URBAN FOREST MANAGEMENT PLAN FOR THE TOWN OF COLLINGWOOD

2020-2030

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Executive Summary

Collingwood's urban forest includes all the trees, woody and associated vegetation within the town's boundaries. It is both natural and manmade: all the trees and shrubs within the municipal urban limits plus the associated lands that contribute to the environment of populated places- municipal watersheds, recreation sites and roadsides. These trees and shrubs provide a wide range of benefits which contribute to the town's economic prosperity, social wellbeing, environmental health and cultural vibrancy. The annual value of these ecological services provided by the urban forest canopy cover to the community of Collingwood was $1.07 million in 2018.

Municipal street and park trees are a prominent part of Collingwood's urban forest. The town's tree inventory consists of 9,078 trees comprised of over 11 Genera (woodland properties not included); maple species make up the largest single proportion at 30%.

In 2018, the tree canopy cover of the Town of Collingwood (urban areas plus rural areas) was 31.7%. When the shrub/thicket canopy was added to the tree canopy, the total urban forest canopy cover was measured at 38.3%.

The long-term vision for the urban forest, guiding principles and strategic goals were developed in consultation with town staff, external stakeholders and the community who provided feedback from two on-line questionnaires through the Town's Engage Collingwood website:

Long-term Vision

The Town of Collingwood values the urban forest and its contribution to the liveability of our community. In addition to the environmental, social, aesthetic and economic benefits of the urban forest, the Town recognizes the importance trees have on health, quality of life, tourism, recreation and green infrastructure. The Town is committed to sustainable management of the urban forest as well as supporting community action and stewardship to maintain, renew and enhance this natural resource for future generations.

Strategic Goals

1. Develop policy framework and procedures for municipally-owned trees that acknowledge trees as green infrastructure and a municipal / community asset.
2. Develop policies and practices that maintain tree canopy cover while balancing infrastructure, development and the natural environment.
3. Manage municipally-owned urban, roadside and woodlot trees through an understanding of their age, composition and quality and implications for maintenance, removal and replacement (arboricultural best practices).
4. Improve the resilience of the urban forest (current and anticipated stressors, including climate change, pests and diseases) by implementing policies and management practices that optimize tree health, diversity, structure and age classes.
5. Utilize human resources efficiently and effectively to address the tree related activities.
6. Prioritize protection and maintenance of all trees while recognizing the importance of mature, healthy trees and preservation of older large-canopied species.
7. To transition towards proactive tree establishment and replacement whereby all potential plantable locations on town lands are explored and apply “right tree, right place” principles, except where policy requires that new trees be planted on adjacent private property development.
8. Build awareness and engagement among municipal staff and the community regarding the importance and contribution of the urban forest and the Town’s effort to sustain this resource.
9. Explore stewardship initiatives and develop more partnerships that support the urban forest.
10. Use new technologies in selected areas for integration of trees in hardscapes such as downtown and parking lots to increase green infrastructure.

Important Findings

Key policies, by-laws and related legislation affecting the Collingwood's urban forest were reviewed and implications for the management of the town's urban forest assessed.

From a Windshield Survey conducted in the 2018 detailed maps were created which show the existing maintenance needs for the street trees in different neighbourhoods.

To support the town's efforts to sustain its urban forest resource, an assessment using the Criteria and Indicators of Sustainable Urban Forest Management was used. Results indicate that 15 of the 25 *performance indicators* were 'moderate' to 'good.' These values are very good relative to other smaller municipalities. This baseline also provides a guide to focus future urban forest management efforts that can be re-assessed every five years to measure progress.

A SWOT (strengths, weaknesses, opportunities, threats and weaknesses) analysis was conducted. Important strengths the Town has include teamwork amongst staff and that the *Community Based Plan* established a performance indicator for tree Canopy (30%) and linked this to the Urban Design Manual. There is the potential to strengthen this work by developing a science-based tree canopy target using the *i-Tree Eco* model. An area for the town to work on includes amending its Official Plan and updating other key town documents such as its *Asset Management Plan* and Public Tree By-law to reflect new policies and technical guidelines to support urban forest and green infrastructure options. Perhaps the single biggest opportunity identified is that Collingwood values its urban forest. This was evident at the Public Meeting held on April 24, 2019. Now that the *Municipal Act* has been amended to require adoption of policies to protect and enhance the tree canopy, the town can leverage its strengths to take advantage of these opportunities.

Planning for and Management of Street and Park Trees

Every street and park tree should receive the appropriate pruning aspects of tree tending periodically through a *Pruning Cycle*. The pruning cycle is the number of years it takes to maintenance-prune all street [and park] trees using programmed maintenance. The estimated annual pruning cost is $47,635. This work could be conducted by a new Urban Forestry Unit with the support of a new Town Forester position.

A comprehensive set of Recommendations and Priorities is combined with two 5-year Operating Plans for the periods 2020-2024 and 2025-2029. In addition, a Ten-Year Financial Plan for the Period 2020-2029 is presented.

Principal Conclusion

Collingwood's urban forest is a valuable resource.

Success in realizing the Vision and Strategic Goals of this Plan relies on the continued excellent teamwork of staff across a variety of departments, partners in the public and private sector including local business and members of the community all under the leadership of an engaged and supportive town Council.

1.0 Purpose, Vision, Guiding Principles & Goals

This Project began with a Request for Proposals to Provide an Urban Forest Management Plan (UFMP) for the Collingwood (RFP No FIN2018-036P). The project was awarded to a team led by Williams & Associates, Forestry Consulting Ltd. The Plan provides strategic long-term (10-year) direction for the Town. The plan characterizes and quantifies the current state of the Town's urban forest and identifies strategies to improve its health and sustainability for future development, redevelopment and enhancement. The plan also reviews current forestry management operations and recommend changes and future needs.

The project started by establishing a Project Team to guide the plans direction and progress. The Project Team was made up of staff from Departments that had a mandate or interest that affected the urban forest or its management and principals of the consulting team. The Team met regularly during the course of the project to schedule activities, discuss and approve methodology and review and approval of reports.

This Urban Forest Management Plan (UFMP) articulates the 10 urban forest management goals (Section 1.4) within the Vision of Collingwood's urban forest as expressed by the community. The Plan's Purpose, Vision, Guiding Principles and Goals were developed by the Project Team with input from Stakeholders and the Public while at the same time reflecting Collingwood's biophysical and land use context. The starting point in this process was determining the current state of the Town's urban forest. This was done through a review of existing information, discussions with Staff from the Town, field visits and consultations with feedback from key Stakeholders and the general public who helped guide the Plan's direction and prioritize the Strategies, Goals and Objectives.

The Town's Request for Proposal for this project included the following background statement which reflects the potential for trees in helping solve one of the community's more pressing problems:

One goal of the UFMP is to provide direction to staff to reduce the impact of stormwater on the drainage infrastructure caused by excessive water runoff, flooding and erosion due to climate change. The UFMP will review the current urban forest and its management and determine how to improve green infrastructure to reduce soil erosion and nutrients before they enter storm sewers during rain events.

At the February 13, 2019 meeting of the Project Team, draft Vision Statements, Guiding Principles and Goals were discussed. These were revised to form the statements provided in Sections 1.2, 1.3 and 1.4 respectively and were widely supported by the community through the Engagement Process (Section 3.8).

1.1 Purpose of this Plan

The purpose of the UFMP is to provide a comprehensive suite of strategies that will enhance Town-owned trees and forests over time and address the risk management and design issues that face the community. It provides a framework within which planning, design, maintenance/operations, and risk management decisions impacting trees principally on municipal lands with consideration for an appropriate framework for trees on private lands.

This UFMP will help set the direction for the Town to understand more about its trees and forests and the environmental benefits they provide; to develop infrastructure to help maintain and improve the community forest; and to develop methods to monitor, maintain and regenerate the urban forest.

The urban forest is part of the town's green infrastructure and should be recognized as a key element to help achieve Collingwood's vision of environmental integrity, social wellbeing and economic vibrancy as laid out in the town's Official Plan.

The UFMP covers a 10-year timeframe containing two 5-year Operating Plans (OPs) and a 10-year Financial Plan (Figure 1. 1). The UFMP includes recommendations within the text, numbered by the Section or Subsection where it is made (e.g. Recommendation 1.1.a is the first recommendation made in Section 1.1, and Recommendation 1.1.b is the second). Each recommendation is referred to by number where it is discussed in the UFSMP. The recommendations were compiled into a Master List of Recommendations Table 5. 1. After the draft UFMP was circulated, the Project Team prioritized recommendations within first and second 5-year Operating Plans (Table 6. 2). Updating these priorities and plans every five years for the subsequent periods is part of the adaptive management philosophy of this strategy.

To coordinate the various administrative units and oversee Plan implementation, it is recommended that the Town establish an Urban Forest Advisory Committee with representation from the Town departments associated with tree management, as well as community representation. Such a committee could be an important mechanism for staff to: share expertise, help ensure consistency in tree policies and maintenance (especially during initial implementation of this UFMP) and work towards more community buy-in.

Figure 1. 1 Collingwood Urban Forest Management Plan Components

RECOMMENDATION 1.1.a: *An Urban Forest Advisory Committee should be established that should include staff from all departments associated with tree establishment and management, with stakeholder representation.*

1.2 UFMP Vision Statement

The Town of Collingwood values the urban forest and its contribution to the liveability of our community. In addition to the environmental, social, aesthetic and economic benefits of the urban forest, the Town recognizes the importance trees have on health, quality of life, tourism, recreation and green infrastructure. The Town is committed to sustainable management of the urban forest as well as supporting community action and stewardship to maintain, renew and enhance this natural resource for future generations.

1.3 Guiding Principles of the UFMP

Guiding Principles are intended to influence the development of the urban forest strategy, management plan and implementation of the plan:

1. The Town strives to manage the urban forest in an ecologically- sustainable and fiscally responsible manner.

2. Trees are green infrastructure and managed as part of an Integrated Asset Framework.

3. Municipally-owned trees will be monitored and assessed using current information and research, leading to an adaptive management approach, allowing an adjustment to standard, urban forestry practices as needed.

4. Municipally-owned trees are maintained according to arboricultural best management practices (e.g., ANSI A300, ISA).

5. The right tree will be planted in the right place to optimize its life span, to maintain species diversity and canopy cover, to maximize green infrastructure and to minimize environmental impacts.

6. To support community engagement in the conservation, management and stewardship of the urban forestry management program.

7. Well-managed, privately-owned trees will contribute to an overall healthy urban forest

1.4 UFMP Goals

Urban Forest Management Goals

Based on the Guiding Principles / Best Practices, Collingwood will work towards the following goals through the implementation of this management plan. The Town will attempt to develop adequate human, capital and operational resources for urban forest management, planning and monitoring to achieve goals and meet targets identified in this plan.

1. Develop policy framework and procedures for municipally-owned trees that acknowledge trees as green infrastructure and a municipal / community asset.

2. Develop policies and practices that maintain tree canopy cover while balancing infrastructure, development and the natural environment.

3. Manage municipally-owned urban, roadside and woodlot trees through an understanding of their age, composition and quality and implications for maintenance, removal and replacement (arboricultural best practices).

4. Improve the resilience of the urban forest (current and anticipated stressors, including climate change, pests and diseases) by implementing policies and management practices that optimize tree health, diversity, structure and age classes.

5. Utilize human resources efficiently and effectively to address the tree related activities.

6. Prioritize protection and maintenance of all trees while recognizing the importance of mature, healthy trees and preservation of older large-canopied species.

7. To transition towards proactive tree establishment and replacement whereby all potential plantable locations on town lands are explored and apply “right tree, right place” principles, except where policy requires that new trees be planted on adjacent private property development.

8. Build awareness and engagement among municipal staff and the community regarding the importance and contribution of the urban forest and the Town’s effort to sustain this resource.

9. Explore stewardship initiatives and develop more partnerships that support the urban forest.

10. Use new technologies in selected areas for integration of trees in hardscapes such as downtown and parking lots to increase green infrastructure.

2.0 Benefits of the Urban Forest

The urban forest can be defined as "the sum of all woody and associated vegetation in and around dense human settlements" (Miller, 1988). "The urban forest includes all woody vegetation within the environs of all populated places. It can be natural and manmade: all the trees and shrubs within the municipal urban limits plus the associated lands that contribute to the environment of populated places- for example greenbelts, municipal watersheds, recreation sites and roadsides" (Grey and Deneke,1978).

Within an urban boundary, land- use type greatly influences the distribution of trees. Residential areas constitute a major portion of the urban forest. Other land-use types where the urban forest is found include parks, recreation areas, transportation areas (streets), agricultural areas, institutional lands and undeveloped areas. A study conducted by the Town of Oakville on its urban forest concluded that the "…quantity and quality of the urban forest canopy cover depends on land use type…the community with the highest urban forest canopy cover is - [a low-density residential land use type] - Eastlake (48.7%) and the lowest urban forest canopy cover is [an Industrial type] QEW East (6.6%)." (Town of Oakville, 2006).

"Urbanization and urban forests are likely to be the greatest forest influence and influential forest of the 21st Century" (Nowak et al, 2005). 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* ~ Professor Eric Jorgensen, Faculty of Forestry, University of Toronto, mid-1960's

These benefits of the urban forest support the five Goal's defined by the community in the *Collingwood Community Based Strategic Plan,* 2015

Figure 2. 1 Five Goals in Collingwood Community Based Strategic Plan

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Figure 2. 2 Trees Support …Accountable Local Government & Culture and the Arts

Support for Economic Growth

Wolf, K.L. 2010. Community Economics - A Literature Review. In: Green Cities: Good Health (www.greenhealth.washington.edu). College of the Environment, University of Washington.

https://www.bluezones.com/2018/09/22-reasons-trees-in-cities-keep-us-healthy-and-save-us-money/

- The presence of larger trees in yards and as street trees can add from 3% to 15% to home values throughout neighbourhoods.[2]
- Averaging the market effect of street trees on all house values across Portland, OR (population 590,000) yields a total value of $1.35 billion, potentially increasing annual property tax revenues $15.3 million.[9]
- A study found 7% higher rental rates for commercial offices having high quality landscapes.[14]
- Shoppers claim that they will spend 9% to 12% more for goods and services in central business districts having high quality tree canopy.[34]
- Shoppers indicate that they will travel greater distance and a longer time to visit a district having high quality trees and spend more time there once they arrive.[34]

Figure 2. 3 Trees support …Economic Growth

Figure 2. 4 Trees support …Public Access to Revitalized Waterfront

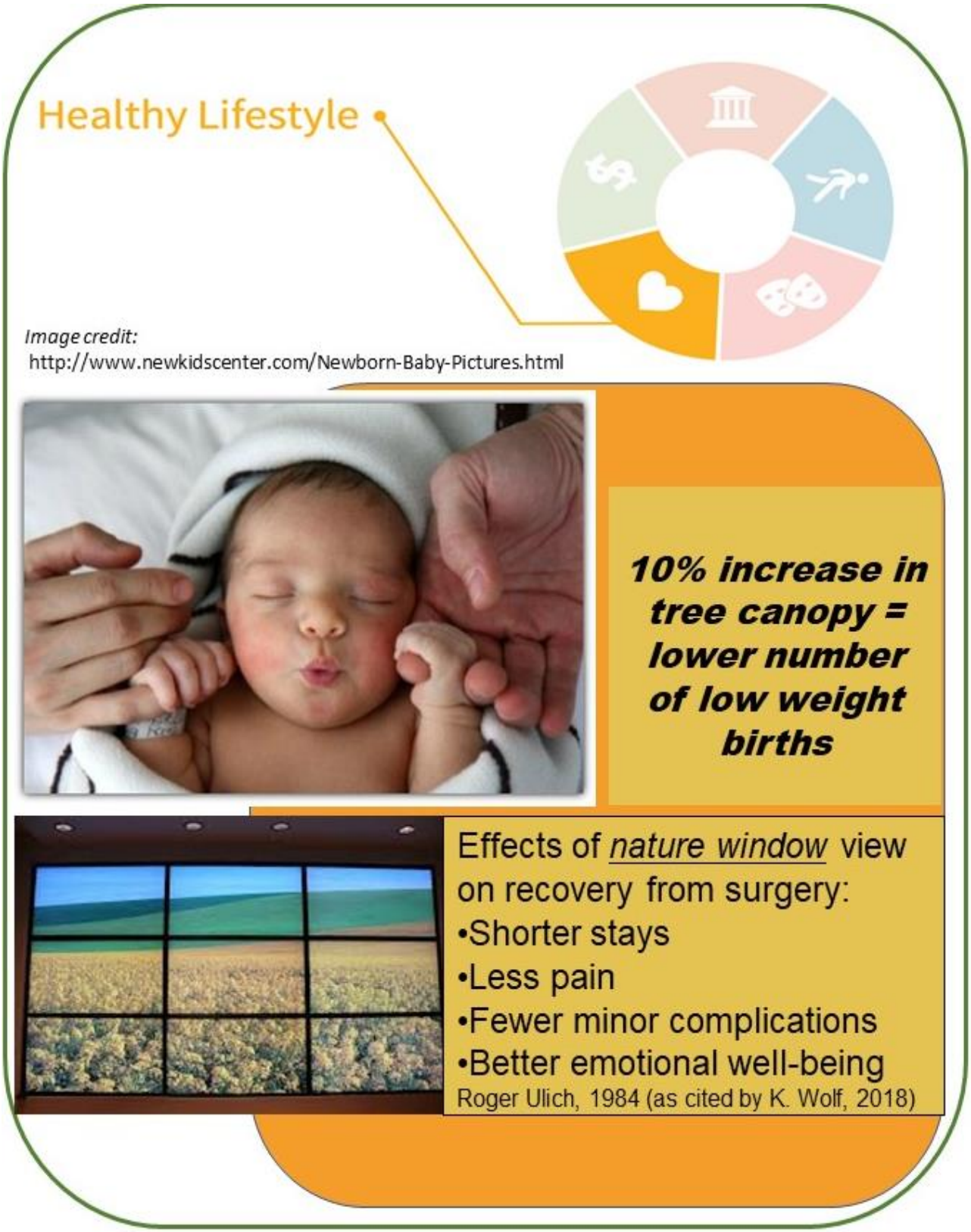


Figure 2. 5 Trees support…Healthy Lifestyle

The U.S. Forest Service has developed a powerful tool called i-Tree which measures the form, function and value of trees (itreetools.org). (Figure 2.6)

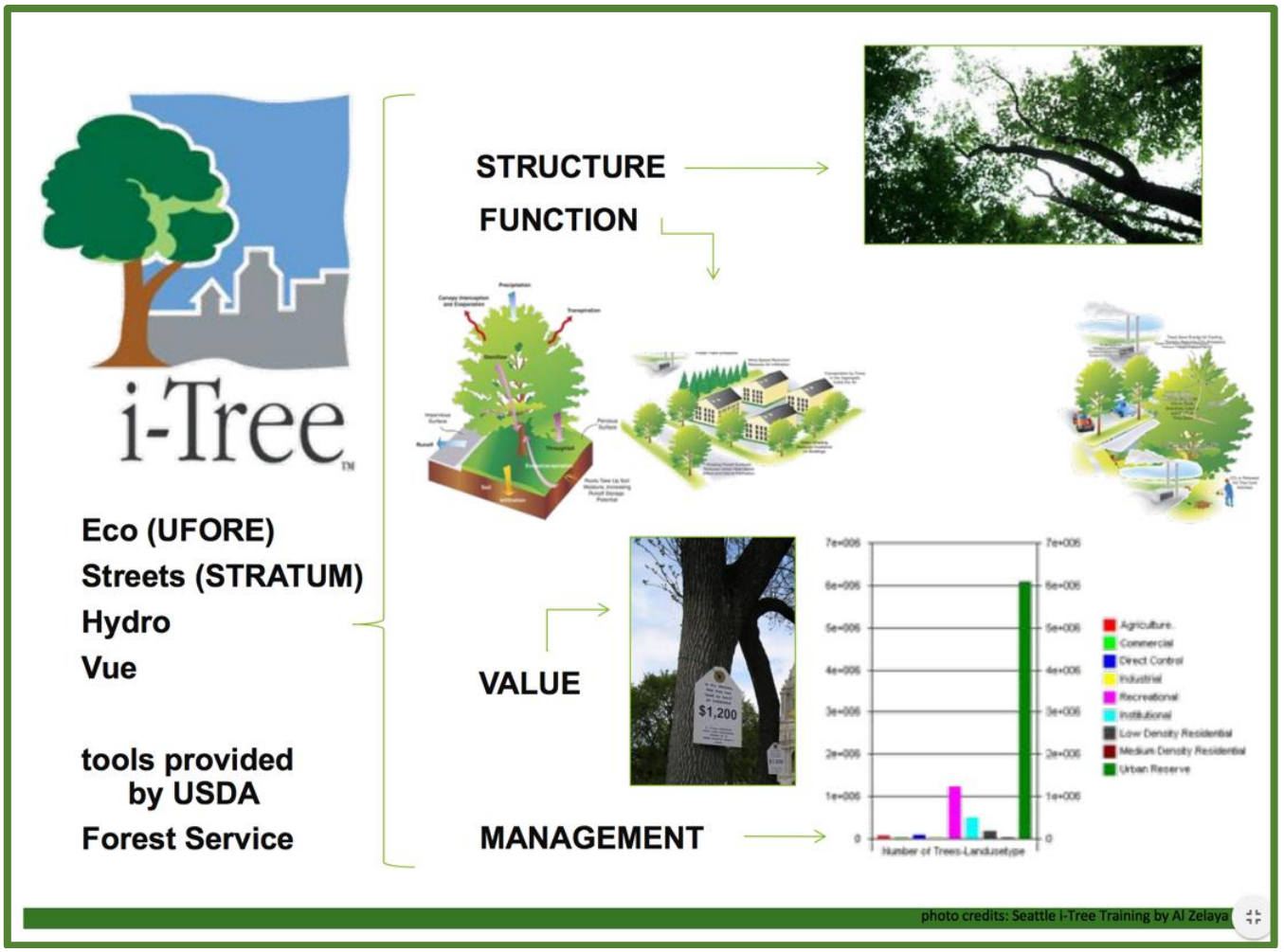
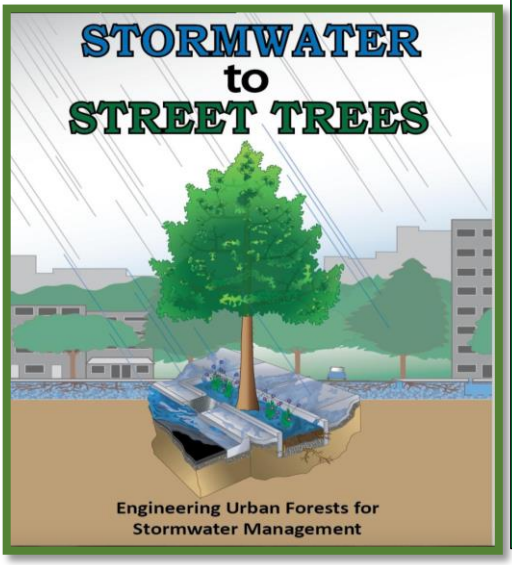


Figure 2. 6 U.S. Forest Service i-Tree for measuring form, function and value of trees (itreetools.org)

"Urban forests provide numerous ecosystem services. To quantify these services and guide management to sustain these services for future generations, the structure or composition of the forest must be assessed." (U.S. Forest Service, NRS-INF-24-13 Revised 2019). Communities across the world use i-Tree to accomplish this.

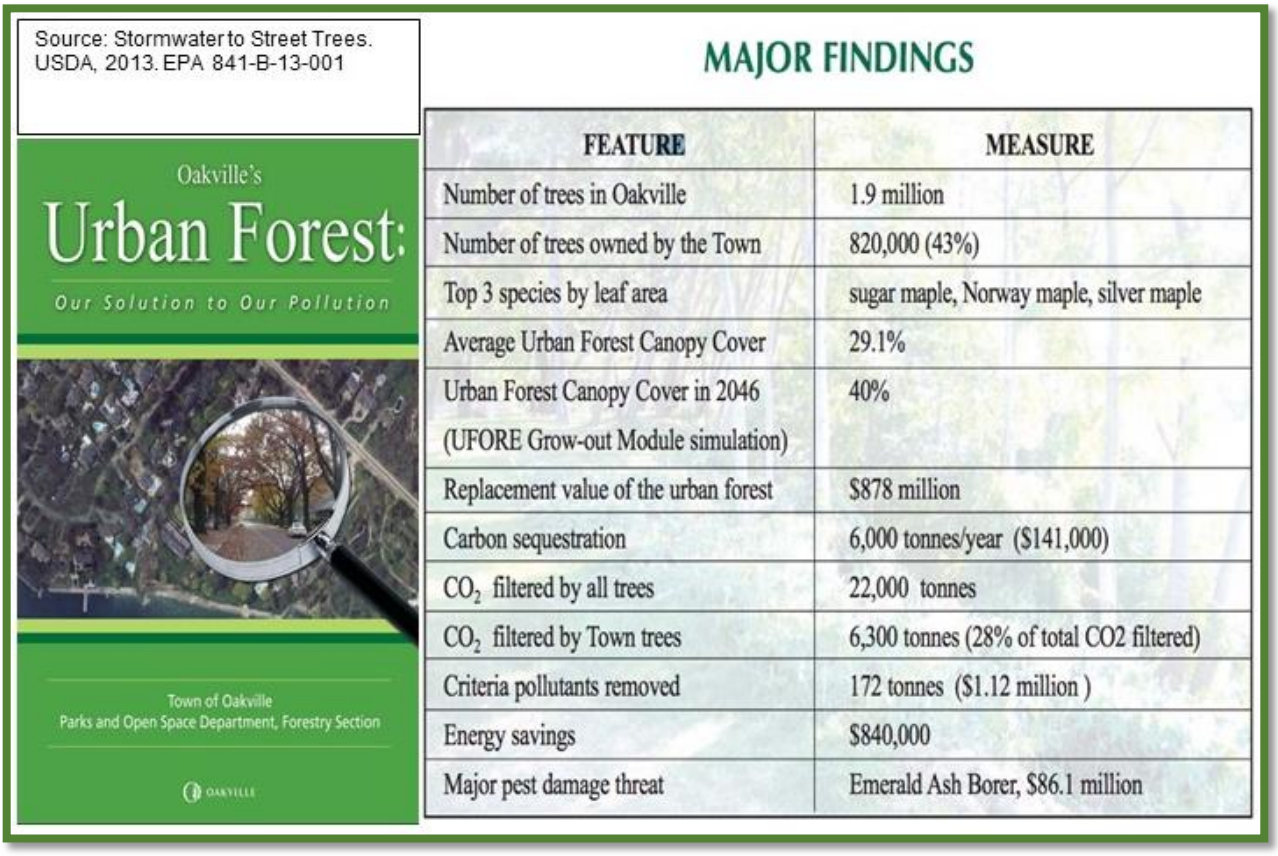


Stormwater Benefits:

In 2010, the State of Indiana Department of Natural Resources conducted a statewide street tree benefit study using i-Tree Streets. The study showed that Indiana's street trees returned $79 million in environmental services and economic benefits; applied to all 567 Indiana communities, reductions in stormwater management costs accounted for 64% of the environmental services (stormwater, energy, air quality, and CO_2) provided by street trees. Solution: installing trees in *locations that are engineered to retain stormwater* is a great way to augment existing stormwater management systems, increasing their capacity and improving water quality while greatly improving urban forest canopy.

Source: 1 Stormwater to Street Tree. USDA 2013 EPA 841-B-13-001

Figure 2. 7 Example of an i-Tree Project at the regional level: Indiana, U.S.



MAJOR FINDINGS

FEATURE	MEASURE
Number of trees in Oakville	1.9 million
Number of trees owned by the Town	820,000 (43%)
Top 3 species by leaf area	sugar maple, Norway maple, silver maple
Average Urban Forest Canopy Cover	29.1%
Urban Forest Canopy Cover in 2046 (UFORE Grow-out Module simulation)	40%
Replacement value of the urban forest	$878 million
Carbon sequestration	6,000 tonnes/year ($141,000)
CO_2 filtered by all trees	22,000 tonnes
CO_2 filtered by Town trees	6,300 tonnes (28% of total CO2 filtered)
Criteria pollutants removed	172 tonnes ($1.12 million)
Energy savings	$840,000
Major pest damage threat	Emerald Ash Borer, $86.1 million

Figure 2. 8 Example of an i-Tree Project at the local level: Oakville, Ontario

Source: Oakville's Urban Forest: Our Solution to Our Pollution,

RECOMMENDATION 2.0.a: *The Town undertake an i-Tree Eco Project to baseline & measure the form, function and value of the community's urban forest*

RECOMMENDATION 2.0.b*: The Town undertake an i-Tree Hydro Project to assess the impact of tree canopy cover on stream flow*

2.1 Historical Context for Town of Collingwood

The Town of Collingwood is situated along the shoreline of Nottawasaga Bay (Georgian Bay) in the northwest corner of the County of Simcoe and has a total area of 3,378 hectares. Collingwood has 21,793 permanent residents (2016 Census) and has been identified by the *Provincial Growth Plan* for the Greater Golden Horseshoe as the primary settlement area, or focal point, for growth in the northwestern portion of Simcoe County. It is anticipated that Collingwood will reach a population of 33,400 over the next fifteen years (2031).

Collingwood functions as the major commercial center for northwest Simcoe County and northeast Grey County, servicing an overall trade area in 2011 of approximately 85,000 people. While there are still a number of manufacturing plants within Town, the municipality has experienced a significant shift toward tourist-related service industries since the closure of the Collingwood Steamship Lines shipbuilding operation in 1986. Collingwood is a major tourist destination for the residents of southern Greater Golden Horseshoe (GGH). Its location along the shoreline of Georgian Bay and proximity to the Niagara Escarpment ideally situates the municipality as the "gateway" to the winter resort areas to the west.

Collingwood's proximity to the southern GGH municipalities has potential impact not only on demand for residential development, but also on the need for future support services including commercial (food/ retail/ financial/ convention/ recreational) services, as well as hard and soft servicing facilities (e.g., roads/ parks/ water supply/ sanitary sewage disposal). *This population growth and development will have a major impact on the forests, wetlands and urban street and park trees of Collingwood and area.*

This expansion will result in new trees being planted along streets in new developments and as new public parks are established. There may be pressure in the future to modify the Town street tree planting location standard and move tree planting more onto private property because of the impacts of the Province's *Places to Grow Plan* https://www.placestogrow.ca/ ; the implications of this impact will be analyzed in the Urban Forest Management Plan (UFMP).

Having a plan to plant and manage municipally-owned trees and to educate citizens will benefit the community and save costs in the future. Involving community partners will result in greater acceptance and understanding of the value of trees. This green infrastructure will continue to increase in value for more than two generations.

2.1.1 Ecological and Landscape Context for Town of Collingwood

Collingwood is at the southern edge of the Great Lakes – St. Lawrence Forest Region, typically dominated by sugar maple with associate beech, basswood, ashes, red maple and oaks. Much of Collingwood's forest is second growth and/or wetlands dominated by silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), white elm (*Ulmus americana*), poplar (*Populus spp*.), and white cedar (*Thuya occidentalis*).

Collingwood is also within the Simcoe Lowlands physiographic region, most of which is occupied by sand plains associated with Georgian Bay. The sand plain includes a number of former beaches that were left as the lake levels decreased after the glaciers melted. The eastern part of Collingwood including much of downtown and residential area is on beveled till plain with heavier-textured soils. Clay plains occupy a small area in southwest corner of the Town.

Although Collingwood is not within the Niagara Escarpment planning area, the Escarpment dominates views to the western side of Collingwood and almost all surface and ground water originates from it. Significant recreational and residential facilities in adjoining municipalities that are associated with skiing and other activities on and near the escarpment functionally increase population pressures on Collingwood.

Soil has a fundamental impact on tree growth and health, and their management, particularly in an urban context. The UFMP will discuss the relevancy of soil in urban tree health and growth and in how engineered soils and other options could be included as part of development engineering design standards. Adequately planned and designed street tree habitat can contribute towards reducing the town's costs for stormwater management.

Six waterways flow through the Town to Georgian Bay. From west to east there is Townline Creek, Silver Creek, Black Ash Creek, Pretty River, Batteaux Creek and Bower's Beach Creek. All are within the jurisdiction of the Nottawasaga Valley Conservation Authority (NVCA). The Silver Creek Wetland Complex that extends to the west into the Town of Blue Mountains is the only Provincially Significant Wetland within the Collingwood, partly in the Grey-Sauble Conservation gJurisdiction. This wetland complex is within one kilometer of the Nottawasaga Bay shoreline and is over 327 ha in size and lies. There are numerous non-evaluated wetlands in the Town.

Collingwood's forest occupies 665 ha in Collingwood (OMNRF need reference), 19.5 percent of the Town's total area. Deciduous (mostly), coniferous, and plantation upland forests cover 510 ha while the remaining 155 ha is treed swamp. There are also 245 ha of non-treed wetlands including marsh and thicket swamps covering another 7.2 percent of Town area. This includes 109 ha of the globally rare Great Lakes Coastal Marsh. (NVCA 2011 - Natural Heritage Study, page 32). The NVCA

(Personal Communication) reports that there is currently 489.1 ha of forest in Collingwood. Forest loss continues to occur within the Town of Collingwood - since 2002, significant forest loss has been associated with residential development, industrial development, and highway construction (Highway 26 bypass).

Municipal land ownership: parks, forest, wetlands

Collingwood has 85.12 ha of municipal parks, including 6.7 ha of port lands on Heritage Drive which contains a bare minimum of trees (Harbourlands and Millennium Parks).

The Town owns a number of mostly small parcels that include some forest, the largest being a 23-ha parcel (George Christie Nature Trails) off the Georgian Trail in the west part of town. There are a number of municipally-owned parcels which are at present vacant land on the waterfront.

The Town has an extensive trail system with 60 km of trails; 26% with asphalt, concrete or wood surface and 74% with crushed limestone or natural surface. Off road trails have mostly crushed limestone surfaces and on road bike routes and lanes are mostly asphalt with some concrete.

Town roads

There are 204.6 km of streets in Collingwood. Table 2. 1below shows the classification of the street system. Condominium streets are not municipally-owned. “Planned local” streets were not built in 2018.

Table 2. 1 Street classes and length in Town of Collingwood

GIS Street class	Class #	Length (m)
Arterial	3	51,145
Collector	2	18,712
Condo	4	18,387
Local	1	105,487
Planned local	6	10,883

3.0 Assessing the Urban Forest and Its Management

The steps and processes used to develop the Town of Collingwood's Urban Forest Management Plan are shown in the flowchart below (Table 3. 1) which includes brief descriptions of each planning step with references to sections of the Plan where the step/process and associated findings are described in more detail.

