CITY OF VAUGHAN

EXTRACT FROM COUNCIL MEETING MINUTES OF MARCH 26, 2024

Item 2, Report No. 9, of the Committee of the Whole (Working Session), which was adopted without amendment by the Council of the City of Vaughan on March 26, 2024.

2. URBAN FORESTRY MANAGEMENT PLAN AND WOODLAND MANAGEMENT STRATEGY

The Committee of the Whole (Working Session) recommends:

1) That the recommendations contained in the report of the Deputy City Manager, Public Works dated March 6, 2024, be approved;

2) That the comments from the Committee be received; and

3) That the presentation by Shanon Kalra-Ramjoo, Director of Parks, Forestry & Horticulture Operations, and Miles Peart, Manager of Urban Forestry, be received.

Recommendations

1. That the Urban Forest Management Plan (UFMP) as described in Attachment No. 1 be approved;
2. That the Woodland Management Strategy (WMS) as generally described in Attachment No. 2 be approved;
3. That the Ten-year Operating and Financial Plan as generally described in Attachment No. 3 be approved;
4. That the Five-Year Priority Action Plan as generally described in Attachment No.4 be approved; and
5. That the City Clerk forward a copy of this report to York Region, TRCA, York Region District School Board and York Region Catholic School Board.

Committee of the Whole (Working Session) Report

DATE: Wednesday, March 6, 2024 **WARD(S):** ALL

TITLE: URBAN FORESTRY MANAGEMENT PLAN AND WOODLAND MANAGEMENT STRATEGY

FROM:
Zoran Postic, Deputy City Manager, Public Works

ACTION: DECISION

Purpose

To seek council endorsement of the Urban Forest Management Plan and the associated Woodland Management Strategy that will provide a basis for the City's adaptive management of its urban forest resource, which will continue over the 20-year life of the plan.

Report Highlights

- First-ever Urban Forest Management Plan that will guide the sustainable management of Vaughan's urban forest resource for the next 20 years.
- The City consulted widely with members of the public as well as internal and external stakeholders during two public engagement phases.
- The plan includes a review of the current state of the urban forest, including a criteria and indicators assessment.
- The Urban Forest Management Plan has a vision, five goals, 14 strategies and 76 actions.
- There is a woodland management strategy to provide sustainable direction for the management of Vaughan's 27 community woodlands.
- A flexible lifecycle costing approach ensures a flexible approach to future budgets and impacts to service levels.
- A 10-year operating, and financial plan has been established that amounts to an annual operating budget of $4.55M by 2028.
- A Five-Year Priority Action Plan has been developed to guide strategic planning efforts over the course of the next few years.

Recommendations

1. That the Urban Forest Management Plan (UFMP) as described in Attachment No. 1 be approved;
2. That the Woodland Management Strategy (WMS) as generally described in Attachment No. 2 be approved;
3. That the Ten-year Operating and Financial Plan as generally described in Attachment No. 3 be approved;
4. That the Five-Year Priority Action Plan as generally described in Attachment No.4 be approved; and
5. That the City Clerk forward a copy of this report to York Region, TRCA, York Region District School Board and York Region Catholic School Board.

Background

The City of Vaughan's Urban Forest is made up of over five million trees on public and private lands

Vaughan's urban forest includes all trees and their ecosystems within the city's municipal area. This includes trees on private lands, public parks and in conservation areas, as well as those along boulevards and streets, natural areas and the city's woodland communities. The urban forest provides important benefits for the health and livability of the community. Those benefits, often called ecosystem services, include providing habitat for wildlife, sequestering carbon, urban temperature cooling, stormwater interception and air purification. Trees and woodlands are vital components of the "green infrastructure" asset class and are the only municipal asset to increase in value and provide greater service to the community as they age.

Stewardship of the Urban Forest aligns with the Term of Council Service Excellence Strategic Plan

Urban Forestry in Vaughan has the unique ability to intersect with not only Environmental Sustainability, but every Term of Council strategic priority. Trees are a critical component of safe, clean, and beautiful neighbourhoods and are of considerable importance to our citizens. Forestry related citizen requests are consistently the highest volume of calls received in the Public Works portfolio. Forestry operations, permitting and plan review functions are vital components of many areas of municipal administration. Figure 1 illustrates the intricate framework within which urban forestry in Vaughan exists.

Figure 1: Vaughan's Urban Forest Network

The Urban Forest Management Plan builds on a strong foundation of urban forest management practices and award-winning Council endorsements already in place.

As recipients of the elite Tree Cities of the World designation two years in a row by the Arbor Day Foundation and the Food and Agriculture Organization of the United Nations, Vaughan already has the basic pillars in place to ensure that trees are properly maintained, effectively managed, and duly celebrated. The current forestry programming, when assessed against a set of criteria and indicators for sustainable urban forest programs scores “Fair” in 2023, indicating opportunities to achieve a healthier, more sustainable urban forest are present.

Previous Reports/Authority

City of Vaughan Official Plan 2010

Green Directions Vaughan

Asset Management Plan – Urban Forestry: Extract from Council Meeting Minutes of September 27, 2021 (Item 2, Report No. 42, of the Committee of the Whole (Working Session)

York Regional Forest Management Plan

Analysis and Options

The City retained Diamond Head Consulting Ltd. to complete the development of the Urban Forest Management Plan and associated Woodland Management Strategy

The Urban Forest Management Plan (see attachment 1 – Urban Forest Management Plan) and Woodland Management Strategy (see attachment 2 – Woodland Management Strategy) offer a 20-year blueprint for citywide tree and woodland management - delineating goals, strategies, and actions to realize Vaughan’s urban forest vision. The first phase of the Urban Forest Management Plan development was to perform a background study on the current state of Vaughan’s urban forest. This background contains information, analysis and benchmarking that the City will use to plan for the continued management of the City’s urban forest. The analysis also serves as a reference point for assessing change and supporting comparison against evolving urban forest conditions.

Remote sensing technology and the City's street tree inventory of approximately 130,000 street trees were used in the central analysis of the State of the Urban Forest report

Part Two of the Urban Forest Management Plan – "What We Have" - provides a snapshot of Vaughan's urban forest, consisting of a summary of its current extent, composition and value, existing management practices, as well as the key challenges it faces.

- As of 2019, Vaughan's city-wide canopy cover was 20%
- Two-thirds of the canopy area in Vaughan is contained to urban areas
- 70% of the street tree inventory is made up of the seven most popular trees
- Estimated street tree asset replacement value of $110 million

Vaughan residents ranked climate change benefits as the most important value of the urban forest

A robust and phased engagement plan was utilized in support of the development of the Urban Forest Management Plan. Phase one of public engagement occurred from March to April of 2023 and was designed to solicit input to inform the vision, principles, and goals of the Urban Forest Management Plan. The tactics deployed during phase one were:

- A community art contest to raise awareness of the project;
- An online survey to involve the community in developing a long-term vision incorporating resident's perspective on the urban forest;
- Earth hour event raising awareness of the project; and
- A virtual open house and stakeholder workshop to consult the community to identify opportunities to preserve, protect and grow the urban forest.

Preferences for urban forest values and goals, along with satisfaction levels of current programming were measured. Overall, tree pruning services were measured as having the highest level of satisfaction and tree planting & replacement were scored with the lowest satisfaction levels. Residents identified street tree planting as the highest priority locations for increased tree planting rates. A full phase one engagement summary is provided as appendix two in the Urban Forest Management Plan.

Protecting trees and woodlands for future generations was ranked as the most important goal for Vaughan's Urban Forest Management Plan

Phase two of public engagement took place from June to July 2023 with the goal of seeking feedback from the community on how the Urban Forest Management Plan draft vision, goals and strategies captured and addressed key concerns and for the management of Vaughan's urban forest. The tactics used during phase two to explore

the goals and strategies that should be prioritized in the final Urban Forest Management Plan are as follows:

- An online community survey;
- Targeted stakeholder workshops;
- City-wide open house; and
- A series of in-person pop up events throughout select Vaughan Public Library locations.

Among the most important strategic priorities measured in phase two of public engagement were: transitioning to a proactive maintenance program, increasing tree planting rates and aligning the forestry program with best practices. A full phase one engagement summary is provided as appendix three in the Urban Forest Management Plan.

"Our vision is for a healthy, growing, and sustainable urban forest canopy that supports biodiversity, human health, recreation and community climate resilience to provide a greener future for generations to come."
The vision statement for Vaughan urban forest was crafted using all the inputs from State-of-the-Urban Forest Report, internal and external stakeholder consultation as well as phase one of public engagement efforts. When consulted in engagement phase two, 84% of respondents agreed with the vision statement.

The Urban Forest Management Plan was created for a 20-year horizon with five over-arching goals informing detailed strategies and prioritized actions.

A strategic framework including goals, strategies and actions to steward Vaughan's urban forest for a 20-year horizon was developed including a City-wide canopy cover target of 25%. The five goals guiding the implementation of Vaughan's Urban Forest Management Plan are as follows:

1. To ALIGN urban forest management best practices
2. To MAINTAIN a healthy and safe urban forest
3. To EXPAND the forest canopy and associated benefits
4. To PROTECT trees and woodlands for future generations
5. To PARTNER in urban forest stewardship

The complete strategic framework as well as detailed Action & Monitoring Plans are detailed in attachment 1 – Urban Forest Management Plan, part five.

Financial Impact

A flexible and detailed lifecycle costing framework was developed to inform future budgets and service levels for Urban Forestry in Vaughan

A 10-year Operating and Financial Plan (Attachment Three – Operating and Financial Plan) was created to support the implementation of the Urban Forest Management Plan and Woodland Management Strategy. The asset management principles of lifecycle costing form the foundation of the Operating and Financial Plan. Systematic consideration of all costs associated with the installation, maintenance, and renewal of forestry assets over their entire lifecycle inform planning activities. The cost associated with lifecycle activities are annualized, which identifies a value that can be used to inform operating budgets that scale with the number or area of the urban forest asset under the City's care. In consideration of present and future economic uncertainty, the Operating and Financial Plan offers a flexible plan allowing for informed, data-driven budget planning and associated outcomes for service levels of forestry assets.

Annual operating costs will increase from $2.5 million in 2024 to $4.6 million in 2028 to support the Urban Forest Management Plan priority programs and initiatives.

The estimated annual operating costs for the Urban Forest Management Plan are outlined in Table 1. The estimated cost of $3.17 million listed for 2025 represents a $672,680 increase over the approved 2024 operating budget.

Table 1: Estimated Annual Operating Costs

Year	Total Operating Cost ($M)	Change in Operating Cost ($M)
2025	$3.17	+0.67
2026	$3.86	+0.36
2027	$4.43	+0.57
2028	$4.55	+0.12
2029-2034	Annual increases based on lifecycle costing model	

An estimated annual average of $1.75 million in capital investment is required to support the Urban Forest Management Plan

The annual capital investment estimates incorporate and build on existing capital funding for current tree replacement programming. A total annual average of $1.75 million will be required to support increased tree planting costs as well as new programming to support the Woodland Management Strategy. Anticipated capital investments to support the Urban Forest Management Plan and Woodland Management Strategy are detailed in table 2.

Table 2: Estimated Capital Costs

Year	Capital ($M)
2025	$1.65
2026	$1.77
2027	$1.65
2028	$1.68
2029-2034	$9.16

Requests for capital and operating funding to bring the Urban Forest Management Plan to life will be considered as part of the annual budgeting process and evaluated against other City priorities.

Staff will continue to investigate and consider alternative funding sources and efficiencies to help reduce incremental budget impacts.
Estimates included as part of the strategy are currently at a planning level and will be further refined for specific projects and initiatives. These estimates will inform future capital and operating budget requests. In addition, support for the Urban Forest Management Plan and its initiatives, as they are developed from plan to implementation, is expected to require additional staffing resources in the order of four full-time employees over four years.

Staff will continue to explore and utilize grant opportunities, partnerships, and alternative funding sources to fund the strategy.

Operational Impact

Various internal stakeholder departments were consulted widely during the Urban Forest Management Plan and Woodland Management Strategy development. Many of the recommended action steps involve several City departments in a collaborative manner, further galvanizing Vaughan's urban forest as a City-wide concern. The impacts on various City departments are detailed in the Action Plan contained in Part Two of the Urban Forest Management Plan (attachment 1 – Urban Forest Management Plan).

Broader Regional Impacts/Considerations

York Region Official Plan section 3.4.29. provides direction for lower-tier municipalities to develop Urban Forest Management Plans. Vaughan's Urban Forest Management Plan was developed with consideration given to:

- York Region Official Plan
- York Region Forest Management Plan

- York Region Climate Action Plan
- York Region Forest Conservation By-law

Vaughan's Urban Forest Management Plan was designed in consultation with York Region Forestry Staff and aims to align with and complement existing forestry management directives.

Conclusion

Vaughan's new Urban Forest Management Plan has been developed to provide long-term direction in facing challenges associated with increasing urbanization and population densities coupled with climate change and resilience of the urban forest. The vision, goals and strategies in Vaughan's first Urban Forest Management Plan identify a path forward for the management of Vaughan's urban forest over the coming two decades.

Staff recommend Council endorse the Urban Forest Management Plan and associated Woodland Management Strategy, both so that the benefits derived from the urban forest are optimized given public investment, and so they may be enjoyed by generations to come.

For more information, please contact: Shanon Kalra-Ramjoo – Director of Parks, Forestry and Horticulture Operations ext. 6308.

Attachments

1. Urban Forest Management Plan
2. Woodland Management Strategy
3. Operating and Financial Plan
4. Five-Year Priority Action Plan

Prepared by

Miles Peart, Manager, Urban Forestry, ext. 6140.

Approved by

Zoran Postic, Deputy City Manager,
Public Works

Reviewed by

Haiqing Xu, on behalf of
Nick Spensieri, City Manager

Attachment 1

Urban Forest Management Plan

March 2024

City of Vaughan

VAUGHAN

Land Acknowledgment

We respectfully acknowledge that the City of Vaughan is situated in the Territory and Treaty 13 lands of the Mississaugas of the Credit First Nation. We also recognize the traditional territory of the Huron-Wendat and the Haudenosaunee. The City of Vaughan is currently home to many First Nations, Métis and Inuit people today. As representatives of the people of the City of Vaughan, we are grateful to have the opportunity to work and live in this territory.

Project Team Acknowledgment

The development of this Urban Forest Management Plan was achieved through the joint collaboration of the City's project management team and external technical professionals.

Prepared by:

DIAMOND HEAD

Date:

March 2024

Project Sponsor:

Shanon Kalra-Ramjoo, Director, Parks, Forestry and Horticulture Operations

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Cover Art: "Through the Canopy" by Stephen Mulder (Watercolour on Cotton)
Vaughan Urban Forest Management Plan Art Contest: First Place Entry (c. July 2021).

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The UFMP at a Glance

As a vibrant urban community, the City of Vaughan's streets and assorted land uses are dotted with urban trees, and interwoven with lush natural ecosystems. The City's trees are a foundational element of our community identity. With a population of over 344,000 residents, our community has experienced substantial growth over past decades. Despite this growth, Vaughan is fortunate to have had success in preserving some of the natural areas and features we consider to be core to our community identity.

Our urban forest supports a broad range of community benefits. These include the production of oxygen, the provision of critical urban habitats, urban heat island reduction, stormwater regulation, removal of pollutants from air and water, carbon sequestration, and many more cultural, social, and economic benefits. Despite its importance to our City, our urban forest faces unprecedented trials ahead. Challenges associated with increasing urbanization and population density coupled with climate change and underinvestment leave our urban forest exposed and less resilient to the challenges ahead.

This Urban Forest Management Plan has been prepared to address these concerns; identifying a path forward to the sustainable management of Vaughan's urban forest over the coming two decades. The goals, strategies, and implementing actions identified in this document identify a clear path forward through which the resilience of Vaughan's urban forest can be built, both so that the benefits derived from it are optimized given public investment, and so that the resource may be enjoyed by generations to come.

The Big Issues:

Vaughan's urban forest vision statement was informed by two rounds of public engagement (2023) and is:

"Our vision is for a healthy, growing, and sustainable urban forest canopy that supports biodiversity, human health, recreation, and community climate resilience to provide a greener future for generations to come."

The Canopy Cover Target:

20% Canopy Cover and 12% Woodland Cover in 2019

Vaughan's Canopy Cover Target is 25% by 2051

This means planting 1400 new trees per year in City-owned boulevards and urban parks, growing 70 additional hectares of tree canopy in TRCA Woodlands by 2051, and increasing tree planting along Regional Roads as well as across private property of all types in the City.

To Achieve 14% Woodland Canopy by 2051...

The City would need to increase woodland area by 500 hectares within the next three decades. To do so would require significant conversion of private urban and rural land uses back to a forested state. There is not enough vacant land available in City and TRCA landholdings to achieve a 14% woodland cover target as recommended by York Region's 2021 State of the Urban Forest Report.

Ten Quick Facts About Vaughan's Urban Forest Today (2024):

1. City-wide canopy coverage is 20% (2019).
2. More than 60% of Vaughan's canopy is contained to the City's woodlands and natural areas.
3. Approximately 60% of tree canopy is found on lands not owned by the City or TRCA.
4. Vaughan has adopted a city-wide canopy cover target of 25%, to be achieved by 2051.
5. The tallest tree in Vaughan reaches a height of about 43 meters.
6. Vaughan's urban forest generates almost $6.5 million worth of community benefits every year.
7. The City of Vaughan manages more than 130,000 street trees and 27 municipal woodlots.
8. The City's urban forest management program operated on a budget of ~$2.2 million in 2023.
9. 15 full-time equivalent staff (FTEs) implement Vaughan's tree management program, supported by contract labour.
10. The City of Vaughan's Woodland Management Strategy provides specific directions for the management of woodlands within the City.

UFMP STRUCTURE

WHAT THIS IS | WHAT WE HAVE | WHAT WE HEARD | WHAT WE FACE | WHERE WE'RE GOING

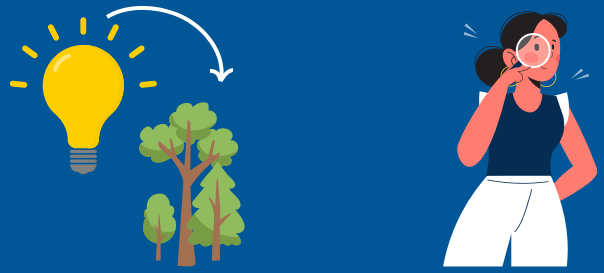
FUTURE DIRECTIONS

VISION | GOALS | TARGETS

ACTIONS + STRATEGIES

GOVERN | MAINTAIN | EXPAND | PROTECT | PARTNER

IMPLEMENTION + MONITORING



The Strategic Framework

The Strategic Framework for the Urban Forest Management Plan is centered around five program goals which broadly support the community vision:

Goal 1: Prioritize good program governance.

Goal 2: Maintain a healthy and safe urban forest.

Goal 3: Expand the urban forest canopy and associated benefits.

Goal 4: Protect trees and woodlands for future generations.

Goal 5: Partner in urban forest stewardship.

Each goal is supported through a set of more specific strategies and nuanced actions, which together map out the path to implementation of the community vision for the management of Vaughan's urban forest. Each goal also features a measurable indicator and relevant target to assist in monitoring the implementation of the UFMP.

Big Moves

Although Vaughan's action plan invokes more than 70 specific program actions to be implemented over the 20-year life of this plan, five high-level "Big Moves" shape much of the operational and resourcing impacts:

1. Shift to a seven-year grid pruning cycle for street trees.
2. Enhanced inventory and monitoring standards and processes.
3. Improved integration of urban trees and urban forest canopy in the City's varied development processes.
4. Improved integration of urban forest asset classes into the City's asset management framework.
5. Enhanced organizational partnerships, community outreach, and public education offerings.

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Glossary of key terms

Biodiversity *The number and types of plants and animals that exist in a particular area, and the relationships that exist between them. Biodiversity includes diversity differences in genes, species and ecosystems.*

Canopy cover *A measure of the extent of the urban forest based on the amount of ground covered by the foliage of trees when viewed from above.*

Ecosystem services *The many and varied benefits to humans provided by the natural environment and from healthy ecosystems. Recreation potential, shade, water filtration, and pollination are all examples of ecosystem services associated with the urban forest.*

Green infrastructure *Natural and human-made community assets that support ecological and hydrological functions and processes.*

Greenspace *A variety of outdoor recreational spaces that residents may use to get exercise, connect with nature, relax or socialize with others.*

Tree equity *When all people experience the benefit of trees and the urban forest in proportion to their needs.*

Urban forest *Urban forests are trees, forests and related abiotic, biotic and cultural components in areas extending from the urban core and encompassing both private and public ownership structures.*

Urban forestry / Urban forest management *The sustained planning, planting, protection, maintenance, and care of trees, forests, and related resources in and around cities and communities for economic, environmental, social, and public health benefits for people.*[1]

Woodland *The City of Vaughan Official Plan defines a woodland as any area of at least 0.2 hectares having a minimum density of trees. The definition excludes cultivated forests like tree farms and orchards. This is a legal definition that extends from Ontario's Municipal Act and Forestry Act. In practice, 'woodland' refers to any natural or semi-natural forest found on public or private property.*

Woodlot *The City of Vaughan uses the term 'woodlot' to refer to specific woodlands that are owned and managed by the City. This is not a legal definition, but is used by the Department of Park, Forestry, and Horticulture Operations and the community. Vaughan is home to 27 City-owned woodlots, supporting a range of values and more than 180 ha of woodland canopy.*

Part 1. What This Is:
Introduction

Part 1. What This Is: Introduction

As a mosaic of vibrant urban spaces and lush natural areas, the City's of Vaughan's urban forest is an important natural asset and a valuable resource for the community. The urban forest provides critical environmental, social, and economic benefits and should be managed to provide optimal community benefit in considering the public costs of its maintenance and care.

1.1 Vaughan's UFMP

Over the past six decades, Vaughan has grown from a community of less than 20,000 to one of more than 300,000. This rapid growth has come with significant change both in the extent of the City's canopy cover, and in the degree of urban pressures exerted on our urban forest.

Cities across Canada have experienced similar changes and, as a result, an increasing number of urban communities are adopting urban forest management plans to better inform the management of their urban forests in the face of the contemporary challenges faced. In 2022, the York Region Official Plan included directions for local municipalities to develop urban forest management plans. Vaughan has prepared this plan in part as a result of that policy directive.

This is Vaughan's first Urban Forest Management Plan. It details a 20-year framework for sustainable management of trees throughout the City. The scope of the Plan includes every tree in the City, on both public and privately managed lands. The Plan sets a baseline for Vaughan's urban forest today, establishes the long-term vision for urban forest management, and defines a set of goals, strategies, and supporting actions toward achievement of that vision.

This Plan includes the following sections:

- **What This Is:** Plan Introduction – introduces the purpose and structure of the Urban Forest Management Plan, the many benefits of the urban forest, and the entities that have a role in its management.
- **Part 2. What We Have:** Program Context and Supporting Analyses – provides a brief history of Vaughan's urban forest, pertinent regulatory contexts, identifies the scope of the City's current urban forest management program, and describes extent, structure, and qualities of Vaughan's urban forest today
- **Part 3. What We Heard:** Outcomes From Engagement – summarizes findings from public engagement undertaken as part of this Plan's development
- **Part 4. What We Face:** Strengths, Challenges, & Opportunities - describes the current strengths, pressing challenges and significant opportunities currently facing the City's urban forest management program.
- **Part 5. Where We're Going:** The Vision, Canopy Cover Target, and Strategic Framework – presents the community's canopy cover target, the Plan vision, the strategic framework for the plan, the action plan, and a monitoring framework.

1.2 Urban Forestry 101

What Is The Urban Forest?

Vaughan's urban forest includes all trees in the City (**Figure 1-1**). The City's urban forest includes the trees, forests, and related abiotic, biotic and cultural components in areas extending from the urban core and encompassing both private and public ownership structures.

