in a way to prevent them from coming loose or moving down the tree.
- An approved equivalent guying material can be utilized at the sole discretion of the Project Manager or designate.
- For B/B and container stock trees where the two stakes are driven into the ground outside the root ball, the tension must be such that the tree is firmly, but not too tightly, supported, remaining in a vertical position.

3.3.5.10 Mulching

- Non-shredded woodchips from tree and woody brush sources measuring between 2.5 cm and 5.0 cm in width and placed to a depth of between 5.0 cm to 7.5 cm spread the following distance from the root collar:
- Caliper (mm) Average radius from root collar (cm) 50 and greater 110 cm
- Mulch should form a flattened donut around the tree rather than a cone. Woodchips must be close, but not in contact with the tree trunk.
- Mulch must be applied no later than 48 hours after planting.
- Mulch should be a consistent and natural colour.

3.3.5.11 Tree Wrapping and Tree Guards

- Contractor is to remove all tree wrapping upon planting of the tree. The Contractor should:
 - Install a plastic tree guard (in parks, median, berms and Blvd.) that is the appropriate height to prevent damage to the base of the tree i.e., from grass cutters and mowers.
 - These tree guards should be made of plastic (black perforated corrugated drainpipe 15 cm diameter 30 cm in height (6-inch diameter 12 inches in height)) and be cut from one end to the other to allow the stem to grow.
 - Tree guards are not required when planting on house side of the sidewalk.

3.3.5.12 Removal of excess tags and other material

All excess materials, such as nursery tags or other items attached to planting stock, should be removed immediately after planting.

3.3.5.13 Restoration

Any site damage should be restored to pre-construction condition to the satisfaction of the Project Manager or designate.

- All disposal of excess material, off site in an approved disposal site.
- Broom cleaning of pavement, concrete and sidewalks.
- Raking grass to ensure it is free of planting materials and/or loam.

- Leave site in a neat condition.

3.3.5.14 Disposal

Woody materials should be disposed of within Halton Region to limit the spread of Emerald Ash Borer (EAB) or other insect or disease pests.

3.3.6 Post Plant Care

3.3.6.1 Post Plant Watering

Watering shall be carried out when required and with enough water to prevent plants and underlying growing medium from drying out, until such time as approved by the Project Manager or designate.

3.3.6.2 Fertilizing

The Contractor should be required to add granular fertilizer before the mulch layer is applied. A granular fertilizer mixture (slow release) with a blend of 6-15-23 3.19 Mg 0.13B 0.5Zn should be used, unless approved by the Project Manager.

3.3.6.3 Additional Watering

The Project Manager may require that a watering schedule be implemented to supplement the work done by city forestry staff using the following specification:

- 10 gallons of water per tree every week for trees located on sandy soils.
- Every 2 weeks for trees located on clay soils.
- Surface watering should be used rather than a watering probe.
- For additional watering over and above the scope of work outlined within this tender, should be made to group additional watering requirements to provide a reasonable daily volume of work.