This project started with an initial Project Team meeting to develop an understanding about current conditions in Collingwood's urban forest and establishing the process to develop the Plan. The Project Team was made up of staff from various departments responsible for tree management and senior members of the consulting team. The meeting produced general agreement on procedures to assess the urban forest and how the trees and forest are managed by the Town.

During the initial Team Meeting, the Team discussed how Collingwood currently manages its urban forest and how work was planned, directed, conducted and audited. This discussion highlighted the various staff and administrative units/departments that affected the management of the urban forest. Municipal, regional and provincial policies that affect the urban forest were discussed at the meeting and are discussed in Section 3.1.

The methods used to assess current condition of the urban forest, and the human and municipal infrastructure/organization are shown in the Project Flowchart (Figure 3.1 a) and listed below (Table 3. 1). The Table includes the purpose and section of each assessment. Recommendations for improvements are included in the text, generally in the area they apply to most fully.

Table 3. 1 Methodology for assessing current conditions

Process	Personnel	Purpose	Section
Policy Review	Consulting Team	Assess supporting or conflicting policies and statues	3.1
Forest Assessment Windshield Survey	Consulting Team	Assess existing forest condition	3.2
Criteria & Indicators	Project Team	Assess Collingwood's standing relative to 25 criteria	3.3
Staff Interviews	Consulting Team	Assess infrastructure, policy and current procedures	3.4
SWOT Analysis	Consulting Team	Identify Opportunities and threats	3.5

.

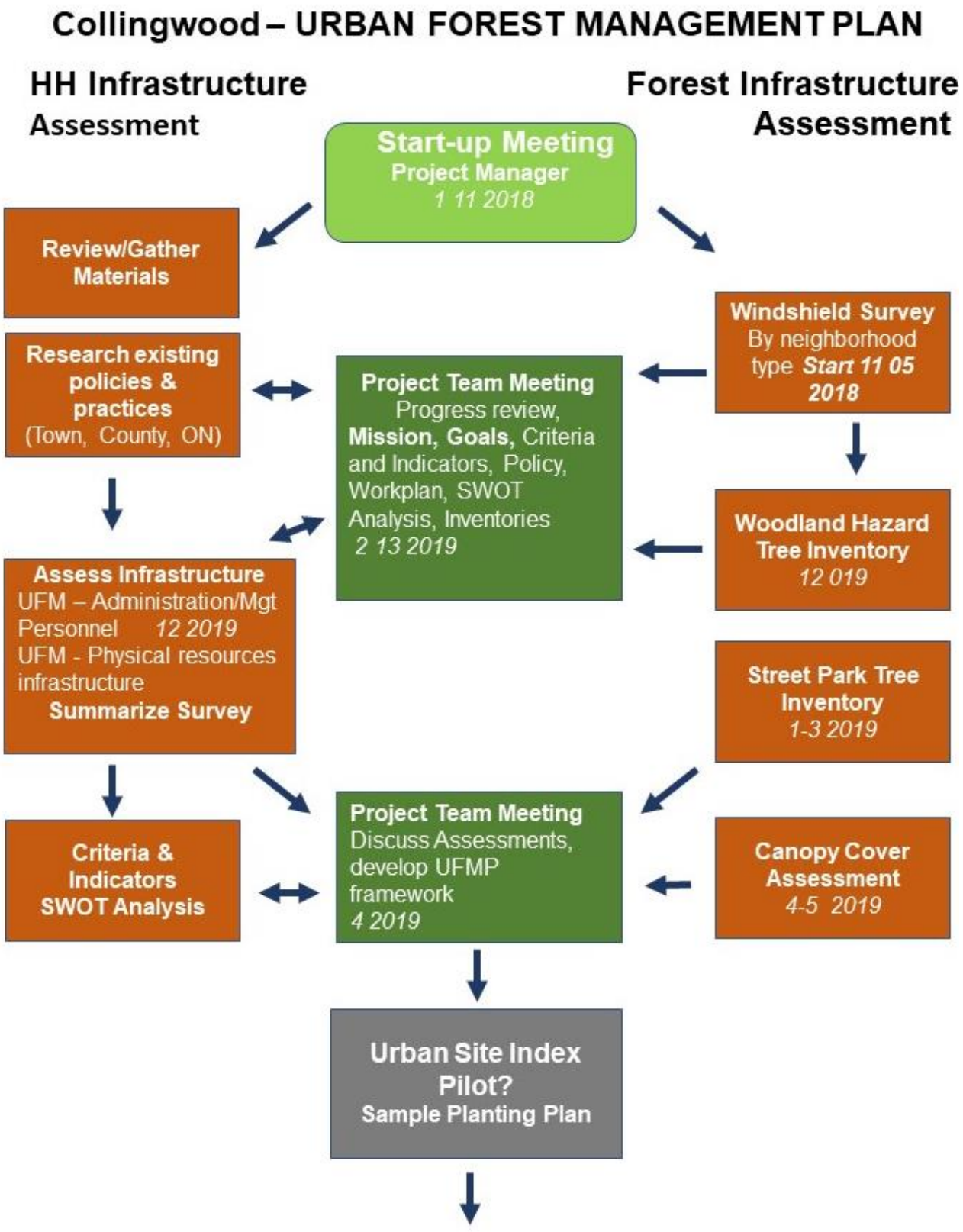


Figure 3. 1 Project Flowchart

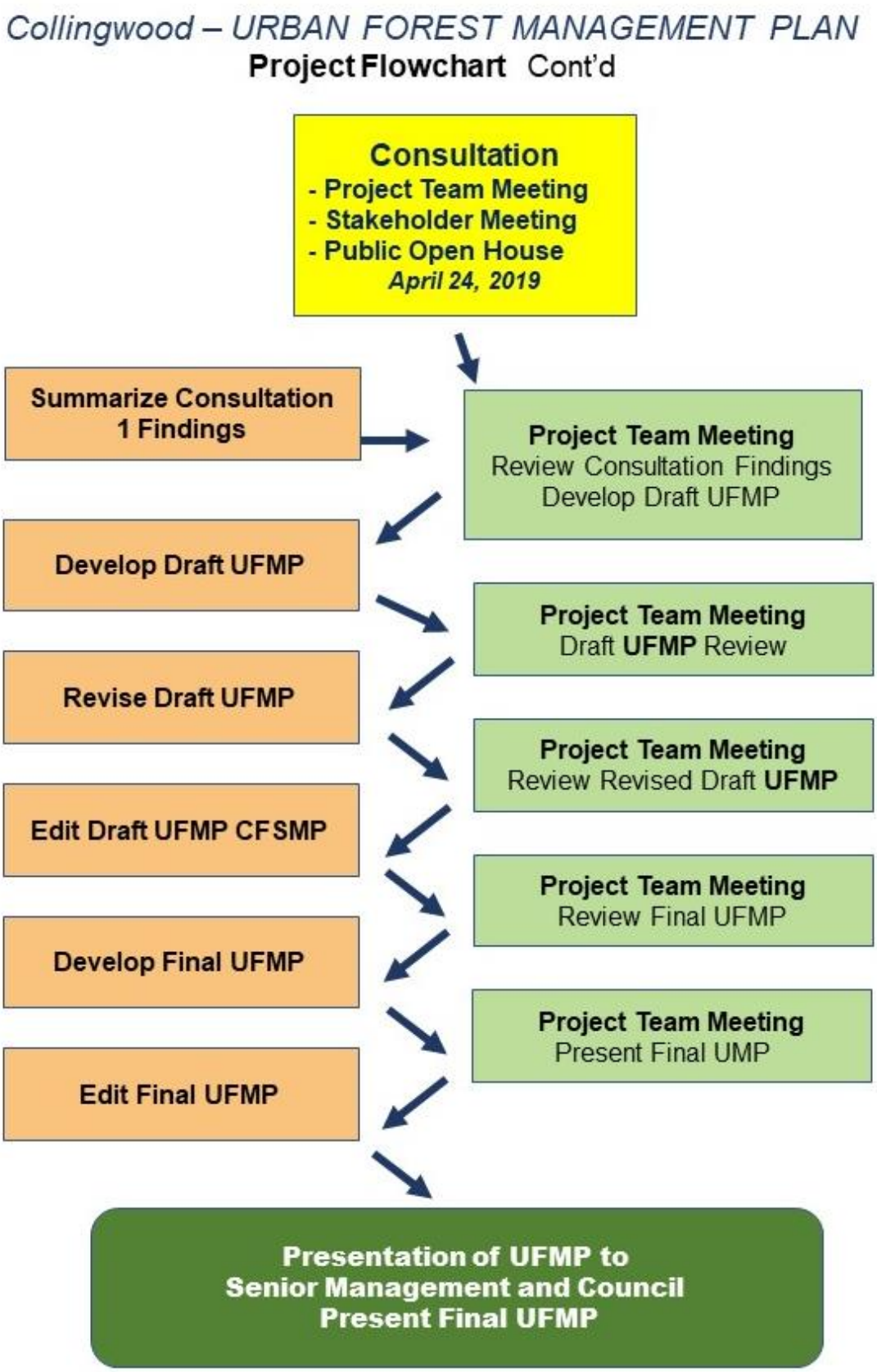


Figure 3.1 a Project Flowchart

3.1 Policies, By-laws and Related Legislation Affecting Collingwood Urban Forest

Before the first Project Team meeting, W&A staff began the policy, by-laws and related legislation analyses by locating and reviewing pertinent documents that affect Collingwood's urban forest. These include policies and related legislation of the town, County of Simcoe, Provincial and Federal levels and other agencies such as Nottawasaga Valley Conservation (NVCA). For example, these policies include the Town's Tree Preservation By-law (2012-84), Official Plan, and the Town Property Standards By-law. Policies of jurisdictions affecting the urban forest are listed with brief comments on those that affect the Community Forest and its management.

3.1.1 Collingwood By-Laws

Tree Preservation By-law 2012-84

The Town passed a "Tree Preservation By-law (larger parcels)" in 2012 to protect trees located on a lot with an area of 0.5 hectares or more, as well as trees located on municipal property and in a woodland. By-law 2012-084 replaced By-law 2003-037, which updated significant provisions such as reducing size limit of area where a permit is required. Currently, a permit is required if / when someone intends to injure or destroy:

- five of more trees in a calendar year with a DBH between fifteen (15) cm and thirty (30) cm;
- any tree with a DBH greater than thirty (30) cm; and,
- trees located on municipal property or in a woodland.

The provisions of the by-law form part of the development approval process governed by the Planning Act and include several sections relating to the permit process. Other sections contained within the by-law include, enforcement, penalties for non-compliance, compensation, and appeals.

Further review and recommended update of this By-law and Recommendations are contained in Sections 3.4 and 3.5.

Property Standards By-law 2016-040

The Town's Property Standards By-law has clauses that apply to trees on private property. Property owners are required to maintain trees on their property by pruning or removal so that there is no danger or hazard to any person or property. Under Section 5.1 Maintenance of Yards and Vacant Land, subsection 5.1.5 states that, "a tree or other plant, or limb or branch of it, that is dead, diseased, decayed or damaged shall be removed from the property or otherwise pruned to remove the dead, diseased, dying or dangerous portions of the tree or plant so as to prevent a hazard or damage to any property." Subsection 5.1.6 requires that all hedges, shrubs, trees or other plants located in a yard or vacant land shall be planted and maintained in a manner that, at the discretion of the Town, does not:

a) adversely affect the safety of the public;
b) adversely affect the safety of vehicular or pedestrian traffic;

c) constitute an obstruction of view for vehicular or pedestrian traffic; or
d) wholly or partially conceal or interfere with the use of any hydrant or water valves

Sign By-law 2012-110

This by-law regulates the use of signs of a commercial nature intended to be viewed from any vehicular or pedestrian right-of-way in the Town. Subsection 6.6 (q) prohibits signs from being attached to any tree by any means. Subsection 6.6 (q) applies to all types of signs, including, election signs and banner signs as stated in subsections 16.2.2 (d) and 20.1 (c) respectively.

Public Nuisance By-law 2013-021

The Public Nuisance By-law protects public trees in a peripheral way. Subsection 3.10 states, "No person shall damage or destroy or attempt to damage or destroy any public property." Presumably this subsection can apply to Town owned trees.

Zoning By-law

The Zoning By-law protects, under the Environmental Protection (EP) zoning, natural heritage areas, hazard areas, environmental buffer areas and any lands below the contour of 178 meters.

3.1.2 Collingwood Policies

Official Plan

The current Official Plan (OP) of the Town of Collingwood covers the planning period 2015-2031. References here are from the Office Consolidation of 2015.

The Provincial Policy Statement and the Places to Grow, Growth Plan for the Greater Golden Horseshoe, as amended for Simcoe County, and by extension the Simcoe County Official Plan, provide the primary basis for managing Collingwood's growth, development and environmental protection to 2031, including overall population and employment allocations, and a policy framework for how and where growth will proceed .

The OP has specific policies for development and site alteration required to protect the Natural Environment as mandated by the Provincial government including Provincially Significant Wetlands, and Habitat for Endangered and Threatened Species, and adjacent lands. There are specific policies for protecting designated Environmental Protection Areas as shown on Schedule A of the Plan. This classification includes lands unsuited for development due to inherent natural hazards such as susceptibility to flooding or erosion, poor drainage, organic soils or steep slopes and protects the Town's most significant natural heritage features.

Environmental Protection

Two Categories of Natural Heritage Resource Areas (see below - NVCA-Natural Areas Strategy) as indicated on Schedule B are lands that warrant varying levels of protection. Category 1 areas are those where development is prohibited. They include Provincially-Significant Wetlands, major river

valleys, fish habitat located within significant valley-lands and primary woodlands encompassing in excess of four hectares (9.9 acres) that are more than 75 years old. The Category 2 classification encompasses locally significant wetlands, younger woodlands larger than 10 hectares (25 acres), and/or fish habitat located outside significant valley-lands. Category 2 lands are where limited forms of development, in accordance with the land use designations on Schedule A, may be possible subject to the findings of an Environmental Impact Statement (EIS).

The OP goes on to describe goals and objectives for Environmental Protection. For example, two of the goals are

- To preserve and enhance the quality of the natural environment by establishing development guidelines and policies which implement the Greenlands' objectives of the County of Simcoe Official Plan and which minimize land use conflicts within environmentally sensitive areas.

- To preserve and enhance natural heritage features and areas (Greenlands) deemed to have Provincial or regional significance by establishing development guidelines and policies in relation to locally significant environmental features.

Further, policies are written that describe additional criteria for Category 1 (adjacent lands) and Category 2 lands (development prerequisites). For example, no development or site alteration, except for public works/uses shall be permitted in Category 1 lands. Even then an EIS is required for public works. For Category 1 and 2 Woodlands there are policies for reclassification of woodlands from Category 1 to 2 or vice versa pending an EIS and study requirement for that EIS.

The Town has not established Significant Woodlands following MNRF guidelines. The OP does not specifically use the words "urban forest" or "green infrastructure", but clearly asserts the importance of green spaces and natural areas to the community and provides specific direction to development projects as noted below.

Community Based Strategic Plan (2015)

The Community Based Strategic Plan (CBSP) is an overarching document that outline's the community's vison and goals. It is used to assist Council in developing priorities and action items to achieve the goals. It provides the basis for Town involvement with citizens and stakeholders. The CBSP explains Collingwood's Vision with five goals.

While a number of these may have some slight connection to the urban forest, the key goal relates to 'Healthy Lifestyle'. One of the objectives here is 'Preservation of the Natural Environment' and the three action items are as follows:

1. Update the Natural Heritage System (NHS) policies of the Official Plan.
2. Continue to request the dedication of environmentally sensitive lands as part of the development approval process.
3. Review and update tree canopy policies.

The Performance indicators for these objectives are

- Prepare an NHS Amendment to the Official Plan.
- Requirement for at least 30% tree canopy on development sites. (now included in the Urban Design Manual)

Other Action Items related to the urban forest are to;

- Update the Recreation Master Plan (which is complete),
- Develop a comprehensive Waterfront Master Plan (WMP) that guides future development, as well as preserves natural and cultural heritage and improves public access (also complete)
- Develop effective asset management methods for the Town's grey infrastructure assets,
- Develop considerations for including green infrastructure in asset management, and
- Monitoring of the CBSP is done annually through a dashboard-based report card.

Urban Design Manual (2010)

The Town of Collingwood Urban Design Manual (UDM) was adopted in 2010. The purpose of the UDM is to encourage the design of a complete, effective and sustainable built environment consistent with Collingwood's character and vision for the future. It is a comprehensive document that includes street tree planting, subdivisions, transportation, landscaping, and site character. It provides guidance on design matters that are directly related to ensuring that development projects are of high quality, pedestrian-oriented, interconnected, sensitive to the natural and built environment, and provide adequate public facilities and infrastructure. The UDM shall apply to all projects subject to review and planning approval by the Town through subdivisions, condominiums, and site plan control applications as permitted under the Planning Act and adoption of Bylaws 2010-082 and 2010-083.

The UDM includes standards to help direct design to ensure that the natural site features and functions (such as terrain, landscape, and drainage) are preserved and become part of new projects including integrating natural functions such as drainage patterns into site design; and, protecting and enhancing the tree canopy including maintaining significant trees. Existing trees and/or vegetation should be maintained to satisfy the requirements for buffers, landscape perimeters, or tree canopy, provided the vegetation in question is healthy; non-invasive or native species; of appropriate size; and in sufficient quantities to achieve the tended purpose(s).

The Landscape &Public Spaces section requires the use of hardy native plant and non-invasive species that require little or no irrigation. There are specific size and maintenance requirements for street trees, as well as spacing between trees and planter size. Street trees shall be required along both sides of all streets and pedestrian connections for all divisions of land and developments. The objective is to provide sufficient tree cover to create tree canopy shade (at maturity) over a minimum of 30 per cent of the site area, with particular attention to hard surface areas. This includes large parking lots.

Relevant sections of the UDM will be considered; this includes but is not limited to:

1) Section 1-7 F. Significant Trees will be reviewed with regard to developing a Tree Protection During Construction Policy and Procedure for the Town

2) Section 10-6 C. Street Trees will be reviewed in combination with a review of town's interdepartmental Business Process mapping to analyse the coordination amongst various departments to help place the town street tree to harmonize all town assets and utilities in the context of the urban design

3) Section 10-10 G. Tree Canopy will be reviewed in combination with a review of town's interdepartmental Business Process mapping to analyse the coordination amongst various departments to ensure the desired outcome.

The UDM does not include consideration of the importance for maintaining large-stature trees in the urban fabric and new urban areas. The scientific literature points out that large-size trees provide exponentially more ecological services to a community as they get bigger (https://www.itreetools.org/). This requires growing the public tree to a minimum DBH (diameter at breast height) of 20 cm. In order to accomplish this in intensive/harsh urban conditions, more municipalities are moving towards adopting minimum standards for soil which specify the correct quantity and quality of soil. Since this is at the core of being able to achieve and maintain a tree canopy cover objective, the UFMP will include discussions on the importance of maintaining large-stature trees and providing appropriate conditions for plantings in new developments.

Asset Management Plan (2014)

The Town has an Asset Management Plan for grey infrastructure that deals with the usual assets such as roads, water, buildings and equipment. However, there is no mention of green infrastructure (GI), and it was not in the Plan mandate to include it.

Generally-accepted accounting practices (GAAP) need to account for natural features as tangle asset. In 2009, PSAB (Public Sector Accounting Board) made it mandatory for municipalities in Ontario to report on tangle assets. Since then some municipalities have initiated Asset Management Plans for their ecosystems called Municipal Natural Asset Initiatives.

The closest mention of GI was in the Level of Service Description for Parks and Recreation. It states (pg. 3-3) Trails - Provide safe/accessible/maintained trails for the community based on Town standards. Although much of this applies to the trail surface itself, staff also deal with hazard trees and planting new trees to enhance the trail beauty. Similarly, while not specifically mentioned, sidewalk and road improvements include tree removal, maintenance and replanting. In the Land Improvements asset list, park landscaping, and drainage improvements are included. In the Building Asset class, the list includes a green roof. These all could be considered Green Infrastructure.

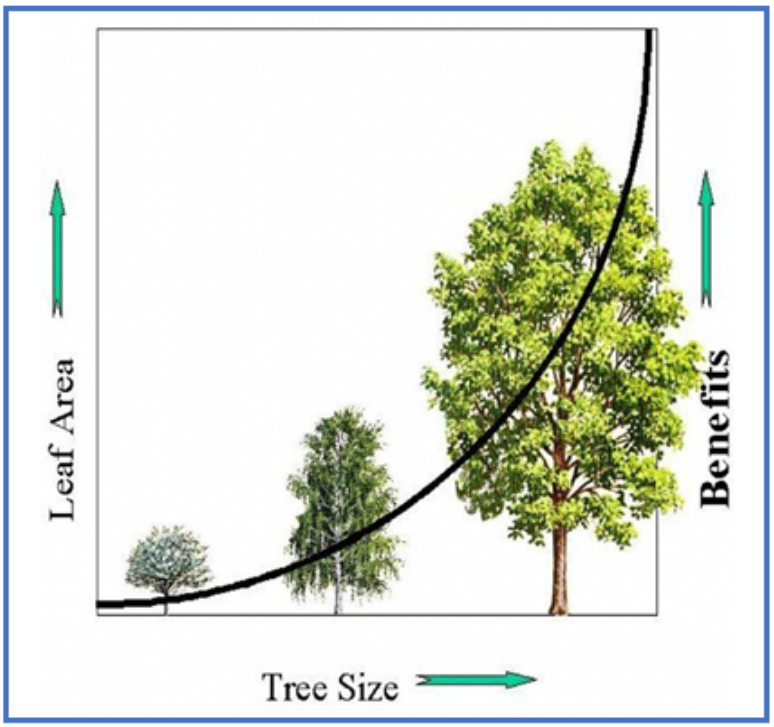
The urban forest is an unrecognized asset. The template for the Town Asset Management Plan could easily include these urban forests as components of Green Infrastructure.

Tree removal and maintenance for hazards can make up a significant part of the overall cost. Proactive tree maintenance supported by an inventory of the urban forest helps reduce risks and costs over time. There is no description of the software used to manage tree assets because the town does not have at present a work order management system linked with the public-tree

inventory. Applying a Physical Asset Management approach to strategically manage the public tree as 'a biogenic utility' would set the foundation for optimizing the public tree's contribution to the 4 pillars of community sustainability: economic, environmental, social and cultural benefits for people.

A Case for Large-Stature trees

Size counts! Large trees provide much more benefits than small trees. How much more?



There is scientific evidence that large-stature[2] trees 'pay us back' through the range of services they provide which includes: more shade, cleaner air, more stormwater management, conserving energy, mitigating heat island and cooling a parking lot. When we use large-stature trees these benefits are multiplied by 8 times over small-stature[2] trees according to studies conducted at the Centre for Urban Forest Research in Davis, CA. While "we may never have the arching canopies we once had……we can still achieve large, extensive and functional canopies …..[by] planting large-stature trees in as many appropriate places as possible."

Source: Kenny[1]

However, designing urban space, both below and above ground, that is "appropriate" to sustain healthy, large-stature trees is a challenge – particularly in dense urban fabrics. For example, an all too common, costly cycle of failure to establish large-stature trees is often repeated in high density urban designs throughout Ontario as well as in other jurisdictions. When urban planning and civil engineering designs are not synergized with landscape architecture and urban forestry designs trees often die; graphics which illustrates this problem and an approach to solve it are contained in *Oakville's Urban Forest; Our Solution to Our Pollution*[3]

[1] Kenney, A. 2001. Structure and Function of Southern Ontario's Urban Forests. IN The Proceedings of Woods Talk: Community Action to Conserve Ontario's Woodlands. Federation of Ontario Naturalists. Toronto, ON. June 14-17, 2001

[2] *The Large Tree Argument*. The Case for Large-Stature Trees vs. Small-Stature Trees. Center for Urban Forest Research., Pacific Southwest Station, USDA Forest Service, Davis, California and the Southern Center for Urban Forestry Research & Information, Southern Research Station, USDA Forest Service, Athens, Georgia. 2004

[3] *Oakville's Urban Forest: Our Solution to Our Pollution*. Corporation of the Town of Oakville, Parks and Open Space Dept.,31-35, 2006.
https://www.itreetools.org/resources/reports/Oakville's%20Urban%20Forest.pdf

Figure 3. 2 A Case for Large-Structure Trees

Active Transportation Network Framework (ATNF) (2017)

Active Transportation in Collingwood consists of an overlapping network of trails, roads, bike lanes and sidewalks. It provides physical access and connectivity to the various places within the community that people travel to for their daily activities. The ATNF defines "guiding principles, policies and implementation projects or "elements" that can help to make Active Transportation in Collingwood a safer, easier, more convenient and desirable transportation choice …." The importance of shade and street trees, on new and existing trails, is noted as providing for sun health, traffic calming, user comfort and aesthetic appeal.

Requisite with this is using the urban forest management principles for tree selection, planting and short- and long-term maintenance; these will be discussed in the UFMP.

Development Standards (2007)

The Town of Collingwood Development Standards are intended as guidelines for land development. The planting of street trees is an important part of new developments and these Standards have specific detail for tree planting, location, minimum clearances, species, etc. These Standards include: landscape implementation procedures for streetscapes, stormwater management ponds, naturalization works and examples of maintenance agreements.

There are also details for park development, trails and walkways, and landscaping. Standard drawings are included for deciduous and coniferous tree plantings, shrub planting, tree protection and trail landscaping. Slight revisions have been made to the planting details as part of this Plan.

The link between any suggested amendments to the Urban Design Manual and the need for changes to the town engineering design standards will be covered in the UFMP.

Emerald Ash Borer Management Plan, Staff Report 2014-27

In 2014, Council approved the staff report *Pest Preparedness Report- Emerald Ash Borer (EAB)*. As part of this Plan, the town's tree inventory was updated in 2019. Five strategies to deal with the EAB infestation were reviewed in the staff report. "Option 5" was recommended and approved which involves the following:

1) Phase One: Remove All Hazard Trees (2014/2015)
2) Phase Two: Treatment (2015-)
3) Phase Three: Removals of Small Ash Trees (2016-2018)
4) Phase Four: Removal of Infested Trees (2019-2024)

In 2015 a contractor was retained to inject 70 healthy ash trees with TreeAzin. An additional 70 ash trees were treated in 2016, totalling 140 Town-trees being treated with TreeAzin. The program was repeated in 2017 (using the 2015 list) and 2018 (using the 2016 list) with excellent success. On average, two trees (out of 70) were deemed unhealthy for further treatment in 2017 and 2018. In 2019, Collingwood contracted to treat the 70 trees/year through 2023.

It is expected that the number of untreated, declining ash trees will dramatically increase in 2019 and 2020 due to the population growth of Emerald Ash Borer in Collingwood. Based on the 2019 Tree Inventory update, the Town could consider treating additional ash trees that remain healthy.

3.1.3 Collingwood Studies, Plans & Reports

Natural Heritage System Report 2011 (NVCA)

In 2011 the Nottawasaga Valley Conservation Authority conducted a Natural Heritage System report for the area of Collingwood. In Phase 1 of this report, the NVCA conducted an extensive review with field surveys, an ecological classification, a cultural history as well as a description of existing natural heritage features. It describes how Natural Heritage Planning works in Southern Ontario with key components of the natural heritage policies from the Provincial Policy Statement (PPS) of 2005. The Natural Heritage Reference Manual (2010) provides technical guidance for the implementation for natural heritage policies of the PPS. The report describes each of the provincial natural heritage features and functions as they apply to Collingwood including: provincially significant wetlands, species at risk, significant woodlands and significant wildlife habitat.

Phase 2 of the Report evaluated the natural heritage features and developed the natural heritage system. This was done in consultation with a Stakeholder Committee of the public and private sectors. Based on stakeholder committee direction, three natural heritage scenarios were developed. A draft proposed natural heritage system, based on stakeholder committee discussion, was then developed and subject to further

stakeholder review. The report examined how the draft system integrates with a number of perspectives and initiatives including: the Town's development mandate, the Provincial Policy Statement, County and adjacent municipal natural heritage systems, as well as broader natural heritage initiatives.

Peer Review of the Natural Heritage Survey by Natural Resource Solutions Inc. (NSRI) 2012

The Town contracted with NRSI to conduct a peer-review, of the NVCA Natural Heritage Report. This review assessed the science and methodology used in the Natural Heritage System Report, including, the steps used to delineate the Natural Heritage System.

The review suggested a number of policy and organizational changes to the NHS Report including:

- Develop Official Plan policies that deal with the natural heritage features outside of the NHS
- Develop Official Plan policies that deal with existing development adjacent to the NHS or overlapping with the buffer areas of the NHS
- Develop policies with regards to buffer widths adjacent to various features (wetlands, woodlands, cultural meadows, etc.)

3.1.4 Collingwood's Canopy Cover

Tree Canopy Study 2008 and 2012

The Town conducted tree canopy cover assessments in 2008 and 2012 to determine the canopy cover (CC) in Collingwood and help identify whether the CC was increasing or decreasing. Both studies were conducted by measuring the crown areas from aerial photography and estimating the area of canopy relative to the ground area. The 2012 survey likely provided a better determination because the aerial photography was of a higher resolution and could better show individual trees, groups of trees and successional areas for delineation.

The 2012 survey estimated that CC in Collingwood was 28.23%, including 6.43% of successional forests (i.e. brushy or young forests). The authors concluded that canopy cover was slightly lower in 2012 due to increased development and that the decrease was somewhat offset by an increase in successional forest area (old fields growing back into forests).

The 2012 report provided a number of recommendations to preserve trees and stabilize the current canopy coverage. They include construction impact mitigation, having a tree inventory, new planting and tree maintenance.

Tree Canopy Study 2019

And update of the Tree Canopy Study was undertaken in 2019 as part of this Project. It will be discussed in Sections 3.7.1 and 4.2.

County of Simcoe Policies and By-Laws

The County of Simcoe allows lower tier municipalities, such as Collingwood to establish land use designations and policies to ensure that new development occurring within these settlements is planned in an orderly and appropriate way.

Forest Conservation By-law

The Simcoe County Forest Conservation By-law regulates tree harvesting/destruction in woodlands at least one hectare (2.47 acres) in size and in woodlands designated as Significant by the Ontario Ministry of Natural Resources and Forestry).

The Objectives of the By-law are to:

- conserve the forest landscape and prevent over-harvesting,
- protect Sensitive Natural Areas,
- encourage "good forestry practices" and
- ensure a sustainable supply of timber for industry and landowners.

This County By-law is generally not enforced in Collingwood because of potential conflicts with the Town Tree Preservation By-Law. The Town should revise and update its tree regulation to harmonize the regulations of the Town and County and meet the expectations of the community. The Collingwood By-Law is discussed further in Sections 3.3 and 3.5.

3.1.5 Conservation Authority Policies

Most of the Town lies within the jurisdiction of the Nottawasaga Valley Conservation Authority (NVCA). A very small part of northwest Collingwood lies in the area of the Grey-Sauble Conservation Authority. Under Section 28 of the *Conservation Authorities Act, 1990,* and Ontario Regulation 172/06, each Conservation Authority regulates designated hazard lands within and adjacent to watercourses, wetlands and shorelines; and regulates alterations to. According to the NVCA mapping, Collingwood is in a significant groundwater recharge area and has a highly vulnerable aquifer to contamination. The Town works/consults with the Conservation Authorities in development of plans and policies affecting the environment.

3.1.6 Province of Ontario Policies and Legislation

Ontario policy provides limited direction in urban forestry matters, leaving this responsibility to the municipal level of government. However, there are a number of provincial statutes, policies and plans that directly and indirectly affect municipal urban forest management and regulation (Table 3. 2).

Table 3. 2 Province of Ontario Statues and Policies affecting the urban forest

Statute or Policy	Relevance
Planning Act, 1990	Establishes the framework for municipal planning in the province. It provides municipalities with the power to develop official plans and regulate development, including requiring landscaping with trees and shrubs on the site and parkland dedication. Enables bylaws regulating tree cutting in woodlands, and other areas.
Provincial Policy Statement(PPS), 2014	This companion to the *Planning Act* provides guidance for land use planning, protection for significant woodlands, and encourages jurisdictions to integrate green infrastructure, including the urban forest.
Growth Plan for the Greater Golden Horseshoe (Places to Grow) 2013.	This plan encourages planning authorities to; - identify natural heritage features and areas that complement, link, or enhance natural systems, - develop a system of publicly accessible parkland, open space and trails, including shoreline areas, - establish an urban open space system within built-up areas, which may include … public parks. When there is a conflict between this and the PPS with regard to natural environment then the direction that applies the most protection to the natural environment prevails.
Municipal Act, 2001	Allows any municipalities to regulate the injury or destruction of trees on public and private lands. It allows the municipality to enter land along its highway to inspect trees and remove trees if they pose a hazard to persons using the highway. An upper-tier municipality may delegate all or part of its power to pass a by-law respecting the destruction or injuring of trees in woodlands to one or more of its lower-tier municipalities with the agreement of the lower-tier municipality or municipalities, as the case may be. An upper-tier municipality may enter into an agreement with any of its lower-tier municipalities for the upper-tier municipality to designate one or more of its officers to enforce by-laws passed by the lower-tier municipality and vice-versa. New amendment to Section 270 (1) of the Municipal Act: A municipality shall adopt and maintain policies with respect to the following matters: On March 1, 2019, the day named by proclamation of the Lieutenant Governor, subsection 270 (1) of the Act is amended by adding the following paragraphs: (see: 2017, c. 10, Sched. 1, s.32) The manner in which the municipality will protect and enhance the tree canopy and natural vegetation within the municipality.
Ontario Heritage Act, 1990	Allows for the designation of heritage properties and/or cultural heritage landscapes in the Province, including trees on such lands that may have heritage value.
Forestry Act, 1990	Provides a legal definition for “woodlands” based on stem densities, and “good forestry practices” for tree by-laws, as well as certain provisions pertaining to boundary/shared trees.
Endangered Species Act 2007	Applies to species listed as Endangered or Threatened in the Act. There are eight terrestrial species noted in Collingwood that are listed as Threatened or Endangered in Ontario; butternut, four turtles, two birds and one snake.