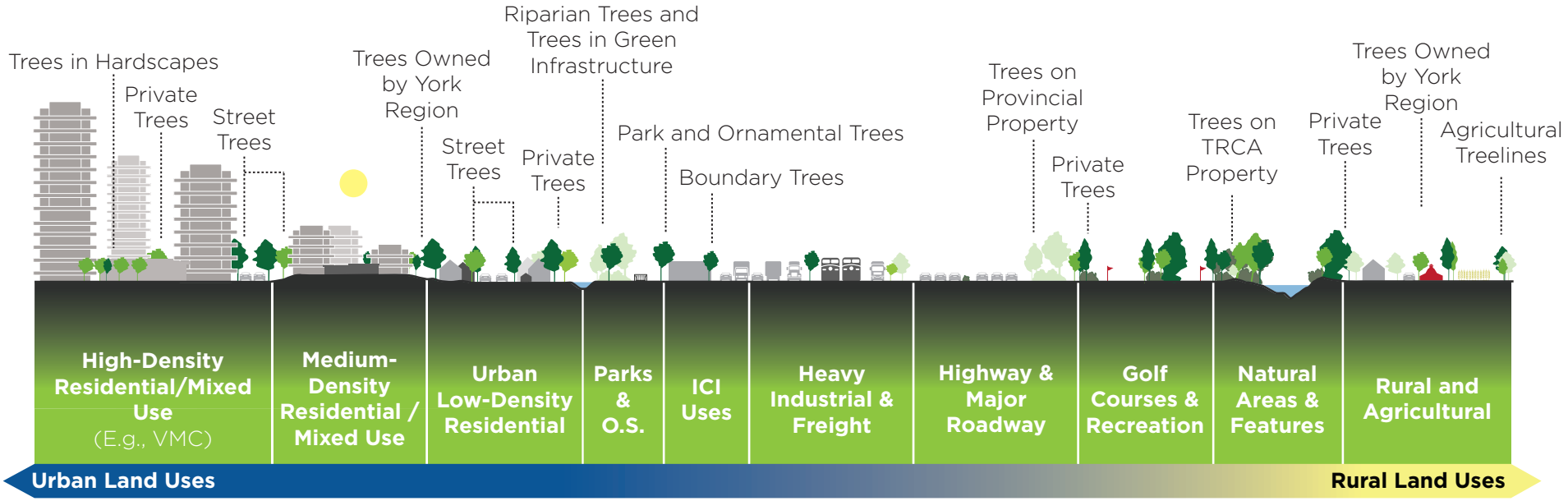


Figure 1-1. *While Vaughan's urban forest spans a range of land uses, this document is scoped around the City's forested parks and intensively managed street trees.*

Why Is The Urban Forest Important?

Urban forests play a vital role in fostering a healthy and livable environment for life in urban communities. Trees provide shade and cool the air temperature, improve air quality, and support biodiversity. These benefits are often referred to as ecosystem services and are often categorized into four main groups:

- **Regulating services:** These are benefits that help balance and regulate natural processes. They include climate regulation, carbon sequestration, water purification, pollution control, and flood management, becoming even more vital as climate change challenges intensify.
- **Cultural Services:** These are intangible benefits that enrich human experiences, such as aesthetic value, spiritual significance, shade, recreational opportunities, and educational resources. They contribute to community identity, well-being, and local tourism.
- **Supporting Services:** Fundamental to all ecosystems, these services, like nutrient cycling, soil formation, and habitat creation, underpin the availability of other ecosystem benefits.
- **Provisioning Services:** These are the tangible goods produced by trees, from food and water to timber and medicines. These services cater to the needs of humans and wildlife while bolstering the local economy.

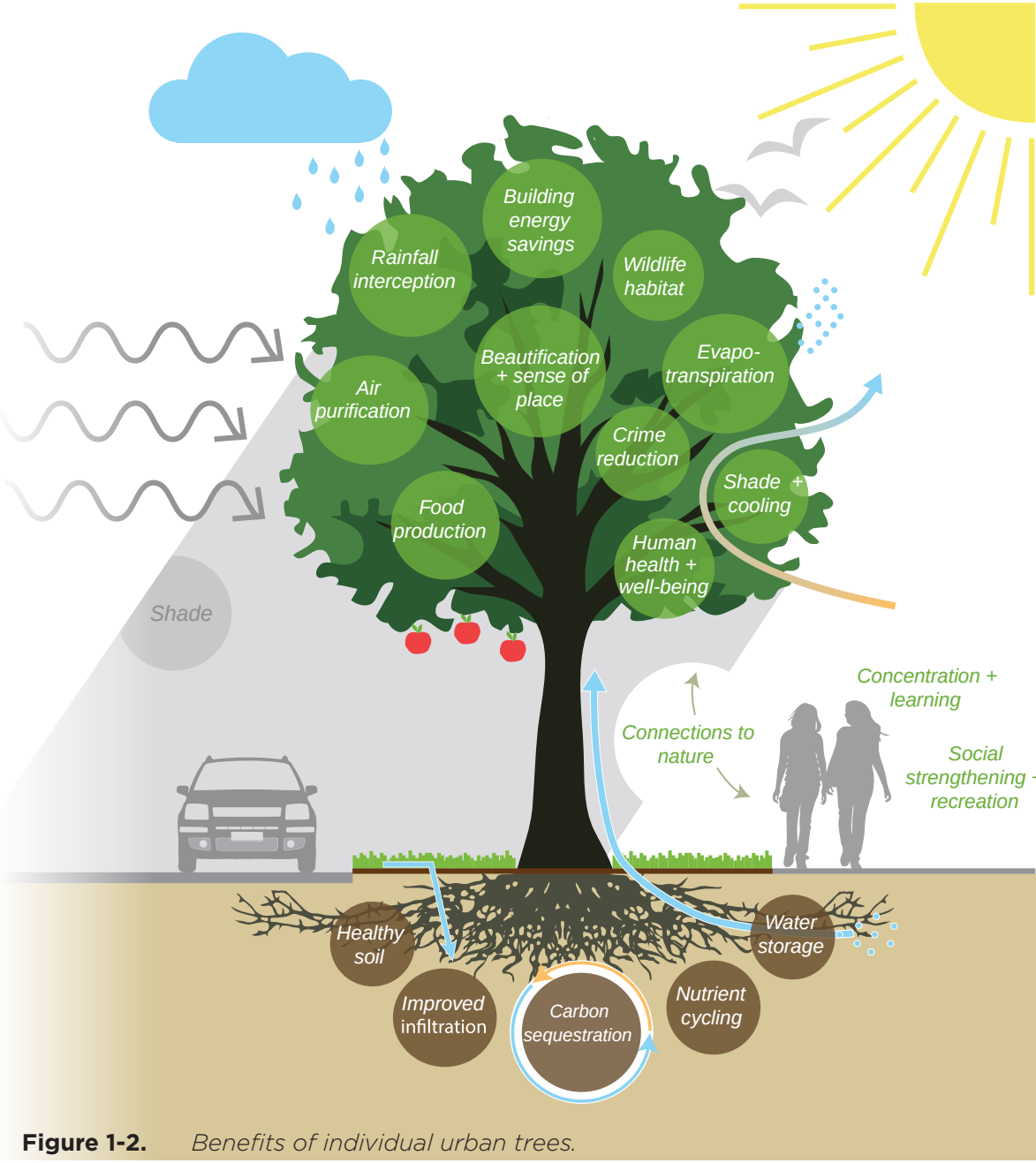


Figure 1-2. *Benefits of individual urban trees.*

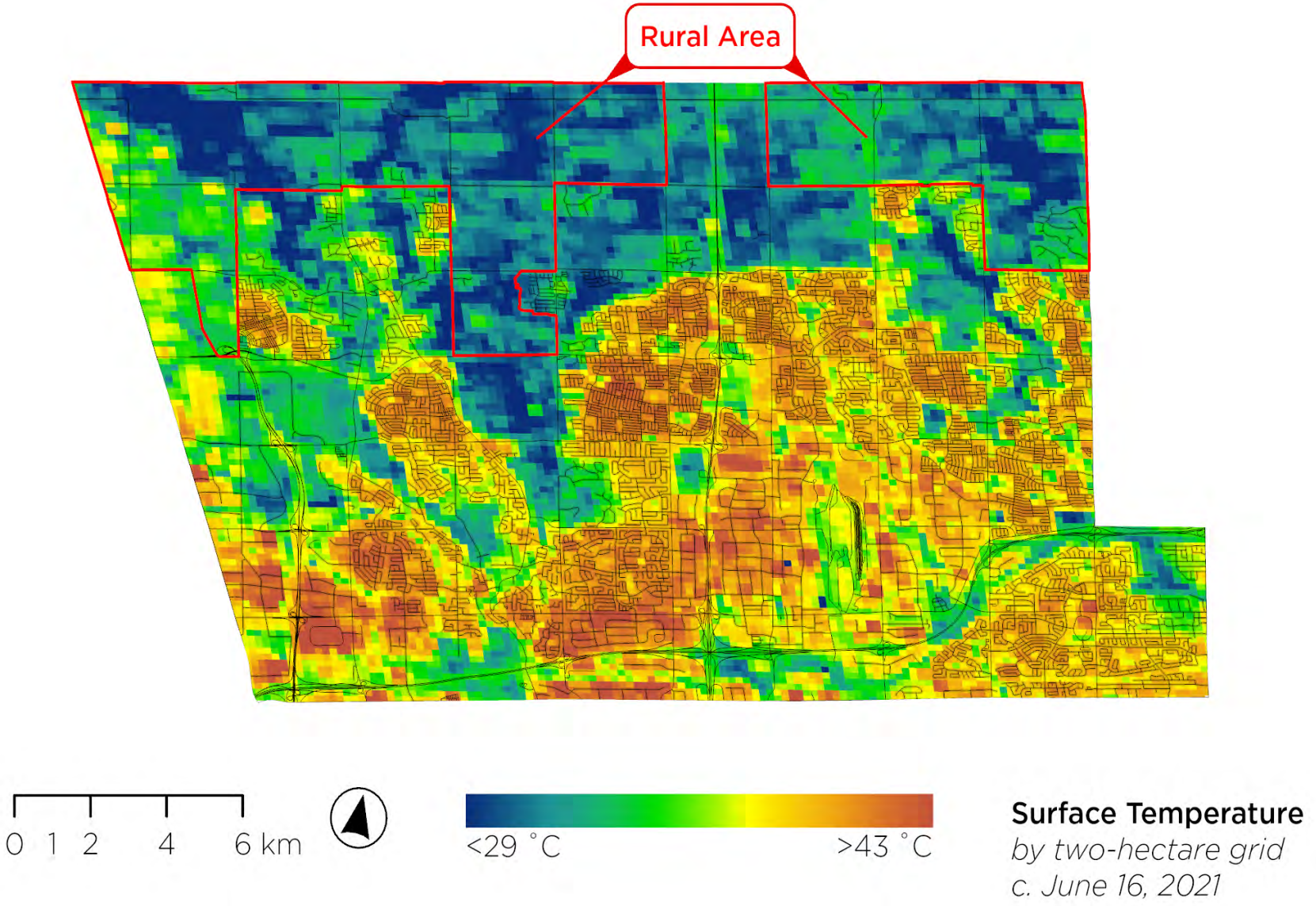


Figure 1-3. *Vaughan surface temperature mapping. The City's hottest surface temperatures contrast its coolest; this is heavily moderated by the presence of tree canopy (***Figure 2-6***).*

Urban forests provide benefits at multiple scales, from individual trees to entire woodland communities. Larger, healthier trees generally provide a greater share of benefits, supporting more shade, cooling larger areas, filtering more pollutants from air and water, and providing enhanced habitat for native fauna. A sampling of common urban forest benefits are described following.

Healthy people and communities

Trees promote physical and mental well-being, offering places to exercise and find quiet contemplation. Exposure to greenery has been found to lower stress levels, improve work performance, and even shorten hospital recovery times.[2,3,4] Having a nearby park or natural area has been shown to increase the likelihood of people achieving recommended levels of physical activity.[5]

Financial value

Urban trees support the local economy. Trees in urban settings help local shops outperform less green commercial districts by encouraging people to stay longer and spend more.[6] A high cover of trees has raised neighbourhood property values in studies from Finland to Florida.[7,8,9]

A sense of place

Forests and trees offer individuals and communities layers of meaning that contribute to cultural benefits like strong civic identity and pride.[10]

Clean air and water

Trees capture rain and filter pollutants from air and water.[11,12] Some of this water resurfaces in streams, lakes, wetlands, and ponds. The urban forest cleans the air by taking in pollutants like carbon monoxide, road particulates, and nitrogen dioxide and releasing oxygen.[13,14]

Climate resilience

The urban forest sequester carbon, helping to limit global climate change.[15,16] At the local level, shade and evapotranspiration, or the process of trees losing water through their leaves, cools the surrounding air and surfaces.[17] Urban areas with minimal vegetation experience temperatures several degrees warmer than areas with over 40% canopy cover.[18]

The urban forest can also mitigate the impact of storms and flood events[19] by intercepting and slowing rainfall with their canopy, stem and roots.

Habitat and biodiversity

The urban forest is a reserve of biodiversity.[20] Trees, in life and death, support habitat used by many more plants, animals, fungi, and microbes. Intact forests with complex habitats support an even greater variety of life. Animal residents of the urban forest also benefit from many of the same ecosystem services humans value, like clean water and forest foods.[21]

Resources

While the urban forest is primarily grown and managed in urban communities for its intangible benefits, many cities salvage removed trees for products such as wood chips and mulches. Fruit trees in community gardens or orchards can provide fresh, locally grown food. Some trees support medicinal resources, providing natural remedies and ingredients for traditional medicines.

CLIMATE REGULATION
Trees protect against powerful winds, sequester carbon, and reduce harmful pollutants.
ENERGY EFFICIENCY
Trees can save building maintenance costs through cooling and heating year around.
TEMPERATURE COOLING
Trees cool cities by providing shade and cooling hard surfaces.
ECONOMIC STIMULUS
Urban forests promote a lively street life and attract customers.
STORMWATER MANAGEMENT
Trees intercept rainwater and slow stormwater runoff during storm events.
ENHANCE PHYSICAL AND MENTAL HEALTH
Urban forests encourage physical activity which in turn helps reduce stress, anxiety and depression.

Valuing Ecosystem Services

Assigning a financial value to the benefits supported by an urban forest helps to communicate their significance to the communities they exist within. **Table 1-1** quantifies the amounts and financial value of a small selection of ecosystem services supported by Vaughan's urban forest (in 2023). The identified values uses methods from the USDA's i-Tree Canopy tool and includes all trees in Vaughan, both public and private. Further information on the i-Tree approach and Vaughan's urban forest ecosystem services can be found in the **2023 State of the Urban Forest report**.

Vaughan's urban forest is estimated to deliver approximately $6.5 million worth of services per year from carbon sequestration, runoff/stormwater management, and air pollutant removals, alone. The urban forest also stores 542 thousand tonnes of carbon, with an estimated value of $102 million based on Canada's 2023 carbon pricing.

The monetary figures capture only a subset of the forest's numerous benefits, many of which are intangible and difficult to measure (e.g., social, cultural, and recreational values). Therefore, the actual value of services from Vaughan's urban forest is likely much greater than reported here.

Table 1-1. *City of Vaughan ecosystem services generated by all canopy cover within Vaughan.*

Tree Canopy Ecosystem Service Estimates (i.e., All Trees in the City)		
Ecosystem Service	**Service Estimates**	**Dollar Value ($)**
Carbon & Stormwater		
C Sequestered annually in trees (t)	14,200	$2,682,000
C stored in trees (t)	542,000	$102,291,000
Avoided runoff (L)	1,221,268,000	$2,839,000
Air Quality		
CO removed annually (t)	5.4	$8,000
NO2 removed annually (t)	19.7	$14,500
O3 removed annually (t)	194.6	$960,000
PM10 (t)	Negligible	Negligible
PM2.5 (t)	13	$2,230,000
SO2 removed annually (t)	2	Negligible
Total air pollution removed (t/year)	234.7	$3,215,000
Total Annual Service Value		**$6,428,000**
Total Stored Carbon Value		**$102,291,100**

1.3 Why Do We Manage The Urban Forest?

Urban forestry is the sustained planning, planting, protection, maintenance, and care of trees, forests, and related resources in and around cities and communities for economic, environmental, social, and public health benefits for people.[22]

The management of the urban forest requires slightly different thinking than is applied to other forms of municipal asset. This is because, unlike traditional infrastructure like roads or sewers, trees gain value as they mature, while conventional assets begin to depreciate in value immediately following installation (**Figure 1-4**). Most expenses in a tree's life cycle occur through relatively expensive planting and removal activities. To optimize public investment in urban trees, it is important to employ practices that work to extend tree lifespans. Urban forest managers ultimately look to maximize community benefits while minimizing the frequency of costly removal and replacement activities.

Just like a car or bicycle, trees require routine maintenance and eventual replacement. To plan for the future, the City plans for routine maintenance to extend the life-cycles of the assets under its care—this includes tree assets.

Urban trees are vulnerable to various challenges, including soil contamination, drought, pests, and extreme weather. Consistent preventive maintenance—such as watering, pruning, and inspection—is essential for maintaining a healthy urban forest. Regular maintenance also reduces community costs related to extreme weather events, and reduces the frequency at which premature (and relatively expensive) removal, and replacement activities occur.

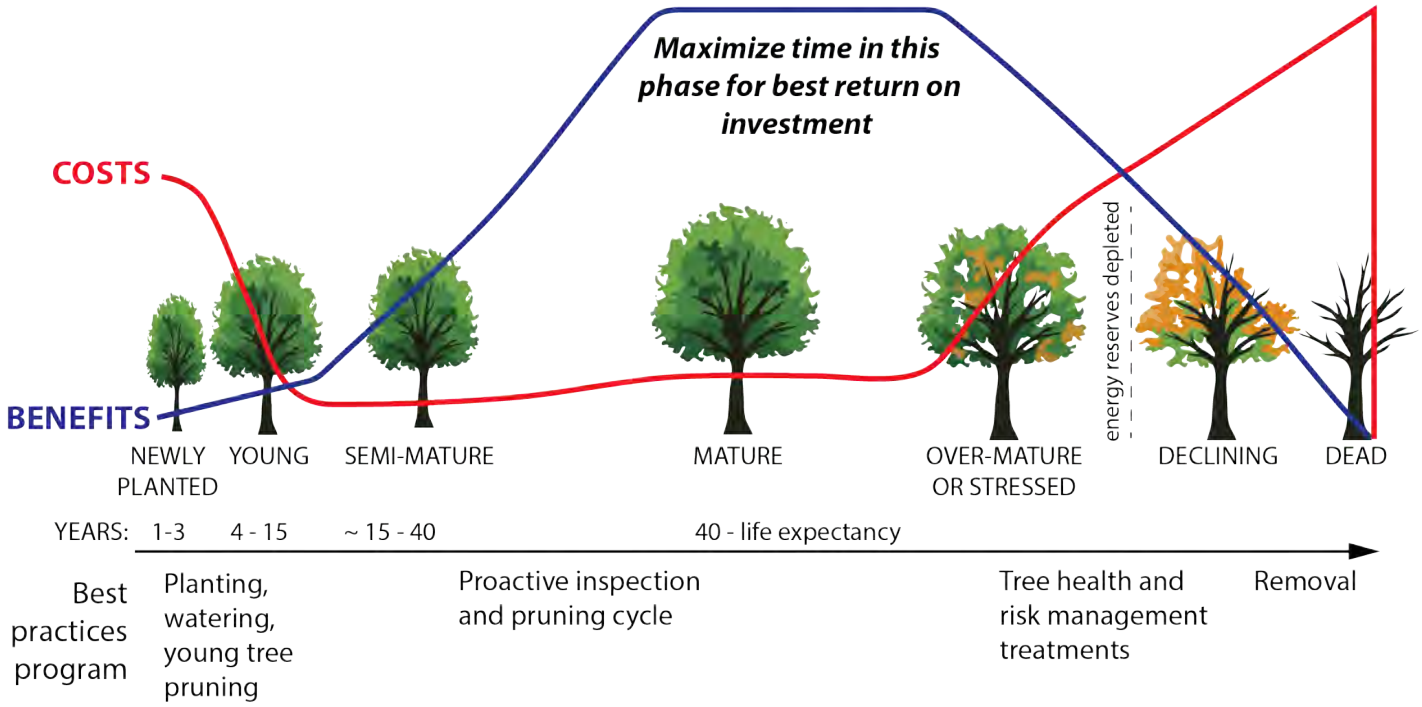


Figure 1-4. *Magnitude of management costs and tree benefits over the tree life cycle.*

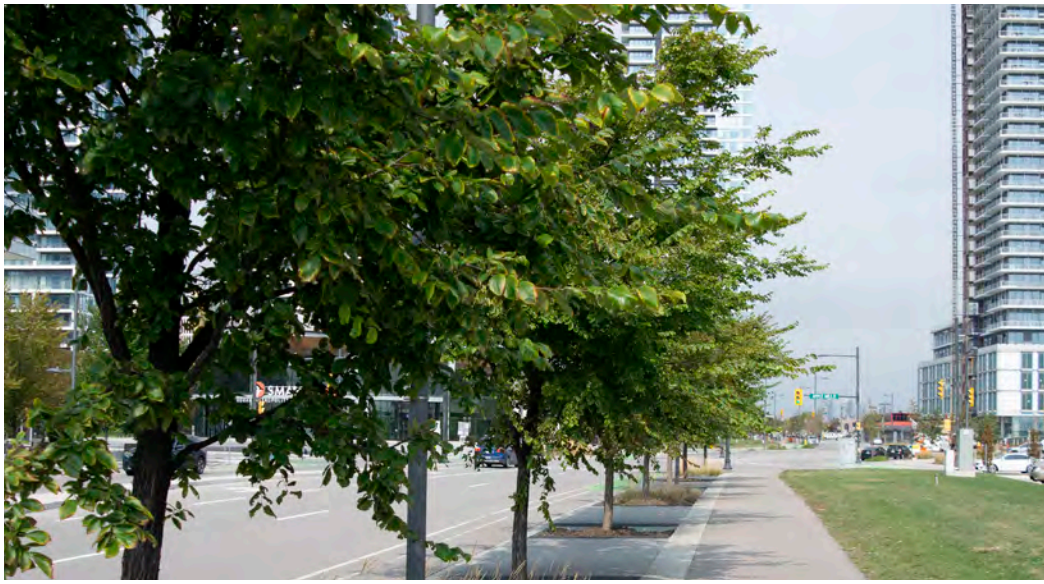
Part 2. What We Have:
Program Context and Supporting Analyses

Part 2. What We Have: Program Context and Supporting Analyses

2.1 Who Manages The Urban Forest?

The management of Vaughan's urban forest is the collective responsibility many actors. The City is directly responsible for just 16% of the urban forest canopy—the portion of the urban forest found on City-owned land. Of the remainder, 24% is owned or managed by the Toronto and Region Conservation Authority, while 60% is managed by others, mainly private property owners.

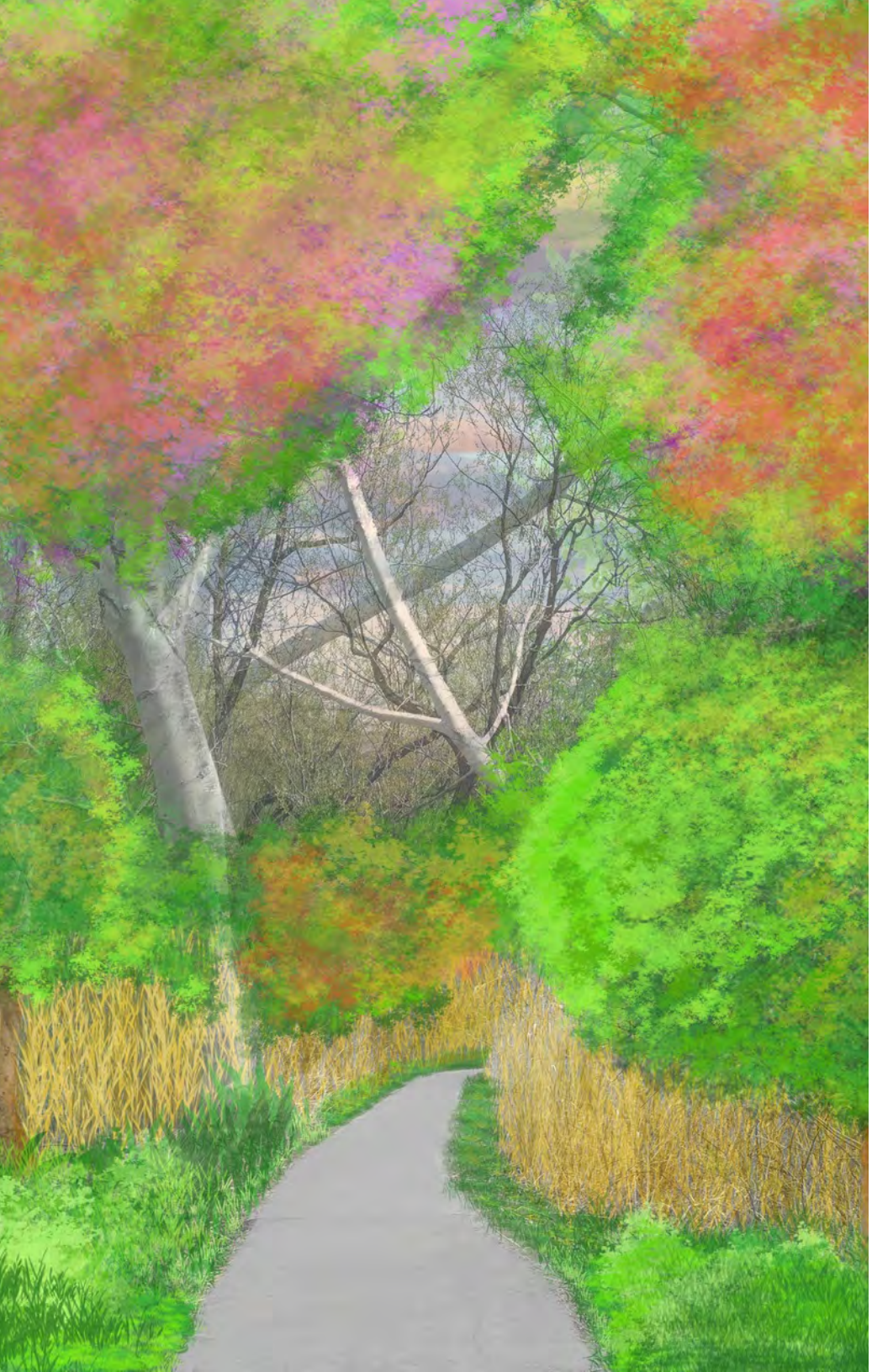
While the City is primarily responsible for urban forest management on City-owned property, guidelines and standards like the Tree Protection By-law provide the City with the ability to influence urban forest outcomes on private land in some cases.