Appendix C2: Tree Planting List and Species Preference

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|-------------------------|--------------------|-------------|--------------|-----------------------|----------|-------|-------|-----------------------------|----------------------------|---------|
| Fir, White | | Pinaceae | <i>Abies</i> | <i>concolor</i> | No | √ | √ | 14 | 6 | Medium |
| Fir, Balsam | | Pinaceae | <i>Abies</i> | <i>balsamea</i> | Yes | X | √ | 15 | 6 | Medium |
| Maple, Mountain | | Sapindaceae | <i>Acer</i> | <i>spicatum</i> | Yes | X | X | 6 | 3 | Small |
| Maple, Red | 'Brandywine' | Sapindaceae | <i>Acer</i> | <i>rubrum</i> | No | √ | √ | 10 | 4 | Small |
| Maple, Tartarian | | Sapindaceae | <i>Acer</i> | <i>tataricum</i> | No | √ | √ | 5 | 6 | Small |
| Maple, Paperbark | | Sapindaceae | <i>Acer</i> | <i>griseum</i> | No | √ | √ | 7 | 5 | Small |
| Maple, Amur | Ruby Slippers' | Sapindaceae | <i>Acer</i> | <i>ginnala</i> | No | √ | √ | 6 | 6 | Small |
| Maple, Amur | | Sapindaceae | <i>Acer</i> | <i>ginnala</i> | No | √ | √ | 6 | 6 | Small |
| Maple, Norway | 'Columnare' | Sapindaceae | <i>Acer</i> | <i>platanoides</i> | Invasive | X | X | 14 | 4 | Small |
| Maple, Tartarian | Hotwings' | Sapindaceae | <i>Acer</i> | <i>tataricum</i> | No | √ | √ | 7 | 6 | Small |
| Maple, Sugar 'Columnar' | 'Columnare' | Sapindaceae | <i>Acer</i> | <i>saccharum</i> | No | √ | √ | 20 | 4 | Small |
| Maple, 'Columnar' | 'Columnare' | Sapindaceae | <i>Acer</i> | <i>rubrum</i> | No | √ | √ | 15 | 5 | Small |
| Maple, Striped | | Sapindaceae | <i>Acer</i> | <i>pensylvanicum</i> | Yes | X | X | 9 | 7 | Small |
| Maple, Celebration | 'Celebration' | Sapindaceae | <i>Acer</i> | <i>x Freemanii</i> | No | √ | √ | 14 | 6 | Medium |
| Maple, Armstrong | 'Armstrong' | Sapindaceae | <i>Acer</i> | <i>rubrum</i> | No | √ | √ | 20 | 5 | Medium |
| Maple, Manitoba | | Sapindaceae | <i>Acer</i> | <i>negundo</i> | Yes | X | X | 9 | 9 | Medium |
| Maple, Scarlet Sentinal | 'Scarlet Sentinal' | Sapindaceae | <i>Acer</i> | <i>rubrum</i> | No | √ | √ | 15 | 8 | Medium |
| Maple, Hedge | | Sapindaceae | <i>Acer</i> | <i>campestre</i> | No | √ | √ | 10 | 10 | Medium |
| Maple, Autumn Spire | 'Autumn Spire' | Sapindaceae | <i>Acer</i> | <i>rubrum</i> | No | √ | √ | 16 | 8 | Medium |
| Maple, sycamore | | Sapindaceae | <i>Acer</i> | <i>pseudoplatanus</i> | Invasive | X | X | 12 | 11 | Medium |
| Maple, sycamore | 'Regal Petticoat' | Sapindaceae | <i>Acer</i> | <i>pseudoplatanus</i> | Invasive | X | X | 12 | 11 | Medium |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|-----------------------------|------------------|---------------|--------------------|----------------------|----------|--------|-------|-----------------------------|----------------------------|---------|
| Maple, Norway (all species) | | Sapindaceae | <i>Acer</i> | <i>platanoides</i> | Invasive | X | X | 15 | 11 | Medium |
| Maple, Red Sunset | 'Red Sunset' | Sapindaceae | <i>Acer</i> | <i>rubrum</i> | No | √ | √ | 18 | 12 | Large |