3.1.7 Federal Policies and Legislation

Canada does not have a federally-endorsed national urban forest strategy. However, the Canadian Urban Forest Strategy is a voluntary-based document first articulated in 2006 as a strategic initiative of Canada's urban forest practitioners. It coincided with Canada's National Forest Strategy (1988-2008) a government, NGO and private sector coalition whose aim was to move Canada towards forest sustainability. The final iteration (2003-2008) of the National Forest Strategy included a section on urban forests which had as one of its recommendations the creation of a Canadian Urban Forest Strategy. In 2008, when Canada's National Forest Strategy dissolved, the national not-for-profit Tree Canada assumed the Secretariat for the Canadian Urban Forest Strategy.

The fact that the federal government has not endorsed an urban forest strategy as part of its mandate has significant negative implications for Canadian communities where the highest level of government responsible for urban forestry is at the municipal level (Kenney, 2005). The involvement of the Canadian federal government in urban forest management remains limited and indirect. However, some support related to pest management is provided through the Canadian Food Inspection Agency (CFIA) and the Canadian Forest Service, which monitors and controls the spread of invasive insect pests, the most important of which include Asian Long-horned Beetle and Emerald Ash Borer.

In contrast, the United States Forest Service, in 1972, was given responsibility for developing an active program in urban forestry under an amendment to the Cooperative Forest Management Act. "The U.S. Forest Service has an urban and community forestry program in cooperation with the states to protect, improve, and establish trees in community, suburban and urban areas. A Federal-State program provides technical and financial assistance to local governments, organizations and individuals to establish and manage trees and related plants in community parks, open spaces, streets, greenbelts, and on private property" (Grey and Denke, 1978). This has led to a plethora of federally-funded urban and community forestry programs and world-class research supported by senior levels of the U.S. government in stark contrast to the lack of similar support in Canada.

3.2 Urban Forest Assessment 2018 Windshield Survey

To characterize the condition of trees in the urban forest, a Windshield Survey of Collingwood's municipal street trees was conducted on November 13-14, 2018 by the W&A consulting team. Most of Collingwood was sampled to include different types of urban areas such as older neighbourhoods (pre-1945), new residential developments (1946-1990 and post 1990) and commercial and industrial areas. This is a cost-effective method to obtain general information about the urban forest on the public road allowance and provides insights to the condition of Collingwood's urban forest and various aspects of tree management, highlighting neighbourhoods requiring maintenance activities from Collingwood's department of Public Works.

The Windshield Survey was conducted by driving the Town roads, 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 not the same as a Tree Inventory (TI) which systematically collects information and recommendations for each tree.

Public Works staff at the Town of Collingwood report that they manage approximately 203 km of road allowance (Table 2.1). The total estimated distance covered in the *Windshield Survey* was 150 km (or 74% of the road allowance).

Figure 3. 3, Figure 3. 4, and Figure 3. 5 are maps illustrating the nine neighbourhoods sampled in Collingwood. Within each neighbourhood, the three dominant trees species (by distribution) were noted and general observations were made regarding the Overall Health of the trees (i.e., Good, Fair, Poor). The amount of maintenance work necessary to meet the tree maintenance standards below were recorded by their "diameter class' (0-20 cm, 21-50 cm, 50 cm+);

1. Town tree maintenance: a standard of 14.5' clearance over the travelled portion of the road and 8' clearance over the sidewalk.
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', 'Low to Moderate', 'Moderate', or 'Moderate to 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 have the capability to manage municipal tree risk through a proactive maintenance system is fundamental to address such issues as corporate liability and public safety; and is an important component of a corporate asset management strategy. The Urban Forest Management Plan will address this need for the Town of Collingwood.
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 town's exposure to risk arising for town trees. This level of risk was assessed as 'Moderate' in most neighbourhoods.

A summary of survey findings is below.

- There are two neighbourhoods assessed as having 'Moderate to High' levels of relative maintenance needs: See Maps for further details. These neighbourhoods should receive additional funds to reduce these issues.

> ***RECOMMENDATION 3.2 a:*** *the town allocate additional funds for tree maintenance budget for the 2 neighbourhoods identified in the 2018 Windshield Survey with "Moderate" to "High" levels of Relative Maintenance needs.*

- 30% of the lands Zoned "Residential" rate 'Moderate to High' for Risk Exposure
- Zoning has an impact on Tree Maintenance; all the lands Zoned either "Commercial" or "Industrial" has Risk Exposure rated as 'low'
- There is a positive correlation between age of the neighbourhood and the volume of work. Most of the neighbourhoods with higher levels of risk exposure were in the oldest age classes
- Lakeshore neighbourhoods have a higher volume of Risk Exposure, due to sightline issues with cedar and dead and dying ash trees being more abundant than other neighbourhoods. We consider this situation to be an immediate public safety issue
- The most common types of tasks observed were generally of the type 'deadwood removal', 'takedown' and 'clearance'
- "North Residential Core" had few mature dominant veteran trees, perhaps caused by significant tree mortality around 40 years ago. Planting opportunities exist in the North and South Residential core
- Town tree Protection Policy Issues: Lack of town tree protection impacted by new sidewalk project at Hume and Pretty River Pkwy.
- Site line issues in urban areas, daylight triangle blocked by trees. Public Works needs to work with traffic control to resolve this issue
- There were numerous cases observed of inappropriate tree species planted on the public road allowance; these are predicted to create maintenance issues in future. Example: 88 Kells Crescent

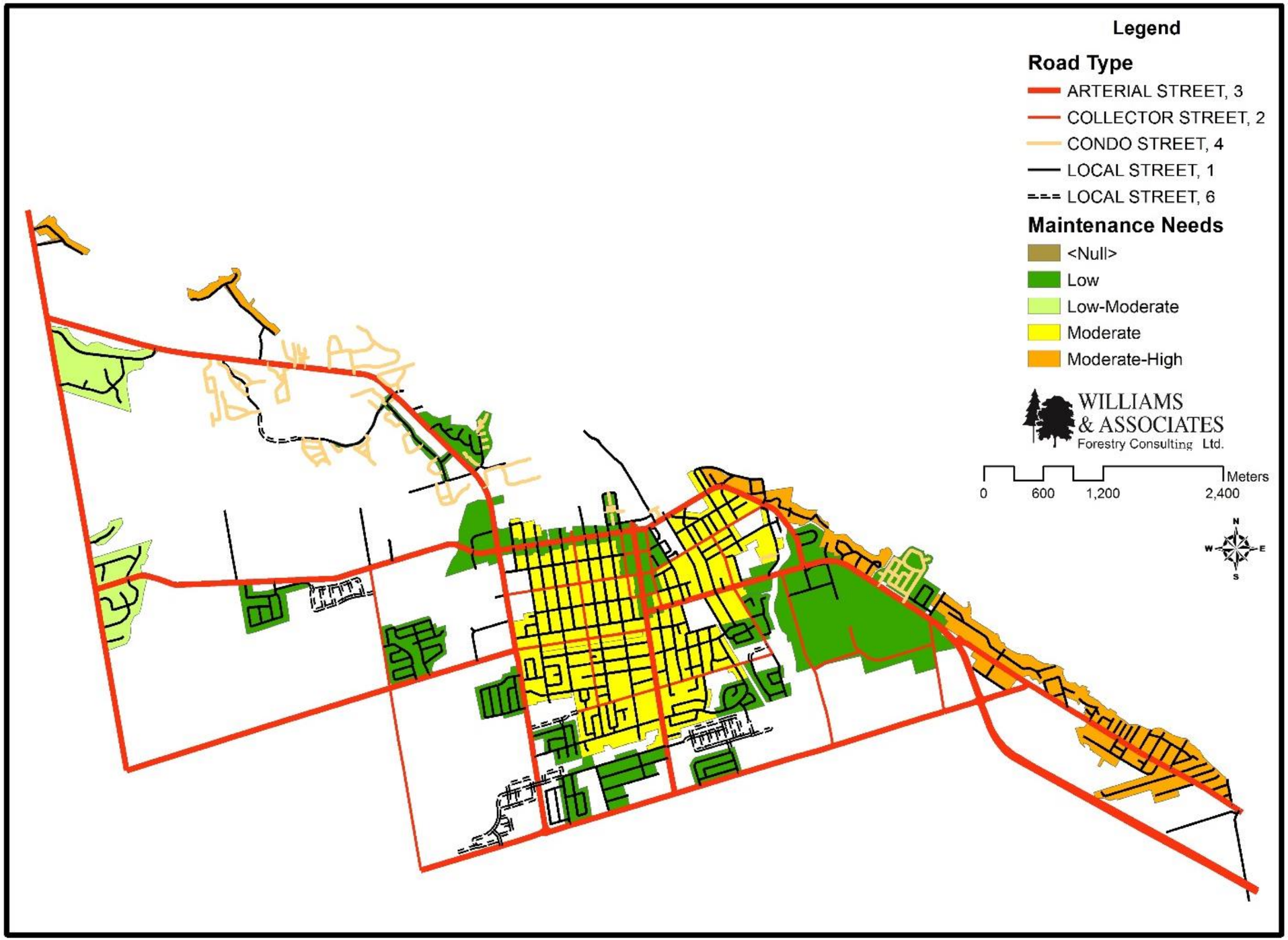


Figure 3. 3 Overview of the maintenance needs for neighbourhoods in Collingwood and their rating for relative tree maintenance needs

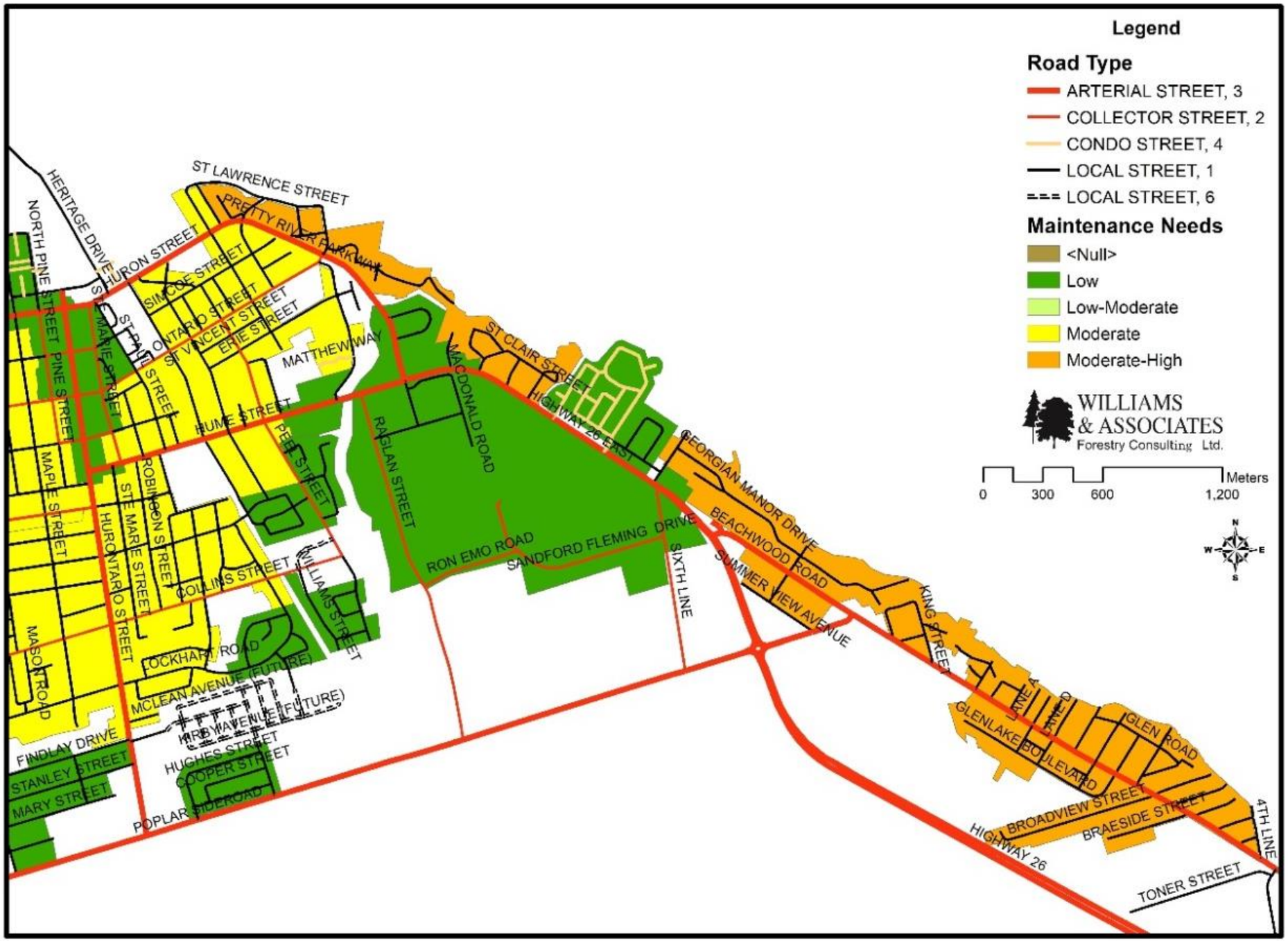


Figure 3. 4 Detailed neighbourhood map of eastern Collingwood showing relative maintenance needs

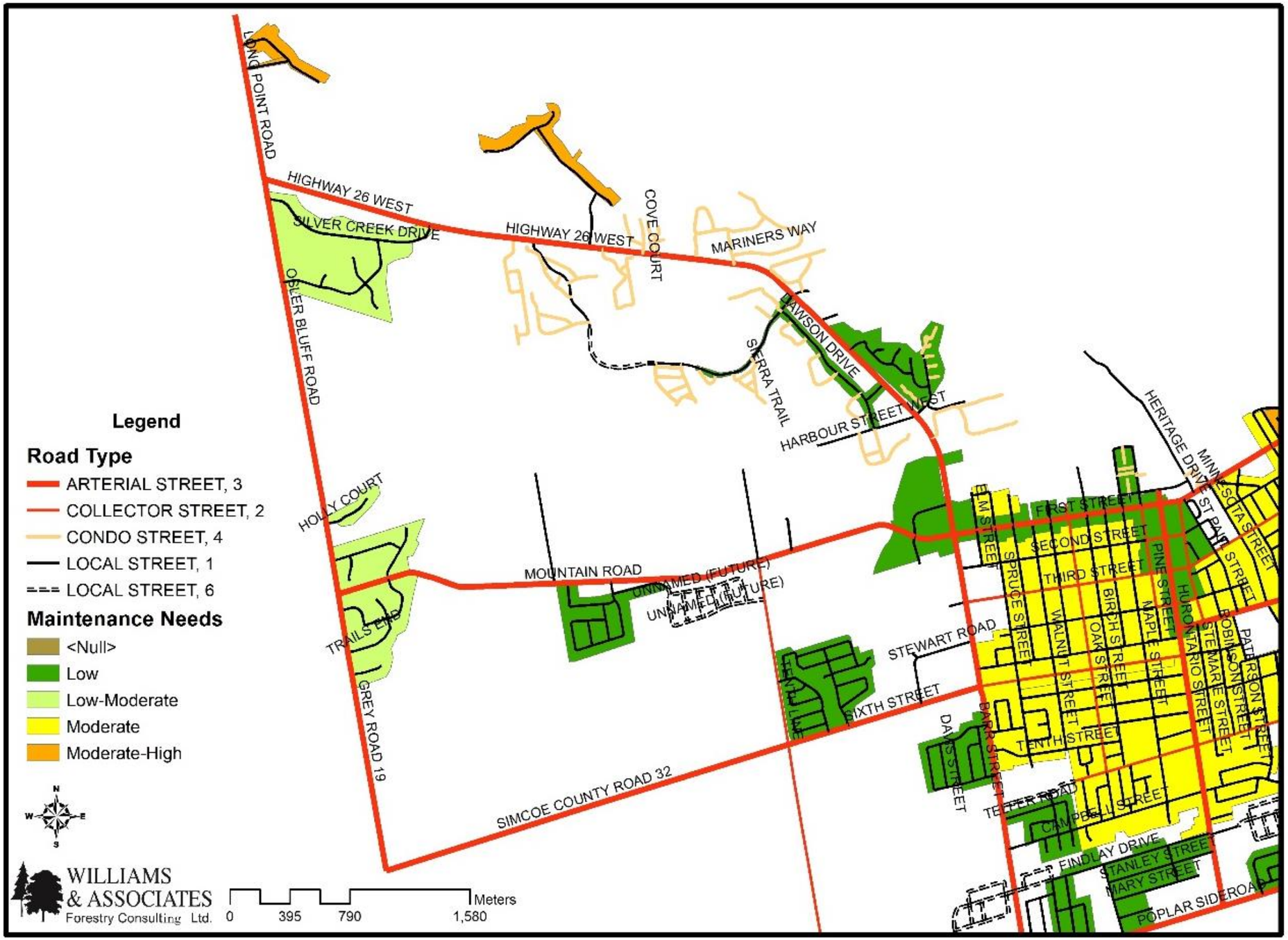


Figure 3. 5 Detailed neighbourhood map of western Collingwood showing relative maintenance needs

3.3 Staff Interviews

Discussions at project team meetings clarified the responsibilities of various Town departments and administrative units in planning for and managing the Urban Forest were undertaken on November 13-14, 2018. Collingwood's human and physical infrastructure for managing the urban forest was explored through one-on-one interviews with staff involved with tree/forest management. The consulting team interviewed staff from Public Works (Operations and Engineering), Planning, Parks, Asset Management and By-Law. Staff from EPCOR (the owner and manager of the hydro infrastructure in Collingwood) was also interviewed.

The interviews focussed on how municipal trees in Collingwood are managed; including practices for pruning and removal, establishment/planting practices, and how existing trees are protected during construction and development. A key aspect of the interviews was to determine the process, personnel and equipment that the Town uses to assess and maintain the existing trees and how that aligned with the urban forest needs. The interviews and discussions clarified the roles of the various departments and staff.

3.3.1 Highlights

Public Works

Seasonal town tree maintenance begins each season with addressing relatively higher risk issues such as tree removals, then progressing to the next level of risk management- tree pruning. There is no written schedule for pruning Town trees. The current approach, while it reflects a somewhat systematic approach, does not reflect a systematic, documented inventory-based schedule. A new approach could support an annual operating budget request for a specified volume of accomplishment units (*number of trees pruned* is the annual key performance measure) to ensure a proactive approach as well as inform the public about regular maintenance on town trees. Schedules would be developed from a new Town Standard that would establish a *Pruning Cycle* for town trees (this will be covered in Section 4.6.2 Pruning). In addition to the *frequency* of pruning, consideration for the *volume* of pruning during each cycle also needs to be established. One consideration impacting the volume of pruning is the safe clearance standard for vehicles and pedestrians which needs to be established over the travelled portion of roads and sidewalks.

> ***RECOMMENDATION 3.3.1 a:*** *The Town establish Maintenance Standards for Town trees which includes a Clearance of 4.4 m (14.5') over the traveled portion of the public road allowance and 2.4 m (8') over public sidewalks*

Contact with residents is often necessary prior to conducting tree work as it can involve sensitive issues such as tree removal. While every effort is made by staff to contact residents in a timely fashion there is no protocol covering this subject and this gap should be addressed.

RECOMMENDATION 3.3.1 b: *Public Works prepare a Policy and Procedures covering customer service for town tree maintenance*

Efficient tracking of Work Orders is essential. The current system is paper-based. Municipal Operations with GIS-based Work Order systems are becoming more and more common place. There are significant differences in the requirements and functions of Work Order tracking systems serving 'Grey' vs 'Green' infrastructure. Generally speaking, a tree specific Work Order tracking system designed to support Forestry maintenance will help Forestry staff serve residents most effectively, is compatible with the new Town Tree Inventory and is available on a Cloud-based subscription platform; this will be covered in Section 4.1.2.

Public Works/Parks/Planning

Responsibility for town trees is shared amongst Departments:

(a) Informally, Planning impacts the quality of the tree's habitat through the Zoning By-law and through establishing policies for tree protection during land development and re-development

(b) Informally, Public Works (Engineering) impacts the quality of the tree's habitat through the Engineering road cross section

(c) Formally, Parks impacts the quality of the tree's habitat through review of the 'tree pit' design and the quality of the tree health by developing the specifications for new planting stock and overseeing tree planting

(d) Formally, Public Works (Operations) impacts the quality of the tree health through its Maintenance Program and its Protection Program during capital projects such as repairs/upgrades to roads and utilities.

A major priority expressed by Public Works staff is the need for better quality trees being planted; specifically addressing the issue of *co-dominant leaders* which leads to unnecessary tree pruning costs for the town after assumption of the subdivision. Fundamental to this problem is that responsibility for tree planting in new developments is with the developer. This problem could be solved by transferring responsibility for tree planting in new developments to the Town. The mechanism to accomplish this is through a *Development Charges Study* review which could consider creating a cash-in-lieu for town trees provision. This would permit the town to improve the quality of the tree planting process.

The town's Tree Protection business process could be strengthened by creating a *Utilities Coordinating Committe*e (OUCC) which is common in many municipalities. Part of the role of a

newly created OUCC made up of representatives of all the local utility companies would be to resolve design issues on an increasingly narrower public road allowance. One of these design issues is ensuring adequate habitat for the town tree: this includes establishing a Corporate standard for minimum soil volume (30 cubic metres minimum); specifications for minimum quality of soil, separating trees and utilities to the extent possible and providing drainage and aeration for the town trees. This would allow the town tree to achieve its potential to contribute to stormwater management (see Section 2.0). Another benefit of an OUCC would be its relevance to supporting a new Corporate Tree Protection Policy & Procedures to address tree protection during capital construction projects undertaken by utilities throughout the town.

RECOMMENDATION 3.3.1 c: *The Town revise its Engineering Road Cross Section Standards, using Engineered Soils where appropriate, to incorporate a new Corporate Standard for minimum soil quantity and soil quality to support the town tree*

RECOMMENDATION 3.3.1.d: *The Town develop a new Policy & Procedures covering tree protection in the Capital Construction process*

RECOMMENDATION 3.3.1.e: *To ensure adequate tree stock quality the Town review its Development Charges Study to consider creating a cash-in-lieu provision for town tree planting*

RECOMMENDATION 3.3.1.f: *The Town create a Utilities Coordinating Committee and include representation from urban forestry*

During the Public Open House on April 24, 2019, the public expressed interest in regulating tree cutting on private land. However, a strategy to improve the management of the Town's private tree population should be in place before new regulations are considered. The Town is beginning the process of developing a Private Tree Management Strategy through this document which will inevitably improve the effectiveness of future regulatory policies.

RECOMMENDATION 3.3.1.g: *The Town develop a Private Tree Management Strategy*

Asset Management

Developing an asset management approach for the Town trees has gained interest and support with staff. This will be covered in Section 4.7.1

Tree Preservation By-law

The existing Tree Preservation By-law 2012-084 is a hybrid bylaw, regulating both forest trees and individual urban trees at the same time. The by-law has some functional problems and is challenging to enforce because it is too broad. The by-law should be updated to correct some administrative problems and be split into two by-laws: one targeting woodlands and one targeting individual urban trees. The limited in-house arboricultural and forestry expertise available for enforcement purposes has been supplemented by appropriate consultants. The Town should develop relationships with forestry consultants who can assist with by-law development and enforcement.

> ***RECOMMENDATION 3.3.1.h:*** *The Town update Tree Preservation By-law 2012-084 and consider replacing it with two By-laws, one for private woodlands and one for private trees (not located in woodlands)*

3.4 Criteria and Indicators of Urban Forest Sustainability

On February 13, 2019 the consulting team undertook an evaluation of the Town's urban forest with the Staff Project Team using an exercise based on the Criteria and Indicators for Sustainable Urban Forest Management (C&I) (Kenney et al. 2011). This process was first described by Clark et al. (1997) and modified in 2011 by Kenney et al. as a method to assess where a municipality fits within a model of urban forest sustainability. It provided a snapshot of the Town's standing with regards to a set of 25 performance indicators as an indication of where the Town 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 in implementing the urban forest strategy 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.

The results of the C&I analysis are provided in Table 3. 3,Table 3. 4, and Table 3. 5, showing that Collingwood's current situation is relatively good. This is very positive, considering that Collingwood is a smaller municipality. While one Performance Indicator for the Vegetation Resource (Table 3. 3) could not be rated because of insufficient data, the Town ranked 'Good' or 'Optimal' in 10 of the remaining Criteria.

Table 3. 3 Criteria and Performance Indicators for Collingwood's Vegetation Resource

Vegetation Resource Performance Indicators

Criteria	Low	Moderate	Good	Optimal	Key Objectives
Relative canopy cover	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	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% of 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.	Provide for uneven-aged distribution city-wide as well as at the neighbourhood level.
Species suitability	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	Fewer than 5 species dominate the entire tree population city-wide.	No species represents more than 20% of the entire tree population city-wide.	No species represents more than 10% of the entire tree population city-wide.	No species represents more than 10% of the entire tree population at the neighbourhood level.	Establish a genetically diverse tree population city-wide as well as at the neighbourhood
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. * Spring, 2019	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 3. 4 Community Framework for Criteria and Performance Indicators

Community Framework Performance Indicators					
Criteria	**Low**	**Moderate**	**Good**	**Optimal**	**Key Objectives**
Public agency cooperation	Conflicting goals among departments and or agencies.	Common goals but no cooperation among departments and/or 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	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.	The green industry operates with high professional standards and commits to city-wide goals and objectives.
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 3. 5 f Resource Management Approach Criteria & Performance Indicators

Resource Management Approach Performance Indicators					
Criteria	**Low**	**Moderate**	**Good**	**Optimal**	**Key Objectives**
Tree Inventory	No inventory	Complete or sample-based inventory of publicly-owned trees	Complete inventory of 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	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 (PLAN IN DEVELOPMENT)	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 accepted and implemented with adaptive management mechanisms.	Develop and implement a comprehensive urban forest management plan 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 urban forest management plan
City staffing	No staff.	No training of existing staff.	Certified arborists and professional foresters on staff with regular professional development.	Multi-disciplinary team within the urban forestry unit.	Employ and train adequate staff to implement city-wide urban forestry plan
Tree establishment planning and implementation	Tree establishment is *ad hoc*	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 (see Canopy Cover criterion-Table 3.3	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.
Maintenance of publicly-owned, intensively managed trees	No maintenance of publicly-owned trees	Publicly-owned trees are maintained on a request/reactive basis. No systematic (block) pruning.	All publicly-owned trees are systematically maintained on a cycle longer than five years.	All mature publicly-owned trees are maintained on a 5-year cycle. All immature trees are structurally pruned.	All publicly-owned trees are maintained to maximize current and future benefits. Tree health and condition ensure maximum longevity.
Tree Risk Management	No tree risk assessment/ remediation program. Request based/reactive system. The condition of the urban forest is unknown	Sample-based tree inventory which includes general tree risk information; Request based/reactive risk abatement program system.	Complete tree inventory which includes detailed tree failure risk ratings; risk abatement program is in effect eliminating hazards within a maximum of one month from confirmation of hazard potential.	Complete tree inventory which includes detailed tree failure risk ratings; risk abatement program is in effect eliminating hazards within a maximum of one week from confirmation of hazard potential.	All publicly owned trees are safe.
Tree Protection Policy Development and Enforcement	No tree protection policy	Policies in place to protect public trees.	Policies in place to protect public and private trees with enforcement.	Integrated municipal wide policies that ensure the protection of trees on public and private land are consistently enforced and supported by significant deterrents	The benefits derived from large-stature trees are ensured by the enforcement of municipal wide policies.
Publicly-owned natural areas management planning and implementation	No stewardship plans or implementation in effect.	Reactionary stewardship in effect to facilitate public use (e.g. hazard abatement, trail maintenance, etc.)	Stewardship plan in effect for each publicly-owned natural area to facilitate public use (e.g. hazard abatement, trail maintenance, etc.)	Stewardship plan in effect for each publicly-owned natural area focused on sustaining the ecological structure and function of the feature.	The ecological structure and function of all publicly-owned natural areas are protected and, where appropriate, enhanced.

Table 3. 6 Summary of results from Criteria and Performance Indicators evaluation

Criteria & Indicators for sustainable urban forest management

Town of Collingwood Project Team self-evaluation, February 19, 2019

Criteria	Performance Indicators					
	Total	Low	Moderate	Good	Optimal	No data
Vegetation Resource	7	1	1	3	1	1
Community Framework	7	2	2	2	1	0
Resource Management Approach	11	3	5	2	1	0
Total...	25	6	8	7	3	1

Most Criteria that assess managing the urban forest Vegetation Resource received a performance indicator of 'Moderate' or 'Optimal' in large part because of the town's investment in updating and completing its inventory of street and active park trees.

The Criterion 'Relative Canopy Cover' in the Vegetation Resources area (Table 3. 3)- the relationship between existing and potential canopy cover) could not be assessed because a there is no data for potential canopy cover (i.e. plantable spaces). Running this data through the forecast module of the *i-Tree Eco* program can project the growth of both the existing canopy cover & the potential canopy cover to a future date as determined in consultation with the Town.

Estimating potential canopy cover would provide the town with a defendable, measurable SMART Corporate Canopy cover goal utilizing a science-based methodology. It would also more clearly permit the Town to re-evaluate and/or re-affirm the canopy cover target in the Town's Community Based Strategic Plan (2015) as well as what efforts and policies might be required to achieve it. It would also enable UFMP Guiding Principle 1.3.10 "Work towards optimal levels of tree/canopy cover to maximize urban forest benefits." This objective is satisfied by Recommendation 2.0.a. Future analysis of the data from the 2019 Canopy Cover Update Study conducted for this UFMP can be used to estimate the potential plantable space currently available in Collingwood for trees. This is a good first step towards estimating potential canopy cover.

While the Town has a Natural Areas Assessment (NVCA 2011), there is no forest inventory of municipally-owned woodlands. This is fundamental to pro-active, sustainable management of this important resource. Woodland inventories are discussed in Section 3.5 (Page 43) and referred to in Section 4.6.

RECOMMENDATION 3.4.a: *The Town should undertake an inventory of its municipally-owned woodlands.*

The Town's self-assessment for the Community Framework was balanced. The Criterion "General awareness of trees as a community resource" received a performance indicator of 'optimal.' This level of community support is very important, as demonstrated during the Engagement Process - potentially providing excellent community support to help move the remaining Criteria forward.

Most Criteria which measure the Resource Management Approach received a performance indicator of. 'Low' or 'Moderate', quite common for smaller municipalities. For example, the Municipality-wide Funding criterion received a 'Low' rating, reflective of a reactive management approach to tree issues. The Staff Interviews (Section 3.3) elucidated a desire to gradually move to a proactive management approach. This would help fulfill UFMP Goal 1.5.1 "To manage Town-owned urban trees and forests through an understanding of the age, composition and quality of trees and implications for maintenance, removal and replacement; with consideration for required infrastructure."

At the end of each 5-year Operating Plan period the Criteria and Indicators of Urban Forest Sustainability should be updated and the next 5-Year Operating Plan adjusted according. This will help ensure the Town tracks its progress towards sustainability.

RECOMMENDATION 3.4.b: *The Urban Forest Advisory Committee should conduct a Criteria and Performance Indicators for Sustainable Urban Forest Management(C&I) in the fifth year of each 5-year Operating Plan*

3.5 Strengths, Weaknesses, Opportunities and Threats (SWOT)

A SWOT analysis generally summarizes current conditions and provides guidance for future directions. As a summary/indicator of the existing situation and potential directions a Strength, Weakness, Opportunity and Threats analysis was conducted with the Project Team (Figure 3. 6, Table 3. 7).

After the background research on the forest, Criteria & Indicators for sustainable urban forest management, and Collingwood's urban forest infrastructure assessments were conducted a SWOT analysis was conducted with the project team that synthesized the results of the above processes, identified potential threats to Collingwood's urban forest and opportunities to move forward. ***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***.

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

The consulting team conducted a SWOT analysis and presented it to the Project Team (Table 3. 7).