The role of City departments

Within the City, several departments are involved in the planning and management of the urban forest.

- **Parks, Forestry and Horticulture Operations**
  - » Manages trees, horticulture, parks, trails, and sport fields. Advises other departments on tree-related matters.
- **Parks Infrastructure Planning and Development**
  - » Focuses on developing strategic park policies, secures parkland through the development process, builds new and redevelops existing parks and trails.
- **Development Engineering**
  - » Reviews and approves municipal services in line with the City's planning and specifications.
- **Infrastructure Planning and Corporate Asset Management**
  - » Updates Asset Management Plans based on available data.
- **Policy Planning and Special Programs**
  - » Conducts small- to large-scale planning studies, develops policies and guidelines for sustainability, and facilitates citizen input.
- **Transportation and Fleet Management Services**
  - » Maintains roads and ensures traffic safety.
- **Development Planning and Urban Design**
  - » Reviews a variety of Development Applications which may impact trees on private property.



"Walkway thru the Forest by my House" by Ronak Gandhi (Digital Mixed Media), Vaughan Urban Forest Management Plan Art Contest: Third Place (c. April, 2023).

Local Enhancement and Appreciation of Forests (LEAF)

LEAF is an established regional NGO that operates in Vaughan. LEAF supports a range of stewardship activities including tree planting events and programs, education, and training, and as such represents a critical partner in supporting the implementation of this document.

"Our mission is to grow and sustain the urban forest by providing quality services and programs that engage communities."

In 2022 LEAF:

- Planted 1,884 native trees and shrubs through the Backyard Tree Planting Program with 665 property owners
- Held 3 educational campaigns that highlight native species
- Held 14 planting events in York Region
- Planted over 3,250 native trees and shrubs on public lands with volunteers dedicating 1,700 hours
- Hosted 16 presentations, 5 tours and 1 workshop with over 700 attendees.

The role of actors external to the City

A range of actors external to the City influence urban forest management on public and private lands:

- **Province of Ontario**
  - » Provides regulatory frameworks and plans like the Greenbelt Plan and Oak Ridges Moraine Conservation Plan.
  - » Responsible for provincial highways and vegetative management within them (MTO).
  - » O.Reg 588/17 requires municipalities to include natural assets in their asset management planning approach.
- **York Region**
  - » Sets regional policies, enacts by-laws protecting rural trees and natural heritage, and responsible for regional road tree maintenance.
  - » Strong regional champion for the urban forest and urban forest management within all of its constituent communities.
- **TRCA**
  - » Manages conservation lands, provides policy guidance, review development proposals in regulated conservation lands, and engages in outreach.
- **Hydro and other utilities**
  - » Prunes trees near utility lines.
  - » Liaises with the City on utility project that may impact City assets, including trees.
- **School Boards**
  - » Manages the School Grounds Greening and Enhancement Program in partnership with York Region and Evergreen to increase canopy cover and demonstrate benefits of trees.
- **NGOs**
  - » Several active NGOs in Vaughan such as the Local Enhancement & Appreciation of Forests (LEAF), Sustainable Vaughan, Forests Ontario, TD Forests Program, and Tree Canada help in education, outreach, securing funding and support greening on public and private land.
- **Residents and Neighbourhood Associations**
  - » Residents maintain, plant, and remove of trees on their properties in accordance with the City's Tree Protection By-law.
  - » Neighbourhood associations and ratepayer groups can raise awareness of trees and woodland preservation, and promote community involvement.
- **Development Industry**
  - » Builds homes, businesses, and facilities in Vaughan meeting the City's development requirements for trees and related landscaping.

This 350-year-old sugar maple (*A. saccharum*), known endearingly as the "Grandpa Maple", has endured many changes to the lands surrounding it. The TRCA now uses it to support maple syrup programming at Kortright Centre, and the tree attracts an estimated one million visitors each year (Heritage Trees, Forests Ontario).

2.2 Urban Forest History

The land currently known as Vaughan lies within the territories and Treaty 13 lands of the Mississaugas of the Credit First Nation,* and the traditional territory of the Huron-Wendat Nation† and the Haudenosaunee.‡ These Nations occupied, controlled and exercised stewardship over lands, waters, resources, and trees in Southern Ontario for thousands of years before the arrival of settler peoples, and they maintain ongoing connections to the landscapes of Southern Ontario and the St. Lawrence River Valley today.

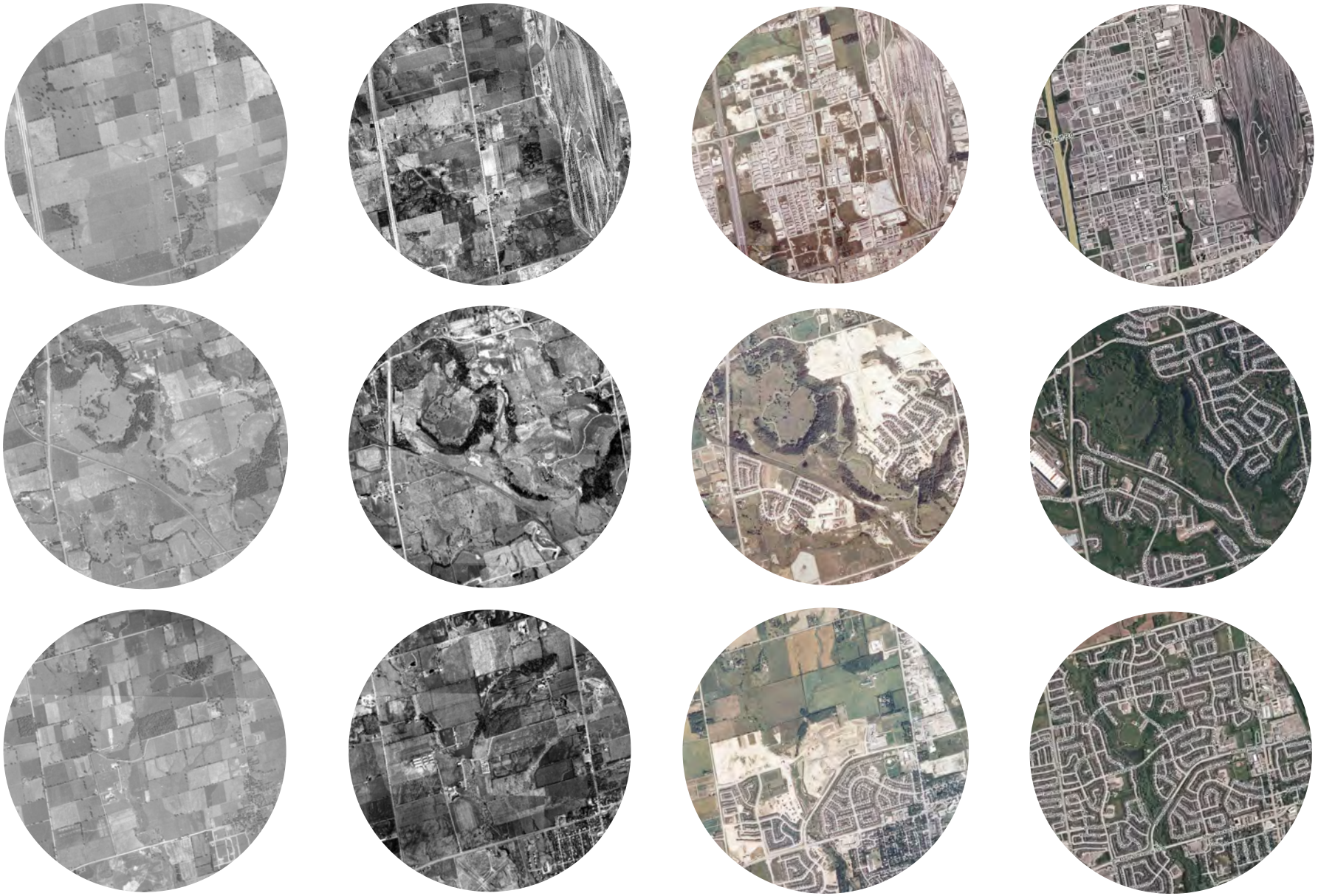
The arrival of Europeans in the 16th century had a significant impact on the region. As more settlers arrived, Indigenous people were pushed from their traditional territories. Forests were cleared to supply timber for construction and to make space for roads, farms, homes and other buildings. Trees and forests were often seen as obstacles to settlement and frequently burned and converted into potash. By the 1860s, much of the forest cover in the southern Ontario had been cleared, which

* Learn more about the Mississaugas of the Credit First Nation at **mncfn.ca**

† Learn more about the Huron-Wendat Nation at **wendake.ca**

‡ Learn more about the Haudenosaunee at **sixnations.ca**

Vaughan Through the Years



This 130-year-old red oak (*Q. rubra*) is located in front of the Church Street School, which opened in 1886. The Church School is thought to have been attended by Lester Pearson, Canada's 14th prime minister and winner of a Nobel Peace Prize for his work in resolving the Suez Canal Crisis of 1957 (Heritage Trees, Forests Ontario).

contributed to significant ecological and social issues such as soil loss, erosion, shortages of fuelwood for heating, and a drastic declines in native biodiversity.

Today's native landscapes in Vaughan are in large part "second-growth" forests, re-grown following the historic removal of woodland cover. Over the past two hundred years, hundreds of non-native species and cultivars, such as apple trees Norway maple, and linden, have also been introduced into the urban landscape. Some introduced species, such as buckthorn, certain honeysuckle species, and even Norway maple have become a significant invasive species over this period, disrupting local ecosystems, and threatening local biodiversity.

Vaughan's transformation from a predominantly rural area into an urban center in the late 20th century came with its own set of challenges, including the introduction of exotic pests and diseases like Dutch elm disease, chestnut blight, and emerald ash borer. These challenges put unprecedented pressure on local ecosystems, resulting in yet another pressure on the already strained ecosystems.

As we navigate the 21st century, Vaughan faces a new set of conditions, including climate change and continued urban expansion. Addressing these challenges requires a collaborative and informed approach to sustainably manage Vaughan's urban forest as a vital resource for generations to come.

Figure 2-1. *Summary of legislation, policies, and programs that influence the urban forest management in Vaughan.*

"Mystical Spruce" by Patrick Butler (Mixed Mediums), Vaughan Urban Forest Management Plan Art Contest: Second Place (c. Feb. 2023).

2.3 Policy Context

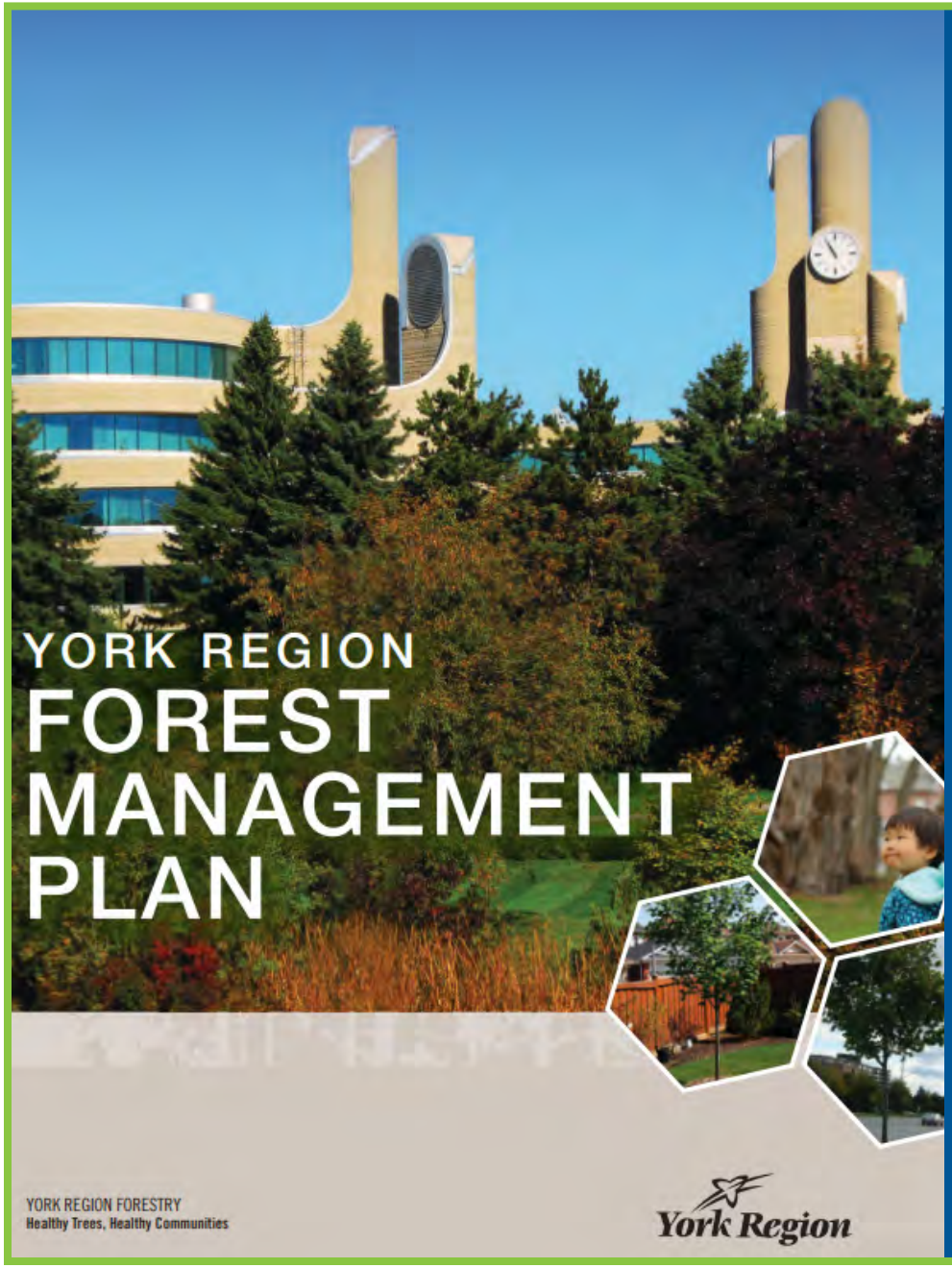
Regulatory context and related initiatives

Vaughan's urban forest management is influenced through a variety of policies, legislation, regulations and standards (**Figure 2-1**). Vaughan's 2023 **State of the Urban Forest** report provides a detailed description of the current (2023) regulatory context to urban forest management in the City.

Vaughan's urban forest management operates within a multifaceted regulatory framework encompassing legislation, policies, and by-laws at the municipal, regional and provincial levels. Central legislation like the *Municipal Act* and the *Planning Act* enable the City to regulate trees and woodland areas. Recent amendments to these acts, especially to the *Planning Act*, have significant implications for development regulation, and therefore for the outlook of trees as part of the development process.

Provincial growth plans such as that for the Greater Golden Horseshoe inform regional development. Environmental acts like the *Greenbelt Act* and the *Oak Ridges Moraine Act* emphasize the protection of agricultural land and ecologically sensitive areas. The *Endangered Species Act* aims to preserve endangered or threatened species and their habitats.

The York Region Official Plan and the City of Vaughan Official Plan, conform to provincial policy and legislation,



YORK REGION FOREST MANAGEMENT PLAN

5 GOALS

#1 CANOPY COVER AND WOODLAND COVER

Increasing tree canopy cover by working toward the existing target of 25% woodland canopy and 40% canopy cover within York Region by 2051.

- **Continue to actively support local municipalities, conservation authorities and others in the development of Urban Forest Management Plans**
- **Undertake urban forestry studies in partnership with local municipalities on a 10-year cycle**

#2 CLIMATE CHANGE AND SUSTAINABILITY

Managing tree and woodland biodiversity to increase ecological resilience and minimize the impacts of climate change.

#3 AWARENESS AND ENGAGEMENT

Increasing public awareness and appreciation of the value of trees and woodlands.

#4 STEWARDSHIP AND TAKING ACTION

Increasing stewardship of trees and woodlands on public and private lands.

- **Strengthen relationships among the Region, local municipalities, Ontario Woodlot Association, Forests Ontario, and others to encourage good forestry practices on private land.**

#5 GOVERNANCE, INNOVATION, RESEARCH AND DEVELOPMENT

Sustainably manage the forests of York Region through continuous improvement, adaptation and innovation.

and provide more specific policy direction in considering the local community context.

By-laws, like the Tree Protection By-law and Zoning By-law, offer more specific rules for tree removal and development regulation. Additional guidelines, like the Tree Protection Protocol and the Sustainability Metrics Program, provide refined procedures and evaluation metrics for sustainable development.

Other plans and policies, although not exclusively forest-centric, impact urban forest outcomes. For example, the Asset Management Plan categorizes urban forest assets and provides financial and technical guidance for their effective management. Green Directions Vaughan focuses on sustainable development and includes actions related to the urban forest. The York Region Climate Change Action Plan, although not explicitly mentioning the urban forest, offers insights into adaptive planning for natural systems.

While Vaughan's Urban Forest Management Plan provides detailed guidance for urban forest management, it does not operate in isolation. Municipal, regional and provincial legislation, by-laws, and policies both enable and constrain the actions within the management plan.

Ontario's Natural Heritage System (NHS) serves as a crucial framework for protecting the provinces environmentally significant features, including woodlands, on both public and private land. Woodlands are classified as "significant" or not based on NHS mapping criteria, which is prescribed through planning documents at different political levels and is explicitly mapped in a similarly intergovernmental way. The effect of all of the definitions and mapping is that while all "significant" woodlands are considered woodlands, not all woodlands meet the criteria for being deemed "significant."

Natural Heritage System

The Natural Heritage System (NHS) is a provincial land use system made up of natural heritage features and areas, and linkages intended to provide connectivity and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. The NHS owes its powers to Ontario's provincial policy statement, to which all land use planning decisions and documents within the province must remain consistent.

The NHS is a provincial planning policy implemented to varying degrees by the province, upper-tier municipalities (e.g. York Region), and by lower-tier municipalities, including the City of Vaughan. Although municipalities cannot remove NHS features identified by provincial or upper-tier planning authorities, they have some latitude in identifying additional areas that meet their own criteria through their own Official Plan schedules.

The City of Vaughan has included its own Natural Heritage Network (NHN) through its Official Plan (2010) (**Figure 2-2**). The NHN presently covers over 6,000 ha, accounting for about 20% of Vaughan's total land area, and 61% of Vaughan's total canopy area. Over half of the City's NHN is presently under the ownership of the City or TRCA.

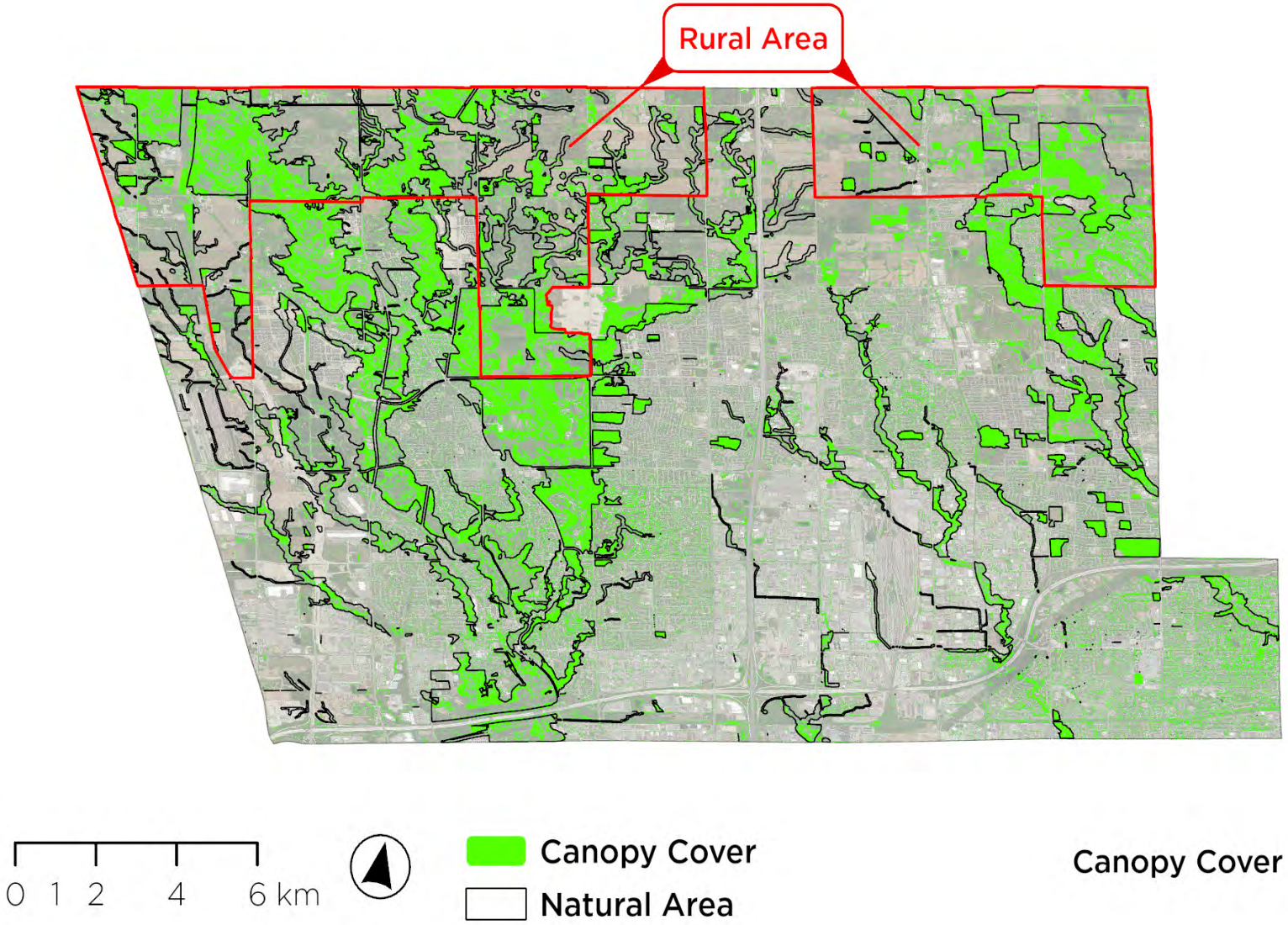


Figure 2-2. *City of Vaughan natural areas (NHN) mapping.*

2.4 Vaughan's Urban Forestry Management Program

The stewardship of Vaughan's urban forest falls mainly to the Urban Forestry Division, a specialized group within the Department of Parks, Forestry and Horticulture Operations. This team comprises 14 full-time staff members and two part-time contributors, totalling 15 full-time equivalent roles (**Figure 2-3**), which includes:

- **One manager of Urban Forestry**, who oversees the urban forestry program and supervises the urban forestry staff
- **Two forestry inspectors**, who conduct tree inspections, customer service, and development application review
- **Three forestry coordinators**, who coordinate staff and various aspects of the program
- **Six arborists**, who undertake scheduled and responsive tree maintenance activities
- **Three forestry labourers**, who provide additional labour capacity when needed.

In 2022, the City also supplemented in-house efforts with approximately 2,500 hours of contracted labour to meet the high volume of service requests, underscoring the program's reliance on external crews.