| Maple, Silver | 'Silver Queen' | Sapindaceae | <i>Acer</i> | <i>Saccharinum</i> | No | √ | √ | 16 | 13 | Large |
| Maple, Freemanii | | Sapindaceae | <i>Acer</i> | <i>x Freemanii</i> | No | √ | √ | 16 | 13 | Large |
| Maple, Freemanii | 'Jeffersred' | Sapindaceae | <i>Acer</i> | <i>x Freemanii</i> | No | √ | √ | 16 | 13 | Large |
| Maple, Red | | Sapindaceae | <i>Acer</i> | <i>rubrum</i> | Yes | √ | √ | 16 | 15 | Large |
| Maple, Silver | | Sapindaceae | <i>Acer</i> | <i>saccharinum</i> | Yes | √ | √ | 18 | 15 | Large |
| Maple, Black | | Sapindaceae | <i>Acer</i> | <i>nigrum</i> | Yes | √ | √ | 20 | 15 | Large |
| Maple, Sugar | | Sapindaceae | <i>Acer</i> | <i>saccharum</i> | Yes | √ | √ | 20 | 15 | Large |
| Maple, Sugar | 'Green Mountain' | Sapindaceae | <i>Acer</i> | <i>saccharum</i> | No | √ | √ | 22 | 17 | Large |
| Horsechestnut | | Sapindaceae | <i>Aesculus</i> | <i>hippocastanum</i> | No | select | √ | 12 | 12 | Medium |
| Horsechestnut, Red | 'Briotii' | Sapindaceae | <i>Aesculus</i> | <i>x carnea</i> | No | select | √ | 12 | 12 | Medium |
| Horsechestnut, Double | | Sapindaceae | <i>Aesculus</i> | <i>baumannii</i> | No | select | √ | 15 | 12 | Large |
| Buckeye, Ohio | | Sapindaceae | <i>Aesculus</i> | <i>glabra</i> | Yes | √ | √ | 13.5 | 13.5 | Large |
| Tree of Heaven | | Simaroubaceae | <i>Ailanthus</i> | <i>altissima</i> | Invasive | X | X | 15 | 11 | Medium |
| Serviceberry, Downy | | Rosaceae | <i>Amelanchier</i> | <i>arborea</i> | Yes | √ | √ | 5 | 5 | Small |
| Serviceberry, Smooth | | Rosaceae | <i>Amelanchier</i> | <i>laevis</i> | Yes | √ | √ | 6 | 4.5 | Small |
| Pawpaw | | Annonaceae | <i>Asimina</i> | <i>triloba</i> | Yes | X | √ | 6 | 4.5 | Small |
| Birch, Gray | | Betulaceae | <i>Betula</i> | <i>populifolia</i> | Yes | X | √ | 10 | 6 | Small |
| Birch, River | | Betulaceae | <i>Betula</i> | <i>nigra</i> | No | X | √ | 13 | 10 | Medium |
| Birch, European White | | Betulaceae | <i>Betula</i> | <i>pendula</i> | No | X | √ | 15 | 10 | Medium |
| Birch, White (Paper) | | Betulaceae | <i>Betula</i> | <i>papyrifera</i> | Yes | X | √ | 18 | 10 | Large |
| Birch, Cherry | | Betulaceae | <i>Betula</i> | <i>lenta</i> | Yes | X | √ | 15 | 12 | Large |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|-------------------------------|-----------------|-------------------|-----------------------|-----------------------|----------|-------|-------|-----------------------------|----------------------------|---------|
| Birch, Yellow | | Betulaceae | <i>Betula</i> | <i>alleghaniensis</i> | Yes | X | √ | 18 | 15 | Large |
| Beech, Blue | | Betulaceae | <i>Carpinus</i> | <i>caroliniana</i> | Yes | X | √ | 8 | 6 | Small |
| Hornbeam, Euro. Pyramidal | 'Fastigiata' | Betulaceae | <i>Carpinus</i> | <i>betulus</i> | No | X | √ | 12 | 5 | Small |
| Hornbeam, European | | Betulaceae | <i>Carpinus</i> | <i>betulus</i> | No | X | √ | 17 | 12 | Large |
| Hickory, Pignut | | Juglandaceae | <i>Carya</i> | <i>glabra</i> | No | X | √ | 17 | 8 | Medium |
| Hickory, Shellbark | | Juglandaceae | <i>Carya</i> | <i>laciniosa</i> | Yes | X | √ | 23 | 15 | Large |