(Image credit: https://courses.lumenlearning.com/cochise-marketing/chapter/reading-defining-and- using-a-swot-analysis/

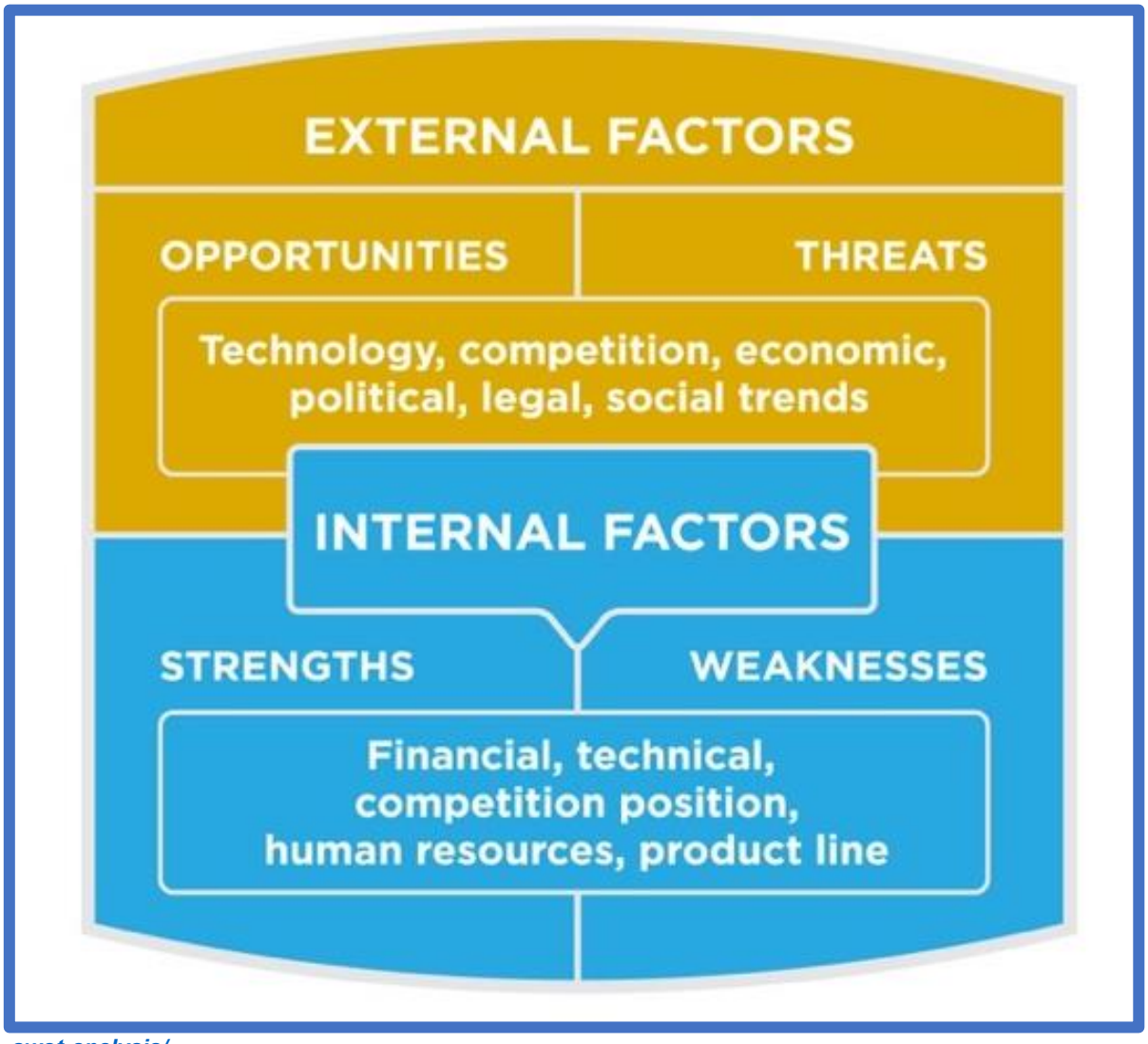


Table 3. 7 Summary of SWOT Analysis for Town of Collingwood Forestry

INTERNAL FACTORS			
Strengths (+)	**Importance**	**Weakness (-)**	**Importance**
Hired a staff person with Arborist expertise in 2016	6	The OP does not specifically use the words "urban forest" or "green hardscape"	1
A Community Based Plan established a Performance Indicator for Tree Canopy (30%) and is linked to the Urban Design Manual	3	Workforce lacks the professional and technical expertise for required tree management	2
Teamwork amongst Staff in different Departments	1	Lack of a functional Work order Management System	3
Trees are the common "bond" between Departments	2	Lack of Municipal Woodland inventory	5
Existence of a functional and up to date Tree Inventory Streets and active Parks	4	Inadequate operating budget for town tree maintenance	4
No Serious Risk Management issues associated with trees	5	Urban forest sustainability was assessed as "Moderate" to "Good"	6
EXTERNAL FACTORS			
Opportunities (+)	**Importance**	**Threats (-)**	**Importance**
Amend and harmonize establishment procedures for trees in the development process	4	Trend towards more severe weather-related tree issues	6
Established Significant Woodlands following MNRF guidelines	5	Insufficient senior government legislation and policy to direct municipal maintenance	5
Municipal Act amendment shall adopt policies that will protect and enhance tree canopy (March 1, 219)	2	Large volume of potentially hazardous private ash trees due to EAB	3
Need Mtn. standards for Clearance: 14.5' for R.O.W. and 8.5' for sidewalks	6	No Utilities Coordinating Committee in place (for tree protection)	4
Community feels trees are valuable	1	Asset Management Plan does not measure green infra structure such as Tree valuation (urban forest is unrecognized asset)	1
Trees can contribute towards mitigating the Stormwater Management issues facing the Town	3	Unenforceable Tree By-Law 2012-084	2

Highlights from the SWOT Analysis

Strengths

1. *Teamwork amongst staff about trees is the common 'bond' between Departments*

The town has a solid foundation to build upon. Good teamwork amongst Departments responsible for Programs impacting the urban forest creates synergy and a common bond; this is reflected in the harmonized delivery of services impacting the urban forest. For example, Tree Canopy, a Corporate Performance Indicator(PI), is linked between *The Community Based Plan* and the *Urban Design Manual* and is implemented through teamwork amongst Planning, Public Works (Engineering) and Parks staff. This PI is currently at 30% for the town. Due to its significance, this PI should be calculated using a science-based approach as discussed in Section 4.2. The tool used to accomplish this calculation, used in communities around the world, is called *i-Tree Eco* - see Recommendation 2.0.a.

2. *Town hired a staff person with Arborist experience in 2016*

Public Works added a staff Truck driver position in 2016 with a skillset in arboriculture; this provides a good starting point for developing in-house expertise for operations-based maintenance of town trees. As the town grows and transitions towards a proactive, scheduled-based maintenance tree Program there is the option to reclassify this position to a full-time Arborist. In the meantime, there is the need to acquire professional-level urban forestry expertise to assist staff in Public Works, Parks, Planning, By-law and Asset Management to implement the key Recommendations in this Plan and provide on-going technical in-put to the existing Town programs which impact the urban forest.

Examples where professional urban forestry technical expertise is required by the Town include implementing the Recommendations in Sections 3.3, 3.4 and 3.5. Current staff is not fully-qualified or able to fully plan, administer and evaluate tree maintenance operations, provide technical Plan Review for development/re-development/MC's and develop Corporate Policy relevant to sustaining urban trees. *The Municipal Act* does not legislate that professional foresters be used for these purposes. However, the *Ontario Professional Foresters Act* does legislate the practice of professional forestry in the Province including urban forestry. The appropriate professional level credential would be a Registered Professional Forester (RPF) who is a Full member of the Ontario Professional Foresters Association with urban forestry experience. Generally, municipalities employing R.P.F's have a more complete, comprehensive and sustainable municipal urban forestry program than those that do not.

> ***RECOMMENDATION 3.5.a:*** *Retain a Registered Professional Forester with urban forestry expertise to assist with planning, policy and regulatory issues.*

Weaknesses

The Official Plan does not specifically use the words 'urban forest' or 'green infrastructure'

While the town has done commendable policy work in protecting the peri-urban forest such as the Georgian Bay shoreline and the watercourses draining into and through its urban lands, the Official Plan does not specifically use the words 'urban forest' or 'green infrastructure.' Planning staff could development new policy support for the urban forest through reviewing the OP Section 3, General Development at the appropriate opportunity. This could include recognizing the urban forest as 'green infrastructure', support for a new policy for tree protection during (capital) construction Projects by ensuring 'no net loss of (tree) canopy' and reviewing existing guidelines for 'lot coverage' as they impact tree habitat.

RECOMMENDATION 3.5.b: *The Town review its Official Plan to develop new policies that support the urban forest*

1. *Lack of a Municipal Woodlands Inventory*

Town street trees, active Parks trees and individual high risk trees located along park trails in woodland parks have been inventoried as part of this Project; however, the woodland parks themselves have not been inventoried. A woodland inventory normally divides a woodland into "compartments" or groups of trees with similar characteristics and summarizes the information on trees, other vegetation, site quality etc. for each compartment, rather than measuring individual trees. An example of a Forest Compartment Map is provided in Figure 3. 7. This level of inventory supports forest management activities such as forest health problems, biodiversity issues, managing hazard trees along trails and boundaries, invasive plant control and generally supports sustainable management. This need is covered by Recommendation 3.4.a.

A woodland inventory is required for the town in order to effectively manage forest health and parkland asset and risk management issues. This is especially important now that the *Emerald Ash Borer* is established in Collingwood which threatens many woodland ecological values. This would consist of 'forest compartment' GIS-based mapping following standard Forest Resource Inventory protocols and would complement the current inventory.

The Town's inventory of its street, active park and woodland park trees and forests should grow with new development in the Town. As a condition of Subdivision/plan Approval during the development process, the Town should require developers to provide the appropriate Town tree and Town woodland attributes for each new subdivision acquired. An additional condition of assumption should be that the developer identify and eliminate all hazardous trees issues near property lines, trails and other town facilities.

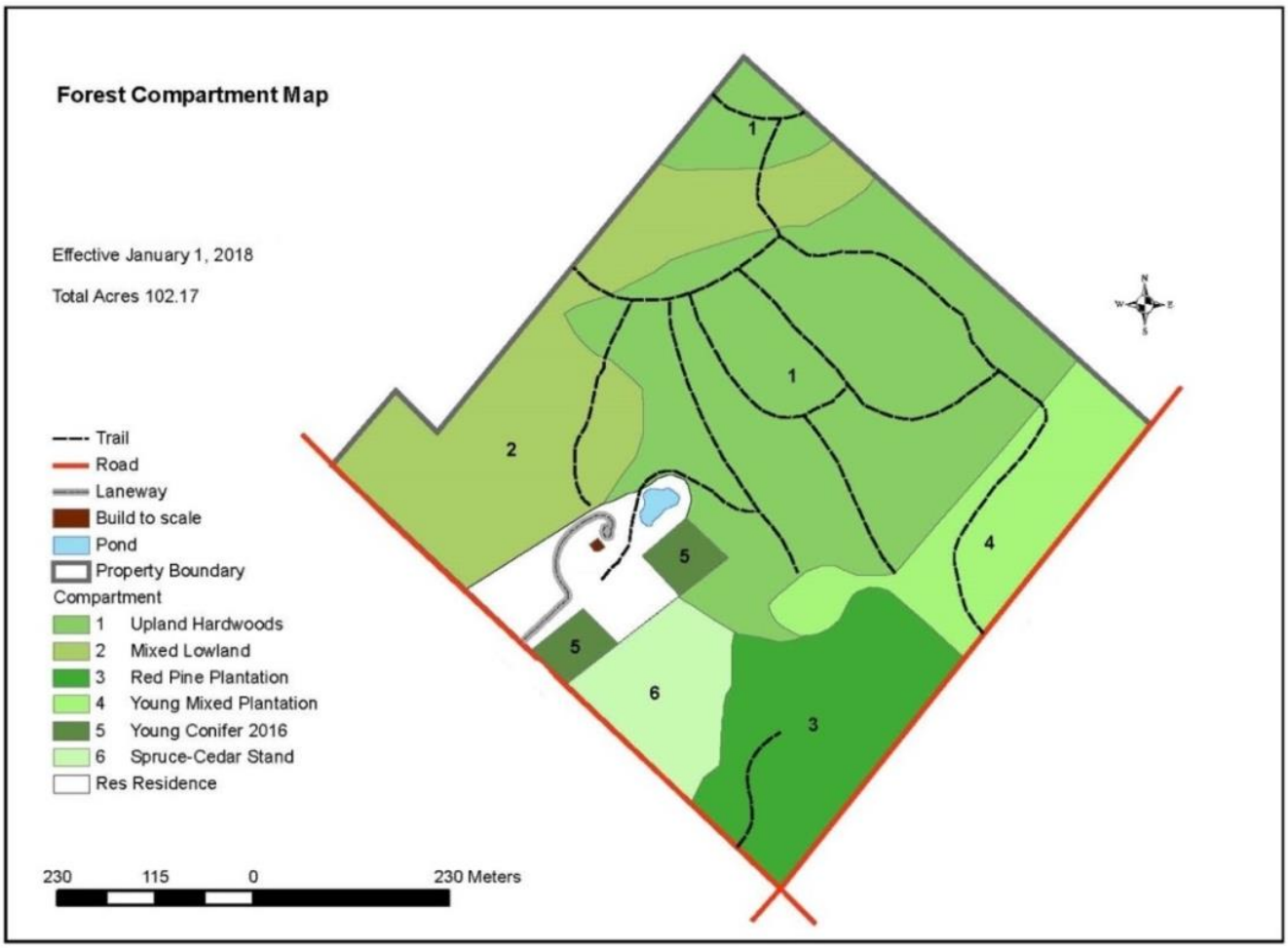


Figure 3. 7 Forest Compartment Map - Example

RECOMMENDATION 3.5.c: *The Town update the Subdivision Agreement to include the requirement that the Developer, as a condition of Subdivision Approval, submit to the Town for approval, a tree and woodland inventory, including all attributes required to be collected, for all the street and active Town trees as well as for Woodland properties in each new property acquired by the Town in a digital format specified by the Town*

RECOMMENDATION 3.5.d: *Prior to assumption, the developer submit to the Town an Arborist report that identifies and subsequently confirms all hazardous tree issues near property lines, trails and other facilities have been completed to the Town's criteria.*

Opportunities

1. *Community feels trees are valuable*

People in Collingwood feel that trees are important. External Stakeholder and Public Open House sessions were held on April 24, 2019 at the Central Park Arena. Three separate information sessions, one for staff, another for external stakeholders and a third for the public took place on the same day. Each one increased in attendance with the Public Open House attracting upwards of 60 people – concerned citizens, long-time residents and recently established newcomers. Two key observations about the attendees were noted:

- How far urban forestry has come when a town of 21,000 is intensely interested in managing its urban forests and
- The keenness of the citizenry in seeing better management and preservation of trees on municipal and private land

Private tree management is addressed by Recommendation 3.4.1.g.

Internal Stakeholders, External Stakeholders and members of the public participated in three targeted engagement sessions to introduce and describe the progress to date on the preparation of the Urban Forest Management Plan, review the importance of the urban forest to the community of Collingwood and hold interactive discussions and ideas for action. Two Surveys were available at the Public Open House to complete and/or take away and return the town. On May 31st, these two surveys were distributed through the town's *Engage Collingwood* website: (1) *Basic Survey- Trees in Collingwood* and (2) *Plan Survey- Forest Strategy & Management Plan* Survey. A summary of the findings of this process is in Section 3.8.

At the sessions people discussed maps, documents and literature. The challenge for the municipality will be in finding a balance: the budgetary balance in managing the municipal trees to the standards asked for by its citizenry. But also, the balance in regulation, as many citizens surprisingly were asking for greater controls on the development industry which seems to have left its mark on the town by occasionally removing trees before building permits or planning approvals are obtained.

2. *Municipal Act amendment: Shall adopt policies that will protect and enhance tree canopy*

The Town should place a priority on estimating its Potential Canopy Cover (Section 3.4) and that a municipality to adopt and maintain policies with respect to the 'manner in which the municipality will protect and enhance the tree canopy and natural vegetation in the municipality.' The Act does not specify whether such policy pertains to public or private trees which …"provides room for municipalities to maneuver on this matter and create a policy that is tailored to the specific geography of their community" (MMAH, 2018 per. comm.).

One of the consequences of the Province's Growth Plan, *Places to Grow,* which was renewed in 2016 is this: it saves the Greenbelt, but it will result in an even denser urban fabric being built in

other areas. This may place some municipalities in a situation where, unless careful consideration is given early in the land use planning design process, they may face a dilemma regarding how to accommodate a basic public service on the public road allowance: the public tree.

The potential loss of the public tree in some higher density developments raises fundamental long-term sustainability issues. This makes it even more necessary for the planning and engineering disciplines to be engaged with the urban forester and landscape architect early in the conceptual design process. This interdisciplinary teamwork is vital to creatively focus efforts in designing new urban fabric that can attain the Corporate Canopy Cover Performance Indicator.

This is especially relevant to a growing suburban community like Collingwood. As it grows and develops into a more urban community the "top down" approach for tree canopy demonstrates the need for new tools "to make trees work." This 'top-down' approach for tree canopy should consider the following:

1) Benchmark and establish realistic tree canopy cover target(s) in the Official Plan.
2) Monitor target(s) attainment and perform 'gap analysis' on a regular basis (5-year)
3) Set minimum soil quantity & quality construction standards for the public road allowance and parks
4) Ensure Secondary Plans demonstrate how they will support these target(s)
5) Ensure Engineering Road Cross Section Designs support these target(s)
6) Ensure Plans of Sub-division demonstrate how they will support these target(s)
7) Ensure Site Plans demonstrate how they will support these target(s)
8) Review existing by-law(s) such as the Zoning by-law and Public Tree By-law to ensure support for these target(s)
9) Develop supporting policy to ensure Committee of Adjustment has the tools to ensure support for these target(s)
10) Coordinate engineering-related issues that impact trees at the Utilities Coordinating Committee (Recommendation 3.4.1.f) to ensure support for these targets(s)
11) Coordinate on-going land-use planning-related issues at the Development Review Committee to ensure support for these target(s).

The Town should periodically review its internal business processes to ensure this top down approach is consistently applied (Recommendation 3.4.b).

Threats

1. *Large volume of potentially hazardous private ash trees due to EAB*

The staff report *Pest Preparedness Report- Emerald Ash Borer (EAB*), *2014* advised that: "It is expected that the number of unhealthy trees will dramatically increase in 2019 and 2020 due to the population growth of EAB in Collingwood." While the report focussed on public ash trees the town will inevitably be drawn into private ash trees through its Property Standards By-law 2016-040. There will be a spike in complaints about dead private ash trees. This may require by-law staff to issue orders to comply with tree removals but first an arborist assessment must be done.

> ***RECOMMENDATION 3.5.e:*** *The Town budget adequate provisions to retain arborist consulting services to assist staff administer By-law 2016-040 as amended*

3.6 Tree Inventories

Two inventories of municipal trees were completed for this project. The first was an update of the 2014 Street and Park Tree Inventory (Section 3.6.1). The second was an inventory of trees in Town woodlands near trails and property lines with high maintenance requirements (Section 3.6.2).

An inventory of Collingwood's street and park trees was conducted in 2014, largely to plan for and help deal with the Emerald Ash Borer (EAB) which was found in nearby areas in 2013 (Collingwood Staff Report #PW 2014-27, Pest Preparedness Report – Emerald Ash Borer). The project inventoried 6,601 trees and is kept as a data set in the Town's GIS system. The inventory yielded data such as the proportion of the street and park trees in Collingwood by genus (Table 3. 8). For example, the inventory found that Maples and Ash species respectively made up 34 and 13% of the sampled trees.

Table 3. 8 Summary of tree species representation from 2014 tree inventory

Genera	Common name	% composition
Acer	Maple	34
Fraxinus	Ash	13
Picea	Spruce	9
Quercus	Oak	7
Tilia	Basswood, linden	5
Pinus	Pine	5
Gleditsia	Honey locust	3

The 2014 inventory is an important asset, especially when developing plans to deal with EAB. However, it has become apparent that trees on some Town properties (e.g., Stormwater Management Facilities) were not included and that the tree population was changing rapidly as Ash mortality picked up and new areas were developed; and that some aspects of the inventory were limiting. To improve its usefulness an inventory update was included in the Request for Proposal (RFP) for this project. The UFMP project included updating the existing 2014 inventory with an improved data collection (i.e., including tree health assessments and prioritized maintenance recommendations), and identifying hazardous trees in Town woodlands along woodland trails and property boundaries.

3.6.1 Tree Inventory Update - 2019

In 2014 an inventory of street and park trees in the urban areas of Collingwood was conducted using the most current nomenclature for woody plant species and potential hazards, citing sources including TD Economics, Trees for Life Canada and several peer- reviewed scientific papers (Collingwood, 2014). Examples of data collected included DBH (diameter at breast height), genus, species, structural defects, diseases and hazard rating.

The 2014 Tree Inventory of street and park trees (Collingwood, 2014) was updated during 2019. This update included refining the data collected for each tree, more accurately locating each tree, updating the inventory of areas included in the 2014 Tree Inventory and including trees from other municipal properties such as Stormwater Retention Ponds.

Table 3. 9 lists the variables collected for each tree, whether the information for each was entered automatically or manually, and details about the variable. The data collected included an ISA Level 2 risk assessment of each tree with a High or Extreme Maintenance Priority (the Level 2 assessment is more detailed than the Level 1 used in the Woodland Tree Maintenance Inventory (Section 4.1.2).

Table 3. 10 provides a summary of the inventoried trees by their proportion of their genus as a percentage of the population. This shows that maple are the dominant street and park tree in Collingwood (30% of the trees) with ash, spruce and oak making up 12, 10 and 8% respectively. Table 3. 11shows that Norway Maple makes up 37% of the maples, the soft maple group (i.e., red, silver and Freeman maple) makes up 35%, and that 18% of the trees are sugar maple.

While over 50 species were identified, most had few individuals. The dominance of the Maple genus in Collingwood and the dominance of Norway Maple among the Maples represent a diversity problem with Collingwood's urban forest. Clark et al (1997) recommend that ideally, no species should comprise more than 10% of the population. The data shown in Table 3. 10 and Table 3. 11 show that two species of maple exceed that criteria, Norway maple and the red/silver/Freeman maple group (i.e., red, silver and Freeman maple are very closely related and often hybridize). This suggests that future planting programs place more emphasis on other species.

RECOMMENDATION 3.6.1a: *As Norway and the silver/red/Freeman species make up greater than 10% of the Town's Street and Park Tree population, future emphasis should be placed on planting other species to diversify the tree population and improve its resilience to disease and climate change.*

Table 3. 9 Data Collected for 2019 Collingwood Tree Inventory

	Variable	Entry Method	Details
1	***Asset ID***	Autopopulated	Unique tree number
2	***Forestry Administrative Zone***	Autopopulated	Town maintenance zone (determined as the project develops (e.g., Rural, old neighbourhoods....)
3	***Street #***	Autopopulated	
4	***Street Name***	Autopopulated	
5	***Assessor***	Entered	Persons name/username
6	***Date Assessed***	Autopopulated	
7	***Owner***	List	Town, private, shared
8	***Site Type***	List	Boulevard, Park, Cemetery, Front, Back, Side, Soil cell/pit/planter?, Woodland
9	***Hydro***	List	yes/no
10	***Scientific Name***	List	
11	***Common Name***	Autopopulated	common name autopopulated (format: maple, red)
12	***Date Planted***	Entered	To be filled out as new trees are planted.
13	***DBH 1***	Entered	Numeric
14	***DBH 2***	Entered	Numeric - Multi-stemmed trees
15	***DBH 3***	Entered	Numeric - Multi-stemmed trees
17	***Vigour***	List	Good, Fair Poor
18	***Maintenance Recommendation 1***	List	(I.e. none, Deadwood, Remove Full, Remove Partial, Remove low, Stump)
19	***Maintenance Recommendation 2***	List	Stake Remove, Stake Install, Water, Fertilize, Mulch, Crown Raise, Crown Reduction)
21	***Priority (Maintenance)***	List	Low, Moderate, High, Extreme
22	***Risk Rating***	List	Level 2 Tree Risk Assessment for trees with High or Extreme priority,
23	***Comments - 50 character string***	Entered	
24	***X***	Autopopulated	GIS Coordinates - UTM autopopulated
25	***Y***	Autopopulated	GIS Coordinates - UTM autopopulated

Table 3. 10 2019 Collingwood Tree Inventory summary by genus and proportion

Genus	Genus Common Name	Number Assessed	Proportion (%)
Acer	Maple	2814	30
Fraxinus	Ash	1110	12
Picea	Spruce	875	10
Quercus	Oak	717	8
Tilia	Basswood/Linden	450	5
Pinus	Pine	389	4
Thuja	Cedar	330	4
Gleditsia	Locust	292	3
Populus	Poplar	272	3
Ulmus	Elm	253	3
Celtis	Hackberry	203	2
Other		1373	16
		9078	100

Table 3. 11 2019 Collingwood Tree Inventory – Proportion of Maple

Common Name	Scientific Name	Number Assessed	Proportion (%)
Norway	*Acer plantanoides*	1033	37
Sugar	*Acer saccharum*	502	18
Silver*	*Acer saccharinum*	407	15
Red*	*Acer rubrum*	332	12
Freeman*	*Acer Freemanii*	316	8
Manitoba	*Acer negundo*	153	5
Other	*Acer sp.*	71	3
		2814	98**

* Silver, Red and Freeman Maple are closely related and hybridize

** 2% lost in rounding errors.

3.6.2 Woodland Tree Maintenance Inventory

During December 2018 and January 2019, trees along trails and property lines in municipal woodlands that required high levels of maintenance were assessed and entered into a separate database. This was a priority, largely because of impending ash mortality from the growing EAB infestation. A total of 2,881 trees were assessed during the Woodland Tree Maintenance Inventory.

There were three differences in the data collected for this inventory and the Individual Tree Inventory described in Section 4.1.1. These differences (Table 3. 12) between the inventories were: only trees with the High or Extreme Maintenance rating within a tree-length of woodland trails and property lines were assessed; a "Level 1" Risk Assessment was conducted (i.e., a Level 1 assessment is less detailed than Level 2 used in the Individual Tree Inventory); and the planting date was not included. Each tree with a high or extreme maintenance priority was assessed and a recommendation made as to whether the tree should be removed or pruned, and the tree was marked with yellow paint. It is anticipated that the identified work would be conducted in 2019 and 2020.

Table 3. 12 Data Collected for Collingwood Woodland Tree Maintenance Inventory

	Variable	Entry Method	Details
21	***Priority (Maintenance)***	List	High, Extreme
22	***Risk Rating***	List	Level 1 Tree Risk Assessment for tree with High or Extreme priority

3.7 Tree Canopy Assessment 2019

In 2008, the Town of Collingwood engaged with Envision – the Hough Group to estimate the canopy cover (CC) within the Town's municipal boundary. The methodology employed in that study entailed the use of ortho-rectified aerial imagery as a base where both trees and woodland were digitized for location (point and polygon data) and the tree crowns or woodland driplines (successional areas) of the respective features were digitized into a polygon layer. The summation of the area for the crowns and woodlands represented the canopy cover metric. The 2008 study found Collingwood's canopy cover to be 28.86%.

Envision Tatham updated the 2008 study in 2013, using similar methods (i.e., digitizing tree crowns and canopy throughout the town) utilizing 2012, current but higher resolution, aerial imagery. The results of that study produced similar results with higher resolution photography (Table 3. 13). That study reported to included tree groupings, individual trees and successional areas that were not discernible in the 2008 photography which should have produced a more complete CC estimate. The study produced a CC estimate of 28.23%, similar but slightly lower than estimated in 2008.

The 2013 CC study stated that "although there was canopy loss due to development over the four years, the percentage loss was softened by this information discrepancy [differing resolutions of photograph]. It is therefore difficult to determine the true change in Collingwood's canopy cover between 2008 and 2012".

Since the 2012 CC study, the United States Forest Service (USFS) developed i-Tree Canopy – an on-line tool that models the ecological benefits and services of the urban forest. The i-Tree Canopy module was utilized to measure the current level of canopy cover for the Town as part of this Urban Forest Management Plan. This module utilizes aerial photography a study area (e.g., municipal boundary). Sample points are generated by the module over the study area that are classified by a user into chosen land use types. For the current assessment, the points are assessed as plantable, non-plantable or canopy, with sub-classes within. The module also generates a variety of ecological benefits / services produced gained from the calculated CC metric.

Table 3. 13 Estimates of the 2008 and 2012 Canopy Cover and Successional Vegetation (in Collingwood).

	2008 Study (sq. m)	**2012 Study** (sq. m)	**% Cover 2008**	**% Cover 2012**	**Change**
Tree Canopy	**9,918,415**	9,703,720	28.86%	28.23%	decrease 0.63%
Successional	**2,091,501**	2,211,662	6.08%	6.43%	increase 0.35%

The 2019 CC updated assessed 2018 imagery using *i-Tree Canopy* point-sample methods that set the new benchmark for recurring studies facilitating canopy cover change analysis as the sample points are stored as a GIS layer that can be utilized in historic or subsequent years with current photography and the same land use types. The data generated by the model can be further analyzed with other data stored in the Town's GIS system to derive other value-added data such as plantable spaces if so desired:

Table 3. 14 Plantable locations

Plantable	Plantable - non-residential	Park, golf course, open space
	Plantable - roadside	Municipal right of way
	Plantable - institutional	Schools, hospitals,
	Plantable - developed softscape	Grassy strips in parking lots, downtown area

Furthermore, a list of the sample points (x,y coordinate data) generated from the model for plantable spaces that may not be suitable for planting was generated separately so that the above results could be further refined in subsequent GIS analysis.

3.7.1 Methodology used to estimate Canopy Cover

The general procedure within *i-Tree Canopy* includes the following steps to run the model:

- Draw or import the project area boundaries (i.e., as an ESRI polygon shapefile in latitude / longitude coordinates).
- *i-Tree Canopy* randomly generates sample points and zooms to each one so you can choose from your pre-defined list of cover types for that spot.
- 500-2000 survey points are suggested; the more points you complete, the more accurate your CC estimate for the study area.
- If estimating CC, tree benefits can also be estimated.

The 2019 Canopy Cover study utilized 3000 points that are randomly generated by the model to estimate CC within the municipal boundary of Collingwood shown in Figure 3. 7,, page 53. This sampling was 50% higher than recommended levels and was utilized to ensure the smaller land use types received an adequate number of sample points to derive suitable statistical accuracy and support future recommendations for those smaller areas.

Each point was examined and classified into one of the categories below. These categories were vetted through the project Advisory Committee.

Table 3. 15 i-Tree Canopy Categories

	i-Tree Canopy Category	Description
Non-Plantable	Non-plantable - Impervious surface	Buildings, Road, concrete, physical impedance
	Non-plantable - Permeable surface	Cultivated agriculture, sports field, cemetery, golf course fairway, driving range, open water, wetlands, gravel parking lot/driveway/work yard, waste management/disposal area, quarry, permeable areas obviously meant to be void of trees
Plantable	Plantable - Grass/herbacious	Residential lawn, open park or golf course area, open space, municipal right of ways, schools, hospitals, regenerating meadow, grassy strips in parking lots or right of ways,
Canopy	Canopy - Tree	Tree canopy
	Canopy - Shrub/thicket	Shrub or early successional forest

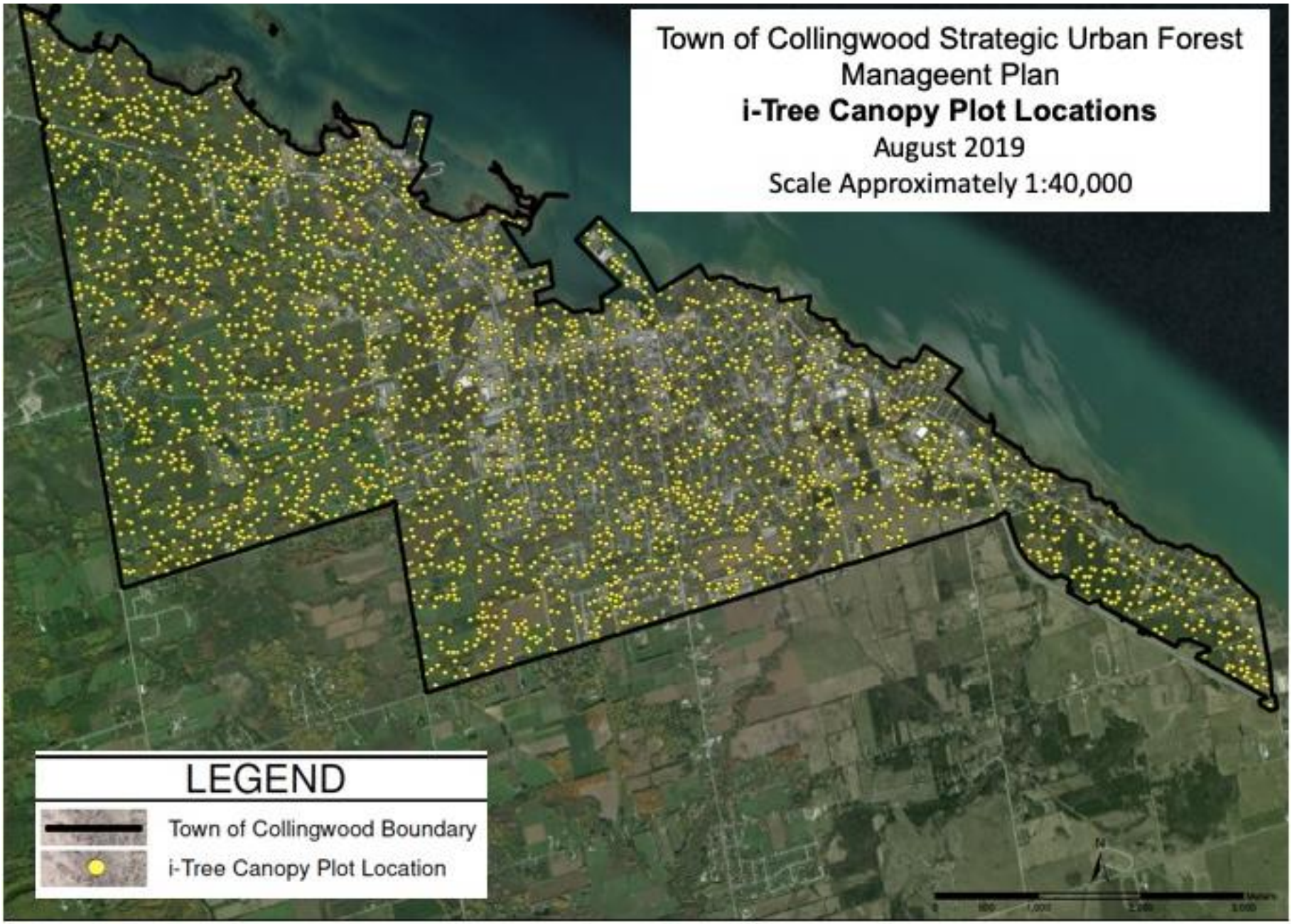


Figure 3. 8 Illustration showing the 3,000 plots assessed within Collingwood's municipal boundary for the 2018 Canopy Cover Study

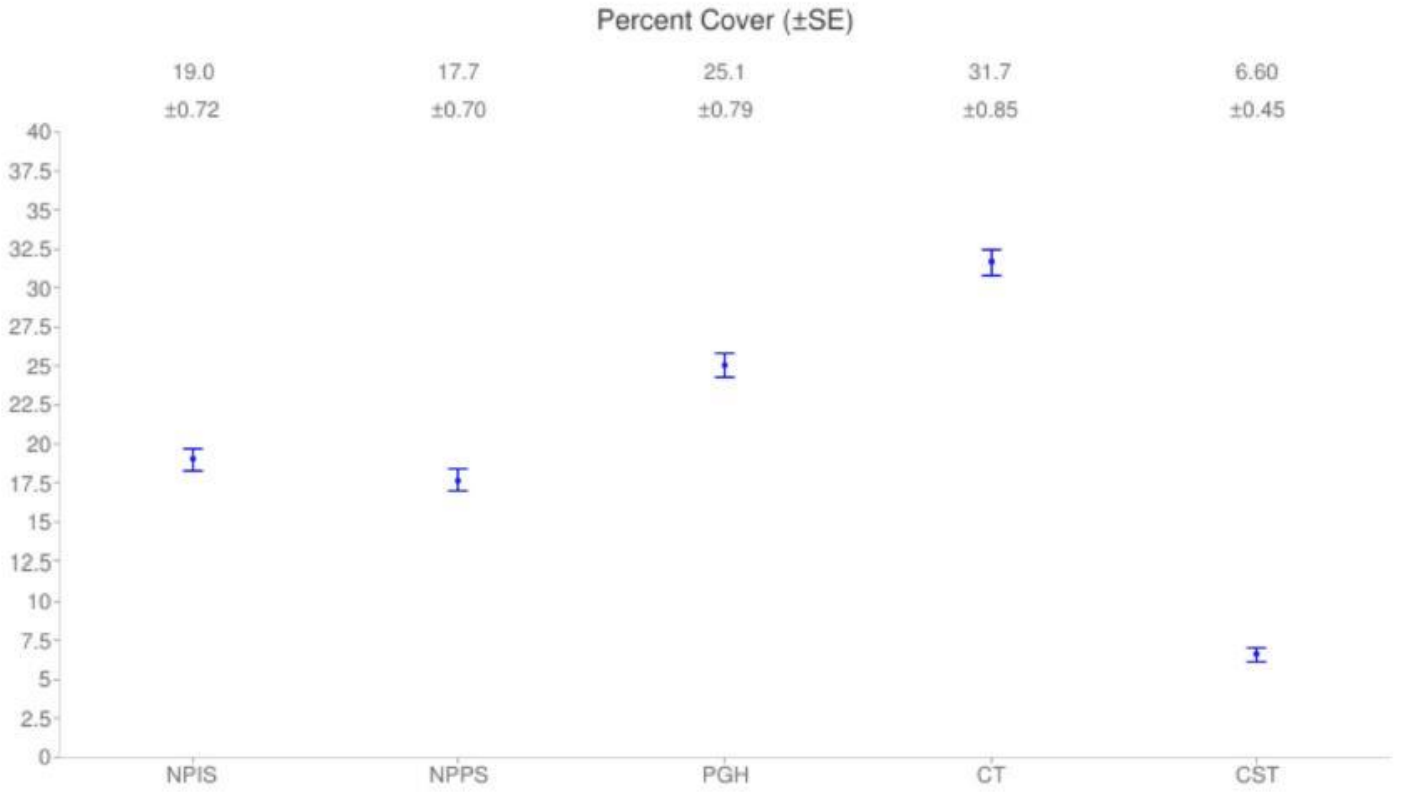
3.7.2 2018 Canopy Cover Update - Results.