The urban forestry management program focuses on six key services areas:

- **Public tree pruning** for hazard abatement and sight line clearance.
- **Forestry permitting and plan review** for minor variance, development application, permits, curb cut applications, internal infrastructure delivery projects, and tree inspections of new subdivisions prior to municipal assumption.
- **Emergency and storm response** which include cleaning up and abating hazards after significant weather events.
- **Public tree removal** for reasons such as end of life and infrastructure conflicts.
- **Tree planting and replacement** of previously removed trees.
- **Tree risk assessment** to monitor, respond to, and mitigate tree-related risks to community safety.

In 2022, the department received over 5,100 service requests, primarily concerning tree pruning, inspections, removal, and storm-related clean-up. While the City aims to resolve these requests within roughly 24 weeks from the inspection date, extenuating circumstances like severe weather events can prolong this timeline.

Operational expenses for the Urban Forestry Group exceeded $2.2 million in 2023, with the majority allocated to staff wages and labour costs. To adequately manage these demands, the department often employs contract crews to supplement its workforce.

Urban Forestry's efforts are primarily focused on urban trees in streets and landscaped parks. Due to resource limitations, the City currently lacks a comprehensive woodland inventory and a dedicated woodland management program.

Urban Forestry Program quick facts:

Leading Department:
Urban Forestry Group

Staff:
15 FTE

Key Tasks

- Public tree pruning
- Forestry permitting and plan review
- Emergency and storm response
- Public tree removal
- Tree planting and replacement
- Tree risk assessment

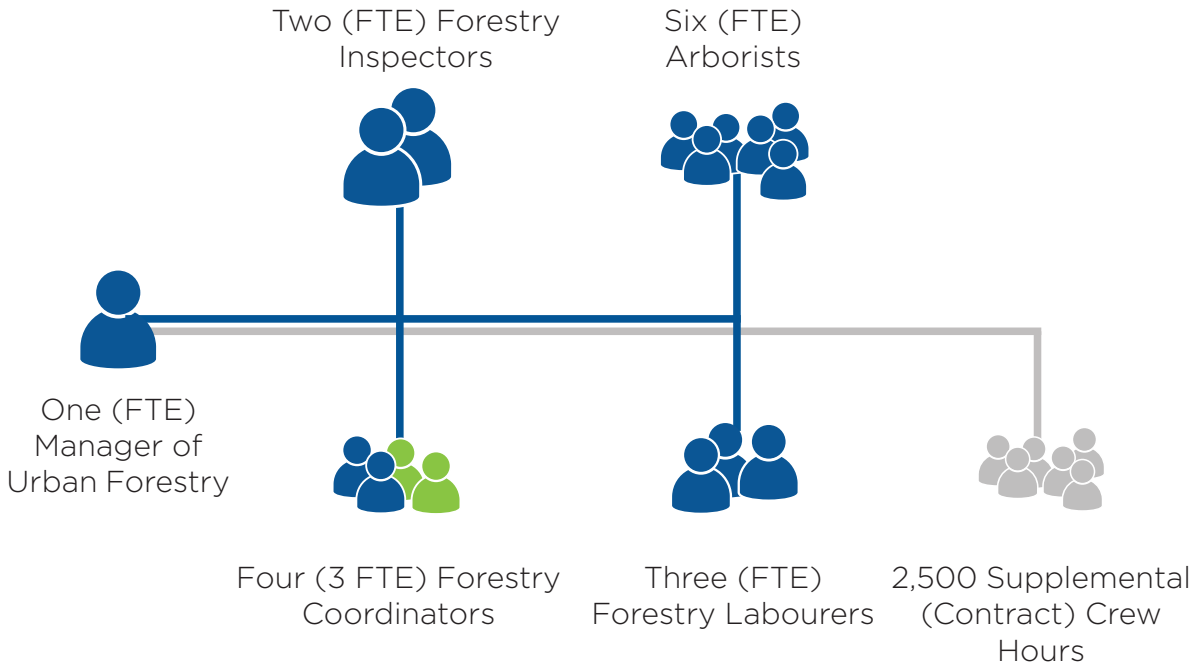


Figure 2-3. *Urban Forestry Group organizational structure (2022). City of Vaughan.*

2.5 Program Report Card

Vaughan's urban forest management program and services have been evaluated against an urban forest sustainability model first proposed by Clark et al. (1997),[23] and most recently updated by Leff (2016).[24] Additional criteria have been incorporated to reflect new standards from the Sustainable Forest Institute for community and urban forests. These criteria and performance indicators serve as benchmarks to assess the current state of an urban forest program compared to an optimal state. Each criterion falls under one of this Plans five goals for urban forest management, and has been evaluated based on a comprehensive review of policy, supporting analysis, and staff interviews.

Overall, Vaughan's urban forest management was assessed as "fair" in 2023. Areas identified for improvement include:

- **Management:** This includes tree inventory, maintenance frequency, risk management, and managing the tree population to ensure a sustainable tree canopy.
- **Partnerships:** This includes partnerships with other levels of government, community organizations and the TRCA.
- **Protection:** This includes policies that protect soils and space for trees in developments, along with the standards applied for tree protection when construction occurs around trees.
- **Growth:** This relates to increasing the urban forest canopy, including the equitable distribution of tree canopy and plans to guide planting and woodland restoration, along with the standards and quality of trees planted in streetscapes and on private property.

The report card in **Figure 2-4** provides a summary of the assessment of each indicator. A complete description of the criteria and indicators can be found in the Appendix.

This section is intended to provide the baseline program conditions against which future program development can be evaluated. Subsequent state of the urban forest reporting and updates to this plan will re-evaluate the position of Vaughan's program as this plan is implemented over its life.

Figure 2-4. *Vaughan's Urban Forest Report Card (Dec., 2023).*

GOVERN

- Awareness of the urban forest as a community resource
- Relative tree canopy cover
- Clear and defensible urban forest canopy assessment and goals
- Interdepartmental and municipal agency cooperation in urban forest strategy implementation
- Municipality-wide urban forest management plan
- Municipal natural asset management
- Municipal biodiversity or woodland management strategy
- Municipal urban forestry program capacity
- Urban forest funding to implement a strategy

PARTNER

- Citizen involvement and neighbourhood action
- Involvement of large private land and institutional land holders
- Urban forest research
- Regional collaboration

PROTECT

- Policy/regulations regulating the protection and replacement of private and City trees
- Policy/regulations for sensitive ecosystems, soils, or permeability through private development
- Internal protocols guide City tree or sensitive ecosystem protection
- Standards of tree protection/care observed during development or by arborists
- Cooperation with utilities on protection (and pruning) of City trees

GROW

- City tree planting and replacement program design, planning and implementation
- Development requirements to plant trees on private land
- Streetscape and servicing specifications and standards for planting trees
- Equity in planting program delivery
- Forest restoration and native species planting
- Selection and procurement of stock
- Ecosystem services targeted in tree planting projects and landscaping

MANAGE

- Tree inventory
- Natural areas inventory
- Maintenance of intensively managed trees
- Publicly owned tree species condition assessment
- Tree risk management
- Emergency response planning
- Pest and Disease management
- Species diversity
- Age diversity (size class distribution)
- Species suitability
- Waste biomass utilization
- Knowledge of trees on private property

2.6 Tree Canopy Cover

Tree canopy cover is a commonly used metric for assessing and tracking the extent of a city's urban forest. Specifically, it reports the area covered by tree crowns, including leaves and branches, as seen from an aerial perspective (**Figure 2-5**).

Vaughan's 2019 Canopy Cover

In 2019, Vaughan's canopy cover was assessed using machine learning techniques that combined LiDAR data and satellite imagery. The analysis estimated that the City is home to 5,400 hectares of tree canopy, covering 20% of it's land area (**Figure 2-6**).

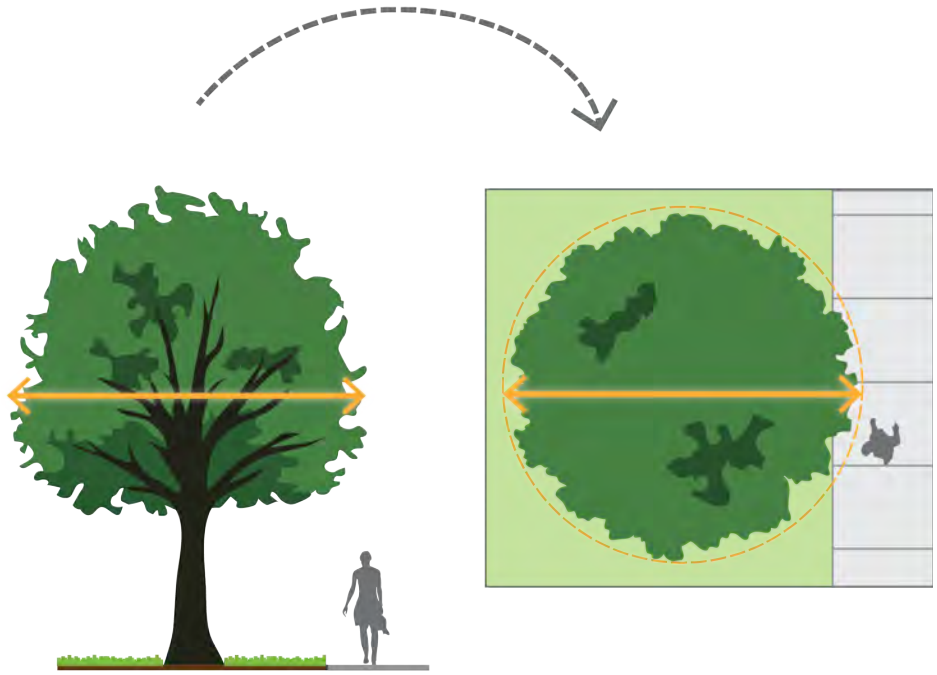


Figure 2-5. *Tree canopy illustrative graphic.*

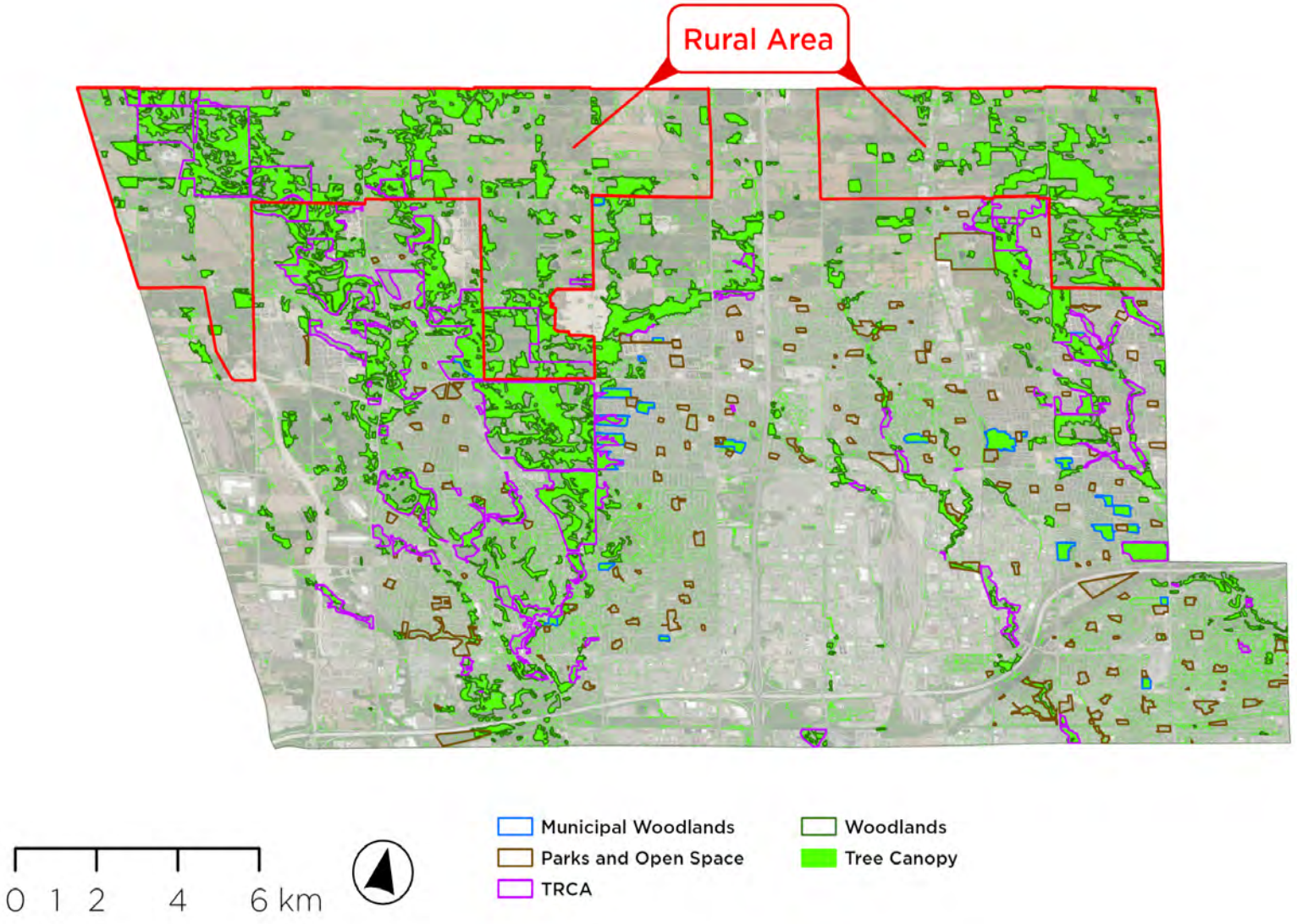


Figure 2-6. *City of Vaughan canopy cover mapping.*

Canopy Cover Comparisons

Canopy cover assessments have also been conducted in several other urban communities in south-central Ontario. This allows for a comparative evaluation of Vaughan's canopy cover against those of other cities. Vaughan's canopy cover aligns closely with larger communities like Hamilton and Mississauga, where cover ranges from 20% to 30% (**Figure 2-7**).

The variation in canopy cover among different communities can be attributed to multiple factors, such as land use patterns, the health of the urban forest, and the intensity of development. Not all municipalities define "urban forest canopy" in the same way; some include rural areas in their calculations (e.g., Burlington), while others do not (e.g., Hamilton). Therefore, comparisons of canopy cover should consider the specific conditions and definitions used in each community.

Canopy By Neighbourhood

Tree canopy cover varies by neighbourhood in Vaughan, ranging from below 10% to 35%. Neighbourhoods with more remnant woodlands tend to have highest overall canopy cover. Examples of this include Woodbridge Centre (35%) and Woodbridge South East (28%) (**Figure 2-8**).

Conversely, neighbourhoods with more industrial and commercial land uses tend to have the lowest canopy cover (less than 10%). Examples include Woodbridge East and South of Maple.

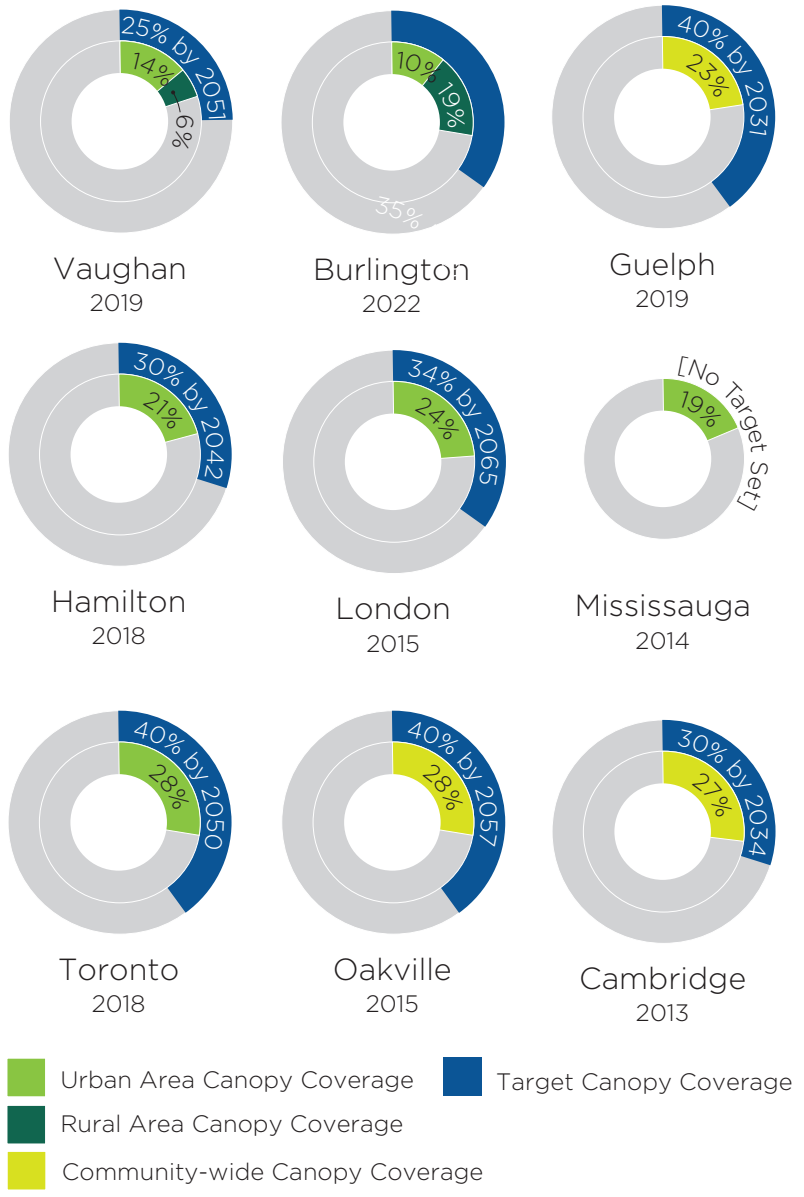


Figure 2-7. *A comparison of Vaughan's program and target to that of its peers.*

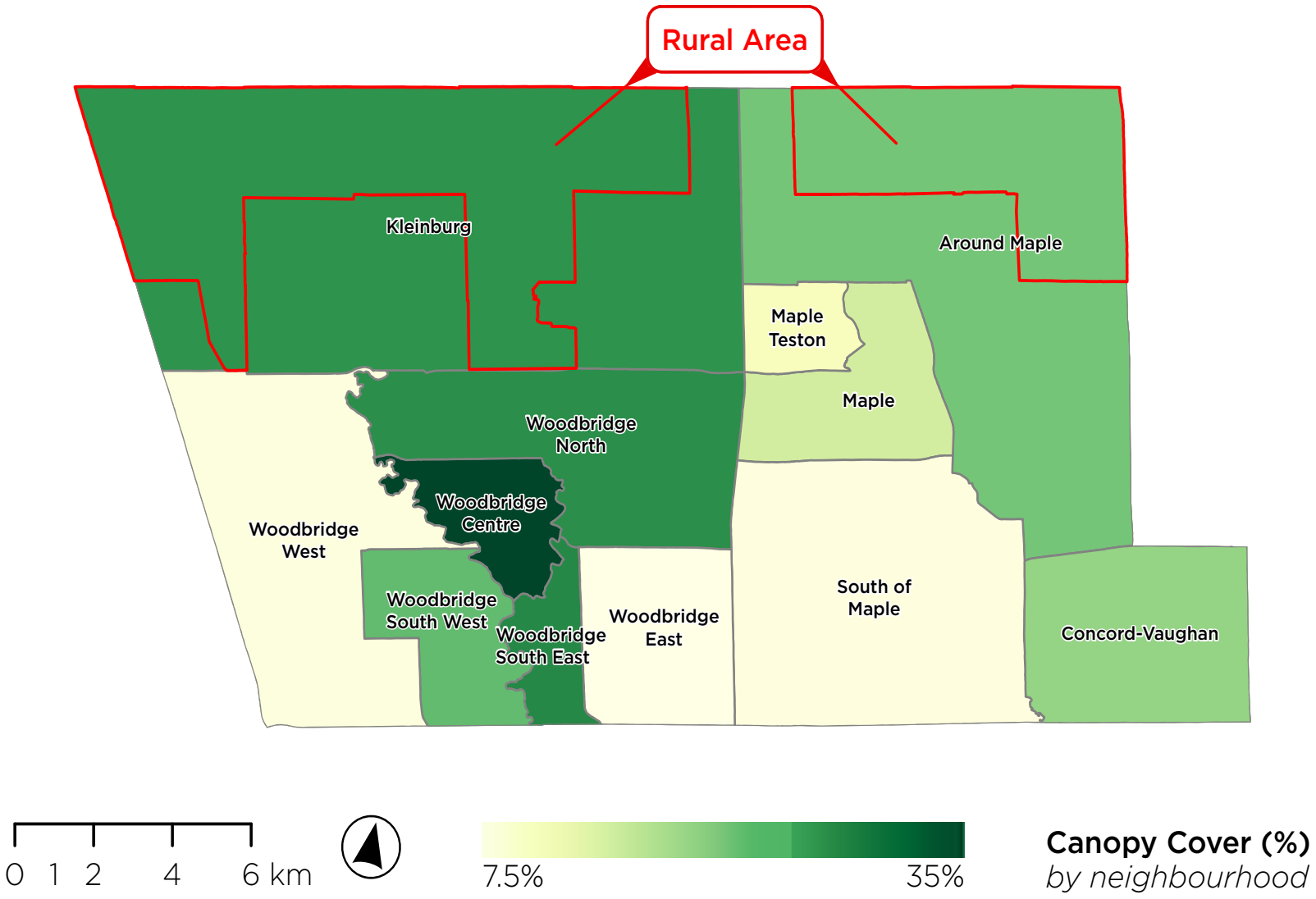


Figure 2-8. *City of Vaughan canopy cover mapping by neighbourhood.*

Canopy By Land Use

In Vaughan, the urban forest canopy is split between City-owned (16%), TRCA-owned (24%), and privately-owned land (60%). Over 60% of the canopy resides in Natural Area zones, which have the highest urban land use canopy cover at 55%. In contrast, institutional land has the lowest at 6%. Although low-rise residential areas occupy the largest land category in the city, they average just a 12% canopy cover (**Table 2-1**).

Table 2-1. *City of Vaughan canopy area and coverage by consolidated land use.*

Consolidated Land Use	Area (ha)	Overstory Count (est.)	Canopy Area (ha)	Canopy Cover (%)	Crown Density (tree/ha)
Urban Area					
Low-Rise Residential	4,854	253,822	579	12%	52
Natural Area	3,989	394,787	2,208	55%	99
Public Roads	3,715	199,499	407	11%	54
Employment	3,055	45,774	96	3%	15
Secondary Plans	2,744	52,408	222	8%	52
Commercial Plaza (+ Theme Park)	886	21,744	53	6%	25
Infrastructure and Utilities	761	23,716	68	9%	31
Parks and City-Owned Open Space	558	31,095	109	20%	56
Private Open Spaces	463	15,273	61	13%	33
High-Rise	108	3,693	12	11%	34
Institutional	53	1,052	3	6%	20
Sub-total	**21,349**	**1,047,693**	**3,834**	**18%**	**43**
Rural Area					
Rural/Agricultural	3,570	90,374	390	11%	25
Natural Area	2,069	197,885	1,102	53%	96
Infrastructure and Utilities	199	9,021	42	21%	45
Public Roads	183	13,840	38	21%	75
Low-Rise Residential	32	1,723	6	19%	53
Secondary Plans	32	3,670	23	70%	114
Sub-total	**6,086**	**316,513**	**1,601**	**26%**	**68**
Total	**27,435**	**1,364,206**	**5,435**	**20%**	**52**

2.7 Tree Equity

Studies have found that canopy is often inequitably distributed within urban communities.[25,26] While specific patterns of inequity vary by local context, education levels and income correlate with canopy cover in many urban centres. Canopy inequities can often add to uneven climate change impacts across demographic and socioeconomic profiles.[27,28] Older adults, for example, are often more vulnerable to extreme heat, and lower-income households may not be able to afford cooling systems.

Figure 2-9 shows current canopy equity across census dissemination areas in Vaughan using methods adapted from American Forests.[29] The American Forests methodology supports the calculation of a Tree Equity Score (TES) using census and climatic datasets (**Table 2-2**).

TES is an evaluation of how well tree canopy and surface temperatures align with income, employment, race, age, and health factors in the community. Tree Equity Score values range from 0 to 100, with lower values corresponding to census dissemination areas that have combinations of high land surface temperatures and low canopy cover relative to under-serviced and vulnerable populations. TES in Vaughan ranges from 60 to 100, with a mean score of 90. The City's dissemination areas with the lowest tree equity, those with TES scores < 70, are predominately located in the Woodbridge North, Woodbridge South West, and Maple Teston neighbourhoods (**Figure 2-9**).