| Hickory, Shagbark | | Juglandaceae | <i>Carya</i> | <i>ovata</i> | Yes | X | X | 20 | 20 | Large |
| Hickory, Bitternut | | Juglandaceae | <i>Carya</i> | <i>cordiformis</i> | Yes | X | √ | 25 | 20 | Large |
| Chestnut, Amercian | | Fagaceae | <i>Castanea</i> | <i>dentata</i> | Yes | X | √ | 18 | 18 | Large |
| Catalpa, Northern | | Bignoniaceae | <i>Catalpa</i> | <i>speciosa</i> | No | X | √ | 12 | 6 | Small |
| Hackberry | | Cannabaceae | <i>Celtis</i> | <i>occidentalis</i> | Yes | √ | √ | 20 | 18 | Large |
| Katsura, Japanese | | Cercidiphyllaceae | <i>Cercidiphyllum</i> | <i>japonicum</i> | No | X | √ | 15 | 4 | Small |
| Redbud, Silver Cloud | 'Silver Cloud' | Fabaceae | <i>Cercis</i> | <i>canadensis</i> | No | √ | √ | 8 | 9 | Medium |
| Redbud, Texas White | 'Texas White' | Fabaceae | <i>Cercis</i> | <i>canadensis</i> | No | √ | √ | 8 | 9 | Medium |
| Redbud, Eastern | | Fabaceae | <i>Cercis</i> | <i>canadensis</i> | Yes | √ | √ | 9 | 9 | Medium |
| Redbud, Forest Pansy | 'Forest Pansy' | Fabaceae | <i>Cercis</i> | <i>canadensis</i> | No | √ | √ | 9 | 9 | Medium |
| Yellowwood | | Fabaceae | <i>Cladrastis</i> | <i>Kentukea</i> | No | X | √ | 14 | 14 | Large |
| Hazelnut, Turkish | | Betulaceae | <i>Corylus</i> | <i>colurna</i> | No | √ | √ | 15 | 8 | Medium |
| Russian Olive | | Elaeagnaceae | <i>Elaeagnus</i> | <i>angustifolia</i> | Invasive | X | X | 8 | 6 | Small |
| Beech, Dawyck Purple | 'Dawyck Purple' | Fagaceae | <i>Fagus</i> | <i>sylvatica</i> | No | X | √ | 8 | 2 | Small |
| Beech, Dawyck Gold | 'Dawyck Gold' | Fagaceae | <i>Fagus</i> | <i>sylvatica</i> | No | X | √ | 16 | 2 | Small |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|--------------------------|--------------------|--------------|--------------------|----------------------|--------|-------|-------|-----------------------------|----------------------------|---------|
| Beech, Purple Fountain | 'Purple Fountain' | Fagaceae | <i>Fagus</i> | <i>sylvatica</i> | No | X | √ | 6 | 4 | Small |
| Beech, Red Obelisk | 'Red Obelisk' | Fagaceae | <i>Fagus</i> | <i>sylvatica</i> | No | X | √ | 13 | 4 | Small |
| Beech, Tricolour | 'Rosea-Marginata' | Fagaceae | <i>Fagus</i> | <i>sylvatica</i> | No | X | √ | 13.5 | 8 | Medium |
| Beech, European | | Fagaceae | <i>Fagus</i> | <i>sylvatica</i> | No | X | √ | 15 | 12 | Large |
| Beech, American | | Fagaceae | <i>Fagus</i> | <i>grandifolia</i> | Yes | X | √ | 30 | 20 | Large |
| Ash, Pumpkin | | Oleaceae | <i>Fraxinus</i> | <i>profunda</i> | No | X | X | 20 | 10 | Large |
| Ash, Black | | Oleaceae | <i>Fraxinus</i> | <i>nigra</i> | Yes | X | X | 15 | 12 | Large |
| Ash, Blue | | Oleaceae | <i>Fraxinus</i> | <i>quadrangulata</i> | Yes | X | X | 15 | 12 | Large |
| Ash, Green | | Oleaceae | <i>Fraxinus</i> | <i>pennsylvanica</i> | Yes | X | X | 18 | 12 | Large |
| Ash, White | | Oleaceae | <i>Fraxinus</i> | <i>americana</i> | Yes | X | X | 21 | 17 | Large |
| Ginkgo, Princeton Sentry | 'Princeton Sentry' | Ginkgoaceae | <i>Ginkgo</i> | <i>biloba</i> | No | √ | √ | 13 | 5 | Small |
| Ginkgo, Golden Colonade | 'JFS-UGA2' | Ginkgoaceae | <i>Ginkgo</i> | <i>biloba</i> | No | √ | √ | 13 | 7.5 | Medium |