The following are the results from the 2018 i-Tree CC study for the Town of Collingwood:

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/21/19

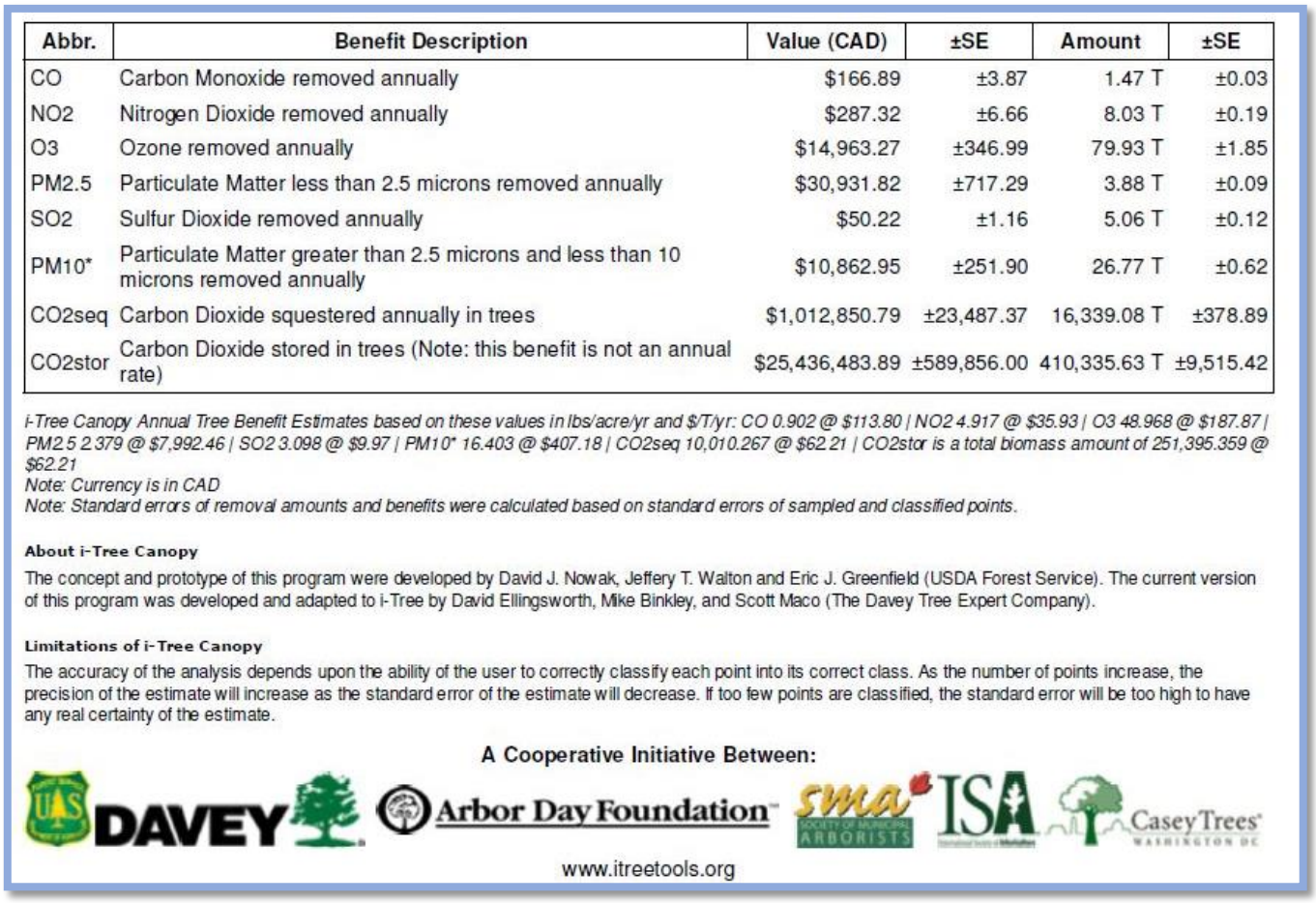


Cover Class	Description	Abbr.	Points	% Cover
Non-plantable - Impervious Surface	Buildings, road, water, concrete, physical impedance	NPIS	570	19.0 ±0.72
Non-plantable - Permeable Surface	Cultivated agriculture, sports fields, cemetery, golf course fairway, permeable areas obviously meant to be void of trees	NPPS	530	17.7 ±0.70
Plantable - Grass or Herbacious	Residential lawn, open park or golf course area, open space, municipal right of ways, schools, hospitals, grassy strips in parking lots or right of ways	PGH	752	25.1 ±0.79
Canopy - Tree	Tree Canopy	CT	950	31.7 ±0.85
Canopy - Shrub or Thicket	Shrub or early successional forest	CST	198	6.60 ±0.45

Figure 3. 9 2018 i-Tree CC Study Results

The 2018 Tree Canopy Study estimated canopy cover in Collingwood to be 31.7%, an increase from the 2012 study results (28.23%). When the 2018-"shrub/thicket" category is considered, the total canopy cover increases from 34.66 (2012) to 38.3% (2018). However, as discussed below this increase is likely a result from a difference in methodology and successional of shrubby areas into tree canopy.

The total value of annual value ecological services generated from the 38.3% canopy cover was estimated to be $1,070,113.26. The component amounts were estimated by the model are shown below.



Abbr.	Benefit Description	Value (CAD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$166.89	±3.87	1.47 T	±0.03
NO2	Nitrogen Dioxide removed annually	$287.32	±6.66	8.03 T	±0.19
O3	Ozone removed annually	$14,963.27	±346.99	79.93 T	±1.85
PM2.5	Particulate Matter less than 2.5 microns removed annually	$30,931.82	±717.29	3.88 T	±0.09
SO2	Sulfur Dioxide removed annually	$50.22	±1.16	5.06 T	±0.12
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$10,862.95	±251.90	26.77 T	±0.62
CO2seq	Carbon Dioxide squestered annually in trees	$1,012,850.79	±23,487.37	16,339.08 T	±378.89
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$25,436,483.89	±589,856.00	410,335.63 T	±9,515.42

i-Tree Canopy Annual Tree Benefit Estimates based on these values in lbs/acre/yr and $/T/yr: CO 0.902 @ $113.80 | NO2 4.917 @ $35.93 | O3 48.968 @ $187.87 | PM2.5 2.379 @ $7,992.46 | SO2 3.098 @ $9.97 | PM10 16.403 @ $407.18 | CO2seq 10,010.267 @ $62.21 | CO2stor is a total biomass amount of 251,395.359 @ $62.21*
Note: Currency is in CAD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

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

Limitations of i-Tree Canopy

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

A Cooperative Initiative Between:

DAVEY Arbor Day Foundation SMA SOCIETY OF MUNICIPAL ARBORISTS ISA Casey Trees WASHINGTON DC

www.itreetools.org

Figure 3. 10 Tree Benefit Estimates

3.7.3 Discussion of the 2019 Canopy Cover Update

The current canopy cover analysis estimated that CC and shrubby vegetation increased from 28.23 to 31.7%, and 6.43 to 6.60% respectively. This suggests that canopy cover has increased. However, because of the high statistical accuracy of the *i-Tree canopy* methods compared to the more-subjective crown-digitizing method, suggests that an actual CC increase is unlikely. It is recommended that the Town re-assess its canopy cover in 2008 and 2012 imagery using *i-Tree canopy* methods and the same set of points and classifications as used in 2019, to provide a sound and economical basis for tracking the change over time.

***Recommendations** for future additional work in this area moving forward are made in Section 4.2 (historic and future updates)*

3.8 Communications and Community Engagement

To assess community interest in the urban forest and to provide direction for management of this important resource, several communication efforts were implemented. These efforts included: a review of the work to date on the project, the state of the urban forest and its management, and exercises to gauge community knowledge and interest in the direction of Town policy and management associated with the urban forest.

The communications and community engagement outreach began with a media announcement regarding the UFMP project. After much of the background research and data collection was completed, direct efforts to engage the public were undertaken to gauge their interest and recommendations. The consultation was organized into two communities: External Stakeholders and the General Public. **External Stakeholders** included institutions such as the Conservation Authorities, utility companies, developers, consultants, and organizations with an interest in the urban forest. The **General Public** included any unaffiliated individuals interested in the urban forest.

An External Stakeholder Meeting and Community Open House were held in April that described the UFMP development process. Subsequently, a questionnaire was posted on the Engage Collingwood website (https://engage.collingwood.ca) for residents to complete and provide input. The brief description of the responses is provided below, and the questionnaires are provided in Appendix 2.

3.8.1 Community Engagement Sessions

Two Engagement sessions were held on April 24, 2019 with the groups described above. The meeting with External Stakeholders was in the afternoon, followed by the General Public Open House in the evening. Each meeting began with presentations by Michael Rosen, RPF, President of Tree Canada – Canada's largest tree/urban forest non-governmental agency and John McNeil, RPF, Managing Principle, McNeil Urban Forestry Inc., supported by Williams & Associates staff and Peter Kuntz, RPF of Kuntz Forestry Consulting Inc. The presentations varied slightly between stakeholder groups but covered the rationale for an urban forest plan for Collingwood along with details of the process for developing Collingwood's UFMP and the state of the Town's urban forest. Input was solicited on progress to date the plan from the attendees.

The purpose of the sessions was to introduce and describe the progress to date on the preparation of the Urban Forest Management Plan, review the background of the urban forest to the community and hold interactive discussions and ideas for action. After the presentations, there were discussions among the attendees and project team.

The participants also viewed the displays, participated in the exercises. The displays included:

- Benefits of the Urban Forest – where participants indicated what they felt were the most important benefits.
- UFMP Guiding Statements – Vision Statement, Guiding Principles and Goals
- Criteria and Indicators for Sustainable Forest Management (C&I)(Section 3.4) – Poster boards with selected C&I were provided so that participants could rank what they felt Collingwood's standing was in five Community Framework Indicators and six Resource Management Approach Indicators . This allowed the Team to compare the rankings from the public meetings with the rankings by the Project Team.
- Street and Park Tree Inventory Update , and
- Canopy Cover Update.

Each *station* was attended by Project Team members who discussed the subject material and other topics with the participants. At the Benefits of the Urban Forest and Criteria and Indicators displays there were exercises to help participants provide input to the UFMP and two surveys were available on the at the Public Open House to complete and/or take away and return the town.

At the sessions people examined maps, documents and literature and had lively discussions with the Project Team, Staff and other participants. The sessions were very successful and details regarding each session are provided below. The challenge for the municipality will be in finding a balance: the budgetary balance in managing the municipal trees vs. the standards asked for by its citizenry as well as the balance in regulation, as many citizens surprisingly were asking for greater control on the development industry where incidences of tree removal prior to building permits or planning approvals were frequently cited.

External Stakeholder Session

Nine representatives of the following organizations participated in the External Stakeholders afternoon session: Local planners, County of Simcoe, Nottawasaga Valley Conservation Authority, Horticultural Society and the Georgian Triangle Developers Institute. During the session there was a good discussion that included the existing Tree Protection By-Law, the cost of maintaining vs. removing trees, tree maintenance policy and funding and the canopy cover Assessment.

Based on questions and comments, planners were interested in more details on policy outcomes (for both Town and private trees) of the UFMP (which, of course, are dependent on many factors including the final UFMP, Council's perspectives). The Conservation Authority wanted the plan to emphasize the appreciation of trees (vs. depreciation). They offered to share GIS layers to strengthen the canopy study (to account for heterogeneity in the landscape, etc. (e.g. hummocks in wetlands)).

Public Open House

Forty members of the public from Collingwood and neighbouring communities attended the Public Open House. The group was very engaged and there were lively discussions on topics associated with the UFMP and other issues regarding Collingwood's Urban Forest.

Based on questions and comments, the public was very concerned about trees on private property, Town policy, and practices associated with tree and forest retention through the development process. Many participants were particularly concerned about tree removals, where all trees were being removed to make room for new subdivisions, or where neighbours were removing multiple trees from their property. Some felt that mandatory trees planted on Town property in new subdivisions should be larger. Many expressed interest in by-laws for protecting soils and trees in new developments, and for protecting and nurturing health forest understories. The public wanted to hear tangible ways that tree conservation and management were to be implemented and enforced by the Town of Collingwood.

Table 3. 16 Number of respondents (2 sessions) who ranked a Benefit of the Urban Forest as most important

BENEFIT	Public (Count)	External Stakeholder (Count)
Reduce stress, speed healing, improves mental health	3	
Reduce stress, improve mental health from recreation*	1	
Social and health components of active treed trail network*		2
Adding 10 trees to a city block offers mood and health benefits akin to a $1,00 raise or being 7 years younger		1
Lowered risk of mortality		
Carbon dioxide absorption	3	3
Environmental benefits of carbon dioxide absorption/ oxygen production*	1	
1 large tree = oxygen for 4 people in one day		2
Absorption of carbon dioxide produced by cars	1	
Shade resulting in cooling and reduced AC costs	3	3
Increased property value	1	2
Flood prevention/amelioration	2	4
Crime reduction		
Wildlife habitat	3	1
*benefits added by individuals at meeting not on poster	18	18

Benefits of the Urban Forest Exercise

At the *Benefits of the Urban Forest* Station, Tree Canada presented a display that described the various benefits of Trees and the Urban Forest, supported by information booklets and flyers. Participants were asked to put stickers next to the Benefit of the Urban Forest that they felt were most important. The results of the exercise are provided in Table 3.14 for the External Stakeholder Meeting and Public Open House.

Criteria and Indicators Exercise

Eleven Criteria and Indicators from the Community Framework, and Vegetation Resource and Resource Management Indicators (Table 3. 3,Table 3. 4,Table 3. 5 respectively) were selected and presented at a station at the Communications Sessions. C&I and the process for it and the UFMP were discussed with participants. For each criterion, participants were asked to place a sticker on the ranking they felt applied to Collingwood. The Rankings of each criteria from the C&I assessment (Section 3.4), External Stakeholder Meeting and Public Open House were "averaged" and that value placed on a chart in Table 3. 17

For the Community Framework criteria, the groups ranked most categories similarly except that the Project Team ranked the "Citizen-Municipality-Business interaction" and the "General Awareness of trees as a community resource" higher than the other two groups. The Project team also assessed the "Age distribution of trees" higher (more diverse) and the Publicly-owned natural areas management planning and implementation" lower than the other two groups.

Survey Results

The Survey on Forest Strategy and Management Plan was completed by five participants at the External Stakeholder Meeting and three at the Public Open House. This Survey asked participants to indicate their level of agreement with the Draft Vision Statement, Guiding Principles and Goals of the UFMP. Results from both meetings indicated strong support for that set the stage for management of Collingwood's UFMP. A summary of the results of this survey for the results of this survey for the External Stakeholders Meeting and Public Open House are provided in Appendices 1a and 1b.

The Survey on Forest Management Strategy and Plan was completed by five participants at the External Stakeholder Meeting and 14 at the Public Open House. This Survey asked participants to indicate their level of agreement with statements regarding the importance of trees, management of the urban forest, costs and budget for activities and policy. Most of the respondents Agreed or Strongly Agreed with all the statements. However, there was slightly less unanimity on a Private Tree By-Law, Tree Planting and Becoming involved in community or outreach projects. A summary of the results of this survey for the results of this survey for the External Stakeholders Meeting and Public Open House are provided in Appendices 2a and 2b.

Table 3. 17 Ratings of selected Criteria & Indicators for Sustainable Forest Management by the Project Team, External Stakeholders and the Public at communications meeting - April 2019

For each criteria, place a sticker to best reflect how you feel the Municipality is currently doing

WILLIAMS & ASSOCIATES Forestry Consultants Ltd.

Criteria and Indicators for Sustainable Urban Forest Management

Community Framework Indicators.

★ Project Team Rating; ★ External Stakeholder Rating; ★ Public Open House Rating

Criteria	Low	Moderate	Good	Optimal
Involvement of large private and institutional land holders	Ignorance issuers. ★★★	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)
Green industry cooperation	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
Neighbourhood action	No action	Isolated or limited number of active groups ★★★	City-wide coverage and interaction	All neighbourhoods organized and cooperating
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
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 environmental, social and economic well-being of community. ★
Maintenance of publicly-owned, intensively managed trees	No maintenance of publicly-owned trees	Publicly-owned trees are maintained on a request/reactive basis. No systematic (block) pruning ★★★	All publicly-owned trees are systematically maintained on a cycle longer than five years	All mature publicly-owned trees are maintained on a 5-year cycle. All immature trees are structurally pruned

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Table 3.17 con't
Resource Management Approach Indicators

★ **Project Team Rating;** ★ **External Stakeholder Rating;** ★ **Public Open House Rating**

Tree Risk Management	No tree risk assessment/remediation program. Request based/reactive system. The condition of the urban forest is unknown	Sample-based tree inventory which includes general tree risk information; Request based/reactive abatement program system ★	Complete tree inventory which includes detailed tree failure risk ratings; risk abatement program is in effect eliminating hazards within a maximum of one month from confirmation of hazard potential ★★	Complete tree inventory which includes detailed tree failure risk ratings; risk abatement program is in effect eliminating hazards within a maximum of one week from confirmation of hazard potential
Tree Protection Policy Development and Enforcement	No tree protection policy	Policies in place to protect public trees ★★★	Policies in place to protect public and private trees with enforcement	Integrated municipal wide policies that ensure the protection of trees on public and private land are consistently enforced and supported by significant deterrents
Publicly-owned natural areas management planning and implementation	No stewardship plans or implementation in effect ★	Reactionary stewardship in effect to facilitate public use (e.g. hazard abatement, trail maintenance, etc.). ★★	Stewardship plan in effect for each publicly-owned natural area to facilitate public use (e.g. hazard abatement, trail maintenance, etc.)	Stewardship plan in effect for each publicly-owned natural area focused on sustaining the ecological structure and function of the feature

Vegetation Resource Indicators & Objectives

★ **Project Team Rating;** ★ **External Stakeholder Rating;** ★ **Public Open House Rating**

Relative canopy cover	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 potential
Age distribution of trees	Any Relative size class represents more than 75% of the tree population	Any size class represents between 50% and 75% of the tree population ★	No RDBH class represents more than 50% of the tree population ★	25% of the tree population is in each of the four size classes

3.8.2 Engage Collingwood Surveys

As a follow-up to the Engagement Sessions (Section 3.8.1) and to elicit input from additional members of the community, the Town posted the Questionnaires distributed at the Engagement Sessions on the Engage Collingwood website (https://engage.collingwood.ca) for residents to complete and provide input.

On May 31st, these two surveys were distributed through the Town's *Engage Collingwood* website: (1) Basic Survey- Trees in Collingwood and (2) Plan Survey- Forest Strategy & Management Plan Survey 38. A summary of the findings of this process is in Section 3.8.2. Summaries of the responses are provided below.

Feedback on UFMP Guiding Statements/Direction

Thirty-eight respondents completed the on-line questionnaire assessing the level of agreement with the Guiding Principles, Vision Statement and goals of the Goals for the UFMP, developed by the Project Steering Committee.

The responses showed broad support for the guiding statements for the UFMP. Response showed that between 89% and 100% of the respondents agreed or could live with each of the statements, 13 of the 18 questions had responses greater than 95% (approval/acceptance).

Additional comments also reflected support for the statements, including: support for policies affecting private lands (i.e., limiting tree removals or support for planting); that the development process was causing problems with the urban forest, calling for greater support of the urban forest; budget/costs (too high or too low), and the need for community education/participation.

Feedback on the urban forest, policy and the management of Town trees

Seventy-three respondents completed the second on-line questionnaire assessing the current level and ideas for the future direction of this UFM project and Collingwood's urban forest management program. Nine questions involving the importance of trees and the urban forest to the community, tree maintenance, budgeting/costs, and regulation were presented.

Seventy eight and 80% respectively of respondents agreed or could live with the need for a private tree by-law and their participation in community projects. Responses to other questions regarding importance of trees, required budget increases to support tree planting and maintenance, and achieving the Town's canopy cover goals were between 94% and 100 % agreement or acceptance.

4.0 Moving Forward

4.1 Tree Inventory

The 2019 inventory update provided a critical building block in Collingwood's urban forest management program. Currently, the inventory resides and is maintained on the Town GIS system and various administrative units with "tree" responsibilities (e.g., Public Works, Parks, Planning and Development) The Unit then records such activities as: tree planting, maintenance or removal activities on paper or electronic forms that are then submitted to the GIS staff so the inventory can be updated accordingly. This process makes it very inefficient for staff to plan and complete work. For staff to effectively use the inventory to efficiently conduct and plan the required (and important) tree maintenance, they need up-to-date information to easily determine what work needs to be done and what has been completed.

The tree inventory should be completely updated (e.g., every 10 years) to ensure that its information reasonably represents the tree population. Implementing a grid -pruning approach combined with creating Forestry Operating Zones, in which all the street and park trees were pruned on a cycle, creates efficiencies whereby the Tree Inventory would be updated as pruning of the trees within a Forestry Operating Zone was completed.

4.1.1 Tree Inventory Data Management

This inventory/work functionality can be achieved by acquiring and implementing an integrated Work Order (WO) management system that enables staff to enter required work into the inventory as it is identified; create 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... all in live time. A number of WO management systems are available that would link with update the inventory as discussed above. The efficiencies obtained by implementing such a system should more than pay for itself and help fulfill municipal responsibilities regarding community safety, Canopy Cover, and asset management and valuation.

> ***RECOMMENDATION 4.1.2.a*** *The Town adopt an integrated inventory/work order management system that tracks recommended work, outstanding Work Orders and updates the inventory as work is completed*

4.1.2 Tree Maintenance Work Scheduling

An inventory system which is updated in real time when work is identified, or completed, improves efficiency and reduces costs in a number of ways. Staff can plan workdays to complete all work in an area at one time rather than returning to an area a number of times to do work that could have been completed in a single trip. This is partly because of the reality that much of the cost of doing tree work is in getting to the site and setting up. Another example would be where crews go to a site to do work, only to find that it has already been partly or completely done already.

4.2 Tree Canopy

The 2019 canopy cover assessment used *i-Tree Canopy* program, rather than the tree crown measurement methods used in 2008 and 2012. While *i-Tree Canopy* is more statistically accurate and repeatable over time, the newer methods make it difficult to compare the different canopy cover estimates.

As discussed earlier, one advantage of the *i-Tree Canopy* method is that the same sample points (3,000) can be assessed using imagery from different years, providing direct comparison of canopy change over time. The greater accuracy of the i-Tree process is because the Canopy cover categories can be compared statistically rather than a more subjective compilation of tree crown areas drawn by a technician. The latter method is more prone to error because it includes numerous opportunities for the operator to make errors or measuring CC. As the i-Tree Canopy requires only the identification of CC category on specific points, there is only a slight opportunity for error, and the sampling methods result in a statistically accurate assessment .

Canopy Cover Change Analysis

The i-Tree Canopy method is simple, repeatable and economical; therefore, it is recommended to be used in future CC assessments. The assessments could be done by staff or a Forestry consultant using historic or future imagery to develop comparable assessments of CC over time.

> ***RECOMMENDATION 4.2.a**: The Town re-assess Canopy Cover estimates conducted in 2008 and 2012 using i-Tree Canopy to enable direct comparisons among years to track change over time.*

> ***RECOMMENDATION 4.2.b:** The Town conduct future Canopy Cover analyses in 2024 or other years using i-Tree Canopy to enable direct comparisons among years and track change over time.*

Relative/Potential Canopy Cover

Relative Canopy Cover is the first criteria in the Vegetation Resource Section of the *Criteria and Indicators Analysis* (Table 3. 3) and is rated based on the comparison between CC and Potential CC. In simple terms, Potential CC is sum of CC plus the area of plantable spaces that have the potential to be planted to trees and become CC combined with a projection of how much canopy is produced over a future period with assumptions about such influencers as the tree mortality rate. A model that can calculate potential canopy cover is the forecast module in the *i-Tree Eco* Model.

As mentioned in the 2019 Canopy Cover Assessment Report an iteration of the CC analysis would be to run i-Tree Canopy utilizing the town's present urban boundary. This is logical given the inevitable urban development pressures on the remaining rural lands. Combining this calculation with the calculation of the Potential canopy cover using the forecast module in *i-Tree Eco* (Recommendation 2.0.a), would give the Town a science-based, defendable canopy cover target. This would permit the town to evaluate the feasibility of its Corporate Performance Indicator for Tree Canopy (currently at 30%). Finally, it would permit the town to complete the self-assessment exercise for its Criteria and Indicators of Urban Forest Sustainability (Recommendation 3.4.b).

Analysis of Canopy Cover by Land Use

The data from the 2018 CC assessment can also be used to effectively estimate canopy cover, planting space and other variables by land use categories in Collingwood. This can be done by overlaying /merging layers from the Town's GIS system such as land use boundaries like zoning (i.e., industrial residential, commercial) , municipal road allowances, or Forestry Operating Zones with the canopy cover Assessment sampling points so the data from the CC assessment can be subdivided and applied to these parts of Collingwood. The results of this analysis can help Collingwood target tree planting opportunities within land uses that may have a higher proportion of Plantable Spaces in order to enhance CC development.

> ***RECOMMENDATION 4.2.c:*** *The Town should analyze Canopy cover within land use types to help maintain or increase Canopy Cover by identify areas where there are high proportions of plantable spaces or where more emphasis should be placed on tree retention.*

4.3 Woodland Inventory

This topic was discussed in the Strengths and Weaknesses (Section 3.5) and subject of Recommendation 3.4.a.

4.4 Strategy on Connectivity

The urban areas of Collingwood include many natural areas in public and private ownership that may or may not be connected to other natural habitats. While they all contribute to Collingwood's natural heritage and values, some are on private property that may eventually be developed, others have been intentionally incorporated into the urban fabric because of their importance to the community or are undevelopable because they are or protect natural features like ravines, wetlands or significant woodlands from hazards like flooding or development.

The importance of some areas may have been recognized by regulations under the Conservation Authorities Act. While Conservation Authority policies and regulations affect specific areas; the protection of other, smaller or adjoining habitats like wetland pockets, meadows or woodlands would be subject to Town planning policies and bylaws.

Urban wildlife and plant populations in urban natural areas are healthier and more sustainable if they are connected/linked to other nearby habitats, allowing movement between blocks. These linkages provide opportunities for plants and animals to move among natural areas, replenishing depleted populations and providing greater habitat area and diversity to wildlife.

Urban and rural natural areas may be linked by direct connections or by being close to nearby habitats. Such connections are often linear, following landscape features (e.g., drainages, waterways, windbreaks, shelterbelts, road allowances). Animals and plants move within and through natural habitats, but also live in and move through developed and landscaped areas. For example, landscaping with mixtures and patches of plant classes like annuals, perennials, shrubs and trees provide better habitat than large swards of mown grass with scattered trees. This is especially true when more native species are used, and such plantings adjoin or connect with more-natural areas.

Linear urban natural areas, like naturalized trails and waterways, help connect urban habitats together and with nearby rural ones. Working with appropriate guidelines and partners, the Town and community can work together to improve and increase habitat and connectivity, and many aspects of people's lives and interests. As well, naturalized areas such as trails, drains and parks are cheaper to maintain than managed landscaping as there is no need for mowing, watering and other maintenance. While there are always some negative interactions between people and wildlife, the benefits of integrating nature with people's lives are overwhelming.

A number of recommendations to improve connectivity among urban natural habitats and between urban and rural areas are provided below.

> ***RECOMMENDATION 4.4.a:*** *During the development planning process, the Town should identify existing or potential linkages among habitats on the subject land and nearby properties and acquire important features for Town parkland, or otherwise protect them*

RECOMMENDATION 4.4.b: *The Town undertake a Naturalization Program for developed parkland adjoining or linking natural habitats using native plants, and naturalize landscaped patches for natural habitat*

RECOMMENDATION 4.4.c: *The Town Initiate a Communications Program regarding the importance of linkages/connectivity among natural systems, the use of native plants in landscaping and naturalization.*

4.5 Policy Review and Development.

As Collingwood is a rapidly-growing municipality there is an increasing need to update policy in many areas to address community demands, increasing infrastructure requirements and the ever-changing provincial and federal policy environment. The Communications and Community Engagement process of this project brought out needs to update policies associated with the urban forest, including tree/forest aspects of the development process, policies regarding street, park and private-tree management, and tree/forest protection regulations.

Compensation for public and private trees affected by construction is another example of an area where policy needs to be developed. Consideration for such a policy would include public or private trees affected by municipal or other public projects such as roads, utility or other construction. It would also include compensation for public trees affected by projects on adjacent private lands such as disturbances associated with project such as driveway entrances, buildings or other site alterations.

No Shade Policy is currently in place in Collingwood. A Shade Policy is in recognition of public health concerns associated with excessive sun and heat and would largely be associated with providing shade for public areas such as parks and sports fields. Shade is an important aspect of Canopy Cover but is a more targeted consideration that could be modelled after the City of Toronto Policy for the Provision of Shade at Parks, Forestry and Recreation Sites. While the Toronto policy only applies to active parks and recreation sites, Collingwood could consider drafting such a policy that includes other Town property and private lands.

An example of a municipal tree removal, pruning and compensation policy that covers tree removal criteria, the tree removal process and compensation is from the City of Aurora: https://www.aurora.ca/Thingstodo/Documents/Parks/Appendix%203,%20Policy%20C,%20Tree%20Removal%20and%20Compensation.pdf

RECOMMENDATION 4.5.a *The Town should begin a Comprehensive Policy Review regarding all aspects of the Urban Forest and its Management, including but not limited to development and construction, tree protection policy and regulations, tree compensation and shading for areas where public congregates.*

4.6 Planning for and Management of Street and Park Trees

"Forest-grown trees are self-maintaining unless a specific forest management objective requires otherwise. Street trees are forest trees transplanted to an alien environment, thus demanding intensive management ([called] arboriculture)." (Miller, 1988). This is attained through activities that include pruning, fertilization, protection, cabling & bracing, root cutting/management and removal & replacement.

Long-term planning and management for a community can be contained in a Master Street Tree Design Manual (described in the Tree Maintenance Section) with a goal of 'full stocking' (Miller,1988), or having trees established in all available planting spaces. An available planting space is an area where a tree or trees could grow that is not required for other uses or would not compromise critical structures like buildings, sidewalks or roads.

The Master Street Tree Design Manual can specify the development of age classes and species themes by blocks or street segments simplifies making crew and equipment assignments. It should also direct the over-all population diversity in species and age classes and tree spacing to develop more resilient tree populations. It could also describe annual monitoring of Town trees for potential problems such as insect and disease issues using an Integrated Pest Management approach (IPM) (Miller, 1988).

RECOMMENDATION 4.6.a *The Town develop a Master Street & Park Tree Design Manual to create a diverse and resilient tree population*

Workload volume associated with tree planting & establishment and the need for a specific type of scheduled pruning, called 'training', for all the developing street trees- has become an issue for staff (Section 3.3.1). This issue is expected to intensify as more development is assumed by the Town: this creates a large, new 'wave' of trees which is maturing in a similar fashion to a demographic cohort (i.e. 'baby boomers'). This produces a spike in demand for new types of tree maintenance that occurs at each life stage (age class). For example, when trees reach a certain height, age class 21-40, maintenance operations transition from ground based pruning to aerial bucket trucks. Figure 4. 1 shows that in a typical fast-growing municipality in southern Ontario, the number of street trees more than doubled from 1992-2012. This workload volume moves along the age class axis over time.