Table 2-2. *Demographic, economic, and environmental factors used in determining priority canopy areas within Vaughan.*

Factor	Description of Measurement
Climate	Average surface temperature, as measured from remote sensing data.
Income	Percentage of people living on incomes below 200% of the federally-designated poverty line (< CAD $40,000) recorded by the 2021 Census.
Age	Seniors (age 65+) and children (0-14) as a proportion of working age adults (15-64) recorded by the 2021 Census.
Racialized People	Persons who do not identify as primarily white in race, ethnicity, origin and/or colour. For the purposes of the tree equity analysis, racialized people are represented by the percentage of people who self-reported "visible minority" status on the 2021 Census.
Employment	Percentage of the labour force that is experiencing unemployment, recorded by the 2021 Census.

Street Tree Equity

Figure 2-10 provides a mapping of current canopy equity in the City of Vaughan using the city's streets layer as the summary unit. The calculation methods used in determining a Street Tree Equity Score are much the same as those used in calculating standard Tree Equity Score, however instead of offering an evaluation of the equity of canopy dispersion within the city, it offers an evaluation of the equity in street tree distribution within the city. Differing from the TES, which considers canopy distribution across both private

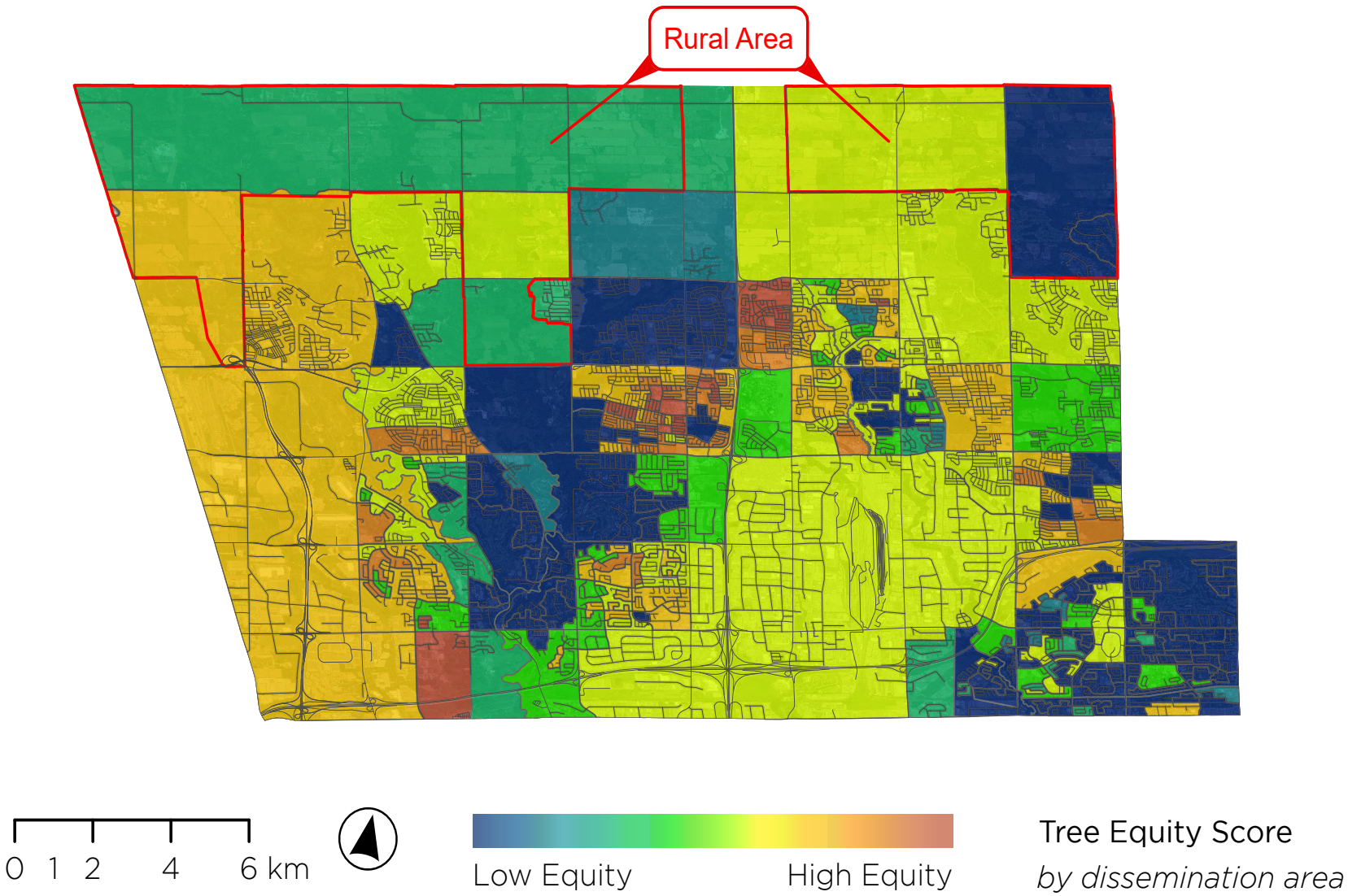


Figure 2-9. *City of Vaughan tree equity score mapping.*

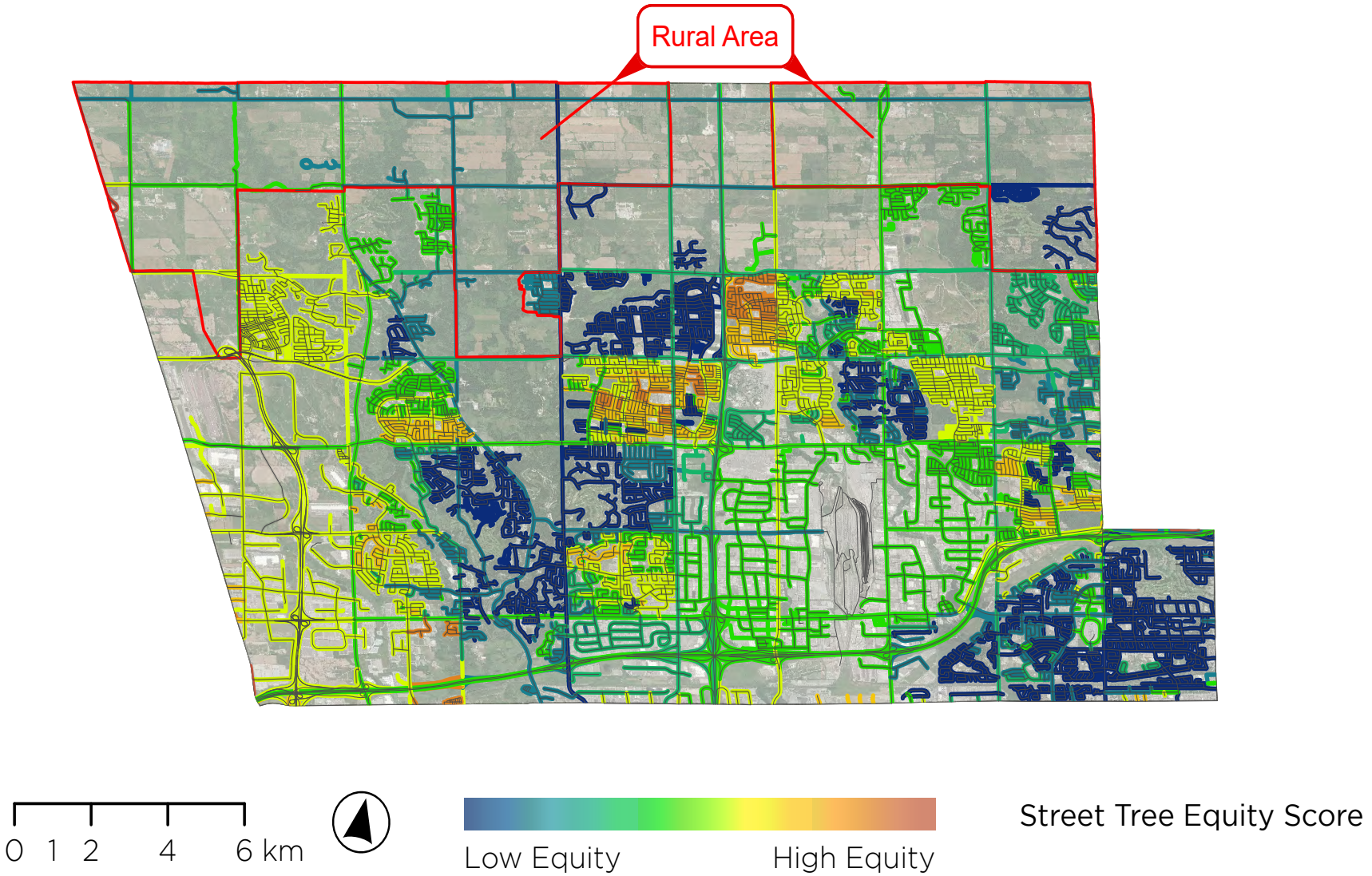


Figure 2-10. *City of Vaughan street tree equity score mapping.*

and public land uses, the street TES score offers a measure of equity which the City can more directly influence.

Street TES in Vaughan ranges from 40 to 100, with a mean of 88. Streets with low TES are overwhelmingly located in the Woodbridge North neighbourhood, and in particular, in the Vellore subdivision. Many of the streetscapes with low tree equity scores are located in the dissemination areas with the lowest TES in the City.

The combination of low street tree equity score and low tree equity score indicates a significant role for additional street tree planting in improving neighbourhood access to the urban forest. In contrast, areas with high street tree equity score but relatively low tree equity score, such as some of the newer subdivisions in Elder Mills, suggest there is low tree canopy on private property compared with street tree planting.

Operationalizing Equity

Together, the two measures of tree equity can be used as an input into a coordinated planting strategy identifying where the City will endeavour to plant new street trees over the short-term. Tree equity is only one consideration in a viable planting strategy, as scores need to be considered against actual opportunities for planting on the ground. Often a lack of street trees is caused by limited planting space in the right-of-way. Creating new planting spaces in the public realm can be a solution, however this tends to be costly and should be balanced against opportunities for growing canopy in the private realm as well as prioritizing planting out the public realm in low equity areas where space for trees already exists.

2.8 Street Trees

Vaughan's street tree inventory, last updated in 2016, consists of approximately 130,000 trees. A majority of these trees (~70%), belong to seven genera (**Figure 2-11**). Maples are especially dominant, making up more than a quarter of the inventory alone, followed by lindens (*Tilia* sp.) and honey locusts (*Gleditsia* sp.). Norway maple (*Acer platanoides*), as a single species, constitutes 10% of the inventory. Ivory silk lilac (*Syringa reticulata*) and little-leaf linden (*Tilia cordata*) each exceed 5%.

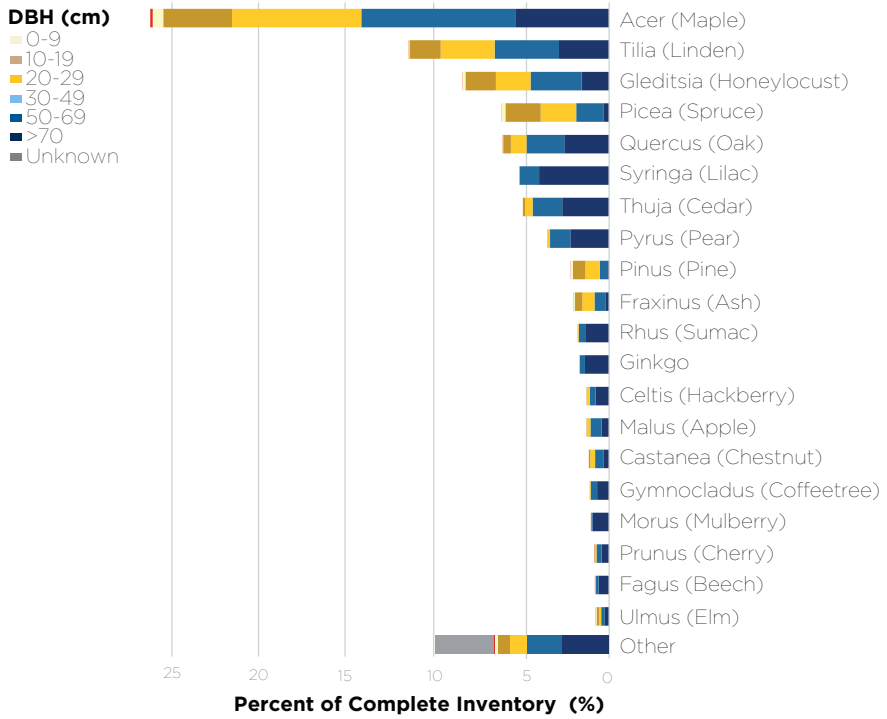


Figure 2-11. *Vaughan's street tree inventory by species and diameter class.*

In terms of age distribution, a significant portion—over 80%—of trees have a diameter at breast height (DBH) of less than 30 cm. This skew towards smaller trees is likely indicative of a relatively young inventory and likely due to the City's rapid urban growth over recent decades. The City might expect to see a larger share of larger-caliper trees as some of its newer subdivisions mature. This aging will impact the cost of maintenance, as larger, more mature trees on an activity cost basis tend to be more expensive to care for and remove than smaller-diameter specimen.

2.9 Woodland Ecosystems

Vaughan lies in the Mixedwood Plains ecozone, and along the transition between the Carolinian ecoregion to the south, and the Lake Simcoe-Rideau ecoregion to the north. The City experiences four distinct seasons with average temperatures ranging from 20°C in summer to -5°C in winter, and receives about 800 mm of annual rainfall. Summers tend to experience greater precipitation than the winter months. Climate change has brought a greater frequency and severity of drought, storms and other extreme weather.

The Carolinian ecoregion to the south is primarily characterized by deciduous forests. Common species include sugar and red maple, yellow birch, beech, red and white oak, hawthorn, and basswood. In this ecoregion, high population density and a long history of land clearing to support agriculture and urban use means that most forests are fragmented "second-growth". Less than 13% of the land in the ecoregion is covered by native deciduous woodlands today.

What is a Woodland?

Ontario's *Forestry Act* defines "woodlands" based on a density of trees per hectare. The definition includes lands that have a minimum of:

a. 1,000 trees of any size,
b. 750 trees with a diameter over five centimetres,
c. 500 trees with a diameter over 12 centimetres, or
d. 250 trees with a diameter over 20 centimetres.

Some land uses such as Christmas tree plantations are excluded form this legal definition. The *Municipal Act* applies this definition to areas that are one hectare or larger in size.

The City of Vaughan and York Region have included woodlands of at least 0.2 hectares in size in their Official Plan definitions. When determining "significant woodlands" protected through the Natural Heritage System, the City follows York Region's criteria-based approach. Woodlands can occur on public or private property throughout the City.

The Lake Simcoe-Rideau ecoregion is characterized by deciduous, coniferous, and mixed forests marking the transition between the Carolinian ecoregion and harsher boreal environments to the north. The Lake Simcoe-Rideau ecoregion is home to distinctive coniferous species such as eastern white pine, red pine, white cedar, black spruce, tamarack, and eastern hemlock, as well as deciduous species like red and sugar maple. Deciduous, coniferous, and mixed forests account for 16%, 5%, and 9% of the ecoregion, respectively, while urban development and agriculture occupy the balance. Forests in the ecoregion

face challenges from invasive forest pests and diseases, leading to significant declines of once-abundant tree species such as ash, elm, chestnut, and butternut.

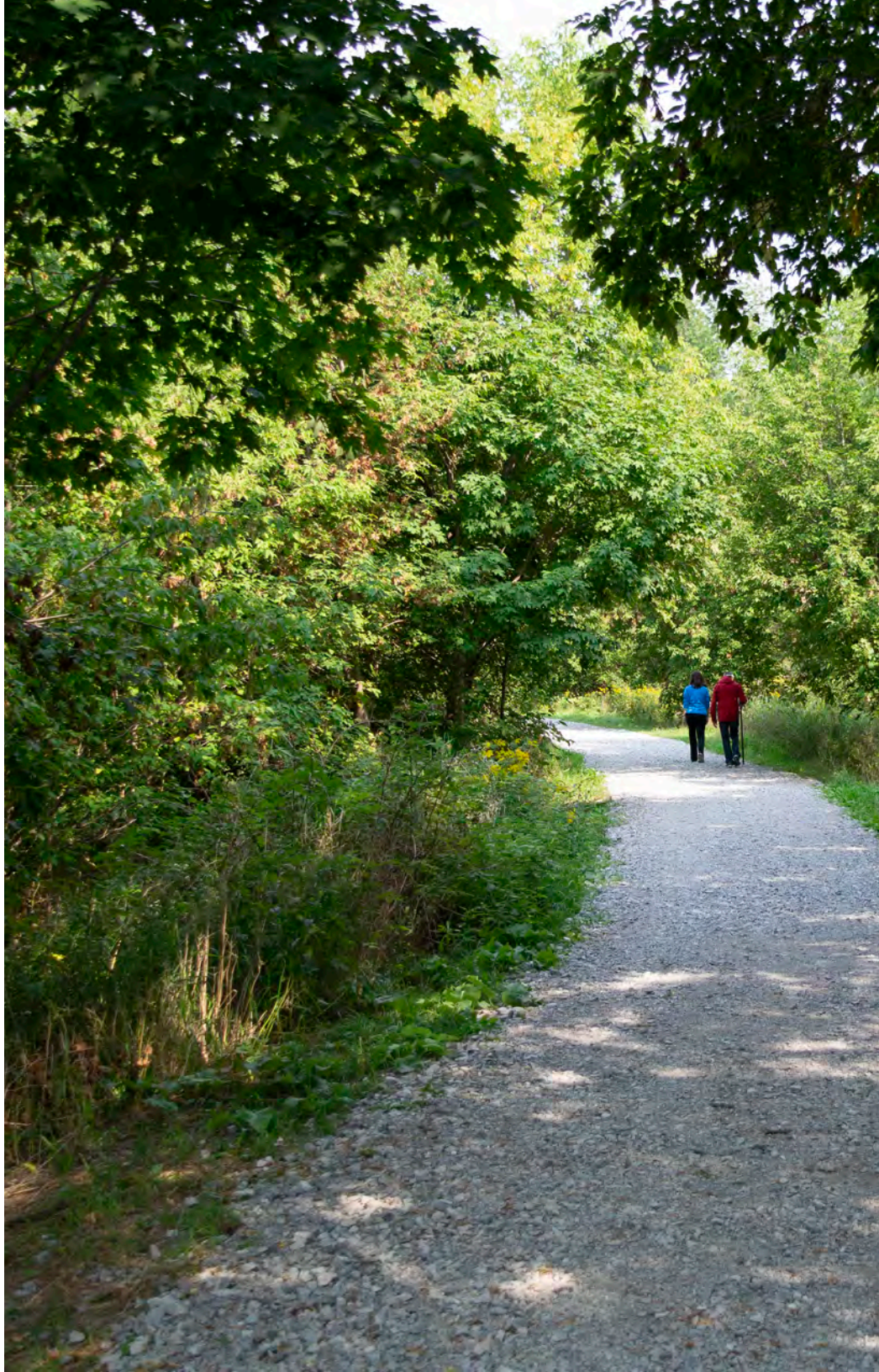
The area is home to a wide range of important fauna, including the green heron, eastern kingbird, white-tailed deer, Virginia opossum, Midland painted turtle, yellow perch, and banded killifish. Many species at risk can be found in Vaughan's woodland habitats.

Woodlands in Vaughan

Vaughan's 3,300 hectares of woodland canopy make up 60% of the city's total canopy area. The City's Official Plan protects more than 85% of this forest area through Natural Heritage Policy. The City refers to woodland properties it owns and manages as "woodlots" to distinguish them from other woodlands, a naming convention that has taken hold in the community. Vaughan oversees 27 unique woodlots which contain a collective 180 hectares of woodland area. Vaughan's woodlots presently serve a balance of recreation and conservation community functions. The Toronto and Region Conservation Authority (TRCA) manages around 1,000 hectares of woodland canopy and 2,100 hectares of land area within the City. The remaining woodland canopy (around 1,200 hectares) is found on lands under private or other management.

Vaughan's Woodland Management Strategy

While this UFMP provides some direction for managing Vaughan's woodland ecosystems, **a separate Woodland Management Strategy (WMS) has been prepared and contains strategic directions for the City's woodlands, with a special focus on the 27 community woodlots owned and managed by the City.**



Part 3. What We Heard:
Outcomes From Engagement

Part 3. What We Heard: Outcomes From Engagement

Public engagement is crucial to developing a community-driven Urban Forestry Management Plan. The public was engaged through two rounds of engagement in 2023 to collect feedback during the development of this strategy. The first round of engagement took place in March-April and focused on gathering community values and goals, while the second took place in June revolved around fine-tuning the draft UFMP directions, goals, and strategies.

This section summarizes key findings from the public engagement through both rounds. Complete engagement summaries for both rounds are available in the Appendix.

3.1 Phase 1 Engagement

Approximately 950 residents and 10 organizations participated through various channels (online survey, mapping tool, art contest, open house, and stakeholder workshop).

Values

Nearly 500 respondents engaged with the survey tool offering through the first round of engagement. A majority of respondents prioritized the climate, environmental, and ecological benefits generated by Vaughan's urban forest. Also identified is that while a majority of respondents preferred streetscapes featuring with large, mixed-species trees, most currently reside near streets with smaller stature specimens.

Vision

Respondents vision for the urban forest varied broadly, however key themes included more green spaces, expanded tree canopies, enhanced recreation opportunities, biodiversity, aesthetics, and environmental benefits like air and water quality (**Figure 3-1**).

Figure 3-1. *Cloud of survey responses related to Vaughan's urban forest vision statement.*

Satisfaction with Urban Forest Services

Survey respondents were also asked about their satisfaction with the different key service areas of Vaughan's current management program (**Figure 3-2**). Tree planting and replacement represented the service area with the lowest satisfaction, with a rate of dissatisfaction exceeding 35%. A significant number of respondents were either unaware or neutral about the City's services across most service areas, identifying opportunities for enhanced public education and outreach as an outcome from this Plan.

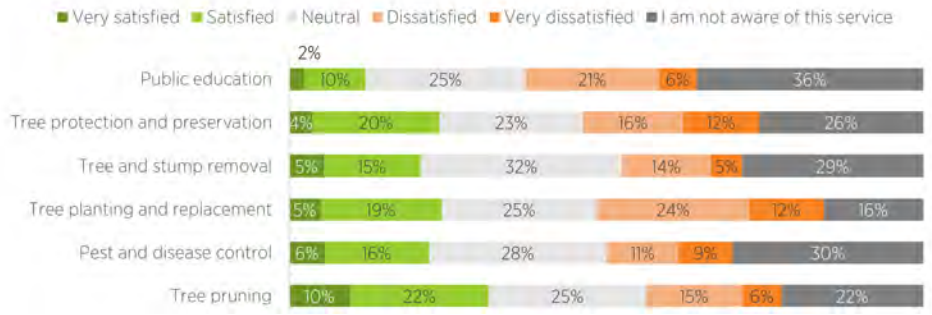


Figure 3-2. *Satisfaction levels with current service levels for trees in parks and along streets (total respondents: 411).*

Vaughan's urban forest vision statement was informed by the first phase of engagement and is:

"Our vision is for a healthy, growing, and sustainable urban forest canopy that supports biodiversity, human health, recreation, and community climate resilience to provide a greener future for generations to come."

"Cavalcade of Colours" by Amardeep Tandal (Acrylic), Vaughan Urban Forest Management Plan Art Contest: Honourable Mention (c. April 2023).
Next page

3.2 Phase 2 Engagement

In the second phase of public engagement, nearly 200 individuals and 10 stakeholder organizations took part in various offerings such as online surveys, community open houses, stakeholder workshops, and community pop-up events. Feedback was solicited both on the draft vision and on the strategic framework now carried forward into Part Five of this Plan.

Support for Vision

Strong support existed for the draft vision, with more than 80% of respondents indicating strong or very strong support through the online survey.

When asked about support for developing a canopy cover target, 90% of survey participants support increasing the current 20% canopy cover, and 85% favour a canopy cover target. Development concerns were cited by those opposing an increase. York Region suggested a 25-35% canopy cover target for Vaughan in 2021.[30]

Support for the draft goals

Respondents were asked to prioritize goal areas through the online survey. More than 40% of respondents identified Goal 4 (protecting trees for future generations) as their priority, and Goal 3 (expanding the urban forest) was next, favoured by 28%.

Part 4. What We Face:
Strengths, Challenges, & Opportunities

Part 4. What We Face: Strengths, Challenges, & Opportunities

There are several key issues influencing urban forest management in Vaughan. The Strengths, Challenges, and Opportunities put forward following have each been integrated into the program recommendations put forward through UFMP strategic framework and action plan.

4.1 Strengths

Corporate Data Standards

Vaughan has demonstrated a commitment to maintaining high standards for public data, as reflected by its achievement of three ISO certifications from the World Council on City Data (WCCD). This standard sets a precedent for data-driven decision-making that can be applied to urban forest management. Such certifications indicate that the city has existing processes and standards in place to support data collection and analyses; these approaches could be extended to improve the quality and completeness of urban forestry data.