| Ginkgo, Autumn Gold | 'Autumn Gold' | Ginkgoaceae | <i>Ginkgo</i> | <i>biloba</i> | No | √ | √ | 10 | 10 | Medium |
| Ginkgo (Maidenhair) | | Ginkgoaceae | <i>Ginkgo</i> | <i>biloba</i> | Yes | √ | √ | 17 | 11 | Large |
| Locust, Honey | Streetkeeper | Fabaceae | <i>Gleditsia</i> | <i>triacanthos</i> | No | √ | √ | 15 | 7 | Medium |
| Locust, Honey | | Fabaceae | <i>Gleditsia</i> | <i>triacanthos</i> | Yes | √ | √ | 17 | 10 | Medium |
| Locust, Honey | Shademaster | Fabaceae | <i>Gleditsia</i> | <i>triacanthos</i> | No | √ | √ | 17 | 10 | Medium |
| Locust, Honey | Skyliine | Fabaceae | <i>Gleditsia</i> | <i>triacanthos</i> | No | √ | √ | 15 | 13 | Large |
| Locust, Honey | Sunburst | Fabaceae | <i>Gleditsia</i> | <i>triacanthos</i> | No | √ | √ | 15 | 13 | Large |
| Kentucky Coffee Tree | 'Espresso' | Fabaceae | <i>Gymnocladus</i> | <i>dioicus</i> | No | √ | √ | 15 | 10 | Medium |
| Kentucky Coffee Tree | | Fabaceae | <i>Gymnocladus</i> | <i>dioicus</i> | Yes | √ | √ | 17 | 13 | Large |
| Butternut | | Juglandaceae | <i>Juglan</i> | <i>cinera</i> | Yes | X | X | 12 | 11 | Medium |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|------------------------------|--------------------|--------------|---------------------|-------------------------|--------|-------|--------|-----------------------------|----------------------------|---------|
| Walnut, Black | | Juglandaceae | <i>Juglans</i> | <i>nigra</i> | Yes | X | √ | 18 | 18 | Large |
| Cedar, Eastern Red | | Cupressaceae | <i>Juniperus</i> | <i>virginiana</i> | Yes | X | X | 12 | 4 | Small |
| Cedar, Eastern Red Hillspire | 'Hillspire' | Cupressaceae | <i>Juniperus</i> | <i>virginiana</i> | No | X | √ | 12 | 4 | Small |
| Larch, European | | Pinaceae | <i>Larix</i> | <i>decidua</i> | No | X | √ | 15 | 7 | Medium |
| Tamarack (Eastern Larch) | | Pinaceae | <i>Larix</i> | <i>laricina</i> | Yes | √ | √ | 12 | 11 | Medium |
| Sweetgum | Slender Silhouette | Altingiaceae | <i>Liquidambar</i> | <i>styraciflua</i> | No | √ | √ | 15 | 2 | Small |
| Sweetgum | | Altingiaceae | <i>Liquidambar</i> | <i>styraciflua</i> | No | √ | √ | 20 | 4.5 | Small |
| Sweetgum, Moraine | 'Moraine' | Altingiaceae | <i>Liquidambar</i> | <i>styraciflua</i> | No | √ | √ | 13 | 8 | Medium |
| Tulip Tree, Pyramidal | 'Fastigiatum' | Magnoliaceae | <i>Liriodendron</i> | <i>tulipifera</i> | No | √ | √ | 16 | 5 | Small |
| Tulip Tree, Arnold | 'Arnold' | Magnoliaceae | <i>Liriodendron</i> | <i>tulipifera</i> | No | √ | √ | 18 | 6 | Medium |
| Tulip Tree | | Magnoliaceae | <i>Liriodendron</i> | <i>tulipifera</i> | Yes | √ | √ | 25 | 15 | Large |
| Orange, Osage | | Moraceae | <i>Maclura</i> | <i>pomifera</i> | No | X | √ | 12 | 12 | Medium |
| Orange, Osage | 'White Shield' | Moraceae | <i>Maclura</i> | <i>pomifera</i> | No | X | √ | 12 | 12 | Medium |
| Cucumber Tree | | Magnoliaceae | <i>Magnolia</i> | <i>acuminata</i> | Yes | X | √ | 16 | 16 | Large |
| Apple, common | | Rosaceae | <i>Malus</i> | <i>pumila</i> | Yes | X | Select | 7 | 7 | Small |