This type of exponential growth impacts the corporate operating and capital budgets and needs to be fully accounted for in a municipality's Development Charges Study because a tree requires significantly more maintenance as it matures; producing significantly more ecological benefits. *Trees are a unique corporate asset which appreciate in value over time.*

RECOMMENDATION 4.6.b *The Town review its Development Charges Study to reflect full cost accounting for the public tree*

Tree establishment and management activities have potential safety concerns for staff and the public. An Operations Safety Manual details standard operating procedure, worker training & competencies and appropriate MSDS as required by the Occupational Health & Safety Act (OHSA). OHSA also specifies minimum required reasonable precautions, duties & responsibilities of the worker and supervisor to be followed at the work site in addition to a Traffic Control Plan required under the *Highway Traffic Act.*

RECOMMENDATION 4.6.c *The Town develop an Operations Safety Manual for Forestry Operations*

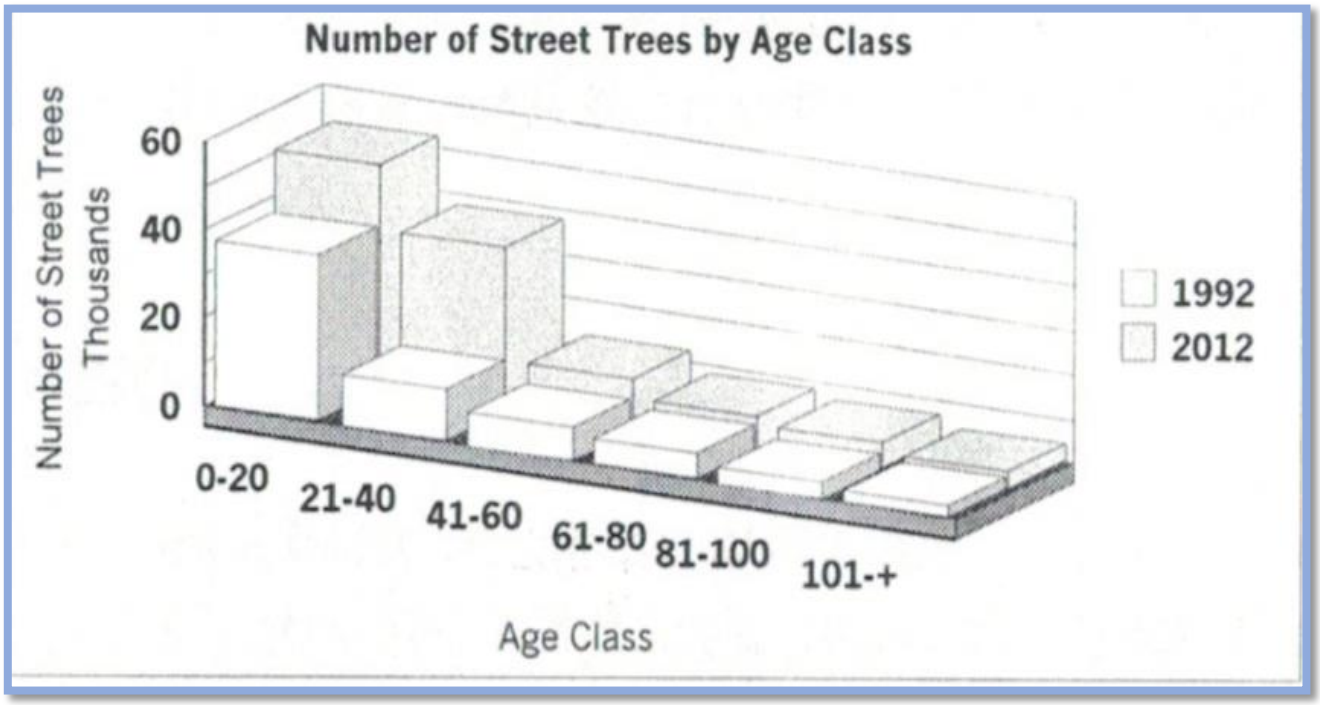

Figure 4. 1 Example of the cumulative street tree populations from 1992 -2012 for a fast growing municipality

4.6.1 Tree Establishment

Tree establishment is a primary aspect of urban forest management and includes activities such as planning for and planting new or replacement trees and tending them for several years so that they can survive on their own. Tending can include watering, mulching, staking and other activities. Specifications for planting street and park trees are provided in Appendix 3 and should be part of a proposed Forestry Operations Manual.

Planting 'the right tree in the right place' where it can best thrive and grow to its full size and provide optimum benefits is the foundation of successful tree establishment. The right tree in the right place is as much about tree hardiness as it is about tree size. If an urban forester can match tough tree species to harsh sites and more sensitive tree species to higher quality sites, a community can utilize a wider variety of species in their urban forest and create a more stable, sustainable tree population. A list of appropriate Tree Species for Collingwood and their site suitability is in Appendix 4.

Urban Site Index (USI) is a systematic approach for evaluating sites with a corresponding species evaluation. The Urban Site Index pays homage to traditional forestry's site index, which is a forestry approach to predicting a tree species' potential growth and health to soil/site conditions. Foresters use site index to decide which species to manage for in different site/soil conditions (ODNR Division of Forestry, 2015).

The output from a USI project is a Planting Plan that identifies planting spots in an area and prescribes particular species for small groups (i.e., 5 or 6 trees) on a street or location) to help optimize the number of trees planted, species diversity and likelihood of the trees prospering. This process can be started with a pilot project in a neighbourhood and then expanded to more areas if appropriate.

> ***RECOMMENDATION 4.6.1.a*** *The Town undertake an Urban Site Index Project to identify plantable tree locations and best species combinations in Town streets and parks*

New trees are required to be planted as part of the development process. A discussion about an alternative business model for tree planting and the need to modify the Town's existing engineering road cross sections to create ' tree habitat' are presented in the *SWOT Analysis* Section. 3.5.

> ***RECOMMENDATION 4.6.1.b*** *The Town amend its Tree Planting Design standards to specify that the wire basket be removed in its entirety at the time of tree planting*

4.6.2 Pruning

Three general pruning strategies are employed at different times over a tree's life:

(i) Training – primarily on young trees to increase structural strength and lower maintenance once the tree is mature,

(ii) Maintenance – primarily on mature trees to remove hazards and improve vigor; hazard pruning and deadwood pruning, and

(iii) Shaping (e.g., shaping the tree to provide clearances for utility lines, sidewalks, roads or buildings).

ANSI A300 Standards for Tree Pruning are voluntary industry consensus standards developed by the Tree Care Industry Association. They should be used to develop written specifications to provide the arborist with a clear set of industry standards.
https://www.standardsportal.org/usa_en/sdo/tcia.aspx

Every street and park tree should receive the appropriate pruning aspects of tree tending periodically through a Pruning Cycle. The pruning cycle is the number of years it takes to maintenance-prune all street [and park] trees using programmed maintenance (Miller, 1988). For example, applying a 10-year pruning cycle means one-tenth of the municipal trees would be pruned each year. Another benefit of adopting this approach is that the Town's tree inventory can also be updated at the same time thereby reducing or eliminating periodic expenses for inventory updates.

A Tree Inventory is required in order to subdivide the Town into working areas of equal annual workload and equal annual operating budgets (Miller, 1988). These areas could, in future, be referred to as "Forestry Zones" in a future Town Forestry Operations Manual. For example, Collingwood could be divided into 5 Forestry Zones, each zone requiring two years to complete the periodic pruning. This would result in a 10-year pruning cycle.

> ***RECOMMENDATION 4.6.2.a*** *The Town develop a Forestry Operations Manual*

The 2019 Tree Inventory assessed 9,078 Town trees in Collingwood. A 10-year pruning cycle over the 5 Forestry Zones would suggest that approximately 900 trees per year would be pruned. Considering the tree diameter distribution of the tree population, the estimated cost per year is shown in Table 4. 1and included in Section 6 (Operating and Financial Plan).

The estimated annual programmed tree maintenance-pruning expense is $41,360 using a grid-pruning strategy- Table 4. 1.

4.6.3 Tree and Stump Removals

At some point in an urban tree's life, it will be necessary to remove it safely. As the value of a tree and the services it provides increase as the tree matures, it is important to retain trees as long as possible before they are removed. Clearly trees should be removed when they become unacceptable risks as identified in a Tree Risk Management Program..

Procedures for stump removal should be included in the Forestry Operations Manual.

Table 4. 1 Estimated annual cost of maintenance pruning using a grid-pruning strategy on a 10-year cycle

Diameter Class (cm)	Pruning cost per tree	# trees	Total Estimated Cost
0-35	$ 50.00	4680	**$ 234,000.00**
36-51	$ 150.00	714	**$ 107,100.00**
52+	$ 250.00	541	**$ 135,250.00**
total		**5935**	**$ 476,350.00**
Estimated annual pruning cost per year (town)**			**$ 47,635.00**

** Assuming 10-year pruning cycle in urban areas on road allowances

4.6.4 Contingency Plans

Calamities of many sorts (e.g., ice storms and forest pests) can result in widespread tree damage and losses, and the need for quick response. Contingency Plans for such events are important to provide instruction for staff to organize necessary internal and external resources.

Contingency planning should be integrated with the Forestry Operations Manual and the Town's Emergency Response Plan to help ensure rapid tree maintenance treatments and service restoration. The document should outline policies and procedures in the event of a forestry storm event and function as both a tactical and operations document. A good example of an urban forestry emergency operations planning guide was funded by a grant from the United States Forest Service:

https://smarttreespacific.org/wp-content/uploads/UrbanForestry-EOP-Guide-printable-11-2013.pdf.

RECOMMENDATION 4.6.4.a *The Town create a Forestry Emergency Response Plan*

4.6.5 Operations Planning

The recommended Forest Operations Plan should include the schedule of operations over the year, considering the seasonal appropriateness of tasks and efficient use of staff and contracted resources. The core forestry cultural activities delivered for a municipality should consist of the following:

Removal - dead, dying and damaged trees present a corporate liability,
Pruning- hazard tree pruning takes priority over Programmed maintenance; however, programmed maintenance will reduce hazards and
Planting- if there are not sufficient funds to maintain existing trees at approved standards, funding for planting should be reallocated to maintenance.

An effective way to plan forestry operations over the year is to develop an annual task chart such as on that is shown in Figure 4. 2

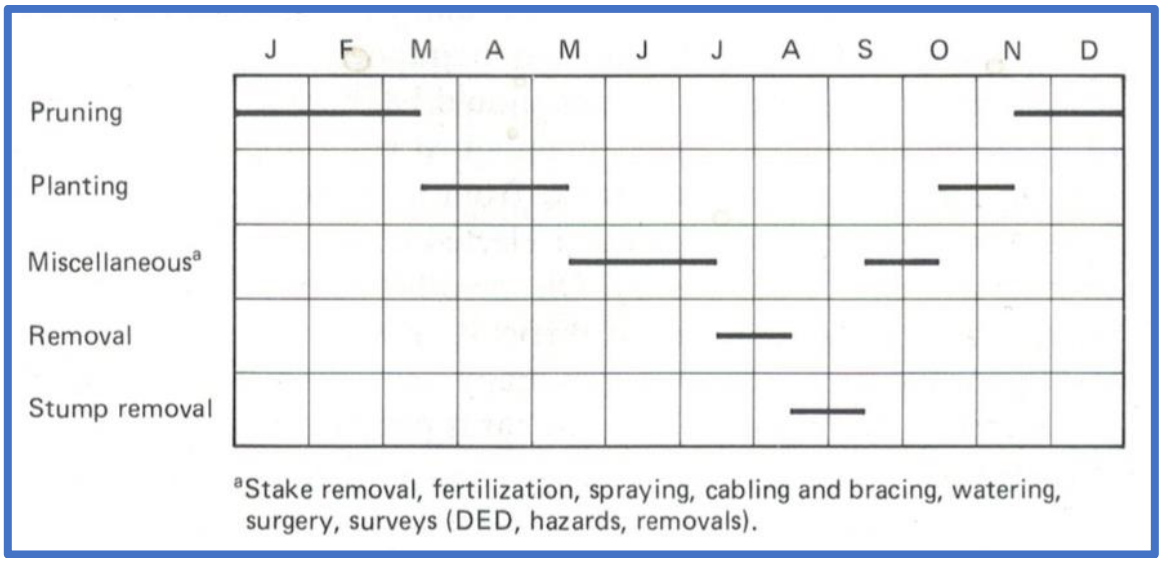

Figure 4. 2 Annual Task Scheduling for the City of Milwaukee Forestry Bureau (Miller, 1988)

The following minimum service standards for Forestry Services should be implemented as soon as the resources such as equipment and labour are in place:

- Pruning Cycle (Programmed Maintenance): 10 years
- Pruning Standard: specifications based on Approved American National Standard, ANSI A300

- Response Time (non-hazardous) pruning: a maximum of 3-4 months

To effectively implement this maintenance a new Urban Forestry Unit should be created as growth of the town progresses, with supporting infrastructure, including a bucket truck. It is anticipated this be scheduled during the 2025-2029 Operating Plan**.** Under the current Town structure this new Urban Forestry Unit would be within Public Works (Operations) Department.

> ***RECOMMENDATION 4.6.5.a*** *The Town create a new Urban Forestry Unit with supporting equipment infrastructure (i.e. a bucket truck)*

In addition to the operational responsibilities of pruning, planting, tree removal and stump removal, the expanded activities for this new Urban Forestry Unit would, over time, include administration/support of tree by-law(s) enforcement, development of corporate tree policies, technical review of trees for Municipal Consents; Road Occupancy permits etc.; technical review of tree protection plans (e.g., site plan, plan of subdivision); and representation on appropriate interdepartmental committees (e.g., Public Utilities Co-ordinating Committee and the Development Review Committee). The Urban Forestry Unit would also focus on developing relations with stakeholders and the public, and lead community tree events such as Arbour Day and National Tree Day.

A new Town Forester position would be a key part the Urban Forestry Unit, taking on a leadership role. The recommended professional designation for such a new position is covered in Section 3.5. Due to the size of the Forestry Unit it is anticipated this Town Forester position be filled on a part-time basis or contracted, at least at the outset. Under the current Town structure this Town Forester position would be report to Public Works.

> ***RECOMMENDATION 4.6.5.b*** *The Town create a new Town Forester position*

4.7 Trees, Green Infrastructure and Asset Management

4.7.1 Green Infrastructure

"Green Infrastructure" (GI), as defined in The City of Toronto's Official Plan refers to "natural and human-made elements that provide ecological and hydrological functions and processes" (Toronto, 2015). Examples of GI options that can be integrated into Green Streets include street trees, green walls, alternate energy sources (wind / solar), high efficiency lighting, Low Impact Development (LID) stormwater infrastructure and more.

In addition to supporting the environmental objectives of the *Toronto Green Standards*, Green Streets are designed to focus on the at-source treatment of stormwater runoff. Green Streets typically employ a 'treatment train' of Green Infrastructure options designed to function like a

natural drainage system by attenuating, filtering and infiltrating stormwater runoff as close as possible to where it is generated. Managing runoff in this manner can reduce or even eliminate part of all of a conventional (grey infrastructure) stormwater conveyance and management system. Green Streets help to build a city that is resilient to climate change and contributes to an improved quality of life. All layers of the urban tree canopy (i.e., leaves, branches and stems), cover the ground and perform critical ecological functions such as managing stormwater; reducing the urban heat island effect and air pollution and providing wildlife habitat.

Enhanced tree canopy also has an aesthetic value, improves quality of life and increases property values. Large canopy native species are preferred, and the most appropriate species are defined for a specific site application using the Vegetation Selection Tool." (*Green Streets Technical Guidelines*, City of Toronto, 2017). Implementation of Green Streets will also assist in addressing climate change adaptation challenges by:

- Helping reduce greenhouse gas emissions that contribute to climate change; and,
- Mitigating the effects of climate change by attenuating and infiltrating stormwater runoff.

The town's *Community Based Plan* established a performance indicator for tree Canopy in new developments and linked this to the *Urban Design Manual*. There is the potential to strengthen this work further by developing a science-based tree canopy target for Collingwod using the i-Tree Eco model (Recommendation 2.0.a) and support the development of new corporate policies supporting green infrastructure options. An example is the *Toronto Green Standard*: https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/.

4.7.2 An Asset Management Approach

Generally Accepted Accounting Practices (GAAP) generally do not account for natural features as a 'tangle asset' in the valuation of municipal property. Grey infrastructure depreciates in value over time such as roads, catch basins, sidewalks, park playground equipment whereas natural features or green infrastructure such as trees- appreciates in value over time.

The PSAB (Public Sector Accounting Board) made it mandatory for municipalities to report on tangle assets starting in 2009; after 5-6-year period, municipalities found huge deficits on maintaining these tangle assets and so began to use Federal Gas Tax funding. Municipalities needed an Asset Management Plan in place to get funding from the Province. The Town has inventoried its 'core' assets; i.e. roads, stormwater facilities, bridges and individual trees in streets and active parks.

In 2018, a new Ontario Regulation on Asset planning came into effect mandating that as of 2018, municipalities must show how their Capital & Operating funds are linked to their Asset Management Plan. However, there is a challenge with natural assets due to the fundamental issues with GAPP. Some communities such as York Region and Oakville have developed Municipal Asset Management Plans (MNAP) for their ecosystems. While the regulations do not

specifically mention trees, the trend is that trees will be "covered by PSAB in the future." (Personal Communication). The town's recently completed tree inventory will be available for any future PSAB-regulations regarding trees.

A CASE FOR FOREST HEALTH MONITORING

An all too familiar pattern repeats itself in Ontario municipalities with regards to the discovery of new, invasive forest species. A new threat goes undetected and therefore grows even larger - until the threat is 'accidentally' first discovered by a curious resident rather than by the experts. However, valuable time is lost to try and control the spread of this invasive forest species. Therefore, the local municipality finds itself in a reactive management position with fewer options to conserve tree canopy. Sound familiar? This pattern occurred in Ontario and other jurisdictions for two of the most serious invasive forest insects- Emerald Ash Borer and Asian Long-Horned Beetle.

There are 3 categories of invasive forest species that are threats in Canada: insects, diseases and plants explained on Tree Canada's web site: https://treecanada.ca/resources/tree-killers/

For a small fraction of what it actually costs to control the problem, municipalities who invest in a scheduled program to setup and regularly monitor for early signs of these 'tree killers' buy valuable time to respond. Depending on the region, the following examples of forest health monitoring Programs may be appropriate:

- Record pertinent information from permanent plots established in public woodland parks, on a 3-year schedule, for invasive plants; a simple report card on the woodland's 'health' can be generated from the data collected
- Sample host tree species in vulnerable neighbourhoods for signs of Asian Long-horned Beetle on an annual basis
- Establish a network of prism traps and conduct annual surveys to determine not only presence of but also to delimit and measure the change in the Emerald Ash Borer population over time and to support ash tree treatment Programs
- Initiate life-cycle specific sampling for indications that gypsy moth and canker worm are building in advance of historical, cyclical population increases
- Support volunteer-based forest health monitoring programs for local neighbourhoods
- Link with other Detection Networks such as the Ontario Invasive Plant Council

Source: Maryland Invasive Species Council

Figure 4. 3 A Case for Forest Health Monitoring

Managing all of these operations-based activities under a Physical Asset Management approach in accordance with the Town's Asset Management Strategy will help harmonize the management of the Town's green infrastructure with its grey infrastructure. Fundamental to this approach is a 'Life Cycle Management Strategy' which requires consideration for the planning, acquisition, installation, operation/management, and disposal of the municipal tree. Transitioning the management of the Town tree to this approach will improve service delivery efficiency. For some municipalities, this is particularly challenging given the Provincial context: insufficient regulatory framework contained in Ontario's Municipal Act regarding the public tree, specifically with regard to the lack of public tree maintenance regulations such as pruning cycles (Green Infrastructure Ontario Coalition): https://greeninfrastructureontario.org/resources/core-reading/#municipal-plans)

As discussed in Section 3.1.2 the Town has an *Asset Management Plan* for grey infrastructure that deals with the usual assets such as roads, water, buildings and equipment. However, there is no mention of green infrastructure (GI), and it was not in the Plan mandate to include it. The Town should include trees in its Corporate Asset Management Program to address this provincial trend.

> ***RECOMMENDATION 4.7.2.a*** *The Town update its Asset Management Strategy to include the public tree*

Once in place, the asset requires regular monitoring to ensure it is operating as designed. An example of this approach is Forest Health Monitoring, as described below:

> ***RECOMMENDATION 4.7.2.b*** *The Town develop a Forest Health Monitoring Program*

A well-rounded suite of urban forestry services balances the various Programs discussed to meet the needs of the community.

Figure 4. 4 Integrated Proactive Urban Forestry Management Program

5.0 Recommendations and Priorities

Recommendations were developed as the text for each section was being developed. Within each section, recommendations were labelled by the sub-section number plus and a letter. For example, the first recommendation in Section 3.4.1 is called Recommendation 3.4.1.a. the second in that sub-section would be called Recommendation 3.4.1.b. Recommendations were compiled into a summary that includes Recommendation #, page #, priority (Low, Medium, High, Urgent), time frame (i.e., year started, and year completed) and Agent (individuals, departments who would implement the recommendation) to form the Master List of Recommendations (Table 5.1).

Table 5.1 summarizes recommendations and relates recommendations back to the UFMP Guiding Principles and Goals (Sections 1.3 and 1.4 respectively). Estimated cost associated with each Recommendation is provided along with the priority and page reference. Recommendations from Tables 5.1 form the primary inputs into the two 5-year Operation Plans and the 10-year Financial Plan in Section 6.

Each Recommendation is related back to the UFMP Guiding Principles and Goals (Sections 1.3 and 1.4 respectively) in Table 5.1, which also provides page reference, priority and estimated cost, associated with each Recommendation. Recommendations from Tables 5.1 form the primary inputs into the two 5-year Operation Plans and the 10-year Financial Plan in Section 6.

Table 5. 1 Master list of recommendations (pg ref, priority, start/end yr, principle, goal, & cost estimate)

Recommendations/Action	Page #	Priority	Start Year	Year Complete	Agent	Guiding Principles	Goal	Estimated Cost ($)
1.0 – Purpose Vision Goals and Objectives	**vii**							
1.1.a: An Advisory Committee for the Urban Forest should be established that includes staff from all departments associated with tree establishment and management, with stakeholder representation.	**3**	**High**	**2024**	**On-going**	**Parks**	**1**	**8**	**in-house**
2.0 – Benefits of the Urban Forest	**5**							
2.0.a: undertake an i-Tree Eco Project to baseline & measure the form, function and value of the community's urban forest	**13**	**Medium**	**2021**	**2022**	**Parks & Public Works**	**3**	**2**	**$100,000**
2.0 b: undertake an i-Tree Hydro Project to assess the impact of tree canopy cover on stream flow	**13**	**Medium**	**2022**	**2023**	**Parks & Public Works**	**3**	**2**	**$35,000**
3.0 Methods used to assess the Urban Forest	**17**							
3.2.a: allocate additional funds for tree maintenance for the 2 neighbourhoods identified in the 2018 Windshield Survey with "Moderate-High" Maintenance Needs	**33**	**Medium**	**2020**	**2020**	**Public Works**	**2**	**3**	**$50,000**
3.3 – Staff Interviews Results, 3.4 -Criteria & Indicators	**39**							
3.3.1.a: establish Maintenance Standards for Town trees which includes a Clearance of 4.4 m (14.5') over the traveled portion of the public road allowance and 2.4 m (8') over public sidewalks	**39**	**Medium**	**2025**	**2025**	**Public Works**	**4**	**3**	**in-house**
3.3.1.b: Public Works prepare a Policy and Procedures covering customer service for town tree maintenance	**40**	**Medium**	**2025**	**2025**	**Public Works**	**6**	**8**	**in-house**
3.3.1.c: revise its Engineering Road Cross Section Standards, using Engineered Soils where appropriate, to incorporate a new Corporate Standard for minimum soil quantity and soil quality to support tree	**41**	**Medium**	**2021**	**2021**	**Engineering**	**5**	**10**	**in-house**

Recommendations/Action	Page #	Priority	Start Year	Year Complete	Agent	Guiding Principles	Goal	Estimated Cost ($)
3.3.1.d: develop a new Policy & Procedures covering tree protection in the Capital Construction process	41	Medium	2021	2021	Public Works	4	6	in-house
3.3.1.e: To ensure adequate tree stock quality review its Development Charges Study to consider creating a cash-in-lieu provision for town tree planting	41	Medium	2024	2024	Finance	2	7	in-house
3.3.1.f: create a Utilities Coordinating Committee and include representation from urban forestry	41	Medium	2024	2024	Public Works	2	8	in-house
3.3.1.g: develop a Private Tree Management Strategy	41	High	2021	2021	Planning	7	6	in-house
3.3.1.h: update Tree Preservation By-law 2012-084 and consider replacing it with two By-laws, one for private woodlands and one for private trees (not located in woodlands)	42	High	2021	2021	Planning	1	2	in-house
3.4.a: undertake an inventory of its municipally-owned woodlands	48	Medium	2022	2023	Parks	3	3	$50,000
3.4.b: The Urban Forest Advisory Committee should conduct a criteria and performance indicators (C&I) for sustainable urban forest management in the fifth year of each 5-year Operating Plan	48	Medium	2024	2024	Parks	4	4	in-house
3.5 SWOT Analysis – Strengths, Weaknesses, Opportunities Threats	48							
3.5.a: Retain a Registered Professional Forester with urban forestry expertise to assist with planning, policy and regulatory issues.	51	Medium	2020	2022	Public Works	1	5	$15,000
3.5.b: review its Official Plan to develop new policies that support the urban forest	52	High	2020	2020	Planning	2	1	in-house
3.5.c: update the Subdivision Agreement to include the requirement that the Developer, as a condition of Subdivision Approval, submit to for approval, a tree and woodland inventory, including all attributes required to be collected, for all the street and active Town trees as well as for Woodland properties in each new property acquired by in a digital format specified by	53	Medium	2021	2021	Engineering	2	3	in-house

Recommendations/Action	Page #	Priority	Start Year	Year Complete	Agent	Guiding Principles	Goal	Estimated Cost ($)
1.0 – Purpose Vision Goals and Objectives …coninued	**vii**							
3.5.d: Prior to assumption, the developer submit to an Arborist report that identifies and subsequently confirms all hazardous tree issues near property lines, trails and other facilities have been completed to 's satisfaction	**53**	**Medium**	**2021**	**2021**	**Planning & Public Works**	**4**	**4**	**in-house**
3.5.e: budget adequate provisions to retain arborist consulting services to assist staff administer By-law 2016-040 as amended	**56**	**High**	**2020**	**2024**	**By-law**	**2**	**5**	**$20,000**
3.6.1a : As Norway and the silver/red/Freeman Maple species each make up greater than 10% of 's Street and Park Tree population, future emphasis should be placed on planting other species to diversify the tree population and improve its resilience to disease and climate change.	**58**	**Medium**	**2020**	**On-going**	**Parks & Public Works**	**5**	**4**	**in-house**

Table 5.1 Cont'd. Master list of recommendations by page, priority, start year, year complete, applicable guiding principle and goals, and estimated cost (continued)

Recommendations/Action	Page #	Priority	Start Year	Year Complete	Agent	Guiding Principles	Goal	Estimated Cost ($)
4.0 Moving Forward	**73**							
4.1.2.a: adopt an integrated inventory/work order management system that updates the inventory as work is completed	73	High	2021	2021	Asset Management	1	7	n/a
4.2.a: re-assess Canopy Cover estimates conducted in 2008 and 2012 using i-Tree Canopy to enable direct comparisons among years and track change over time	74	Lower	2021	2021	Planning	3	2	$10,000
4.2.b: conduct future Canopy Cover analyses in 2024 or other years using i-Tree Canopy to enable direct comparisons among years and track change over time	74	Medium	2024	2024	Planning	3	2	$5,000
4.2.c: Analyze canopy cover within land use types to help maintain or increase Canopy Cover by identifying areas where there are high proportions of plantable spaces or where more emphasis should be placed on tree retention.	75	Medium	x	x	Planning, Parks & Public Works	3	2	$10,000
4.4.a: During the development planning process, should identify existing or potential linkages among habitats on the subject land and nearby properties and acquire important features for Town parkland, or otherwise protect them	76	Medium	2020	On-going	Planning	1	4	in-house
4.4.b: undertake a Naturalization Program for developed parkland adjoining or linking natural habitats using native plants, and naturalize landscaped patches for natural habitat	77	Lower	2025	On-going	Parks	1	4	in-house
4.4.c: Initiate a Communications Program regarding the importance of linkages/connectivity among natural systems, the use of native plants in landscaping and naturalization.	77	Lower	2025	On-going	Parks & Planning	6	9	in-house

Recommendations/Action	Page #	Priority	Start Year	Year Complete	Agent	Guiding Principles	Goal	Estimated Cost ($)
4.5.a: Begin a Comprehensive Policy Review regarding all aspects of the Urban Forest and its Management, including but not limited to development and construction, tree protection policy and regulations, tree compensation and shading for areas where public congregates.	78	High	2020	On-going	Planning	2	1	in-house
4.6.a: develop a Master Street & Park tree Manual to create a diverse and resilient tree population	78	Medium	2021	2021	Public Works	4	7	in-house
4.6.b: review its Development Charges Study to reflect full cost accounting for the public tree	79	Medium	2020	2020	Finance	1	5	in-house
4.6.c: develop an Operations Safety Manual for Forestry Operations	79	Lower	2025	2025	Public Works	4	3	in-house
4.6.1.a: undertake an Urban Site Index Project to identify plantable tree locations and best species combinations in Town streets and parks	80	Medium	2022	2022	Public Works	4	7	$25,000
4.6.1.b: amend its Tree Planting Design standards to specify that the wire basket be removed in its entirety at the time of tree planting	80	Lower	2020	2020	Public Works	4	3	in-house
4.6.2.a: develop a Forestry Operations Manual	81	Medium	2024	2024	Public Works	4	3	in-house
4.6.4.a: create a Forestry Emergency Response Plan	83	Medium	2023		Public Works	4	4	in-house
4.6.5.a: create a new Urban Forestry Unit with supporting equipment infrastructure (i.e., bucket truck)	84	High	2021	2021	Public Works	1	7	$600,000
4.6.5.b: create a new Town Forester position	84	High	2021	2021	Public Works	1	7	$4,000
4.7.2.a: update its Asset Management Strategy to include the public tree	87	High	2021	2021	Finance	2	1	in-house
4.7.2.b: develop a Forest Health Monitoring Program	87	Medium	2024	2024	Public Works	3	4	$10,000

Recommendations/Action	Page #	Priority	Start Year	Year Complete	Agent	Guiding Principles	Goal	Estimated Cost ($)
6.0 Operating & Financial Plans	**97**							
6.1.a: the Urban Forestry Unit prepare an Annual Operating Plan for the upcoming fiscal year during the preparation of the Corporate Annual Operating & Capital Budget to ensure the priorities identified in the current 5-Year Operating Plan are being achieved and/or revised as needed	**99**	**High**	**2021**	**On-going**	**Public Works**	**1**	**5**	**in-house**
6.2.a: implement the 10-year Financial Plan to establish an Urban Forestry Unit including the costs to replant/plant, maintain and remove municipal trees	**105**	**High**	**2020**	**2029**	**Various Dept.'s**	**1**	**5**	**in-house**

6.0 Operating (Action) Plans and Financial Plan

A common approach, in municipal urban forest management plans, focuses on the following four questions: (1) What do we want?; (2) What do we have?; (3) How do we get what we want?;(4) Are we getting what we want? Collingwood's UFMP, to this point, has addressed these 4 questions in detail. This common approach should be refined by adding a strategic approach. Why? What if we viewed the UFMP "…as way to position or reposition the services provided by Town's new Urban Forestry Unit for greater impact, greater influence and greater accomplishments?"

In a municipal forestry context, positioning refers to the place the Forestry Program occupies in the minds of decision-makers and the public. Repositioning means linking what attributes the Forestry Unit possesses to what community problems it can solve or community issues it can address." (personal communication, Dr. P. Ries, MFI, 2019). What would this Plan look like if that was the objective? The SWOT analysis re-affirmed that for many municipalities in Ontario, trees are perceived as relatively lower in the corporate hierarchy of municipal services, largely, because the Public Sector Accounting Board does not require municipalities to report on their trees. How might re-positioning be applied to municipalities such as Collingwood?

Support for this process can be found through The Society of Municipal Arborists' (SMA) leadership-training course called the Municipal Forestry Institute (MFI). MFI teaches how to undertake a repositioning process to focus the municipal Urban Forestry Unit on these 4 strategic-based questions: (1) Where do we want to go and why?; (2) What do we have to contribute?; (3) What community problems can we help solve?; (4) How do we get what we want? Figure 6. 1and Figure 6. 2 illustrate this approach.

Figure 6. 1 Planning to Reposition Forestry services for greater ability to serve the community

This strategic approach aligns the services provided by the Town's Urban Forestry Unit with Community issues and problems that trees can help solve. A good starting point is outlined in Section 2 which demonstrates that 'peer-reviewed scientific literature has reached a critical mass proving that trees support healthy communities.' (Dr. K. Wolf, 2018)

An example of how this works occurred during the development of this Plan. Public Works (Engineering) staff were introduced by W&A to engineered soils and the benefits of reviewing the Town's Engineering Standards, in order to install trees in appropriate locations that are engineered to increase the capacity to retain stormwater and improve water quality while greatly improving forest canopy. This example helps provide answers to the questions generated through applying the strategic approach:

1. **Where do we want to go and why?**
   Trees are part of municipal green infrastructure and require inclusion in the Corporate Asset Management Strategy which will reduce the long-term maintenance costs for Public Works

2. **What do we have to contribute**?
   Trees support:
   - Environmental Health, through Water and Air Quality & Greenhouse Gas Emissions;
   - Economic Prosperity through Diversify and increases a Resilient Economy and Infrastructure;
   - Social Wellbeing through efficiencies in Transportation

3. **What problems can we solve**?
   Environmental degradation, economic decline and human health concerns

4. **How do we get what we want?**
   By realigning our planning components and making connections to issues and people and communicating effectively as illustrated below:

6.1 Operating (Action) Plans 2020-2029

The common approach and the strategic approach were blended in order to develop two 5-Year Operating Plans. Each Plan contains a prioritized list of Recommendations developed in Section 5. Each 5-Year Operating Plan is intended to be referred to by staff when preparing their Forestry Annual Operating Plan, as part of the corporate annual Operating and Capital Budget submission process, with adjustments to priorities as required.

> ***RECOMMENDATION 6.1.a*** *the Urban Forestry Unit prepare an Annual Operating Plan for the upcoming fiscal year during the preparation of the Corporate Annual Operating & Capital Budget to ensure the priorities identified in the current 5-Year Operating Plan are being achieved and/or revised as needed*

The most demanding recommendations of the UFMP include fundamental changes that affect the human and physical infrastructure required to effectively and safely manage the urban forest. It is recommended that these changes are implemented within the first three years of the first Operating Plan. Recommended policy changes such as those that affect tree retention or planting during construction or development have more flexibility and require less resources to implement. Financial aspects are provided in Section 6.2.

6.1.1 2020-2024 Operating Plan

The first 5-Year Operating Plan (OP1) for the period 2020-2024 (Table 6.1) will start the Town of Collingwood on a path to creating and re-positioning the Urban Forestry Unit. Below are significant initiatives will set the groundwork and infuse energy into this phase:

(1) Create a new Town Forester position (Recommendation 4.6.5.b) to lead the newly-established Urban Forestry Unit (Recommendation 4.6.5.a) to implement the UFMP in the Public Works (Operations) Department. This position would also provide supporting expertise to other Departments whose activities affect town trees; including Parks, Planning/Development Review and Public Works (Engineering)

(2) Begin conducting tree maintenance in the 2 neighbourhoods with higher maintenance needs and mitigating identified risks (Recommendation 3.2.a). '(3) Link the Tree Inventory with Operations by acquiring and using an integrated Work Order Management System that updates the Inventory as work is conducted (Recommendation 4.1.2.a).