Partner Organizations

There is interest from the community and stakeholders in the urban forest planning process, as evidenced by participation rates in UFMP engagement. Opportunities for partnership with community-facing organizations like the Local Enhancement & Appreciation of Forests (LEAF) and the Toronto Region Conservation Authority (TRCA) can support a significant resource in maintaining a healthy and resilient urban forest as well as promoting community stewardship of the urban forest. Collaborations with York Region, a long-time leader in urban forest management and stewardship, also offers a significant resource in implementing this Plan.

4.2 Challenges

Climate Change

Climate change poses a significant threat to the health and sustainability of Vaughan's urban forest. Increasing temperatures, more frequent extreme weather events, and fluctuating precipitation patterns will continue to contribute to increased tree stress, health issues, and mortality. Extreme weather events can invoke weeks of cleanup; the derecho on May 21, 2022 resulted in more than 1,000 service calls and cleanup efforts across 800 locations in the city, and weeks of elevated work order volumes. The urban forest management currently lacks proactive measures to combat these effects, making it more vulnerable to the adverse impacts of climate change.

Resourcing

Vaughan's urban forest management program is at present primarily reactive in nature, dealing with issues as they arise rather than seeking to prevent or mitigate their occurrence. This approach is often both resource intensive and resource inefficient, as opportunities for earlier, less costly maintenance interventions are often missed. The current level of resourcing makes it challenging to transition to a more proactive management approach that could be more efficient and effective in the long term.

FUTURE CLIMATE WILL BE...

WARMER

- Warmer average temperatures
- More hot days (above 30 °C)
- Milder winters
- More frequent and longer heat waves
- Longer, warmer growing seasons

WETTER

- Increased annual precipitation, especially in the winter
- Increased frequency of heavy precipitation events

WILDER

- Potential changes in frequency and intensity of extreme weather events
- More freezing rain, hail
- More high wind gusts

YORK REGION CLIMATE PREDICTIONS BY 2050:[24]

- temperature increase by **3.3°C**
- **3x** the days with temperatures above **30°C**
- **33%** increase in the frequency of heavy precipitation
- more frequent rain, hail, freezing rain, snowstorms

THIS IS LIKELY TO LEAD TO...

LESS MOISTURE AVAILABILITY

Evapotranspiration rates will increase relative to precipitation, resulting in drier soils and vegetation

MORE PESTS AND INVASIVE SPECIES

Pests may reproduce more rapidly and more often. Trees and ecosystems may be more vulnerable to attack and invasion

MORE EXTREME WEATHER EVENTS

Heat, extreme precipitation, freezing rain, heavy wet snow, and other events may happen more often leading to more tree damage

EARLIER MELTWATER

Faster snowmelt will result in earlier peak spring flow and flooding and lead to drier conditions later in the summer

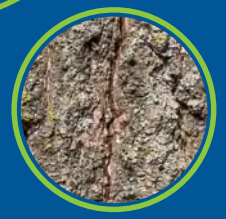
Pest, Diseases, and Invasive Species

Pests, diseases, and invasive species are an ongoing threat in urban forests. Emerald ash borer's arrival (EAB) resulted in the removal of thousands of municipal ash trees between 2010 and 2020. Though that threat has now largely subsided, there exists a range of contemporary forest health concerns including oak wilt, Asian long-horned beetle, hemlock woolly adelgid, beech bark disease, and several others. Invasive plants such as buckthorn, Norway maple, invasive honeysuckle and dog-strangling vine, can each threaten local biodiversity through their varied adaptations that give them a competitive edge over native vegetation. Many of these are present in Vaughan's woodland environments, but are not managed at present.

Development Pressure

Vaughan's population has grown from a community of only 15,000 in the 50 years ago to one of more than 320,000 today. Growth in Vaughan has been characterized by low-density suburban development over past decades. Growth moving forward is likely to feature elements of both intensification as well as continued greenfield-type development. Regardless of its specific nature, increasing competition for urban space in new development threatens the extent and vigour of Vaughan's urban forest. The City will continue to grow, but there needs to be thoughtful consideration for the inclusion of trees in increasingly tight urban environments, particularly where Vaughan is a community that would like to see its canopy grow over time.

OAK WILT



TYPE: fungal disease

TARGET: all oak species, red oak group (pin, red, black) most susceptible

SIGNS AND SYMPTOMS:

- leaves dull green, brown or yellow
- premature leaf fall
- discoloration progression from edge to middle of leaf
- fungal mats (white, grey, or black) under bark with fruity smell
- vertical bark cracks along the trunk

NOTES: Oak wilt was first confirmed in Niagara Falls in 2023. If you suspect oak wilt please contact service@vaughan.ca, or 905-832-2281.

Encroachment

Unauthorized encroachments into city-owned property pose a unique set of challenges for urban forest management. Encroachment in Vaughan most often involves the development of unauthorized trails, rear-yard expansions into public woodlands, landscaping of boulevards in such a way so as to negatively impact tree health, or the dumping of trash into woodland areas. Issues of encroachment are often challenging to stay on top of and manage, generally requiring elements of both education and enforcement in most optimal solutions.

4.3 Opportunities

Climate Change Adaptation and Urban Forest Resilience

A transition from a reactive to a proactive maintenance model would build urban forest resilience. In a proactive model, regular assessment and preventative maintenance help to identify and mitigate tree-related health risks *before* they escalate into larger problems. This shift not only extends the life expectancy of our urban trees but also tends to mitigate the costs associated with storm and extreme weather cleanup.

Coupled with a plan for enhancing the resilience of urban growing conditions, a proactive management program offers a pathway to not just adapt to the challenges of urban development and climate change, but for the urban forest to thrive in spite of them.

Pest and Disease Management

Maintaining a genetically diverse urban forest could act as a natural defense mechanism against the spread of specific pests and diseases. Since pests and diseases usually target a specific range of host species, a diverse urban forest could limit the spread and impact of such threats.

Resourcing Optimization

By investing more heavily into proactive tree maintenance and management, the City would be extending the useful life of the City's urban trees, thereby minimizing the public resources spent funding costly removal, replacement and replanting activities. Supporting tree maturity enhances the public services (e.g., cooling, aesthetics) generated by them, and supports improved contributions toward the City's canopy cover target.

Development Standards and Regulatory Tools

There is an opportunity to refine the range of regulatory tools, and development-related processes, to enhance the integration of urban trees with the City's intensifying urban form. Policy tools, by-laws, standards, and guidelines can help balance the competing needs for development and green infrastructure, without sacrificing housing availability or affordability in increasingly tight urban environments.

Data-Driven Decision Making

Vaughan can improve its data collection and monitoring standards within the urban forestry space. A current and up-to-date street tree inventory is critical toward supporting a data-driven shift toward a proactive maintenance regimen. Organizational partnerships with York Region and the Toronto and Region Conservation Authority (TRCA) could be leveraged to enhance the City's inventory standards and monitoring processes within woodland environments.

CASE STUDY

The **City of London**'s Neighbourhood Tree Matching Fund (**treeME**) helps to build and strengthen London neighbourhoods through encouraging neighbourhood-level and resident-led tree planting. With the support of treeME, **neighbourhood groups can initiate, manage and implement tree planting projects on private land that can help ensure a sustainable urban forest**. Through treeME, residents and nonprofit organizations can apply for funding toward planting trees on private property. Through treeME, applicants must match 25 percent of the total requested amount per project through a combination of volunteer labour, donated services, donated materials, supplies, and other funds raised. In 2023, $200,000 is available in treeME funding to be allocated to successful applicants, with a maximum allocation of $50,000 per project.

Education

Enhanced educational, outreach, and stewardship offerings can improve tree maintenance and management outcomes on private land, can build critical community support for urban forest management, and importantly, develops one of the City's largest urban forest management resources—its people. Since roughly 60% of Vaughan's canopy is privately owned, a developed approach to engagement will be critical to meeting any future-facing canopy cover target.

Part 5. Where We're Going:
The Vision, Canopy Cover Target, and Strategic Framework

Vaughan's Urban Forest Vision

Our vision is for a healthy, growing, and sustainable urban forest canopy that supports biodiversity, human health, recreation, and community climate resilience to provide a greener future for generations to come.

Part 5. What We Want: The Vision, Goals, and Targets

5.1 Setting a Canopy Cover Target

Tree canopy cover is an accessible metric that supports a broad evaluation of the effectiveness of a community's urban forest management practices. Monitoring canopy cover against a target can support decision-making in design, policy, master planning, regulation, and other areas.

Vaughan's Canopy Cover Target:

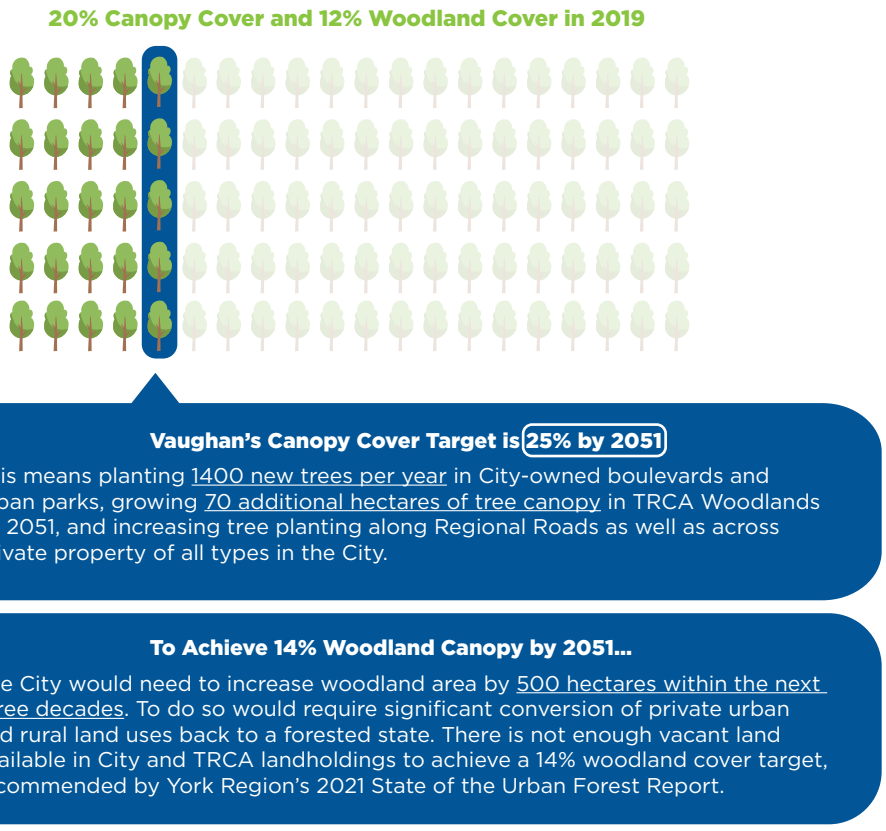


Figure 5-1. *Vaughan's canopy cover target.*

Still, it is important to understand that while progress toward a canopy cover target can be an effective measure of a community's urban forest management successes, canopy cover relative to a target is not a comprehensive indicator of the health of the urban forest, nor the effectiveness of a community's asset management practices. The monitoring plan complements the canopy cover targets with other performance measures.

Methods for setting canopy cover targets have evolved over the years. In 1997, the non-profit organization American Forests advocated for a universal benchmark of 40% canopy cover for municipalities located in forested ecoregions. This recommendation was withdrawn in 2017, acknowledging that a one-size-fits-all target is no longer supported by current research.

Recent developments, like the introduction of the 3-30-300 Rule by the Nature Based Solutions Institute, offer enhanced frameworks that can guide urban forest planning at a neighborhood scale.[31] When setting canopy cover targets, municipalities are now advised to consider a spectrum of factors including existing canopy cover, local climatic conditions, population density, present and future land use, and regulatory policies regarding trees.[32]

York Region's 2021 State of the Forest report proposed Vaughan adopt a city-wide canopy cover target between 25% to 35%, and a woodland cover target from 14% to 17%. These recommendations served as a valuable frame

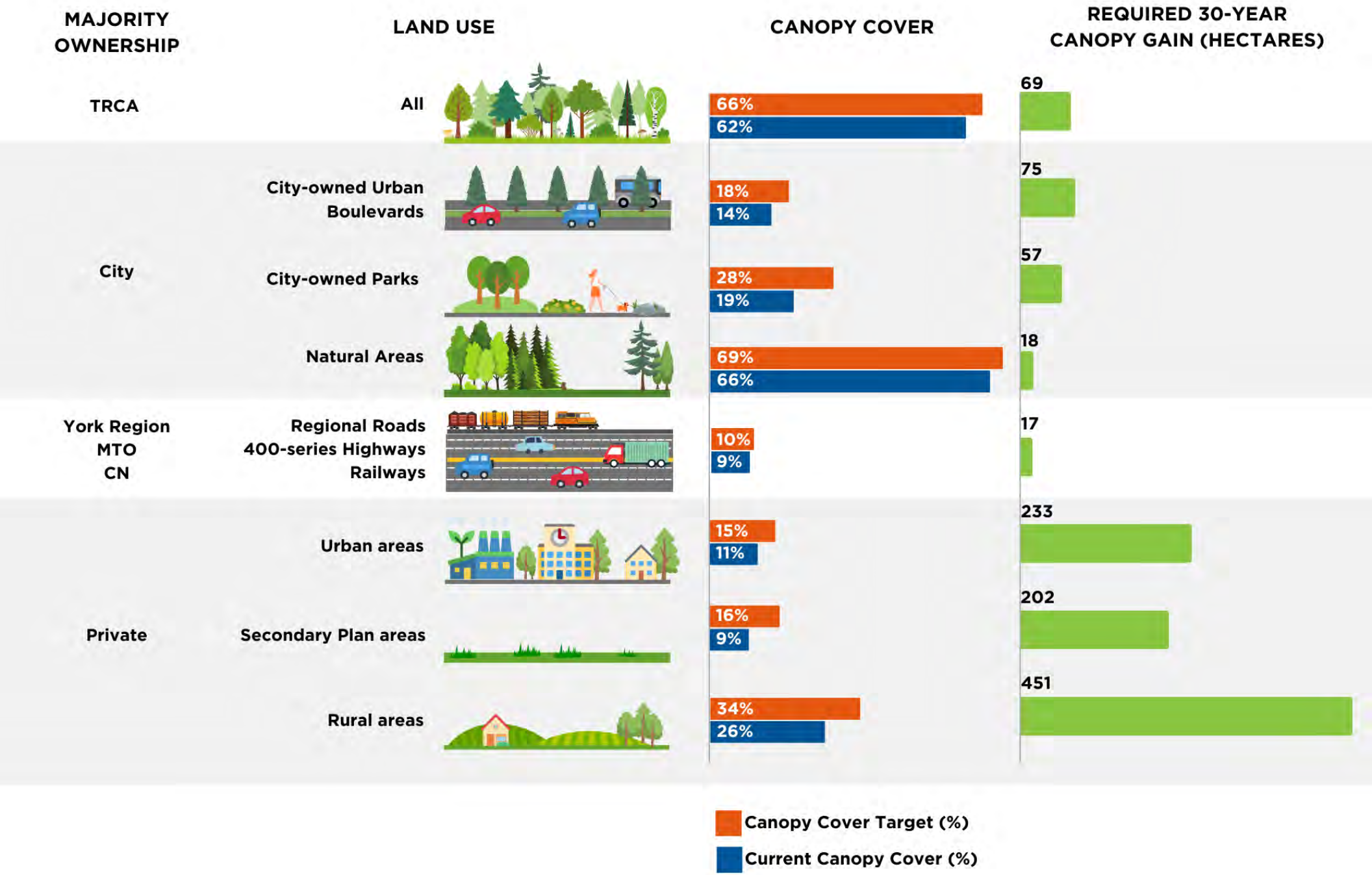

MAJORITY OWNERSHIP
LAND USE
CANOPY COVER
REQUIRED 30-YEAR CANOPY GAIN (HECTARES)
TRCA
All
66%
62%
69
City
City-owned Urban Boulevards
18%
14%
75
City-owned Parks
28%
19%
57
Natural Areas
69%
66%
18
York Region
MTO
CN
Regional Roads
400-series Highways
Railways
10%
9%
17
Private
Urban areas
15%
11%
233
Secondary Plan areas
16%
9%
202
Rural areas
34%
26%
451
Canopy Cover Target (%)
Current Canopy Cover (%)

Figure 5-2. *The 3-30-300 rule illustrated.*

of reference while considering a canopy cover target in Vaughan.

Modelling of canopy change was undertaken to understand Vaughan's urban forest canopy change over time given different rates of tree removal, replacement, and planting. Modelling was sensitive to land uses and ownership structures that exist within Vaughan, as well as estimates of the supply of suitable planting space currently found within those land uses. Modelling suggests that planting at a rate of 1400 net new trees per year over 30 years would be needed across City-owned boulevards and parks to achieve 25% city-wide canopy cover. This number is believed to be well within the available supply of planting spaces over the time period. A planting plan can confirm the suitability of specific sites free from conflict with park programming or other land uses and infrastructure.

Net new planting refers to the new trees planted in addition to replacement trees that also must be planted to fully offset any canopy losses taking place. Modelling assumed a rate of canopy removal and replacement of 0.3% per year. Efforts by the City will need to be accompanied by increased tree canopy on all other land uses in the City. Some of this increase can be secured through retaining existing trees and allowing them to grow; however, it will also require new voluntary tree planting in partnership with the community as well as through development requirements.

5.2 Vaughan's UFMP Strategic Framework

The following sections contains the strategic framework for Vaughan's urban forest management plan. The strategic framework consists of five high-level goals, 14 supporting strategies, and 75 implementing actions (as well as sub-actions in some cases). Collectively this framework and the specific program actions contained within it are designed to achieve the community's unique vision for its urban forest, as was identified through two phases of public engagement. Each strategy is paired both with a quantitative measure for monitoring progress toward its implementation, as well as a relevant target that can be achieved by full implementation of the strategy. See the following page for a summary of the Strategic Framework.

Strategic Framework

Goal 1: Prioritize good program governance

Strategy 1: Continue to strengthen and develop program governance, build urban forest collaboration, and develop the City's urban forestry reputation amongst peer programs.

Strategy 2: Ensure program resourcing is sufficient to broadly implement the UFMP.

Strategy 3: Integrate all urban forest asset classes into the City's broader asset management approach.

Strategy 4: Prioritize equity in program delivery and operational planning.

Goal 2: Maintain a healthy and safe urban forest

Strategy 5: Formalize monitoring, reporting, and review standards and processes.

Strategy 6: Transition from a reactive to a proactive urban forest management paradigm.

Strategy 7: Formalize the City's approach to managing risk across all urban forest asset classes.

Strategy 8: Develop a fulsome approach to managing tree health issues, including pests, invasive species, and disease.

Goal 3: Expand the urban forest canopy and associated benefits

Strategy 9: Ensure design, development, and planning processes are supporting the desired urban forest outcomes.

Strategy 10: Increase the rate of new tree planting to support achievement of the canopy cover target.

Strategy 11: Prioritize forest restoration and biodiversity conservation.

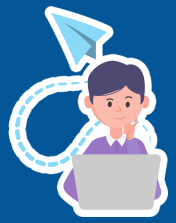
Goal 4: Protect trees and woodlands for future generations

Strategy 12: Ensure the City's regulatory tools, standard processes, and compliance measures are consistently lending to desired outcomes in terms of tree protection.

Goal 5: Partner in urban forest stewardship

Strategy 13: Utilize community capacities to build urban forest management capacities.

Strategy 14: Improve educational programming to build public awareness and understanding of the benefits of the urban forest and its management.



Goal 1: Prioritize good program governance

Encourage and support procedures, relationships, systems and capacities that support Sustainable Urban Forest Management both within Vaughan and as a profession.

Strategy 1: Continue to strengthen and develop program governance, build urban forest collaboration, and develop the City's urban forestry reputation amongst peer programs.

Indicator: Third-party certification(s).

Target: City's urban forest management program (or component) is third-party certified.

Action 1-1. Consider pursuing SFI certification for Vaughan's urban forest management program.

Action 1-2. Continue to seek out and participate in research partnerships and collaborations, including with institutions such as Vineland, Universities, and Colleges.

Action 1-3. Continue to prioritize staff professional development and participation in industry organizations, programs, and events (e.g., professional boards, conference attendance and presentations).

Action 1-4. Cultivate collaborative partnerships with utility providers to enhance standards and practices regarding tree pruning, planting, and protection, and mitigate potential conflicts between trees and existing/new utilities.

Action 1-5. Establish an interdepartmental working group on urban forestry to meet minimally twice a year to share updates of the UFMP implementation and identify and address barriers and challenges in implementation.

Action 1-6. Partner with York Region Public Health Unit to develop local trails for forest therapy and designation through the Global Institute of Forest Therapy (GIFT).

"Hills of Clover" by Atara Hiller (Pen on Paper), Vaughan Urban Forest Management Plan Art Contest: Honourable Mention (c. 2022-23).

Strategy 2: Ensure program resourcing is sufficient to broadly implement the UFMP.

Indicator: Funding $ per street tree, per year.

Target: $23.30, per inventory tree, per year.

Action 2-1. Examine current staffing levels, and consider hiring new role(s) within PFHO to address the capacity gaps and provide additional supports for the implementation of the UFMP.

Action 2-2. Examine current funding levels to ensure that resourcing is sufficient to maintain existing urban forest assets, is scaled as new assets are added, and that funding is adjusted where needed to implement the UFMP.

Action 2-3. Explore external funding opportunities, such as grants and donations, to support the urban forest programs and implementation of UFMP.

Action 2-4. Establish a Canopy Reserve Fund through by-law, direct operating budget surpluses and cash-in-lieu fees collected through the Tree Protection By-law or through development processes to that fund, and establish guidelines for the fund's use.

Strategy 3: Integrate all urban forest asset classes into the City's broader asset management approach.

Indicator: Trees in "poor" or "very poor/dead" condition.

Target: < 2.5% of the inventory population.

Action 3-1. Establish minimum levels of service targets across different urban forestry asset classes.

Action 3-2. Establish a life-cycle costing approach for street tree assets, aligned with level of service commitments, to inform financial planning for maintenance and renewal.

Action 3-3. Continue to integrate all classes of urban forestry asset (incl. woodlands) into the City's asset management framework.

Action 3-4. Develop urban tree asset condition assessment protocols consistent with the industry tree care standards such as the ANSI A300 standards.

Action 3-5. Ensure current urban forest inventory information is available to support asset management integration and sustainable urban forest management operations.

Strategy 4: Prioritize equity in program delivery and operational planning.

Indicator: Tree Equity Score.

Target: No score < 90.

Action 4-1. Prepare a formalized planting strategy which prioritizes planting efforts to areas of the city with relatively low tree equity.

Action 4-2. Ensure the design of forestry-related engagement and educational programming is accessible to all members of the community.

Action 4-3. Work together with Indigenous peoples to identify and support culturally sensitive urban forest and woodland management practices.

Action 4-4. Pilot the concept of food forests in partnership with the TRCA and community partners, supporting both equity outcomes and broader community engagement, education, and outreach

Goal 2: Maintain a healthy and safe urban forest

Leverage urban forest monitoring and maintenance practices supported by industry best practices and third-party certification standards.

Strategy 5: Formalize monitoring, reporting, and review standards and processes.

Indicator: Street tree inventory cycle.

Target: Seven-year iterative.

Action 5-1. Record tree mortality and failure rates in the City's inventory. Where there are repeated issues, conduct site assessments to inform species changes, soil profile rebuilding, or other management interventions.

Action 5-2. Track tree removals and replacements permitted under the City's Tree Protection By-law or through Planning Act approvals.

Action 5-3. Explore opportunities to support and partner in regional and TRCA-led urban forest monitoring programs and procurement (e.g, LiDAR an orthoimagery acquisition).

Action 5-4. Prepare reporting on the State of Vaughan's Urban Forest every five years to provide the latest information about the conditions of City's urban forest, its management, and UFMP implementation.

Action 5-5. Review the UFMP and WMS after ten years and update the actions informed by the recurring State of the Urban Forest reports. Develop a new UFMP and WMS coinciding with the horizon of this plan (2043).

Action 5-6. Update the City's woodlot management plan(s) on a five-year iterative cycle to ensure content and short-term prescriptions remain current and relevant.

Action 5-7. Monitor tree mortality and failure rates and where there are repeat issues, conduct site assessments to inform species changes, soil profile rebuilding, or other management interventions.

Action 5-8. Prepare an annual staff report for information identifying which UFMP and WMS actions were implemented over the past 12 months, as well as an updated program report card.

Strategy 6: Transition from a reactive to a proactive urban forest management paradigm.