| Crabapple | 'Prairie Fire' | Rosaceae | <i>Malus</i> | | No | X | √ | 7 | 7 | Small |
| Crabapple | 'Royal Raindrops' | Rosaceae | <i>Malus</i> | | No | X | √ | 7 | 7 | Small |
| Crabapple | 'Sargent' | Rosaceae | <i>Malus</i> | | No | X | √ | 7 | 7 | Small |
| Crabapple | 'White Angel' | Rosaceae | <i>Malus</i> | | No | X | √ | 7 | 7 | Small |
| Crabapple | 'Royalty' | Rosaceae | <i>Malus</i> | | No | X | X | 7 | 7 | Small |
| Crabapple | 'Spring Snow' | Rosaceae | <i>Malus</i> | | No | X | X | 7 | 7 | Small |
| Redwood, Dawn | | Cupressaceae | <i>Metasequoia</i> | <i>glyptostroboides</i> | No | √ | √ | 15 | 8 | Medium |
| Mulberry, Red | | Moraceae | <i>Morus</i> | <i>rubra</i> | Yes | X | √ | 12 | 12 | Medium |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|----------------------------|------------------------|-------------|----------------------|---------------------|----------|-------|--------|-----------------------------|----------------------------|---------|
| Black Gum | | Nyssaceae | <i>Nyssa</i> | <i>sylvatica</i> | Yes | √ | √ | 13.5 | 8.5 | Medium |
| Ironwood (Am. Hophornbeam) | | Betulaceae | <i>Ostrya</i> | <i>virginiana</i> | Yes | √ | √ | 12 | 8 | Medium |
| Cork, Amur | | Rutaceae | <i>Phellodendron</i> | <i>amurense</i> | Invasive | X | X | 13 | 9 | Medium |
| Spruce, White | | Pinaceae | <i>Picea</i> | <i>glauca</i> | Yes | √ | √ | 25 | 4.5 | Medium |
| Spruce, Red | | Pinaceae | <i>Picea</i> | <i>rubens</i> | Yes | X | X | 20 | 8 | Medium |
| Spruce, Black | | Pinaceae | <i>Picea</i> | <i>mariana</i> | Yes | X | X | 12 | 12 | Medium |
| Spruce, Norway | | Pinaceae | <i>Picea</i> | <i>abies</i> | No | √ | √ | 25 | 10 | Large |
| Spruce, Blue Pyramidal | 'Fastigiata' | Pinaceae | <i>Picea</i> | <i>pungens</i> | No | √ | √ | 6 | 2.5 | Small |
| Spruce, Blue | | Pinaceae | <i>Picea</i> | <i>pungens</i> | No | √ | √ | 20 | 4.5 | Small |
| Spruce, Blue Hoopsii | 'Hoopsii' | Pinaceae | <i>Picea</i> | <i>pungens</i> | No | √ | √ | 15 | 6 | Medium |
| Pine, Eastern White | Pyramidal 'Fastigiata' | Pinaceae | <i>Pinus</i> | <i>strobus</i> | No | X | √ | 15 | 2.5 | Small |
| Pine, Jack | | Pinaceae | <i>Pinus</i> | <i>banksiana</i> | Yes | X | X | 11 | 3 | Small |
| Pine, Pitch | | Pinaceae | <i>Pinus</i> | <i>rigida</i> | Yes | X | X | 9 | 9 | Medium |
| Pine, Scots | | Pinaceae | <i>Pinus</i> | <i>sylvestris</i> | No | √ | √ | 15 | 9 | Medium |
| Pine, Red | | Pinaceae | <i>Pinus</i> | <i>resinosa</i> | Yes | √ | √ | 20 | 10 | Large |
| Pine, Eastern White | | Pinaceae | <i>Pinus</i> | <i>strobus</i> | Yes | √ | √ | 24 | 11 | Large |
| Pine, Austrian | | Pinaceae | <i>Pinus</i> | <i>nigra</i> | No | X | √ | 18 | 15 | Large |
| Planetree, Exclamation | 'Morton Circle' | Platanaceae | <i>Platanus</i> | <i>x acerifolia</i> | No | √ | √ | 16 | 10 | Medium |
| Planetree, London | 'Bloodgood' | Platanaceae | <i>Platanus</i> | <i>x acerifolia</i> | No | √ | √ | 16 | 13 | Large |
| Planetree, London | | Platanaceae | <i>Platanus</i> | <i>x acerifolia</i> | No | √ | √ | 20 | 20 | Large |
| Sycamore | | Platanaceae | <i>Platanus</i> | <i>occidentalis</i> | Yes | √ | √ | 27 | 27 | Large |