(4) Conduct a Town Woodlands Inventory (Recommendation 3.4.a) to provide management guidance.

(5) Update the Corporate Asset Management Strategy to include the public tree *(Recommendation 4.7.2.a)*

(6) Conduct a comprehensive policy review *(Recommendation 4.5.a*) including the Development Charges Study, development and construction , tree protection policies and regulation , Compensation Policies etc.

These actions will help to fundamentally improve how the urban forest is managed.

The second 5-Year Operating Plan (OP2) is for the period 2025-2029 (Table 6.2). As the major strategic recommendations were begun or completed in the first Operating Plan (OP), the recommend activities are to carry on and refine the activities from OP1. Many of the policy recommendations may take time to implement, depending on staff or financial resources. While a timeframe is proposed, it is expected that some of these items from OP1 will be carried over to OP2.

As Annual Operating Plans are prepared for the next year, progress in achieving activities in the current OP is assessed. Progress in achieving goals and objectives will include work completed and changing conditions and should be incorporated into updates of OPs and Financial plans as required.

Figure 6. 2 Repositioning" Forestry services for greater ability to serve the Community. (Source: Municipal Forestry Institute, 2019)

Table 6. 1 5-Year Operating Plan for Collingwood UFMP: 2020- 2024

Rec. #	Recommendation/Action (Abridged)	2020	2021	2022	2023	2024
	HIGH PRIORITY - Operations / Urban Forest Management					
4.1.2.a	*Adopt a Tree Inventory/work order management system.*	**Start**				
1.1.a	*Establish Urban Forest Advisory Committee including departments associated with tree establishment and management.*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.6.5.a	*Create a new Urban Forestry Unit with supporting equipment infrastructure (i.e., bucket truck)*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.6.5.b	*Create a new Town Forester position*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
6.1.a	*The Urban Forestry Unit prepare an Annual Operating Plan for the upcoming fiscal year*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
6.2.a	*Implement the 10-year Financial Plan to establish an Urban Forestry Unit.*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
	Policy, Planning & Development					
4.5.a	*Should begin a Comprehensive Policy Review regarding all aspects of the Urban Forest and its Management,*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
3.5.b	*Review its Official Plan to develop new policies that support the urban forest*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
3.3.1.h	*Update Tree Preservation By-law 2012-084.*	**Start**	**Complete**			
3.3.1.g	*Develop a* Private Tree Management Strategy	**Start**	**Ongoing**	**Complete**		
3.5.e	*Budget to retain arborist consulting services to help administer By-law 2016-040.*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.7.2.a	*Update its Asset Management Strategy to include the public tree*	**Start**	**Ongoing**	**Complete**		
	MEDIUM PRIORITY - Operations / Urban Forest Management					
3.6.1.a	*Reduce proportions of Norway and silver/red maples to help diversify the tree population .*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
3.5.a	*Retain a Registered Professional Forester (urban) to assist with planning, policy and regulatory issues*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
2.0.a	*Undertake an i-Tree Eco Project to assess the form, function and value of the urban forest*					**Complete**
2.0.b	*Undertake an i-Tree Hydro Project to assess effects of tree canopy cover on stream flow*				**Complete**	
4.6.1.a	*Conduct an Urban Site Index Project to develop planting plans for street and park trees.*	**Start**	**Ongoing**	**Complete**		**Complete**
3.2.a	*Allocate funds for tree maintenance for 2 areas with "Moderate-High" Maintenance Needs*	**Start**	**Complete**			
3.3.1.a	*Establish Tree Maintenance Standards for Clearances road allowances and sidewalks*	**Start**	**Complete**			
3.3.1.b	*Prepare a Policy and Procedures covering customer service for town tree maintenance*	**Start**	**Complete**			
3.4.a	*Undertake an inventory of its municipally-owned woodlands*			**Start**	**Complete**	
4.7.2.b	*Develop a Forest Health Monitoring Program*		**Start**	**Ongoing**	**Ongoing**	**Ongoing**
4.6.a	*Develop a Master Street & Park tree Manual to create a diverse and resilient tree population*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.6.b	*Review Development Charges Study to reflect full cost accounting for the public tree*	**Start**	**Complete**			
4.6.4.a	*Create a Forestry Emergency Response Plan*					
4.2.b	*Conduct future Canopy Cover analyses using i-Tree Canopy to monitor changes in CC.*					**Complete**
4.2.c	*Analyze Canopy Cover data by land use type to ID areas for focus on planting or retaining trees*			**Complete**		
3.4.b	*Conduct a Criteria and Indicators (C&I) assessment in the fifth year of each 5-year OP*					**Complete**

Continued..Table 6. 1 5-Year Operating Plan for Collingwood UFMP: 2020- 2024

Rec. #	Recommendation/Action (Abridged)	2020	2021	2022	2023	2024
	Medium PRIORITY - Operations / Urban Forest Management continued					
4.6.2.a	***Develop a Forestry Operations Manual***	**Start**	**Ongoing**	**Complete**		
	Policy, Planning & Development					
3.3.1.c	*Revise Engineering Road Cross Section to require minimum soil quantity and quality for trees.*			**Start**	**Complete**	
3.3.1.d	*Develop new Policy & Procedures covering tree protection in the Capital Construction process*		**Start**	**Complete**		
3.3.1.e	*Review Dev. Charges & consider cash-in-lieu for planting to ensure proper tree establishment*		**Start**	**Complete**		
3.5.c	*Update the Subdivision Agreement to require a tree and woodland inventory to Town standards as a condition of Approval*		**Start**	**Complete**		
3.3.1.f	*Establish a Utilities Coordinating Committee, including representation from urban forestry*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
3.5.d	*Prior to assumption of development, require an Arborist report confirming resolution of all hazard tree issues.*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
	Health, Natural Environment & Climate Change					
4.4.a	*During the development process, identify existing or potential linkages among habitats*	**Start**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
	LOWER PRIORITY -					
	Operations / Urban Forest Management		**Start**	**Complete**		
4.2.a	*Re-assess Canopy Cover estimates conducted in 2008 and 2012 using i-Tree Canopy*		**Start**	**Complete**		
4.6.1.b	*Amend its Tree Planting Design to remove wire basket at time of planting*		**Start**	**Complete**		
4.6.c	*Develop an Operations Safety Manual for Forestry Operations*		**Start**	**Complete**		
	Health, Natural Environment & Climate Change					
4.4.b	*Undertake a Naturalization Program for parkland adjoining or linking natural habitats*		**Start**	**Ongoing**	**Ongoing**	**Ongoing**
4.4.c	*Initiate a Communications Program Re. natural landscaping and linkages to natural systems*		**Start**	**Ongoing**	**Ongoing**	**Ongoing**

Table 6. 2. 5-Year Operating Plan for Collingwood UFMP: 2025- 2029

Rec. #	Recommendation/Action (Abridged)	2025	2026	2027	2028	2029
	HIGH PRIORITY - Operations / Urban Forest Management					
4.1.2.a	*Adopt a Tree Inventory/work order management system.*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
1.1.a	*Establish Urban Forest Advisory Committee including departments associated with tree establishment and management.*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.6.5.a	*Create a new Urban Forestry Unit with supporting equipment infrastructure (i.e., bucket truck)*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.6.5.b	*Create a new Town Forester position*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
6.1.a	*The Urban Forestry Unit prepare an Annual Operating Plan for the upcoming fiscal year*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
6.2.a	*Implement the 10-year Financial Plan to establish an Urban Forestry Unit.*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
	Policy, Planning & Development					
4.5.a	*Should begin a Comprehensive Policy Review regarding all aspects of the Urban Forest and its Management,*					
3.5.b	*Review its Official Plan to develop new policies that support the urban forest*					
3.3.1.h	*Update Tree Preservation By-law 2012-084.*					
3.3.1.g	*Develop a* Private Tree Management Strategy					
3.5.e	*Budget to retain arborist consulting services to help administer By-law 2016-040.*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.7.2.a	*Update its Asset Management Strategy to include the public tree*					
	MEDIUM PRIORITY - Operations / Urban Forest Management					
3.6.1.a	*Reduce proportions of Norway and silver/red maples to help diversify the tree population .*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
3.5.a	*Retain a Registered Professional Forester (urban) to assist with planning, policy and regulatory issues*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
2.0.a	*Undertake an i-Tree Eco Project to assess the form, function and value of the urban forest*					
2.0.b	*Undertake an i-Tree Hydro Project to assess effects of tree canopy cover on stream flow*					
4.6.1.a	*Conduct an Urban Site Index Project to develop planting plans for street and park trees.*					
3.2.a	*Allocate funds for tree maintenance for 2 areas with "Moderate-High" Maintenance Needs*					
3.3.1.a	*Establish Tree Maintenance Standards for Clearances road allowances and sidewalks*					
3.3.1.b	*Prepare a Policy and Procedures covering customer service for town tree maintenance*					
3.4.a	*Undertake an inventory of its municipally-owned woodlands*					
4.7.2.b	*Develop a Forest Health Monitoring Program*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.6.a	*Develop a Master Street & Park tree Manual to create a diverse and resilient tree population*					
4.6.b	*Review Development Charges Study to reflect full cost accounting for the public tree*					
4.6.4.a	*Create a Forestry Emergency Response Plan*					
4.2.b	*Conduct future Canopy Cover analyses using i-Tree Canopy to monitor changes in CC.*					
4.2.c	*Analyze Canopy Cover data by land use type to ID areas for focus on planting or retaining trees*					
3.4.b	*Conduct a Criteria and Indicators (C&I) assessment in the fifth year of each 5-year OP*					**Complete**
4.6.2.a	*Develop a Forestry Operations Manual*					
	Policy, Planning & Development					
3.3.1.c	*Revise Engineering Road Cross Section to require minimum soil quantity and quality for trees.*					
3.3.1.d	*Develop new Policy & Procedures covering tree protection in the Capital Construction process*					
3.3.1.e	*Review Dev. Charges & consider cash-in-lieu for planting to ensure proper tree establishment*					

Rec. #	Recommendation/Action (Abridged)	2025	2026	2027	2028	2029
3.5.c	*Update the Subdivision Agreement to require a tree and woodland inventory to Town standards as a condition of Approval*					
3.3.1.f	*Establish a Utilities Coordinating Committee, including representation from urban forestry*					
3.5.d	*Prior to assumption of development, require an Arborist report confirming resolution of all hazard tree issues.*					
	Health, Natural Environment & Climate Change					
4.4.a	*During the development process, identify existing or potential linkages among habitats*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
	Table 6.2. LOWER PRIORITY -					
	Operations / Urban Forest Management					
4.2.a	*Re-assess Canopy Cover estimates conducted in 2008 and 2012 using i-Tree Canopy*					
4.6.1.b	*Amend its Tree Planting Design to remove wire basket at time of planting*					
4.6.c	*Develop an Operations Safety Manual for Forestry Operations*					
	Health, Natural Environment & Climate Change					
4.4.b	*Undertake a Naturalization Program for parkland adjoining or linking natural habitats*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**
4.4.c	*Initiate a Communications Program Re. natural landscaping and linkages to natural systems*	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**	**Ongoing**

6.2 Financial Plan 2020-2029

This Financial Plan is linked with the two 5-year Operating Plans from Section 6.1. This section provides the financial aspects associated with implementing recommendations.

The Financial Plan is illustrated in Table 6.3, with costs identified new staff or expenses associated with implement the recommendations/actions from the OPs. Table 6.2 does not include costs associated with existing staff or infrastructure. There are many items where no cost has been provided, such as revising policy documents.

The most significant costs are associated with modifications to infrastructure that will enable more effective management of the town's urban forest. These include creating the Town Forester staff position and a new Urban Forestry business unit and completing the Tree Inventory for the town Woodland properties. Additional costs will come from increased levels of tree maintenance.

Recommendation 6.2.a: *The Town implement the 10-year financial plan to establish an Urban Forestry Unit including the costs to replant/plant, maintain and remove municipal trees*

Table 6. 3 10-year Financial Plan for Collingwood Urban Forest Management Plan : 2020-2029

Rec. #	Recommendation/Action	2020	2021	2022	2023	2024	2020 to 2024 Subtotal	2025	2026	2027	2028	2029	2025 to 2029 Subtotal	10--year TOTAL
	HIGH PRIORITY -													
	Operations / Urban Forest Management													
4.1.2. a	*Adopt a Tree Inventory/work order management system.*	$ 6,000	$3,000	$3,000	$3,000	$3,000	$ 18,000	$ 3,500	$ 3,500	$3,500	$3,500	$3,500	$ 17,500	$ 35,500
1.1.a	*Establish Urban Forest Advisory Committee including departments associated with tree establishment and management.*				In House		$ -						$-	$ -
4.6.5. a	*Create a new Urban Forestry Unit*	In House					$ -						$-	$ -
	Purchase and maintain a new/used Bucket Truck for muniicpal tree maintenance	$ 500,000	$20,000	$20,000	$20,000	$ 20,000	$ 580,000	$ 20,000	$20,000	$20,000	$20,000	$20,000	$100,000	$680,000
4.6.5. b	*Create a new Town Forester position*		$70,000	$ 110,000	$ 110,000	$110,000	$ 400,000	$113,300	$116,699	$ 120,200	$ 123,806	$ 127,520	$601,525	$ 1,001,525
6.1.a	*The Urban Forestry Unit prepare an Annual Operating Plan for the upcoming fiscal year*	In House					$ -						$-	$ -
6.2.a	*Implement the 10-year Financial Plan to establish an Urban Forestry Unit.*	In House					$ -						$-	$ -
	Policy, Planning & Development						$ -						$-	$ -
4.5.a	***Should begin a Comprehensive Policy Review regarding all aspects of the Urban Forest and its Management,***	In House					$ -						$-	$ -
3.5.b	*Review its Official Plan to develop new policies that support the urban forest*	In House					$ -						$-	$ -

Rec. #	Recommendation/Action	2020	2021	2022	2023	2024	2020 to 2024 Subtotal	2025	2026	2027	2028	2029	2025 to 2029 Subtotal	10--year TOTAL
3.3.1.h	*Update Tree Preservation By-law 2012-084.*	$15,000					$ 15,000						$-	$15,000
3.3.1.g	*Develop a* Private Tree Management Strategy		$30,000	$30,000			$ 60,000						$-	$60,000
3.5.e	*Budget to retain arborist consulting services to help administer By-law 2016-040.*		In House				$ -		In House				$-	$ -
4.7.1.a	*Update its Asset Management Strategy to include the public tree*	In House					$ -						$-	$ -
	MEDIUM PRIORITY -						$ -						$-	$ -
	Operations / Urban Forest Management						$ -						$-	$ -
3.6.1.a	*Reduce proportions of Norway and silver/red maples to help diversify the tree population .*	In House					$ -						$-	$ -
3.5.a	*Retain a Registered Professional Forester (urban) to assist with planning, policy and regulatory issues*	$20,000	$20,000				$ 40,000						$-	$40,000
2.0.a	*Undertake an i-Tree Eco Project to assess the form, function and value of the urban forest*					$ 110,000	$ 110,000						$-	$ 110,000
2.0.b	*Undertake an i-Tree Hydro Project to assess affects of tree canopy cover on stream flow*				$35,000		$ 35,000						$-	$35,000
4.6.1.a	*Conduct an Urban Site Index Project to develop planting plans for street and park trees.*	$10,000	$10,000	$10,000			$ 30,000						$-	$30,000
3.2.a	*Allocate funds for tree maintenance for 2 areas with "Moderate-High" Maintenance Needs*	$20,000	$20,000	$20,000			$ 60,000						$-	$60,000
3.3.1.a	*Establish Tree Maintenance Standards for Clearances road allowances and sidewalks*		In House				$ -						$-	$ -
3.3.1.b	*Prepare a Policy and Procedures covering customer service for town tree maintenance*		In House				$ -						$-	$ -
3.4.a	*Undertake an inventory of its municipally-owned woodlands*		$20,000				$ 20,000						$-	$20,000
4.7.1.b	*Develop a Forest Health Monitoring Program*		$10,000		$5,000		$ 15,000	$ 5,000		$5,000		$5,000	$ 15,000	$30,000

Rec. #	Recommendation/Action	2020	2021	2022	2023	2024	2020 to 2024 Subtotal	2025	2026	2027	2028	2029	2025 to 2029 Subtotal	10--year TOTAL
4.6.a	*Develop a Master Street & Park tree Manual to create a diverse and resilient tree population*			In House			$ -						$-	$ -
4.6.b	*Review Development Charges Study to reflect full cost accounting for the public tree*		In House				$ -						$-	$ -
4.6.4.a	*Create a Forestry Emergency Response Plan*		In House				$ -						$-	$ -
4.2.b	*Conduct future Canopy Cover analyses using i-Tree Canopy to monitor changes in CC.*				$10,000		$ 10,000				$10,000		$ 10,000	$20,000
4.2.c	*Analyze Canopy Cover data by land use type to ID areas for focus on planting or retaining trees*			$10,000		In House	$ 10,000						$-	$10,000
3.4.b	*Conduct a Criteria and Indicators (C&I) assessment in the fifth year of each 5-year OP*					In House	$ -					In House	$-	$ -
4.6.2.a	*Develop a Forestry Operations Manual*			In House			$ -						$-	$ -
	Policy, Planning & Development						$ -						$-	$ -
3.3.1.c	*Revise Engineering Road Cross Section to require minimum soil quantity and quality for trees.*			In House			$ -						$-	$ -
3.3.1.d	*Develop new Policy & Procedures covering tree protection in the Capital Construction process*			In House			$ -						$-	$ -
3.3.1.e	*Review Dev. Charges & consider cash-in-lieu for planting to ensure proper tree estabalishment*		In House				$ -						$-	$ -
3.5.c	*Update the Subdivision Agreement to require a tree and woodland inventory to Town standards as a condition of Approval*			In House			$ -						$-	$ -
3.3.1.f	*Establish a Utilities Coordinating Committee, including representation from urban forestry*	In House					$ -		In House				$-	$ -
3.5.d	*Prior to assumption of development, require an Arborist report confirming resolution of all hazard tree issues.*	In House					$ -						$-	$ -
	Health, Natural Environment & Climate Change						$ -						$-	$ -
4.4.a	*During the development process, identify existing or potential linkages among habitats*	In House					$ -						$-	$ -

Rec. #	Recommendation/Action	2020	2021	2022	2023	2024	2020 to 2024 Subtotal	2025	2026	2027	2028	2029	2025 to 2029 Subtotal	10--year TOTAL
	LOWER PRIORITY -						$ -						$-	$ -
	Operations / Urban Forest Management						$ -						$-	$ -
4.2.a	*Re-assess Canopy Cover estimates conducted in 2008 and 2012 using i-Tree Canopy*		$12,000				$ 12,000	In House					$-	$12,000
4.6.1. b	*Amend its Tree Planting Design to remive wire basket at time of planting*			In House			$ -						$-	$ -
4.6.c	*Develop an Operations Safety Manual for Forestry Operations*	In House					$ -						$-	$ -
	Health, Natural Environment & Climate Change						$ -						$-	$ -
4.4.b	*Undertake a Naturalization Program for parkland adjoining or linking natural habitats*	$ 10,000	$ 10,000	$10,000	$10,000	$ 10,000	$ 50,000	$10,000	$ 10,000	$ 10,000	$10,000	$10,000	$ 50,000	$100,000
4.4.c	*Initiate a Communications Program Re. natural landscaping and linkages to natural systems*	In House					$ -						$-	$ -
	Cost to Implement the First 5-Year Operating Plan: 2020-2024	$ 581,000	$ 225,000	$ 213,000	$ 193,000	$ 253,000	**$ 1,465,000**							
	Cost to Implement the Second 5-Year Operating Plan: 2025-2029							$ 151,800	$ 150,199	$ 158,700	$ 167,306	$ 166,020	**$794,025**	
	TOTAL COST 2020-2029:													**$ 2,259,025**

7.0 References

Clark, JR, NP Matheny, G Cross and V Wake,1997. *A Model of Urban Forest Sustainability*. J Arboriculture 23(1): 17-30.

Collingwood 2015. *Community Based Strategic Plan*.

Grey, G and FJ Deneke, 1978. *Urban Forestry*. Wiley, 279 p.

Jorgensen, E, 1974. *Towards an urban forestry concept: Proceedings of the 10th Commonwealth Forestry Conference*. Ottawa, Canada; Forestry Service.

Kenney, AW, PJE van Wassenaer, and AL Satel, 2011. *Criteria and Indicators For Strategic Urban Forest Planning And Management.* J Arboriculture & Urban Forestry 2011.37(3): 108-117

McKeen, J. and K. Wolf, 2018, *City Trees Public Health: Diverse Benefits, Diverse Beneficiaries*. University of Washington presentation at the International Urban Forestry Conference, Vancouver, B.C.
http://www.naturewithin.info/Talks/2018.10.Int_Urban_Forestry.Human_Health.Vancouver.pdf

Miller, RW, 1988. *Urban Forestry: Planning and Managing Urban Greenspaces*. University of Michigan/Prentice Hall. 404 p.

Ries, P., Hauer, R., & Peterson, W, 2016. *Systematic management of the urban forest*. Arborists News 25 (3), 46-49

APPENDIX 1A: External Stakeholders Meeting Survey on Forest Strategy and Management Plan Results

VISION STATEMENT

The Vision Statement reflects the desired outcomes of successful implementation of the strategy and plan. It was developed in consultation with the Project Team to meet the needs of the Town for Town-owned trees and forests.

Proposed Vision Statement:

The Town of Collingwood values the urban forest and its contribution to the liveability of our community. In addition to the environmental, social, aesthetic and economic benefits of the urban forest the Town recognizes the importance trees have on health, quality of life, tourism and recreation and green infrastructure. The Town is committed to sustainable management of the urban forest as well as supporting community action and stewardship to maintain, renew and enhance this natural resource for future generations.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
External Stakeholders Meeting	3	1			

Comments: - Public space is preference [I can live with it].

GUIDING PRINCIPLES

Guiding Principles are intended to guide the development of the urban forest strategy, management plan and implementation of the plan. They are statements that represent best practices in the urban forest.

Principles Apply to:
All trees on Town property including roads, parks, and trails.

Principles Do Not Apply to:
All trees on private property
Opportunities that are outside the strategy and management plan will require approval by Council through a staff report

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	2	***1***			***1***

Comments: - At the onset you need to plan for protection and management of trees plotted on private land. Trails need also address connectivity with Provincial and Federal land as well [I fundamentally disagree].
- Public property only [I agree].
- Like the idea of some connection/protection of private trees [I can live with it].

1. The Town strives to manage the urban forest in a sustainable and fiscally responsible manner

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3	**1**			

Comments: - Simply doing the UFMP proves this statement [I agree]
- [changed "urban forest" to "public urban forest"] [can live with it]

Appendix 1a. External Stakeholders Meeting. Survey results continued

2. Trees are green infrastructure and managed as part of an Integrated Asset Framework.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3				*1*

Comments: - Most municipalities see trees as problematic items that reduce the effectiveness of traffic patterns and snow removal [I fundamentally disagree].
- On public properties [I agree].

3. Town trees should be monitored regularly and maintained in a healthy, safe condition using good cultural practices.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3	*1*			

Comments

4. Town trees are maintained according to arboricultural best practices (e.g., ANSI A300, ISA).

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	2	*1*	*1*		

Comments: - As long as the local concerns are addressed [I can live with it].
- Should be flexible [I have no opinion].

5. The right tree is planted in the right place to optimize life span, species diversity, canopy cover, to maximize green infrastructure and to minimize environmental impacts.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3			*1*	

Comments: - I assume that science can suggest the perfect tree, but that doesn't mean all the trees should be the same type, need variety! [I don't like it].
- I also feel that non-native, non-invasive does have a role! [I agree].

6. Support community engagement in the conservation, management, and stewardship of the urban forestry management program.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3	*1*			

Comments: -School programs [I can live with it].

7. Well-managed privately-owned trees contribute in large amount to the urban forest.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3				*1*

Comments: - Where property size/location permits [I agree].
- On lands zoned hazard ok. Not on developed lands [I fundamentally disagree].

Appendix 1a continued

GOALS

Based on the Guiding Principles, The Town of Collingwood will work towards the following goals through the implementation of this Urban Forest Management Strategy and associated Operating plans. The Town will work towards developing adequate human, capital and operational resources for urban forest management, planning and monitoring to achieve goals and meet the targets identified in this strategy and plan.

1. Develop policy framework and procedures for trees on Town lands that acknowledge trees as green infrastructure and a municipal / community asset.

Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3			***1***	

Comments: - Public trees only! Private infrastructure isn't considered a community asset [I don't like it].

2. Develop policies and practices that maintain tree canopy cover while balancing infrastructure, development and the natural environment.

Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3			***1***	

Comments: - Concern for competing interests with development. Due to groundwater levels/SWM often impossible to maintain trees on developments --> fill or bedrock implications [underlined "balancing"] [I agree].
- Public areas only (this may be 5% of development lands) [I don't like it].

3. Manage Town-owned urban, roadside and woodlot trees through an understanding of their age, composition and quality and implications for maintenance, removal and replacement (arboricultural best practices).

Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3	***1***			

Comments

4. Improve the resilience of the urban forest (current and anticipated stressors, including climate change, pests and diseases) by implementing policies and management practices that optimize tree health, diversity, structure and age classes.

Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	2	***1***		***1***	

Comments: - On public lands only [I don't like it].

5. Utilize human resources efficiently and effectively to address the tree related activities.

Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3			***1***	

Comments: - Suggest private tender for competitive rates/more efficient work [underlined "efficiently"] [I agree].
- Use private companies - outsource work to local companies [I don't like it].

Appendix 1a. External Stakeholders Meeting. Survey results continued

6. Prioritize protection and maintenance of all trees while recognizing the importance of mature, healthy trees and preservation of older large-canopied species.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	2	*2*			

Comments: - Preserve keep them growing [I can live with it].
-Need to balance designated/zoned uses for parcels in town vs. tree protection at all costs [I can live with it].

7. To transition towards proactive tree establishment and replacement whereby all potential plantable locations on town lands are explored and apply "right tree, right place" principles, except where policy requires that new trees be planted on adjacent private property development.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3			*1*	

Comments: - Yes! [I agree]
- PREMATURE. There are lots of public lands without trees [I don't like it].

8. Build awareness and engagement among Town staff and the community regarding the importance and contribution of the urban forest and the Town's effort to sustain this resource.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
blank (1)	*1*	*2*			

Comments: - On public property [I can live with it].

9. Explore stewardship initiatives and develop more partnerships that support the urban forest.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
blank (1)	*1*	*1*	*1*		

Comments: - NVCA already does this. Black Ash Creek [I have no opinion].

10. Use new technologies in selected areas for integration of trees in hardscapes such as downtown and parking lots to increase green infrastructure.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
blank (1)	*3*				

Comments: - Green blue urban --> SWM and longevity benefits [I agree].
- On public property (I agree) - Very expensive but worth looking into [I agree].

APPENDIX 1B. Public Open House -Survey on Forest Strategy and Management Plan results

Appendix 1b. Public Open House. Survey results continued

VISION STATEMENT

The Vision Statement reflects the desired outcomes of successful implementation of the strategy and plan. It was developed in consultation with the Project Team to meet the needs of the Town for Town-owned trees and forests.

Proposed Vision Statement:

The Town of Collingwood values the urban forest and its contribution to the liveability of our community. In addition to the environmental, social, aesthetic and economic benefits of the urban forest the Town recognizes the importance trees have on health, quality of life, tourism and recreation and green infrastructure. The Town is committed to sustainable management of the urban forest as well as supporting community action and stewardship to maintain, renew and enhance this natural resource for future generations.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	2	*1*			

Comments: - Protection of trees is important to include [I agree].
- Concerns around private vs. public areas [I agree].
- Should touch on commitment to private land enhancement as well, through policy, education, etc. (I can live with it).

GUIDING PRINCIPLES

Guiding Principles are intended to guide the development of the urban forest strategy, management plan and implementation of the plan. They are statements that represent best practices in the urban forest.

Principles Apply to:
All trees on Town property including roads, parks, and trails.

Principles Do Not Apply to:
All trees on private property
Opportunities that are outside the strategy and management plan will require approval by Council through a staff report

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
		1			*2*

Comments: - All trees need to be included [I fundamentally disagree].
- Government is responsible to make and enforce both private and public communal behaviour. Urban forest must include private property behaviour for the community good [I fundamentally disagree].
- But they can influence through by-laws and insist developers take more of a roll with planting after homes are built. Need proper drainage. Why not planting?

Appendix 1b. Public Open House. Survey results continued

1. The Town strives to manage the urban forest in a sustainable and fiscally responsible manner					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	1		***2***		
Comments: - Don't know about "fiscally responsible manner" but they are somewhat ineffective in managing the balance between sustainable development and sustainable urban forest [I have no opinion].					
2. Trees are green infrastructure and managed as part of an Integrated Asset Framework.					
	3				
Comments:					
3. Town trees should be monitored regularly and maintained in a healthy, safe condition using good cultural practices.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3				
Comments					
4. Town trees are maintained according to arboricultural best practices (e.g., ANSI A300, ISA).					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	2		***1***		
Comments: -Don't know [I have no opinion].					
5. The right tree is planted in the right place to optimize life span, species diversity, canopy cover, to maximize green infrastructure and to minimize environmental impacts.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3				
Comments: -Should be at any rate [I agree]. - This is key!! Need to consider climate change models as well [I agree].					
6. Support community engagement in the conservation, management, and stewardship of the urban forestry management program.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
blank (1)	***2***				
Comments: -Let's see moving forward [blank].					
7. Well-managed privately-owned trees contribute in large amount to the urban forest.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3				
Comments: - [Emphasized "I agree" with 3 plus signs] [I agree]. - Very important [I agree]. - Absolutely! Maybe some financial assistance or training/education.					

Appendix 1b. Public Open House. Survey results continued

GOALS
Based on the Guiding Principles, The Town of Collingwood will work towards the following goals through the implementation of this Urban Forest Management Strategy and associated Operating plans. The Town will work towards developing adequate human, capital and operational resources for urban forest management, planning and monitoring to achieve goals and meet the targets identified in this strategy and plan.

1. Develop policy framework and procedures for trees on Town lands that acknowledge trees as green infrastructure and a municipal / community asset.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3				

Comments:

2. Develop policies and practices that maintain tree canopy cover while balancing infrastructure, development and the natural environment.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3				

Comments: - Balance is the critical word - 1 large tree taken down = 10 smaller trees planted in place, for example [I agree].

Appendix 1b. Public Open House. Survey on Forest Strategy and Management Plan results

3. Manage Town-owned urban, roadside and woodlot trees through an understanding of their age, composition and quality and implications for maintenance, removal and replacement (arboricultural best practices).

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3				

Comments

4. Improve the resilience of the urban forest (current and anticipated stressors, including climate change, pests and diseases) by implementing policies and management practices that optimize tree health, diversity, structure and age classes.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	3				

Comments: - [Added "!" for emphasis] [I agree].

5. Utilize human resources efficiently and effectively to address the tree related activities.

Level of Agreement	*I agree*	*I can live with it*	*I have no opinion*	*I don't like it*	*I fundamentally disagree*
	1	*2*			

Comments: - Reword? Not sure what this is in reference to [I can live with it]

Appendix 1b. Public Open House. Survey results continued

6. Prioritize protection and maintenance of all trees while recognizing the importance of mature, healthy trees and preservation of older large-canopied species.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3				
Comments: - [Emphasized "I agree" with 3 plus signs] [I agree].					
7. To transition towards proactive tree establishment and replacement whereby all potential plantable locations on town lands are explored and apply "right tree, right place" principles, except where policy requires that new trees be planted on adjacent private property development.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	2	***1***			
Comments: - Why the exception - this is worrisome [I can live with it].					
Appendix 1b. Public Open House. Survey on Forest Strategy and Management Plan results					
8. Build awareness and engagement among Town staff and the community regarding the importance and contribution of the urban forest and the Town's effort to sustain this resource.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3				
Comments:					
9. Explore stewardship initiatives and develop more partnerships that support the urban forest.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	3				
Comments:					
10. Use new technologies in selected areas for integration of trees in hardscapes such as downtown and parking lots to increase green infrastructure.					
Level of Agreement	***I agree***	***I can live with it***	***I have no opinion***	***I don't like it***	***I fundamentally disagree***
	2	***1***			
Comments:					

APPENDIX 2A Survey Results from Urban Forestry Management and Plan- External Stakeholders

The Town of Collingwood is developing an Urban Forest Management Plan to outline the opportunities and resources for a sustainable urban/community forest for the health and benefit of our citizens and the environment. The project team invites you to provide input to the plan by completing this survey.