Indicator: Grid pruning cycle.

Target: Seven-year iterative.

Action 6-1. Shift to proactive a seven-year pruning cycle for urban street trees.

Action 6-2. Establish a young tree training program that enables structural pruning in the third, fifth, and seventh year following planting.

Action 6-3. Extend the watering of public trees from the first two years (as is warrantied) to five years after planting.

Strategy 7: Formalize the City's approach to managing risk across all urban forest asset classes.

Indicator: CRM Calls for Tree Inspection/Obstruction/Risk.

Target: < 2,000 annually.

Action 7-1. Formalize a tree risk management policy that applies to all urban forestry asset classes.

Action 7-2. Document operational procedures for risk inspection, frequency, resolution timeframes, qualifications, and documentation to reflect the industry best practices such as the Best Management Practices (BMPs) by the International Society of Arboriculture and Tree Care Industry Association's A300 standards.

Strategy 8: Develop a fulsome approach to managing tree health issues, including pests, invasive species, and disease.

Indicator: Street tree diversity.

Target: Population consisting of < 10% of any single genus and < 5% of any single species.

Action 8-1. Formalize the City's approach to pest management through an integrated pest manage (IPM) policy.

Action 8-2. Increase diversity within the City's street tree population by limiting the planting of overrepresented species and genera.

Goal 3: Expand the urban forest canopy and associated benefits

Grow Vaughan's urban forest toward achievement of 25% tree canopy cover by 2051 and an aspirational target of 14% woodland cover over that same period.

Strategy 9: Ensure design, development, and planning processes are supporting the desired urban forest outcomes.

Indicator: Canopy cover target

Target: 25% by 2051.

Action 9-1. Include the City's 25% city-wide canopy cover target and 2051 horizon as a policy in the Official Plan, Urban Design Guidelines, and other important strategic initiatives (e.g., the Greenspace Strategic Plan, Asset Management Plans), and look to integrate canopy cover targets into the development process.

Action 9-2. Support urban forest management within the City through policy language in the Official Plan that supports urban forest management at a high level.

Action 9-3. Prioritize parkland dedication as land dedication that is unencumbered (free of underground structures) over encumbered lands (e.g., strata parks). In areas of higher-order intensification-type development where strata parks will be accepted as part of the development process, consider opportunities to formalize a minimum proportion of parkland dedicated that is free of encumbrances.

Action 9-4. Update the City's zoning by-law to include provisions that are tree-supportive.

Action 9-5. Explore updates to the City's engineering design criteria & standard drawings to yield better outcomes in tight urban and suburban streetscapes.

Action 9-6. Review the City's Sustainability Metrics Program, and consider opportunities for strengthening the relative position of urban trees and green infrastructure within that framework.

Action 9-7. Review the City's current planting list and ensure that included species are 1. non-invasive, and 2. are not significantly overrepresented.

Strategy 10: Increase the rate of new tree planting to support achievement of the canopy cover target.

Indicator: Rate of tree planting in City parks and boulevards.

Target: 1400 **net new** trees, per year.

Action 10-1(A). Encourage private landowners with significant woodland holdings to participate in sustainable woodland management through subsidy programs such as the MFTIP.

Action 10-2. Explore opportunities for partnership with the TRCA and LEAF to pilot the planting, monitoring and maintenance of a Miyawaki forest.

Action 10-3. Launch a free tree giveaway program to encourage tree planting on private land. Consider opportunities for partnership with York Region, the TRCA, and LEAF and program delivery.

Action 10-4. Continue to support and develop partnerships with LEAF and York Region toward growing canopy cover on private land.

Action 10-5. Support rates of tree planting on key classes of land uses toward achievement of a 25% canopy cover and 14% woodland area by 2051.

Action 10-6. Explore strategic partnerships with LEAF toward enhancing canopy cover on private land.

Action 10-7. Explore strategic partnerships with York Region and LEAF toward enhancing canopy cover and tree planting on industrial, commercial and institutional (ICI) campuses.

Strategy 11: Prioritize forest restoration and biodiversity conservation.

Indicator: Biodiversity Conservation Woodlot Management Plan Scores.

Target: >75% of woodlot assets score 3 ("fair") or greater.

Action 11-1. Prepare woodlot management plan(s) for the remaining 26 woodlots the City does not yet have a woodlot management plan for.

Action 11-2. Undertake ecosystem restoration consistent with the findings and prescriptions of the City's Woodland Management Strategy and accompanying Woodlot Management Plans.

Action 11-3. Develop a Biodiversity Strategy to help inform restoration sequencing and priority areas for future acquisition and/or afforestation.

Action 11-4. Develop operational standards for woodland trail design, development and maintenance.

Goal 4: Protect trees and woodlands for future generations

Ensure tree protection requirements and processes within the City are lending to the right balance between regulation and supporting continued community growth.

Strategy 12: Ensure the City's regulatory tools, standard processes, and compliance measures are consistently lending to desired outcomes in terms of tree protection.

Indicator: City-wide canopy cover.

Target: 25% by 2051.

Action 12-1. Consider updates to the City's tree protection protocol to formalize the handling of circumstances where the protocol can't be satisfied as part of a capital project.

Action 12-2. Track tree removals and replacements permitted through the development approval process.

Action 12-3. Explore potential partnerships with LEAF toward realizing better outcomes through tree replacement requirements on private land.

Action 12-4. Develop a municipal licensing program for arborists and tree care companies.

Action 12-5. Review and update the City's Tree Protection By-law (052-2018).

Action 12-6. Require applications for development identify the mature canopy area that would be lost and replaced through development proposal.

Action 12-7. Require specific tree protection hold-backs for contractors working around public trees as part of City projects.

Action 12-8. Develop the City's approach to managing issues of encroachment where they impact urban trees.

Action 12-9. Review and update tree-related language used in the City's subdivision and/or site plan agreements.

Action 12-10. PFHO to undertake annual reviews of critical regulatory materials and be involved in any regulatory or policy updates that intersect with urban trees.

Goal 5: Partner in urban forest stewardship

Spread awareness, support urban forestry education, and leverage community capacities and partnerships in implementing this Urban Forest Management Plan and the City's Woodland Management Strategy.

Strategy 13: Utilize community capacities to build urban forest management capacities.

Indicator: Volunteer hours per year.

Target: 1,000 per year.

Action 13-1. Establish Community Boards/Committees to involve community groups and members in Vaughan's urban forest stewardship and management.

Action 13-2. Implement an "adopt-a-tree" program.

Action 13-3. Establish an "honour roll" of trees, maintain the honour roll in a public forum, such as the City's website.

Action 13-4. Continue to develop and resource the City's Green Guardians program.

Action 13-5. Develop and implement programs that leverage community capacity to support urban forest monitoring, invasives removal, and planting. Work with the TRCA and other levels of government where possible.

Strategy 14: Improve educational programming to build public awareness and understanding of the benefits of the urban forest and its management.

Indicator: City-sponsored or led urban forest education events, per year.

Target: Four events.

Action 14-1. Prioritize the ongoing development and upkeep of PFHOs web page as a hub for information, education, and news.

Action 14-2. Offer urban forest walks to improve people's access to and understanding of Vaughan's urban woodlands.

Action 14-3. Share the urban forest inventory online (e.g., through a web map).

Action 14-4. Expand publicly available educational resources on pests, diseases and invasive species.

Action 14-5. Partner with York Region to engage with School Boards toward delivering a tree-related programs and outreach, and identify champion teachers and classrooms to support urban forestry events.

Action 14-6. Partner with the Vaughan Public Libraries to provide community education through initiatives such as the Story Walk Program.

Action 14-7. Develop partnerships with community organizations and non-profits such as LEAF to build capacity toward the delivery of community outreach and educational activities.

5.3 The Action Plan

The following pages contain the full action plan for the City of Vaughan's Urban Forest Management Plan. Specific actions are itemized and the departments with a vested interest in each action are identified. In addition, a timeframe to implementation has been identified, as well as an estimated financial commitment, a type, and a priority level. The following is a full summary of values contained to each of those fields:

Vested Interest

PFHO	Parks, Forestry, and Horticulture Operations
PIPD	Parks Infrastructure Planning and Development
DENG	Development Engineering
REST	Real Estate Services
DPLN	Development Planning
PPLN	Policy Planning and Special Programs
LEGL	Legal Services
IPAM	Infrastructure Planning and Corporate Asset Management
FINS	Financial Services
CMSR	Community Services
OCIO	Office of the Chief Information Officer
CSCO	Corporate and Strategic Communications
ECDV	Economic Development
TRCA	Toronto and Region Conservation Authority (External)
YORK	York Region (External)
ALL	All internal (City of Vaughan) interests

Timeframe

SHORT	1 - 5 years
MID	6 - 10 years
LONG	11 - 20 years

Financial Commitment

$	Staff time or otherwise < $10,000
$$	$10,000 - $50,000
$$$	$50,000 - $150,000
$$$$	Needs an estimate or otherwise > $150,000

Type

BLPL	Actions which involve the adoption of new or revised by-laws or policy.
MNTR	Actions which support ongoing monitoring or reporting on the City's urban forest or the implementation of this Plan.
PCDR	Actions which involve both formal and informal procedural outcomes.
PRGM	Actions which broadly relate to the City's urban forest management program.
RSRC	Actions which relate to the development of new or use of existing program resources.
SPEC	Actions which invoke technical requirements for different program elements.
STWD	Actions which propose the development of different stewardship or community outreach outlets.

STDY	Actions which invoke the development of supplemental studies, plans or strategies in support of the City's urban forest.
PTNR	External partnerships supporting urban forest management and the implementation of the UFMP.

Priority

	No priority ranking indicates that the action is not a priority over the first ten years of implementation and may be prioritized at a future date or otherwise implemented as capacities permit.
YES	Indicates that an action is a priority over the first ten years of the UFMP's implementation.
HIGH	Indicates an action is critical to UFMP implementation over the first ten years, and should be a forefront priority in financial and resource planning.

Table 5-1. *City of Vaughan UFMP action plan.*

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Goal 1: Prioritize good program governance					
Strategy 1: Continue to strengthen and develop program governance, build urban forest collaboration, and develop the City's urban forestry reputation amongst peer programs.					
Action 1-1. Consider pursuing SFI certification for Vaughan's urban forest management program.	PRGM	PPLN, PFHO	MID		$
	Why: The Sustainable Forest Institute's urban and community forestry certification will identify a certification scheme based on some of the best practices in urban forest management. Achieving SFI certification will therefore provide evidence of the City's leadership in managing its urban forest. SFI certification is expected to be expedited for communities currently holding Tree Cities of the World or other third-party certifications, meaning Vaughan could potentially achieve certification through incremental improvements.				
Action 1-2. Continue to seek out and participate in research partnerships and collaborations, including with institutions such as Vineland, Universities, and Colleges.	PTNR	PFHO	SHORT		$
	Why: Research and development benefits the discipline of urban forestry broadly, and ensures Vaughan stays at the cutting edge of best practices, science, and disciplinary advances.				
Action 1-2(A). Participate in climate-adapted seed transfer, provenance, and species trials for both urban and woodland plants.	STDY	PFHO	MID		$$
	Why: Some native species and provenances may face challenges given future climate conditions. More research on plant adaptability will support the City in building the climate resilience of its urban forest (including in woodland areas).				
Action 1-3. Continue to prioritize staff professional development and participation in industry organizations, programs, and events (e.g., professional boards, conference attendance and presentations).	PRGM	PFHO	SHORT		$
	Why: Prioritizing professional development and staffs' broad investment in the urban forest management industry supports the reputation of the City's program, supports the City's program being informed by current best practices, and develops a professional network that the staff can draw on for a variety of purposes.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 1-4.	Cultivate collaborative partnerships with utility providers to enhance standards and practices regarding tree pruning, planting, and protection, and mitigate potential conflicts between trees and existing/new utilities.	PRGM	PFHO, ENGN	MID		$
		Why: Develop working relationships with third-party utility providers can significantly improve life cycle outcomes for urban trees that compete with utilities and services for space in urban growing sites.				
Action 1-5.	Establish an interdepartmental working group on urban forestry to meet minimally twice a year to share updates of the UFMP implementation and identify and address barriers and challenges in implementation.	PCDR	ALL	SHORT	HIGH	$
		Why: The working group will provide a platform for experience and information sharing, as well as discussion of challenges and opportunities related to urban forest management. Regular meetings will ensure the implementation of the UFMP is coordinated across departments.				
Action 1-6.	Partner with York Region Public Health Unit to develop local trails for forest therapy and designation through the Global Institute of Forest Therapy (GIFT).	PTNR	PPLN, PFHO, PIPD	LONG		$
		Why: Forest therapy, inspired by the Japanese practice of Shinrin-Yoku or "forest bathing," promotes healing and wellness by immersing individuals in natural environments. Led by trained guides, it emphasizes a mindful sensory experience, facilitating stress reduction, improved attention, enhanced immunity, and elevated mood. Partnerships with York Region Public Health Unit may identify opportunities to leverage forest therapy as a means of enhancing community health and well-being.				
Strategy 2: Ensure program resourcing is sufficient to broadly implement the UFMP.						
Action 2-1.	Examine current staffing levels, and consider hiring new role(s) within PFHO to address the capacity gaps and provide additional supports for the implementation of the UFMP.					
Action 2-1(A).	Utilize students and internships to build project-driven and temporary capacities within PFHO.	RSRC	PFHO, FINS	SHORT	HIGH	$$$$
		Why: Internships can be used to build temporary, often project-driven capacities within a forest management program. In addition to labour benefits, these roles are important training opportunities, and develop relationships with the next generation of urban forestry professionals.				
Action 2-1(B).	Expand arboricultural capacities within PFHO.	RSRC	PFHO, FINS	SHORT	HIGH	$$$$
		Why: PFHO is currently constrained by resources.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 2-1(C).	Establish formal woodland management capacity within the within PFHO.	RSRC	PFHO, FINS	SHORT	**YES**	$$$$
		Why: Vaughan currently has no capacity to administer any level of a woodland management program, or implement the City's Woodland Management Strategy. Formalized capacity to manage Vaughan's woodlands would position the City to support WMS implementation and to take an active role in the management of the City's woodland areas.				
Action 2-2.	Examine current funding levels to ensure that resourcing is sufficient to maintain existing urban forest assets, is scaled as new assets are added, and that funding is adjusted where needed to implement the UFMP.	RSRC	PFHO, FINS	SHORT	**YES**	$
		Why: Vaughan's urban forestry program is currently constrained by resources. Ensuring PFHO resourcing scales with program scope and demands is core to good program governance.				
Action 2-3.	Explore external funding opportunities, such as grants and donations, to support the urban forest programs and implementation of UFMP.	RSRC	PFHO, ECDV	SHORT	**YES**	$
		Why: Vaughan's urban forestry program is currently constrained by resources. Leveraging grants and external funding opportunities to develop the program can both support program capacity, and can support broad implementation of the UFMP. **Examples:** *secure funding sources for tree planting such as 2 Billion Trees Program, and employment funds such as the Green Jobs and Canada Summer Jobs wage subsidies.*				
Action 2-4.	Establish a Canopy Reserve Fund through by-law, direct operating budget surpluses and cash-in-lieu fees collected through the Tree Protection By-law or through development processes to that fund, and establish guidelines for the fund's use.	RSRC	PFHO, LEGL, FINS	SHORT		$
		Why: Formalizing a fund for the collection and use of cash-in-lieu can better support such activities as tree planting, site preparation, right-of-way improvements, restoration, and other processes that enhance canopy cover, as is intended through the collection of cash-in-lieu.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Strategy 3: Integrate all urban forest asset classes into the City's broader asset management approach.						
Action 3-1.	Establish minimum levels of service targets across different urban forestry asset classes.	PRGM	PFHO, FINS, IPAM	SHORT	**YES**	$
		Why: Formalizing levels of service helps to understand life-cycle cost implications for service commitment and ensure the maintenance activities are resourced adequately.				
Action 3-2.	Establish a life-cycle costing approach for street tree assets, aligned with level of service commitments, to inform financial planning for maintenance and renewal.	PRGM	PFHO, FINS, IPAM	SHORT	**HIGH**	$$
		Why: Life-cycle costing for street tree assets supports asset management integration and supports the City in establishing levels of resourcing sensitive the level of service commitments.				
Action 3-3.	Continue to integrate all classes of urban forestry asset (incl. woodlands) into the City's asset management framework.	PRGM	PFHO, FINS, IPAM	SHORT	**YES**	$
		Why: Asset management planning is a principal driver in establishing levels of resourcing toward the maintenance of public assets.				
Action 3-4.	Develop urban tree asset condition assessment protocols consistent with the industry tree care standards such as the ANSI A300 standards.	PCDR	PFHO, FINS, IPAM	SHORT		$
		Why: Condition can be used to prioritize maintenance activities and investment.				
Action 3-5.	Ensure current urban forest inventory information is available to support asset management integration and sustainable urban forest management operations.					
Action 3-5(A).	Update the City's street tree inventory on an iterative seven-year cycle (15% of inventory, per year), aligned with the grid pruning program.	RSRC	PFHO, IPAM	SHORT	**YES**	$$$$
		Why: A current and complete tree inventory information is foundational to a proactive maintenance regimen and a key input into an informed risk management approach.				
Action 3-5(B).	Expand the City's inventory of trees to include most urban park trees.	RSRC	PFHO, PIPD, IPAM	LONG		$$
		Why: Urban park trees are managed in a way comparable to street trees. As is the case with street tree assets, current information supports data-driven decision making, and would support monitoring efforts within park assets.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 3-5(C).	Establish and maintain a plot inventory within City woodlots.	RSRC	PFHO, TRCA, IPAM	MID	**YES**	$$$
		Why: Maintaining an inventory program within the City's woodlots helps to inform their sustainable management and supports asset management integration.				
Action 3-5(D).	Require geospatial inventory information be provided to the City for any public trees that will be assumed following the end of a development process.	RSRC	PFHO, OCIO	MID		$
		Why: The City can ensure the inventory population remains current through requiring assumed trees be identified through a spatial submission.				
Strategy 4: Prioritize equity in program delivery and operational planning.						
Action 4-1.	Prepare a formalized planting strategy which prioritizes planting efforts to areas of the city with relatively low tree equity.	PCDR	PFHO, PPLN	SHORT	**YES**	$$$
		Why: The urban forest can be used to support resolution of social, environmental, and health disparities while enhancing overall community well-being. Prioritizing planting in low equity area presents a socially responsible approach to urban greening, supports environmental justice, and improves public health within the community.				
Action 4-2.	Ensure the design of forestry-related engagement and educational programming is accessible to all members of the community.	PRGM	PPLN, PFHO	SHORT		$
		Why: Ensuring forestry-related education and outreach programs are designed to facilitate the participation of all members of Vaughan's community is important in ensuring program delivery and offerings are serving the community in an equitable fashion.				
Action 4-3.	Work together with Indigenous peoples to identify and support culturally sensitive urban forest and woodland management practices.	PTNR	PFHO	MID		$$$$
		Why: For thousands of years, Indigenous Peoples have served as stewards to the natural ecosystems that have existed within the lands now known as the City of Vaughan. Although the landscape has changed dramatically over the past few centuries, there may be significant opportunities for meaningful knowledge exchange between the City and Indigenous Peoples on urban forest management, including the identification of culturally-sensitive management practices or supporting reconciliation through urban forestry programs and initiatives.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 4-4.	Pilot the concept of food forests in partnership with the TRCA and community partners, supporting both equity outcomes and broader community engagement, education, and outreach	PTNR	PPLN	MID		$
		Why: Food forests are a diverse arrangement of primarily edible plants that attempt to mimic the ecosystems and patterns found in the natural world. Food forests tend to be low-maintenance once established, and can produce a reasonable crop toward food security outcomes.				
Goal 2: Maintain a healthy and safe urban forest						
Strategy 5: Formalize monitoring, reporting, and review standards and processes.						
Action 5-1.	Record tree mortality and failure rates in the City's inventory. Where there are repeated issues, conduct site assessments to inform species changes, soil profile rebuilding, or other management interventions.	MNTR	PFHO	SHORT		$
		Why: Datasets that provide insight into specific areas of repeated challenges can support adaptive management processes that help to optimize use of public funds.				
Action 5-2.	Track tree removals and replacements permitted under the City's Tree Protection By-law or through Planning Act approvals.	MNTR	PFHO	SHORT		$
		Why: Insights into rates of private tree removal and replanting can support monitoring of the City's progress toward achieving its canopy cover target, and can inform reviews of applicable by-laws and development requirements as required.				
Action 5-3.	Explore opportunities to support and partner in regional and TRCA-led urban forest monitoring programs and procurement (e.g, LiDAR an orthoimagery acquisition).	MNTR, PTNR	PFHO	MID		$$
		Why: Leveraging existing urban forest monitoring processes and intervals minimizes duplication of work and lends to an efficient use of resources.				
Action 5-4.	Prepare reporting on the State of Vaughan's Urban Forest every five years to provide the latest information about the conditions of City's urban forest, its management, and UFMP implementation.	MNTR	PFHO	SHORT	**YES**	$$$
		Why: Regular reporting on urban forest composition, health condition, canopy cover, as well as other important KPIs such as rates of tree planting and removal, trees pruned, tree permit issued, service request volume and response time, and operational costs.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 5-5.	Review the UFMP and WMS after ten years and update the actions informed by the recurring State of the Urban Forest reports. Develop a new UFMP and WMS coinciding with the horizon of this plan (2043).	MNTR, PTNR	PFHO	SHORT	**YES**	$$$
		Why: Urban forest management is an adaptive process and should be flexible to changing community needs and context. Revisiting this UFMP after ten years will ensure the content, especially the recommendations, remains relevant to evolving community contexts.				
Action 5-6.	Update the City's woodlot management plan(s) on a five-year iterative cycle to ensure content and short-term prescriptions remain current and relevant.	PGRM	PFHO	MID	**YES**	$$
		Why: Sustainable woodlot management should be responsive to evolving forest conditions and pressures. The City's woodlot management plans should be revisited on a regular basis to ensure management strategies are effectively addressing to the current pressures facing individual woodlots.				
Action 5-7.	Monitor tree mortality and failure rates and where there are repeat issues, conduct site assessments to inform species changes, soil profile rebuilding, or other management interventions.	MNTR	PFHO, IPAM	LONG		$$
		Why: Datasets that provide insight into specific areas of repeat challenge can support adaptive management processes that can optimize use of public funds.				
Action 5-8.	Prepare an annual staff report for information identifying which UFMP and WMS actions were implemented over the past 12 months, as well as an updated program report card.	MNTR	PFHO	SHORT		$
		Why: Concise annual (public) reporting on overall implementation of the UFMP helps to ensure the UFMP remains a public priority, and provides a recurring touch point through which implementation can be monitored.				
Strategy 6: Transition from a reactive to a proactive urban forest management paradigm.						
Action 6-1.	Shift to proactive a seven-year pruning cycle for urban street trees.	PCDR	PFHO	SHORT	**HIGH**	$$$$
		Why: A seven-year grid pruning cycle is an industry-standard and is conformed to by several of Vaughan's peer communities. A meaningful proactive maintenance regimen is known to extend the life cycle of street trees, optimizing the community benefit for public investment, and is known to reduce the costs associated with clean-up following storm events.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 6-2.	Establish a young tree training program that enables structural pruning in the third, fifth, and seventh year following planting.	PCDR	PFHO	SHORT	**YES**	$$$$
		Why: Unmanaged structural issues are more expensive to rectify as trees grow, and can lead to premature declines and failures. A young tree "training" program is a cost-effective means of addressing structural deficiencies while intervention is still relatively inexpensive and generally less impactful to the trees overall health.				
Action 6-3.	Extend the watering of public trees from the first two years (as is warrantied) to five years after planting.	PCDR	PFHO	SHORT	**YES**	$$$$
		Why: Young trees are most vulnerable to extreme heat and drought. Frequent watering significantly reduces young tree mortality. The standard (two-year) period under which young trees are typically watered (through standard warranty periods) may need to be extended in light of threat posed by climate change.				
Strategy 7: Formalize the City's approach to managing risk across all urban forest asset classes.						
Action 7-1.	Formalize a tree risk management policy that applies to all urban forestry asset classes.	BLPL	PFHO	SHORT	**YES**	$$
		Why: A formal risk management policy guides timely and appropriate actions to assess, prevent and address potential risks associated with trees in public spaces.				
Action 7-2.	Document operational procedures for risk inspection, frequency, resolution timeframes, qualifications, and documentation to reflect the industry best practices such as the Best Management Practices (BMPs) by the International Society of Arboriculture and Tree Care Industry Association's A300 standards.	PCDR	PFHO	SHORT		$
		Why: Operational procedures offers detailed guidance on how a risk management policy would be being implemented on the ground.				
Strategy 8: Develop a fulsome approach to managing tree health issues, including pests, invasive species, and disease.						
Action 8-1.	Formalize the City's approach to pest management through an integrated pest manage (IPM) policy.	BLPL	PFHO	SHORT	**YES**	$$
		Why: An IPM provides long-term solutions for pest prevention and management. A well-designed IPM approach can establish the metrics, monitoring procedures, thresholds, that support consistent and clear pest management within the City.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 8-2.	Increase diversity within the City's street tree population by limiting the planting of overrepresented species and genera.	PCDR	PFHO, PIPD, DPLN, DENG, YORK	SHORT		$$
		Why: Diversity is important in building the urban forest's resilience to pests and disease. Current best practice suggests a single species of street tree should not make up more than 5% of the city's tree population, and a single genera 10%.				
Goal 3: Expand the urban forest canopy and associated benefits						
Strategy 9: Ensure design, development, and planning processes are supporting the desired urban forest outcomes.						
Action 9-1.	Include the City's 25% city-wide canopy cover target and 2051 horizon as a policy in the Official Plan, Urban Design Guidelines, and other important strategic initiatives (e.g., the Greenspace Strategic Plan, Asset Management Plans), and look to integrate canopy cover targets into the development process.	BLPL	PPLN, PIPD, DPLN	MID		$
		Why: Canopy cover targets are aspirational figures. Setting a canopy cover target provides a clear direction for urban forest endeavours, and offers a measurable goal to guide resource allocation and decision making. To increase canopy cover, the City will need a combination of good management practices, effective tree protection measures, proactive maintenance programs, supportive tree regulations, well-resourced urban forestry team, and strong public support and stewardship. Therefore the canopy cover target provides a good overview of how well a city's urban forest program performs.				
Action 9-2.	Support urban forest management within the City through policy language in the Official Plan that supports urban forest management at a high level.	BLPL	PPLN, PFHO	MID	**YES**	$
		Why: The Official Plan is a guiding City document, moderating where, when, and how growth occurs. Including policy support for the urban forest broadly (and not just the Natural Heritage System) could help support urban forest outcomes across the community. These could include, for example: • adopting the City's canopy cover target in policy, • supporting equity in the planning of the urban forest, • including policy supports for the 3-30-300 rule, • preserving space for mature, healthy trees on private and public property, including adequate soil volume and appropriate growing medium, • support imposing requirements for soil volume in alignment with municipal standards where an application is subject to site plan control or to a Community Planning Permit process, and • provide the City's CoA shall have consideration for Vaughan's urban forest at multiple geographic scales, prioritizing the retention of large, mature trees over replacement or cash-in-lieu.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 9-3.	Prioritize parkland dedication as land dedication that is unencumbered (free of underground structures) over encumbered lands (e.g., strata parks). In areas of higher-order intensification-type development where strata parks will be accepted as part of the development process, consider opportunities to formalize a minimum proportion of parkland dedicated that is free of encumbrances.	PCDR	PPLN, DPLN, PIPD, LEGL, REST	SHORT		$
		Why: Parks are generally one of the City's primary opportunities to retain large mature trees in good soil volumes. In strata parks, periodic maintenance to the waterproofing membrane below the park will eliminate the potential for large, mature canopy area over any time horizon. This is a compromise that is made in highly urbanized areas. Strata parkland does not preclude trees altogether; there are a range of fast-growing, often smaller-stature species that make good candidates for use in strata parks as their useful life cycle roughly aligns with that of the underlying waterproofing membrane.				
Action 9-4.	Update the City's zoning by-law to include provisions that are tree-supportive.	BLPL	PPLN	MID		$$
		Why: The Zoning by-law can include tree friendly provisions, including: • parking islands or planting areas of a minimum size based on the number of parking stalls or parking area, • setbacks to allow ample pervious planting space for trees, • consolidated outdoor amenity areas or landscaped open space, • reconsidered requirements for landscaped areas (e.g., not enabling parking on hardscape or requiring a larger softscape area in low-density zones), or • reduced parking requirements.				
Action 9-5.	Explore updates to the City's engineering design criteria & standard drawings to yield better outcomes in tight urban and suburban streetscapes.	SPEC	DPLN, PFHO	MID	**YES**	$$
		Why: The Engineering Design Criteria & Standard Drawings can be revised to include tree-friendly provisions, including: • root trenching (e.g., below sidewalks), • use of structural soils, • minimum soil volume(s), • irrigated boulevards in highly urbanized sites, and • use of soil cells.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 9-6.	Review the City's Sustainability Metrics Program, and consider opportunities for strengthening the relative position of urban trees and green infrastructure within that framework.	BLPL	DPLN, PPLN, PFHO	MID		$$
		Why: Vaughan's Sustainability Metrics program has significant impact on tree planting and protection measures on developing lots by including tree friendly elements such as specifying minimum boulevard requirements for tree planting/ growth opportunities by land use or level of density.				
Action 9-7.	Review the City's current planting list and ensure that included species are 1. non-invasive, and 2. are not significantly overrepresented.	PRGM	PFHO	SHORT		$
		Why: Adjustments to the approved planting list are a simple high-impact way of influencing street tree stock selection and diversity.				
Strategy 10: Increase the rate of new tree planting to support achievement of the canopy cover target.						
Action 10-1.	Explore opportunities for partnerships with LEAF, the TRCA, York Region, the OWA, and EOMF, toward supporting woodland management and afforestation on private land.					
Action 10-1(A).	Encourage private landowners with significant woodland holdings to participate in sustainable woodland management through subsidy programs such as the MFTIP.	PRGM	PFHO, YORK, TRCA	MID		$
		Why: Afforestation in rural areas will depend on the land owner's willingness to participate. Promoting pre-existing subsidy programs encourages encourage voluntary stewardship.				
Action 10-1(B).	Explore opportunities for subsidy programs and partnerships toward afforestation on private land.	PTNR	PFHO, YORK, TRCA	SHORT		$
		Why: Afforestation is the only means through which the City will achieve a woodland target, and could be a significant contributor toward a canopy cover target as well.				
Action 10-2.	Explore opportunities for partnership with the TRCA and LEAF to pilot the planting, monitoring and maintenance of a Miyawaki forest.	PTNR	PFHO	MID		$$
		Why: Miyawaki forests achieve mature canopy in about 20 years, rather than 100 or more, because trees grow up, rather than out. There have been a few successful pilots of these programs in Ontario and Quebec, and they could be used to build community and capacity in the urban forest.				