| Aspen, Trembling | | Salicaceae | <i>Populus</i> | <i>tremuloides</i> | Yes | X | Select | 10 | 5 | Small |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|-------------------------|------------------|-------------|--------------------|----------------------|----------|-------|--------|-----------------------------|----------------------------|---------|
| Poplar, Balsam | | Salicaceae | <i>Populus</i> | <i>balsamifera</i> | Yes | X | √ | 13 | 6 | Medium |
| White Poplar | | Platanaceae | <i>Populus</i> | <i>alba</i> | Invasive | X | X | 12 | 12 | Medium |
| Aspen, Large-toothed | | Salicaceae | <i>Populus</i> | <i>grandidentata</i> | Yes | X | Select | 18 | 12 | Large |
| Cottonwood, Eastern | | Salicaceae | <i>Populus</i> | <i>deltoides</i> | Yes | X | √ | 27 | 21 | Large |
| Cottonwood, Black | | Salicaceae | <i>Populus</i> | <i>trichocarpa</i> | No | X | √ | 27 | 21 | Large |
| Plum, American | | Rosaceae | <i>Prunus</i> | <i>americana</i> | No | X | X | 5 | 5 | Small |
| Plum, Canada | | Rosaceae | <i>Prunus</i> | <i>nigra</i> | Yes | X | X | 5 | 5 | Small |
| Cherry, Choke | | Rosaceae | <i>Prunus</i> | <i>virginiana</i> | Yes | X | √ | 5 | 5 | Small |
| Cherry, Kwanzan | 'Kwanzan' | Rosaceae | <i>Prunus</i> | <i>serrulata</i> | No | X | √ | 7 | 5 | Small |
| Cherry, Pin | | Rosaceae | <i>Prunus</i> | <i>pensylvanica</i> | Yes | X | √ | 8 | 8 | Medium |
| Cherry, Black | | Rosaceae | <i>Prunus</i> | <i>serotina</i> | Yes | X | √ | 15 | 6 | Medium |
| Fir, Douglas | | Pinaceae | <i>Pseudotsuga</i> | <i>menziesii</i> | No | √ | √ | 20 | 5 | Medium |
| Hop tree | | Rutaceae | <i>Ptelea</i> | <i>trifoliata</i> | Yes | X | √ | 5 | 5 | Small |
| Pear | | Rosaceae | <i>Pyrus</i> | <i>calleryana</i> | Invasive | X | X | 9 | 9 | Medium |
| Oak, Red Kindred Spirit | 'Bicolor Nadler' | Fagaceae | <i>Quercus</i> | <i>rubra</i> | No | √ | √ | 10 | 2 | Small |
| Oak, English | 'Skinny Genes' | Fagaceae | <i>Quercus</i> | <i>robur</i> | No | √ | √ | 15 | 3 | Small |
| Oak, English Pyramidal | 'Fastigiata' | Fagaceae | <i>Quercus</i> | <i>robur</i> | No | √ | √ | 15 | 5 | Small |
| Oak, English | 'Skyrocket' | Fagaceae | <i>Quercus</i> | <i>robur</i> | No | √ | √ | 20 | 5 | Medium |
| Oak, Shumard | | Fagaceae | <i>Quercus</i> | <i>shumardii</i> | Yes | √ | √ | 12 | 12 | Medium |
| Oak, Bur | | Fagaceae | <i>Quercus</i> | <i>macrocarpa</i> | Yes | √ | √ | 18 | 13 | Large |
| Oak, English | | Fagaceae | <i>Quercus</i> | <i>robur</i> | No | √ | √ | 18 | 13 | Large |
| Oak, Swamp White | | Fagaceae | <i>Quercus</i> | <i>bicolor</i> | Yes | √ | √ | 15 | 15 | Large |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|------------------------|--------------|--------------|------------------|----------------------|----------|-------|-------|-----------------------------|----------------------------|---------|
| Oak, Chinquapin | | Fagaceae | <i>Quercus</i> | <i>muehlenbergii</i> | No | √ | √ | 15 | 15 | Large |
| Oak, Pin | | Fagaceae | <i>Quercus</i> | <i>palustris</i> | Yes | √ | √ | 20 | 13 | Large |