1) TREES ARE AN ESSENTIAL FEATURE OF A LIVABLE COMMUNITY:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
4	1				

2) A PRIMARY FUNCTION OF MUNICIPAL GOVERNMENT SHOULD BE THE PROTECTION OF GREEN INFRASTRUCTURE:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
1	2	2			

3) More than 75% of all trees within the Town's urban boundary are located on private property. The Urban Forest Management Plan may recommend a private property tree bylaw to regulate the removal of certain trees based on age, size, historical value, etc. A private property tree bylaw is essential to protect and manage the urban forest.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
1	1	1	1	1	

4) STREETS WITH TREES ON ALL MUNICIPAL BOULEVARDS ARE ESSENTIAL TO CREATE AESTHETICALLY PLEASING AND WELCOMING NEIGHBOURHOODS:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
2	2	1			

5) IN ORDER TO ACHIEVE THE GOALS OF THE URBAN FORESTRY MANAGEMENT PLAN, IT WILL BE NECESSARY TO INCREASE THE ANNUAL BUDGET FOR TREE PLANTING. DO YOU SUPPORT AN INCREASE IN THE TREE MAINTENANCE BUDGET?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
3	1	1			

6) WOULD YOU AGREE THAT AN INCREASE IN THE COST OF ROAD CONSTRUCTION SHOULD INCLUDE TREES AND PLANTABLE SPACES IS BENEFICIAL?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
3	2				1

5) IN ORDER TO ACHIEVE THE GOALS OF THE URBAN FORESTRY MANAGEMENT PLAN, IT WILL BE NECESSARY TO INCREASE THE ANNUAL BUDGET FOR TREE PLANTING. DO YOU SUPPORT AN INCREASE IN THE TREE MAINTENANCE BUDGET?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
3	1	1			

6) WOULD YOU AGREE THAT AN INCREASE IN THE COST OF ROAD CONSTRUCTION SHOULD INCLUDE TREES AND PLANTABLE SPACES IS BENEFICIAL?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
3	2				1

QUESTION 7 DIFFERENT FOR ONLINE AND INFO SESSION SURVEY

7) TO MEET THE CANOPY COVER GOAL OF 30%?, IT WILL BE NECESSARY TO PLANT MORE TREES ON BOTH PUBLIC AND PRIVATE PROPERTY:					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
3	2				

8) TO MEET THE TOWN CANOPY COVER GOALS IN THE FUTURE, IT WILL BE NECESSARY TO PLANT MORE TREES ON BOTH PUBLIC AND PRIVATE PROPERTY. - AS A PROPERTY OWNER, WOULD YOU BE WILLING TO PLANT A TREE ON YOUR PROPERTY?		
Yes	Maybe	No
5		1

9) THE TOWN SHOULD CREATE PUBLIC EDUCATION PROGRAMS TO INCREASE AWARENESS AND UNDERSTANDING OF TREE CONSERVATION:					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
4	1				

10) WOULD YOU CONSIDER BECOMING INVOLVED IN COMMUNITY PROJECTS THAT PROMOTE CONSERVATION AND ENVIRONMENTAL AWARENESS?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
1	2	3	4		1

COMMENTS

- Education roles with consideration for all other municipal expectations
  Bylaw will result in FEES (bad)
  Developer are already required to provide tree/lot on boulevard
- Congratulations on process and working towards UMFP

APPENDIX 2B Survey Results from Urban Forestry Management and Plan - Public Open House

The Town of Collingwood is developing an Urban Forest Management Plan to outline the opportunities and resources for a sustainable urban/community forest for the health and benefit of our citizens and the environment. The project team invites you to provide input to the plan by completing this survey.

1) TREES ARE AN ESSENTIAL FEATURE OF A LIVABLE COMMUNITY:					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
14					

2) A PRIMARY FUNCTION OF MUNICIPAL GOVERNMENT SHOULD BE THE PROTECTION OF GREEN INFRASTRUCTURE:					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
11	3				

3) MORE THAN 75% OF ALL TREES WITHIN THE TOWN'S URBAN BOUNDARY ARE LOCATED ON PRIVATE PROPERTY. THE URBAN FOREST MANAGEMENT PLAN MAY RECOMMEND A PRIVATE PROPERTY TREE BYLAW TO REGULATE THE REMOVAL OF CERTAIN TREES BASED ON AGE, SIZE, HISTORICAL VALUE, ETC. A PRIVATE PROPERTY TREE BYLAW IS ESSENTIAL TO PROTECT AND MANAGE THE URBAN FOREST.					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
11	1		1	1	

4) STREETS WITH TREES ON ALL MUNICIPAL BOULEVARDS ARE ESSENTIAL TO CREATE AESTHETICALLY PLEASING AND WELCOMING NEIGHBOURHOODS:					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
14					

5) IN ORDER TO ACHIEVE THE GOALS OF THE URBAN FORESTRY MANAGEMENT PLAN, IT WILL BE NECESSARY TO INCREASE THE ANNUAL BUDGET FOR TREE PLANTING. DO YOU SUPPORT AN INCREASE IN THE TREE MAINTENANCE BUDGET?					
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
12	2				

6) WOULD YOU AGREE THAT AN INCREASE IN THE COST OF ROAD CONSTRUCTION SHOULD INCLUDE TREES AND PLANTABLE SPACES IS BENEFICIAL?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
13					1

QUESTION 7 DIFFERENT FOR ONLINE AND INFO SESSION SURVEY

7) TO MEET THE CANOPY COVER GOAL OF 30%?, IT WILL BE NECESSARY TO PLANT MORE TREES ON BOTH PUBLIC AND PRIVATE PROPERTY:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
11	3	1			

8) TO MEET THE TOWN CANOPY COVER GOALS IN THE FUTURE, IT WILL BE NECESSARY TO PLANT MORE TREES ON BOTH PUBLIC AND PRIVATE PROPERTY.
- AS A PROPERTY OWNER, WOULD YOU BE WILLING TO PLANT A TREE ON YOUR PROPERTY?

Yes	Maybe	No
13		1

9) THE TOWN SHOULD CREATE PUBLIC EDUCATION PROGRAMS TO INCREASE AWARENESS AND UNDERSTANDING OF TREE CONSERVATION:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
11	2	1			

10) WOULD YOU CONSIDER BECOMING INVOLVED IN COMMUNITY PROJECTS THAT PROMOTE CONSERVATION AND ENVIRONMENTAL AWARENESS?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
7	6	1			

COMMENTS
-Terrible Room for a meeting (too noisy) Won't attend another here
- I'm involved with Collingwood Horticultural Society and the Arboretum Committee
- Private Property bylaw is essential investigate cutting trees on Public land (Hen& Chicken Pathway North of Cranberry Surf (To enhance views?)
-Need Bylaw to prevent cutting of Large Diam. >30 cm on Private properties unless recommended by Certified Arborist
-Education need to include health, Mental health & Economic benefits to the community
-Education need to include health, Mental health & Economic benefits to the community, People need to understand why conservation is essential
-In new developments, the developers should be contributing more

APPENDIX 3 Tree Planting Specifications

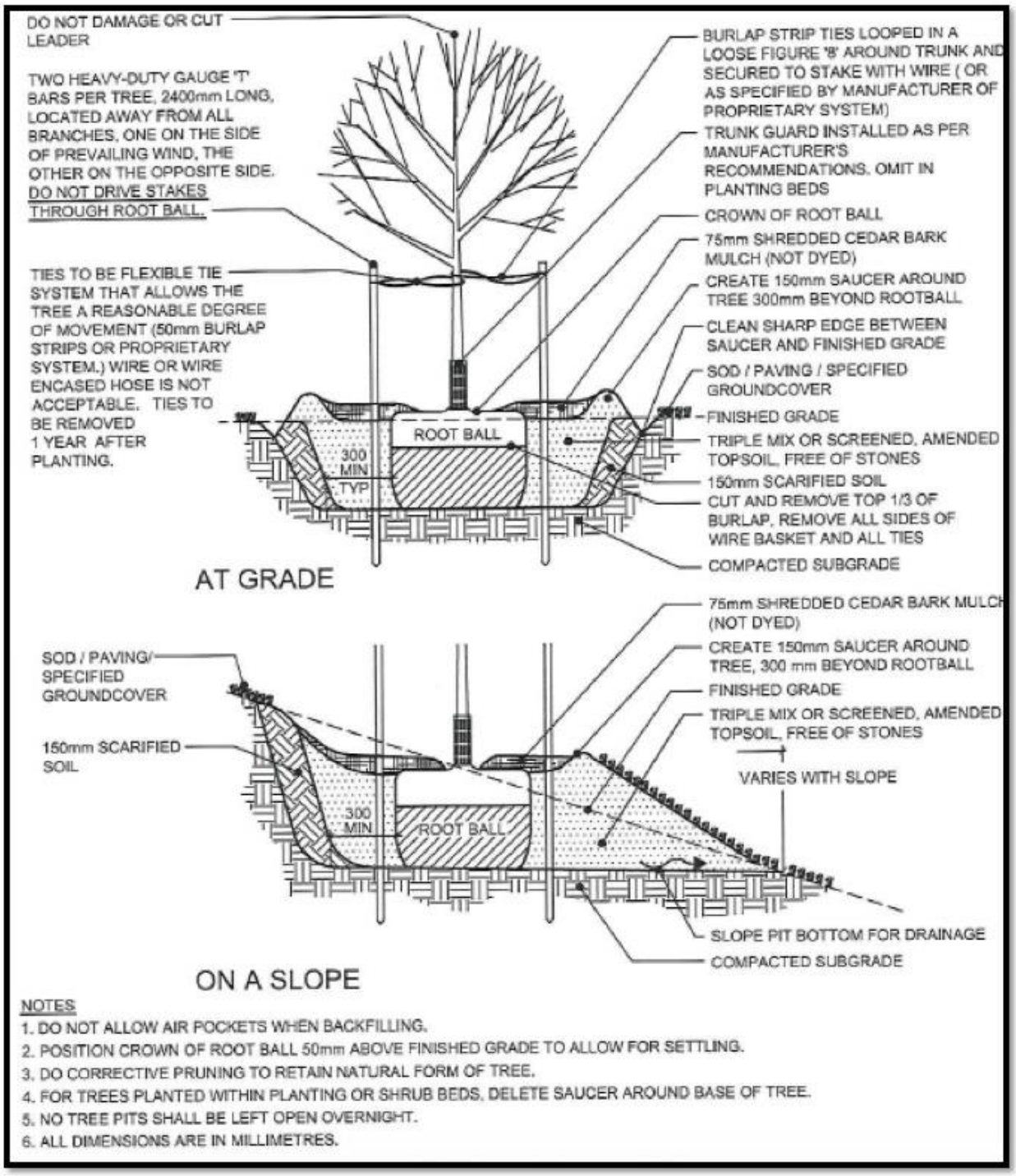

Figure Appendix 3. 1 Town of Collingwood tree planting methodology for deciduous trees

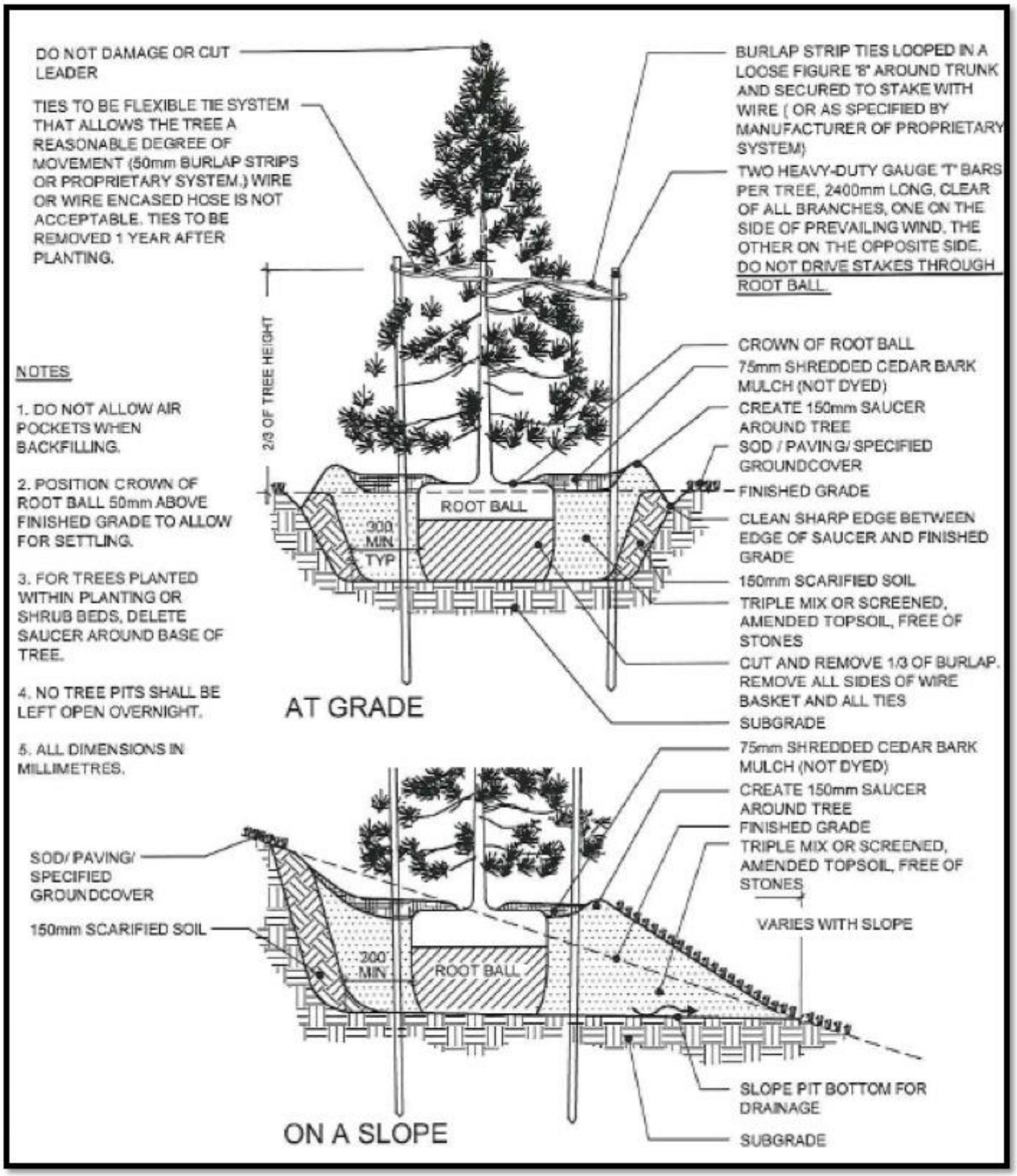

Figure Appendix 3. 2 Town of Collingwood tree planting methodology for coniferous trees

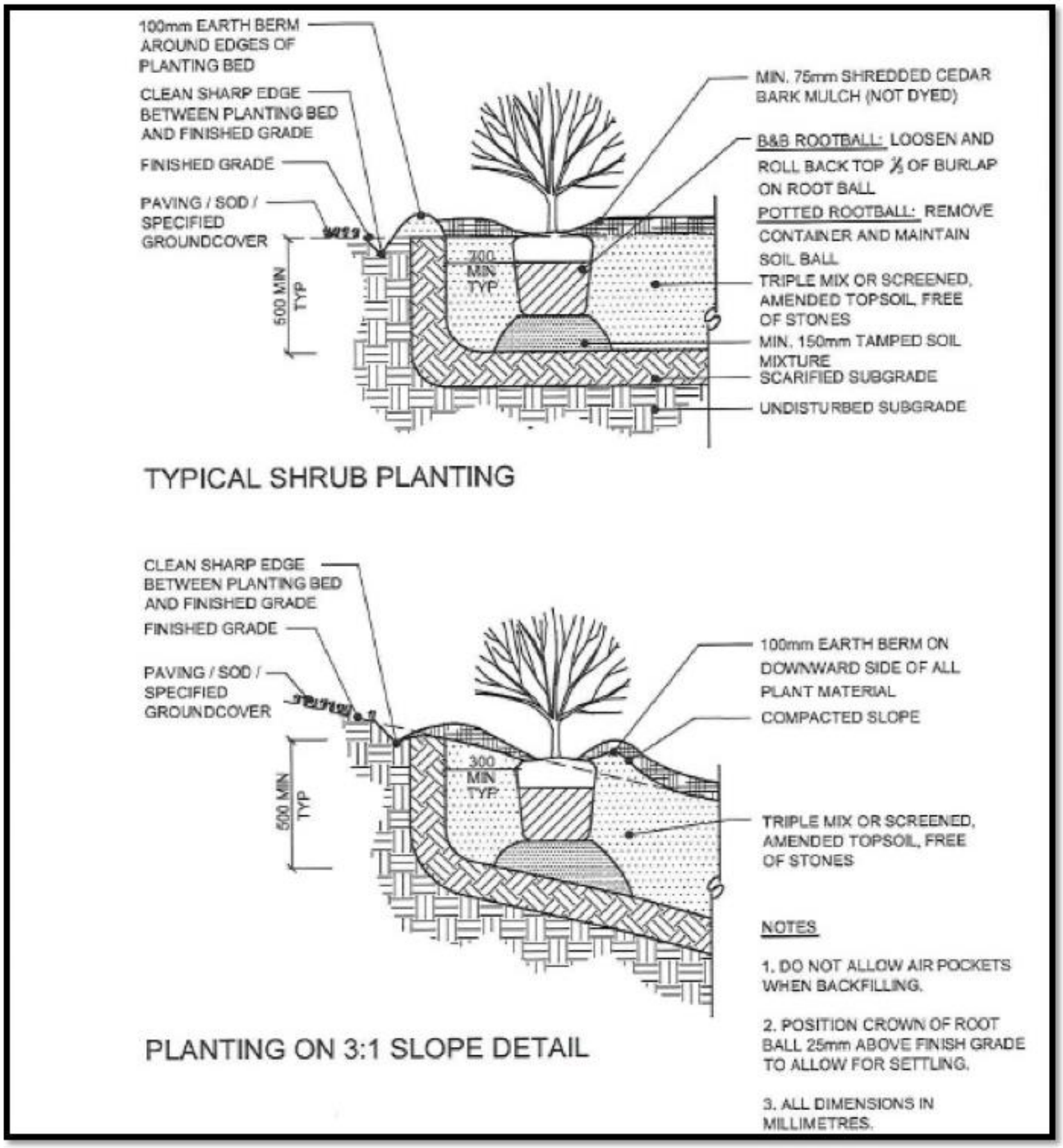

Figure Appendix 3. 3 Town of Collingwood tree planting methodology for shrubs

Appendix 3. Continued

Considerations for amending Tree Planting and Tending Specifications

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

Residential Street Trees

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.

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

Park Trees / Naturalization Planting

Locations to be supplied by and 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 should be spray painted with an “X” for each tree location.

Tree Quality

Minimum caliper should be 40 to 50 mm unless otherwise specified.
The diameter of branches should be 1/3 of the diameter of the trunk at the junction
Co-dominant stems should be removed
Girdling roots are not acceptable and should be cut before planting.

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.
All Hydro-vac operations must be in compliance with the safe practices prescribed for such equipment published by the Electrical and Utilities Safety Association. The Contractor is responsible for sub-contracting this function if required. The town 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.

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.

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

Post Plant Watering

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

Fertilizing

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

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.

Additional Watering

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

- 10 gallons of water per tree every week for trees located on sandy soils and
- 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 4 Tree Planting List and species site suitability for Collingwood

Appendix 4 Acceptable tree species to plant at different site-types in Collingwood									*Williams & Associates*
Deciduous Species									
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Aspen, Large-toothed	*Populus grandidentata*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Aspen, Trembling	*Populus tremuloides*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Basswood	*Tilia americana*	Large	**YES**	NO	limited	**YES**	**NO**	**YES**	Roads - only wide boulevards
Birch, Cherry	*Betula lenta*	Large	**YES**	NO	**NO**	**YES**	**planter**	**YES**	
Birch, European White	*Betula pendula*	Large	**NO**	NO	**NO**	**YES**	**planter**	**YES**	
Birch, Gray	*Betula populifolia*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Birch, River	*Betula nigra*	Large	**NO**	NO	**NO**	**YES**	**planter**	**YES**	
Birch, White (Paper)	*Betula papyrifera*	Large	**YES**	NO	**NO**	**YES**	**planter**	**YES**	
Birch, Yellow	*Betula alleghaniensis*	Medium	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Beech, American	*Fagus grandifolia*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Beech, Blue	*Carpinus caroliniana*	Medium	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Beech, European	*Fagus sylvatica*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Beech, Dawyck Gold	*Fagus sylvatica*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Beech, Dawyck Purple	*Fagus sylvatica*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Beech, Purple Fountain	*Fagus sylvatica*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Beech, Red Obelisk	*Fagus sylvatica*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	

Appendix 4 Acceptable tree species to plant at different site-types in Collingwood									*Williams & Associates*
Deciduous Species									
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Beech, Tri-colour	*Fagus sylvatica*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Black Gum	*Nyssa sylvatica*	Medium	**YES**	NO	**NO**	**YES**	**NO**	limited	
Buckeye, Ohio	*Aesculus glabra*	Large	USA	NO	**YES**	**YES**	**NO**	**YES**	
Butternut	*Juglans cinera*	Large	**YES**	NO	**NO**	**YES**	**NO**	**NO**	
Catalpa, Northern	*Catalpa speciosa*	Large	USA	NO	**NO**	**YES**	**NO**	**NO**	
Cherry, Black	*Prunus serotina*	Small	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Cherry, Kwanzan	*Prunus serrulata*		**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Cherry, Pin	*Prunus pensylvanica*	Small	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Chestnut, Amercian	*Castanea dentata*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Cork, Amur	*Phellodendron amurense*	Medium	**NO**	**YES**	**NO**	**YES**	**NO**	**NO**	Don't plant near Natural Areas
Cottonwood, Black	*Populus trichocarpa*		**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Cottonwood, Eastern	*Populus deltoides*		**YES**	NO	**NO**	**YES**	**NO**	**NO**	
Crabapple, Royalty	*Malus*	Medium	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Crabapple, Prairie Fire	*Malus*	Medium	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Crabapple, Royal Raindrops	*Malus*	Medium	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Crabapple, Sargent	*Malus*	Medium	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Crabapple, Spring Snow	*Malus*	Medium	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Cucumber Tree	*Magnolia acuminata*	Large	**YES**	NO	**NO**	**YES**	**NO**	limited	

Appendix 4 Acceptable tree species to plant at different site-types in Collingwood									*Williams & Associates*
Deciduous Species									
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Elm, Rock	*Ulmus thomasii*	Medium	**YES**	NO	**YES**	**YES**	**NO**	**YES**	
Elm, Slippery	*Ulmus rubra*	Large	**YES**	NO	**YES**	**YES**	**NO**	**YES**	
Elm, American Princeton	*Ulmus americana*	Large	USA	NO	**YES**	**YES**	**NO**	**NO**	
Elm, Valley Forge	*Ulmus americana*	Large	USA	NO	**YES**	**YES**	**NO**	**NO**	
Elm, Accolade	*Ulmus japonica x wilsoniana*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Ginkgo (Maindehair)	*Ginkgo biloba*	Medium	**YES**	NO	**YES**	**YES**	**YES**	**NO**	
Ginkgo, Autumn Gold	*Ginkgo biloba*	Medium	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Ginkgo, Golden Colonade	*Ginkgo biloba*	Medium	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Ginkgo, Princeton Sentry	*Ginkgo biloba*	Medium	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Hackberry	*Celtis occidentalis*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Hazelnut, Turkish	*Corylus colurna*	Medium	**NO**	NO	**YES**	**YES**	**??**	**NO**	
Hickory, Bitternut	*Carya cordiformis*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Hickory, Pignut	*Carya glabra*	Large	USA	NO	**YES**	**YES**	**NO**	**YES**	
Hickory, Shagbark	*Carya ovata*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Hickory, Shellbark	*Carya laciniosa*	Large	**YES**	NO	**YES**	**YES**	**NO**	**YES**	
Hop tree	*Ptelea trifoliata*	Medium	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Hornbeam, European	*Carpinus betulus*	Large	**NO**	NO	**NO**	**YES**	**YES**	**NO**	

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Deciduous Species									
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Hornbeam, European Pyramidal	*Carpinus betulus*	Large	**NO**	NO	**NO**	**YES**	**YES**	**NO**	
Horsechestnut	*Aesculus hippocastanum*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Horsechestnut, Double	*Aesculus baumannii*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Horsechestnut, Red	*Aesculus x carnea*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Ironwood (American Hophornbeam)	*Ostrya virginiana*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Katsura, Japanese	*Cercidiphyllum japonicum*		**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Kentucky Coffee Tree	*Gymnocladus dioicus*	Large	**YES**	NO	limited	**YES**	**YES**	**YES**	Roads - only wide boulevards
Lilac, Japanese Tree	*Syringa reticulate*	Medium	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Linden, Little-leaf	*Tilia cordata*	Large	**NO**	NO	limited	**YES**	**NO**	**NO**	Roads - only wide boulevards
Locust, Black	*Robina pseudoacacia*	Large	**NO**	NO	**NO**	limited	**NO**	limited	
Locust, Honey	*Gleditsia triacanthos*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Locust, Honey Streetkeeper	*Gleditsia triacanthos*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Locust, Honey Shademaster	*Gleditsia triacanthos*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Locust, Honey Skyline	*Gleditsia triacanthos*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Locust, Honey Sunburst	*Gleditsia triacanthos*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Amur	*Acer ginnala*	Medium	**NO**	**YES**	**YES**	**YES**	**NO**	**NO**	Don't plant near Natural Areas

Appendix 4 Acceptable tree species to plant at different site-types in Collingwood									*Williams & Associates*
Deciduous Species									
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Maple, Ruby Slippers Amur	*Acer ginnala*	Medium	**NO**	**YES**	**YES**	**YES**	**NO**	**NO**	Don't plant near Natural Areas
Maple, Black	*Acer nigrum*	Large	**YES**	NO	**YES**	**YES**	**NO**	**YES**	
Maple, Hedge	*Acer campestre*	Medium	**NO**	**YES**	**YES**	**YES**	**NO**	**NO**	Don't plant near Natural Areas
Maple, Manitoba	*Acer negundo*	Large	**YES**	**YES**	**NO**	**NO**	**NO**	**NO**	Don't plant near Natural Areas
Maple, Paperbark	*Acer, griseum*	Medium	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Red	*Acer rubrum*	Large	**YES**	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Armstrong	*Acer rubrum*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Autumn Spire	*Acer rubrum*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Brandymine	*Acer rubrum*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Maple, 'Columnar'	*Acer rubrum*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Red Sunset	*Acer rubrum*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Scarlet Sentinal	*Acer rubrum*	Large	USA	NO	**YES**	**YES**	**YES**	**NO**	
Maple, Silver	*Acer saccharinum*	Large	**YES**	NO	**YES**	**YES**	limited	**YES**	with large rooting area
Maple, Silver Queen	*Acer Saccharinum*	Large	**NO**	NO	**YES**	**YES**	limited	**NO**	
Maple, Sugar	*Acer saccharum*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Maple, Sugar 'Columnar'	*Acer saccharum*	Large	**NO**	NO	**NO**	**YES**	**YES**	**NO**	
Maple, Green Mountain	*Acer saccharum*	Large	**NO**	NO	**NO**	**YES**	**YES**	**NO**	
Maple, sycamore	*Acer pseudoplatanus*	Large	**NO**	**YES**	limited	limited	**NO**	**NO**	Don't plant near Natural Areas

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Deciduous Species									
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Maple, Tartarian	*Acer tataricum*	Small	**NO**	**YES**	**YES**	**YES**	**NO**	**NO**	Don't plant near Natural Areas
Mountain-Ash, American	Maple, Tartarian 'Hot-Wings'	Medium	**YES**	NO	**NO**	**YES**	limited	**YES**	
Mountain-Ash, Showy	*Sorbus decora*	Medium	**YES**	NO	**YES**	**YES**	limited	**YES**	
Mulberry, Red	*Morus rubra*	Medium	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Oak, Black	*Quercus velutina*	Large	**YES**	NO	limited	**YES**	**NO**	**YES**	
Oak, Bur	*Quercus macrocarpa*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Oak, Chinquapin	*Quercus muehlenbergii*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	Good or drier sites
Oak, English	*Quercus robur*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Oak, English Pyramidal	*Quercus robur*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Oak, English Skinny Genes	*Quercus robur*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Oak, English Skyrocket	*Quercus robur*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Oak, Pin	*Quercus palustris*	Large	**YES**	NO	limited	limited	**YES**	limited	Clayey sites, acidic soils
Oak, Red	*Quercus rubra*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Oak, Red Kindred Spirit	*Quercus rubra*	Large	**YES**	NO	**YES**	**YES**	**YES**	**NO**	
Oak, Shumard	*Quercus shumardii*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	Good or moist sites
Oak, Swamp White	*Quercus bicolor*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	Good or moist sites
Oak, White	*Quercus alba*	Large	**YES**	NO	**YES**	**YES**	**YES**	**YES**	Good or moist sites
Orange, Osage	*Maclura pomifera*	Medium	USA	NO	**NO**	limited	**NO**	**NO**	
Orange, Osage 'White Sheild'	*Maclura pomifera*	Medium	**NO**	NO	**NO**	limited	**NO**	**NO**	

Appendix 4 Acceptable tree species to plant at different site-types in Collingwood									*Williams & Associates*
Deciduous Species									
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Pagoda Tree, Japanese	*Sophora japonica*	Large	**NO**	NO	**NO**	**YES**	**NO**	**NO**	
Pawpaw	*Asmina triloba*	Medium	**YES**	NO	**NO**	limited	**YES**	**YES**	
Pear	*Pyrus calleryana*	Medium	**NO**	**YES**	**YES**	limited	**NO**	**NO**	Don't plant near Natural Areas
Planetree, London	*Platanus x acerifolia*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Planetree, London Bloodgood	*Platanus x acerifolia*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Planetree, Exclamation	*Platanus x acerifolia*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Plum, Canada	*Prunus nigra*	Small	**YES**	NO	**NO**	limited	**NO**	**YES**	
Plum, American	*Prunus americana*	Small	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Poplar, Balsam	*Populus balsamifera*	Large	**NO**	NO	**NO**	**YES**	**YES**	**YES**	
Redbud, Eastern	*Cercis canadensis*	Small	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Redbud, Forest Pansy	*Cercis canadensis*	Small	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Redbud, Silver Cloud	*Cercis canadensis*	Small	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Redbud, Texas White	*Cercis canadensis*	Small	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Redwood, Dawn	*Metasequoia glyptostroboides*	Medium	**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Sassafras	*Sassafras albidum*	Small	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Serviceberry, Downy	*Amelanchier arborea*	Small	**YES**	NO	**YES**	**YES**	**YES**	**YES**	
Serviceberry, Smooth	*Amelanchier laevis*	Small	**YES**	NO	**YES**	**YES**	**YES**	**YES**	

Appendix 4 Acceptable tree species to plant at different site-types in Collingwood									*Williams & Associates*
Deciduous Species									
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Sweetgum	*Liquidambar styraciflua*	Large	USA	NO	**YES**	**YES**	**YES**	limited	
Sweetgum, Moraine	*Liquidambar styraciflua*	Medium	USA	NO	**YES**	**YES**	**YES**	**NO**	
Sweetgum, Slender Silhouette	*Liquidambar styraciflua*	Medium	USA	NO	**YES**	**YES**	**YES**	**NO**	
Sycamore	*Platanus occidentalis*	Large	**YES**	NO	limited	**YES**	**YES**	**YES**	Good sites only
Tulip Tree	*Liriodendron tulipifera*	Large	**YES**	NO	limited	**YES**	**YES**	**YES**	Good sites only
Tulip Tree, Arnold	*Liriodendron tulipifera*		USA	NO	limited	**YES**	**YES**	**NO**	Good sites only
Walnut, Black	*Juglans nigra*	Large	**YES**	NO	**NO**	limited	**NO**	limited	Good sites only
Willow, Black	*Salix, nigra*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	Wetter sites
Willow, Corkscrew	*Salix, matsudana*	Large	USA	**YES**	**NO**	limited	**NO**	**NO**	Don't plant near Natural Areas
Willow, Peach leaf	*Salix, amygdaloides*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	Wetter sites
Willow, Golden Weeping	*Salix alba*	Large	**YES**	NO	**NO**	limited	**NO**	**NO**	Wetter sites
Yellowwood	*Cladrastis Kentukea*	Large	USA	NO	**NO**	limited	**NO**	limited	Good sites only
Zelkova, Japanese	*Zelkova serrata*		**NO**	NO	**YES**	**YES**	**YES**	**NO**	
Zelkova, Japanese Gold Falls	*Zelkova serrata*	Large	**NO**	NO	**YES**	**YES**	**YES**	**NO**	

Conifer Species	*Conifers should only be considered for plating near roads in very wide boulevard areas.*								
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Cedar, Black	*Thuja occidentalis 'Nigra'*		**YES**	NO	**NO**	**YES**	**NO**	**NO**	
Cedar, Eastern Red	*Juniperus virginiana*		Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**
Cedar, Eastern Red Hillsprire	*Juniperus virginiana*		**YES**	NO	**NO**	**YES**	**NO**	**NO**	
Cedar, Eastern White	*Thuja occidentalis*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	
Cedar, Emerald	*Thuja occidentalis*		**YES**	NO	**NO**	**YES**	**NO**	**NO**	
Cypress, Bald	*Taxodium distichum*	Large	USA	NO	**NO**	**YES**	**NO**	**NO**	Wetter sites
Fir, Balsam	*Abies balsamea*	Large	**YES**	NO	**NO**	**YES**	**NO**	**NO**	Moist sheltered sites
Fir, White	*Abies concolor*	Large	USA	NO	**NO**	**YES**	**NO**	**NO**	Moist sheltered sites
Fir, Douglas	*Pseudotsuga menziesii*	Large	USA	NO	**NO**	**YES**	**NO**	**NO**	Moist sheltered sites
Hemlock, Eastern	*Tsuga canadensis*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	Moist sheltered sites
Larch, European	*Larix decidua*	Large	**NO**	NO	**NO**	**YES**	**NO**	limited	Moist and drier sites
Pine, Austrian	*Pinus nigra*	Large	**NO**	NO	**NO**	limited	**NO**	**NO**	Moist and drier sites
Pine, Eastern White	*Pinus strobus*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	Roads - only wide boulevards
Pine, Eastern White Pyramidal	*Pinus strobus*	Large	**YES**	NO	**NO**	**YES**	**NO**	**NO**	Roads - only wide boulevards
Pine, Jack	*Pinus banksiana*	Large	**YES**	NO	**NO**	limited	**NO**	limited	Drier sites
Pine, Pitch	*Pinus rigida*	Large	**YES**	NO	**NO**	limited	**NO**	**YES**	Moist and drier sites
Pine, Red	*Pinus resinosa*	Large	**YES**	NO	**NO**	limited	**NO**	**NO**	Moist and drier sites
Pine, Scots	*Pinus sylvestris*	Large	**NO**	**YES**	**NO**	limited	**NO**	**NO**	Moist and drier sites
Spruce, Blue	*Pigea pungens*	Large	USA	NO	**NO**	**YES**	**NO**	**NO**	Good sites only
Spruce, Blue	*Pigea pungens*	Large	USA	NO	**NO**	**YES**	**NO**	**NO**	Good sites only

Conifer Species	***Conifers should only be considered for plating near roads in very wide boulevard areas.***								
Common Name	**Scientific Name**	**Stature**	**Native**	**Invasive**	**Roads**	**Parks**	**Hard-scape**	**Woodlots**	**Comments**
Hoopsi									
Spruce, Blue Pyrmidal	*Pigea pungens*	Medium	USA	NO	**NO**	**YES**	**NO**	**NO**	Good sites only
Spruce, Norway	*Picea abies*	Large	**NO**	NO	**NO**	**YES**	**NO**	limited	
Spruce, Red	*Picea rubens*	Large	**YES**	NO	**NO**	limited	**NO**	**YES**	Roads - only wide boulevards
Spruce, White	*Picea glauca*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	good sites and moist sites
Tamarack (Eastern Larch)	*Larix laricina*	Large	**YES**	NO	**NO**	**YES**	**NO**	**YES**	good sites and moist sites