| Oak, Red | | Fagaceae | <i>Quercus</i> | <i>rubra</i> | Yes | √ | √ | 16 | 15 | Large |
| Oak, Black | | Fagaceae | <i>Quercus</i> | <i>velutina</i> | Yes | √ | √ | 20 | 20 | Large |
| Oak, White | | Fagaceae | <i>Quercus</i> | <i>alba</i> | Yes | √ | √ | 20 | 20 | Large |
| Locust, Black | | Fabaceae | <i>Robinia</i> | <i>pseudoacacia</i> | Invasive | X | X | 9 | 6 | Small |
| Willow, Golden Weeping | 'Tristis' | Salicaceae | <i>Salix</i> | <i>alba</i> | No | X | √ | 20 | 20 | Large |
| Willow, Black | | Salicaceae | <i>Salix,</i> | <i>nigra</i> | Yes | X | √ | 10 | 5 | Small |
| Willow, Peach leaf | | Salicaceae | <i>Salix,</i> | <i>amygdaloides</i> | Yes | X | √ | 9 | 6 | Small |
| Willow, Corkscrew | 'Totuosa' | Salicaceae | <i>Salix,</i> | <i>matsudana</i> | No | X | √ | 10 | 7 | Medium |
| Sassafras | | Lauraceae | <i>Sassafras</i> | <i>albidum</i> | Yes | √ | √ | 8 | 8 | Medium |
| Pagoda Tree, Japanese | | Fabaceae | <i>Sophora</i> | <i>japonica</i> | No | X | √ | 22 | 20 | Large |
| Mountain-Ash, American | | Rosaceae | <i>Sorbus</i> | <i>americana</i> | Yes | X | √ | 6 | 6 | Small |
| Mountain-Ash, Showy | | Rosaceae | <i>Sorbus</i> | <i>decora</i> | Yes | X | √ | 7 | 6 | Small |
| Lilac, Japanese Tree | 'Ivory Silk' | Oleaceae | <i>Syringa</i> | <i>reticulate</i> | No | √ | √ | 8 | 4 | Small |
| Cypress, Bald | | Cupressaceae | <i>Taxodium</i> | <i>distichum</i> | No | X | √ | 20 | 8 | Medium |
| Cedar, Emerald | 'Emerald' | Cupressaceae | <i>Thuja</i> | <i>occidentalis</i> | No | X | √ | 4 | 1 | Small |
| Cedar, Black | 'Nigra' | Cupressaceae | <i>Thuja</i> | <i>occidentalis</i> | No | X | √ | 5 | 1.5 | Small |
| Cedar, Eastern White | | Cupressaceae | <i>Thuja</i> | <i>occidentalis</i> | Yes | X | √ | 20 | 3 | Small |
| Basswood | | Malvaceae | <i>Tilia</i> | <i>americana</i> | Yes | X | √ | 27 | 13 | Large |
| Linden, Little-leaf | | Malvaceae | <i>Tilia</i> | <i>cordata</i> | No | X | √ | 17 | 20 | Large |
| Hemlock, Eastern | | Pinaceae | <i>Tsuga</i> | <i>canadensis</i> | Yes | X | √ | 20 | 5 | Medium |
| Elm, White | 'Princeton' | Ulmaceae | <i>Ulmus</i> | <i>americana</i> | No | √ | √ | 21 | 15 | Large |

| Common Name | Cultivars | Family | Genus | Species | Native | Roads | Parks | Est. Height (m) at Maturity | Est. Width (m) at Maturity | Stature |
|-------------------|----------------|----------|----------------|------------------|--------|-------|-------|-----------------------------|----------------------------|---------|
| Elm, White | | Ulmaceae | <i>Ulmus</i> | <i>americana</i> | Yes | X | X | 24 | 15 | Large |
| Elm, Accolade | wilsoniana | Ulmaceae | <i>Ulmus</i> | <i>japonica</i> | No | √ | √ | 23 | 20 | Large |
| Elm, White | 'Valley Forge' | Ulmaceae | <i>Ulmus</i> | <i>americana</i> | No | √ | √ | 21 | 21 | Large |
| Elm, Slippery | | Ulmaceae | <i>Ulmus</i> | <i>rubra</i> | No | X | X | 12 | 9 | Medium |
| Zelkova, Japanese | 'Gold Falls' | Ulmaceae | <i>Zelkova</i> | <i>serrata</i> | No | X | √ | 11 | 7 | Medium |
| Zelkova, Japanese | | Ulmaceae | <i>Zelkova</i> | <i>serrata</i> | No | X | √ | 15 | 15 | Large |