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 10-3. Launch a free tree giveaway program to encourage tree planting on private land. Consider opportunities for partnership with York Region, the TRCA, and LEAF and program delivery.	PTNR	PFHO, YORK	SHORT		$$$
	Why: To achieve the City's canopy cover target, increasing canopy cover on private land, and in particular, single-detached residential areas, is essential. Tree giveaways are an excellent way of directly influencing the rate of planting on private land.				
Action 10-4. Continue to support and develop partnerships with LEAF and York Region toward growing canopy cover on private land.	PTNR	PFHO, YORK	SHORT		$$
	Why: Canopy change on private land will decide whether Vaughan hits or misses its canopy cover target. Strategic partnerships with organizations like LEAF could enhance the City's influence over canopy cover on private property.				
Action 10-5. Support rates of tree planting on key classes of land uses toward achievement of a 25% canopy cover and 14% woodland area by 2051.					
Action 10-5(A). Increase planting rates to **1400 net new trees** (i.e., in addition to any and all replacements), per year on City property, mainly urban boulevards and parks.	PCDR	PFHO, PIPD, DENG, PPLN, DPLN	Ongoing	HIGH	$$$$
	Why: Canopy modelling has assumed the City will maintain a minimum rate of 1400 net new trees per year toward supporting a 25% city-wide canopy cover target by 2051.				
Action 10-5(B). Advocate with York Region, MTO and Railway Corporations to add **new canopied area** along major transportation corridors.	PTNR	PFHO, YORK	Ongoing	Yes	$$
	Why: Canopy modelling assumes canopy growth will occur in these areas, supporting a 25% city-wide canopy cover target by 2051.				
Action 10-5(C). Work with the TRCA to secure **70 hectares of new canopied area** in TRCA landholdings in Vaughan, over the coming 30 years.	PTNR	PFHO, TRCA	Ongoing	Yes	$$
	Why: Canopy modelling has assumed TRCA woodlands in Vaughan can be grown by 70 hectares over the next 30 years, supporting a 25% city-wide canopy cover target by 2051. Growth may occur through enhanced forest management and protection or new tree planting initiatives.				

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 10-6. Explore strategic partnerships with LEAF toward enhancing canopy cover on private land.	PTNR	PFHO	SHORT		$$
	Why: Canopy change on private land will decide whether Vaughan hits or misses its canopy cover target. Strategic partnerships with organizations like LEAF could enhance the City's influence over canopy cover on private property.				
Action 10-7. Explore strategic partnerships with York Region and LEAF toward enhancing canopy cover and tree planting on industrial, commercial and institutional (ICI) campuses.	PTNR	PFHO	SHORT		$$
	Why: The City's ICI uses in general have low canopy cover at present. Supporting programs to increase canopy cover on these areas would significantly contribute to achieve the City's canopy cover target.				
Strategy 11: Prioritize forest restoration and biodiversity conservation.					
Action 11-1. Prepare woodlot management plan(s) for the remaining 26 woodlots the City does not yet have a woodlot management plan for.	STDY	PFHO	SHORT	HIGH	$$$$
	Why: Vaughan has prepared its first woodlot management plan coinciding with the development of the UFMP (for Sugar Baker Bush Woodlot). The City is home to 27 total woodlots—each should have their own Forest Management Plan to informed nuanced forest management activities within them.				
Action 11-2. Undertake ecosystem restoration consistent with the findings and prescriptions of the City's Woodland Management Strategy and accompanying Woodlot Management Plans.	PCDR	PFHO	MID	Yes	$$$$
	Why: As is the case in many urban communities, decades of urban growth have impacted the health and extent of Vaughan's woodland ecosystems. The City's woodland management strategy and woodlot management planning framework provide a structure through which sustainable woodland management can be achieved within the City of Vaughan. The City needs to support the resourcing levels required to support implementation of both of those documents, as well as the restorative activities prescribed.				
Action 11-3. Develop a Biodiversity Strategy to help inform restoration sequencing and priority areas for future acquisition and/or afforestation.	PGRM	PPLN, PIPD, PFHO	LONG		$$$$
	Why: A Biodiversity Strategy typically offers insights into the availability and location of habitats for local flora and fauna. Such strategies typically view the City as a network, and could support the identification of existing or potential habitat and corridor areas for conservation, as well as candidate sites for afforestation or future parkland acquisitions.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 11-4.	Develop operational standards for woodland trail design, development and maintenance.	SPEC	PFHO, CMSR, PIPD	MID		$
		Why: In woodland settings, trail infrastructure can negatively impact ecosystems if design, construction, and maintenance practices are not				
Goal 4: Protect trees and woodlands for future generations						
Strategy 12: Ensure the City's regulatory tools, standard processes, and compliance measures are consistently lending to desired outcomes in terms of tree protection.						
Action 12-1.	Consider updates to the City's tree protection protocol to formalize the handling of circumstances where the protocol can't be satisfied as part of a capital project.	BLPL	PFHO, DPLN, DENG	MID		$$
		Why: Tight working areas through some capital projects mean the specifications outlined in the current protocol can sometimes not be satisfied. Providing flexibility in the approach laid out through the protocol could support improved tree outcomes where the specifications of the current protocol cannot be met.				
Action 12-2.	Track tree removals and replacements permitted through the development approval process.	MNTR	PFHO, OCIO, DPLN	SHORT		$
		Why: Insights into rates of private tree removal and replanting can supplement review of the City's progress toward achieving its canopy cover target, and can inform reviews of applicable by-laws and development requirements as required. Monitoring of removals and replacements should include documentation of the stream of development under which removal was authorized (e.g., by-law permit, *Planning Act* approval).				
Action 12-3.	Explore potential partnerships with LEAF toward realizing better outcomes through tree replacement requirements on private land.	PGRM	PFHO	MID		$$
		Why: A municipal licensing program could offer a means for the City to influence the quality and training of tree contractors operating in the City.				
Action 12-4.	Develop a municipal licensing program for arborists and tree care companies.	BLPL	PFHO, LEGL	MID		$$
		Why: A municipal licensing program could offer a means for the City to influence the quality and training of tree contractors operating in the City.				

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 12-5. Review and update the City's Tree Protection By-law (052-2018).	BLPL	PFHO, LEGL, CMSR	SHORT	HIGH	$$
Why: Adjustments to the City's Tree Protection By-law could enhance tree protection outcomes on public and private land, including: • establishment of a definition for professional arborists and limit the definition to professionals holding third-party professional credentials in arboriculture, • strengthening the by-laws presumption clause, • enabling staff to receive reports of improper removal and then verify the information received, • requiring a fulsome appraisal method (e.g., CTLA) for public trees removed or injured in contravention of the by-law as the basis of penalty setting, • increasing maximum penalties for infractions on private land, • revisiting the requirements for neighbour consent for any removals within six metres of a property line (i.e., reconsider the approach to boundary trees), • providing the City discretion to refuse the issuance of a permit where the tree is healthy and options other than removal are available, • directing fees collected as cash-in-lieu to a reserve fund, • including language for cost recovery for hazard abatement work on private trees, • enabling administrative penalties, • ensure the Tree Protection By-law prevents the removal of trees planted as replacement trees up to the point where they are of a size to be protected anyway, and • ensuring alignment between the Tree Protection Protocol and Tree Protection By-law in terms of permit requirements, conditions, and fees.					
Action 12-6. Require applications for development identify the mature canopy area that would be lost and replaced through development proposal.	SPEC	DPLN, PPLN	SHORT		$
Why: The reality is that development often results in a short-term reductions in canopy area where mature trees are removed from a site to facilitate site works, and smaller, immature trees go in to replace those lost. Insights into the canopy area that will be realized as the newly planted trees on site mature can help the City understand whether site design is supporting broad canopy objectives.					

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 12-6(A).	Ensure a current city-wide canopy dataset is publicly available if the canopy impacts of tree removal are to be identified as part of a Tree Protection Plan.	RSRC	IPAM, OCIO	SHORT		$
		Why: Providing applicants with a current and high-resolution canopy dataset in common software formats will enable design teams to understand the canopy impacts of a proposed development.				
Action 12-6(B).	Provide guidance to applicants (TOR) on the maximum canopy area(s) that will be supported as a function of tree soil volume and species.	SPEC	DPLN, PPLN, PFHO	SHORT		$
		Why: Providing applicants with a current and high-resolution canopy dataset in common software formats will enable design teams to understand the canopy impacts of a proposed development.				
Action 12-6(C).	Track the canopy lost and mature canopy expected on a site-by-site basis in a central dataset.	MNTR	DPLN, PPLN, PFHO, OCIO	SHORT		$
		Why: Connecting site-level processes to broader city-wide trends, in terms of canopy change, can help the City evaluate whether current standards and requirements are achieving desired canopy outcomes.				
Action 12-7.	Require specific tree protection hold-backs for contractors working around public trees as part of City projects.	PRCD	DENG, IPAM, PIPD, LEGL, FISC	SHORT		$
		Why: Hold-backs at fair value and specifically for unauthorized damage to public trees can be an effective compliance measure.				
Action 12-8.	Develop the City's approach to managing issues of encroachment where they impact urban trees.					
Action 12-8(A).	Record issues of boulevard encroachment under the relevant tree record in the City's tree inventory on an ongoing basis. Include time-stamped photos of boulevard trees within the inventory.	MNTR	PFHO	SHORT		$
		Why: Misuse of boulevard spaces is an issue in Vaughan. Monitoring the situation better positions the City to administer an informed response.				

Action		Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 12-8(B).	Record instances of woodland encroachment as part of broader woodland management inventory efforts.	MNTR	PFHO	SHORT		$
		Why: Misuse of the City's woodland areas is an issue in Vaughan. The severity of woodland encroachment issues varies widely from one woodland to the next. Monitoring the situation better positions the City to administer an informed response.				
Action 12-8(C).	Consider establishing enforcement capacity within PFHO.	RSRC	PFHO, FINS, LEGL, CMSR	MID	**Yes**	$$
		Why: There are currently challenges with the enforcement of penalties under the City's Tree (052-2018) and Encroachment (034-2017) By-Laws owing to a disconnect between the technical nature of infractions and the general role of the City's By-Law and Compliance office and staff. Establishing dedicated enforcement capacity in PFHO, as the City's subject matter experts on trees, could improve tree-related enforcement outcomes relative to the Tree and Encroachment By-Laws.				
Action 12-8(D).	Establish standards and procedures to manage legacy issues of encroachment.	PRGM	PFHO, LEGL	LONG		$
		Why: Recognizing that some of the encroachment issues are not the sole fault of the current property owner, the City should consider establishing an internal process managing inherited issues of encroachment in a reasonable and equitable way.				
Action 12-8(E).	Notify the owners of property adjacent to unauthorized boulevard encroachments of the issue. Focus on education rather than compliance. Make public education materials available online and in the municipal offices (e.g., brochure).	PRGM	PFHO	LONG		$
		Why: Encroachment is an issue that tends to balloon if left unchecked. Property owners see unauthorized modifications elsewhere in the community or on their street and assume the modifications are authorized. It is often not an issue of wilful non-compliance. Launching a small education program to combat the encroachment issue could have positive effect.				

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 12-8(F). Inventory, decommission, and restore areas where unauthorized trails and other encroachments have degraded ecosystem quality.	PRGM	PFHO, PIPD	MID	Yes	$$$$
	Why: Encroachment is an issue that tends to balloon if left unchecked. Property owners see unauthorized modifications elsewhere in the community or on their street and assume the modifications are authorized. It is often not an issue of wilful non-compliance. Launching a small education program to combat the encroachment issue could have positive effect.				
Action 12-9. Review and update tree-related language used in the City's subdivision and/or site plan agreements.	SPEC	PFHO, PPLN, PIPD, TRCA, LEGL	SHORT		$
	Why: Legal agreements play a key role in implementing municipal policy, standards, specifications, guidelines and procedures, through binding language that prescribes the standards of the associated development, as well as the processes involved in its construction. Revisions could include: • clarifying deficiencies in the public road allowance (e.g., unauthorized encroachment) will be corrected before being assumed by the City, • requiring the developer to provide (city-sponsored) educational materials related to encroachment with every purchase agreement/offer, • requiring the execution of tree protection agreement(s), • requiring the selection of stock to be from the City's preferred tree list, and that stock selection generally meet diversity targets or otherwise be approved by PFHO.				
Action 12-9(A). Subdivision and site plan agreements require new development install fencing where private yards abut woodlands owned by the City or TRCA.	SPEC	PFHO, PPLN, PIPD, TRCA, LEGL	SHORT		$
	Why: Physical barriers along property lines have the effect of clarifying property limits and discourage encroachment.				
Action 12-10. PFHO to undertake annual reviews of critical regulatory materials and be involved in any regulatory or policy updates that intersect with urban trees.	MNTR	PFHO, ALL	SHORT		$
	Why: Ensuring critical regulatory materials such as the City's Tree Protection By-law, encroachment by-law subdivision/site plan language, and tree protection protocol are reviewed by PFHO staff on an annual basis, and ensuring any updates processes involve PFHO as a critical stakeholder, both help to ensure tree regulation is meeting the City's needs on an ongoing basis.				

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Goal 5: Partner in urban forest stewardship					
Strategy 13: Utilize community capacities to build urban forest management capacities.					
Action 13-1. Establish Community Boards/Committees to involve community groups and members in Vaughan's urban forest stewardship and management.					
Action 13-1(A). Establish a community tree board comprised of community members and representatives from local environmental groups to serve in an advisory role to staff on urban forest management and UFMP implementation.	STWD	PFHO, PPLN	MID	**Yes**	$
	Why: The community tree board could offer a dedicated platform supporting ongoing urban forestry communication and engagement for members of the community. The board could help align community groups and members both with the City and with each other so that efforts are coordinated and not duplicative.				
Action 13-1(B). Establish a woodland steward program, where interested members of the public can act as the community representative of each of Vaughan's 27 woodlands.	STWD	PFHO, PPLN	MID	**Yes**	$
	Why: The woodland steward program would build community capacity, support 'eyes on the ground' within specific woodland areas, and could reduce the volume of inquiries associated with woodland and woodland health (informational inquiries could be directed to the relevant community steward).				
Action 13-2. Implement an "adopt-a-tree" program.	STWD	PPLN, PFHO	LONG		$$$
	Why: An "adopt-a-tree" program can be an effective mechanism to involve individuals, businesses, or organizations in urban tree management by allowing them to "adopt" and care for public trees.				
Action 13-3. Establish an "honour roll" of trees, maintain the honour roll in a public forum, such as the City's website.	STWD	PPLN, PFHO	LONG		$
	Why: Honour roll of trees is a program to recognize trees that are of significant cultural, historical, and ecological values in Vaughan. The program could offer to feature individuals or groups who take care of the recognized trees; this often installs a sense of pride in the owners of honour roll trees.				

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 13-4. Continue to develop and resource the City's Green Guardians program.	STWD	PPLN, PFHO	SHORT	**Yes**	$$
	Why: Green Guardians is the City of Vaughan's formalized environmental stewardship program. Continuing to direct resources and develop this program will support the broad implementation of this UFMP.				
Action 13-5. Develop and implement programs that leverage community capacity to support urban forest monitoring, invasives removal, and planting. Work with the TRCA and other levels of government where possible.	PTNR	PPLN, PFHO	SHORT	**Yes**	$$
	Why: The community represents a significant resource in terms of capacity when engaged. Leveraging local partnerships toward better capitalizing on the community resource could support important initiatives such as monitoring, forest health, and achieving the canopy cover target.				
Strategy 14: Improve educational programming to build public awareness and understanding of the benefits of the urban forest and its management.					
Action 14-1. Prioritize the ongoing development and upkeep of PFHOs web page as a hub for information, education, and news.	STWD	PFHO, OCIO, CSCO	SHORT		$
	Why: The PFHO web page could be leveraged to provide a one-stop-shop for information on departmental processes, news, and educational materials.				
Action 14-2. Offer urban forest walks to improve people's access to and understanding of Vaughan's urban woodlands.	STWD	CMSR, PFHO, PIPD	MID		$
	Why: Urban forest walks offer participants opportunities to connect with city staff and other like-minded community members, learn about the urban forest issues and efforts, and share their concerns and values.				
Action 14-3. Share the urban forest inventory online (e.g., through a web map).	STWD	PPLN, PFHO	SHORT		$
	Why: Public access to inventory information enables community members to explore urban trees in the city toward a deeper understanding of the urban forest. There could also be an opportunity to integrate a web map application with the City's CRM system.				

Action	Type	Vested Interest	Timeframe	Priority	Ant. Cost
Action 14-4. Expand publicly available educational resources on pests, diseases and invasive species.	RSRC	PPLN, PFHO	SHORT		$
	Why: This type of educational offering can help boost public understanding of common pests, disease and invasive species. Informed community members often passively support management by reporting issues, avoiding the use of, and occasionally participating in control efforts.				
Action 14-5. Partner with York Region to engage with School Boards toward delivering a tree-related programs and outreach, and identify champion teachers and classrooms to support urban forestry events.	PTNR	PFHO, YORK	SHORT		$
	Why: Education plays a pivotal role in shaping future generations' attitudes and behaviours towards nature and sustainability. By partnering with school boards, the City can provide students with hands-on learning opportunities that enhance students' understanding of ecological principles and instill a sense of responsibility toward preserving and nurturing the environment. The City can also explore planting opportunities on school sites to provide shade and other benefits for students and teachers.				
Action 14-6. Partner with the Vaughan Public Libraries to provide community education through initiatives such as the Story Walk Program.	PTNR	PFHO	SHORT		$
	Why: Leveraging existing engagement programming within the community to deliver enhanced urban forest education offerings can be both an effective and resource-efficient means of supporting community outreach.				
Action 14-7. Develop partnerships with community organizations and non-profits such as LEAF to build capacity toward the delivery of community outreach and educational activities.	PTNR	PFHO	SHORT		$
	Why: Leveraging the capacity of non-profits and community organizations, such as that of LEAF, not only builds PFHO's capacity to deliver educational outreach, but also develops relationships with important community organizations as well.				

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5.4 Monitoring Plan

This following pages summarizes a monitoring plan to track the implementation of both the UFMP and WMS. Monitoring describes the processes and tools the City of Vaughan has at its disposal to track its own progress in implementing different facets of this plan, as well as the accompanying woodland management strategy. Indicators and targets identified through the monitoring plan can be readily integrated into an asset management approach for urban forest asset classes.

A method for re-assessment of each indicator is identified, as is the associated current measurement and a forward-facing target aligned with the actions contained in this document.

Table 5-2. *City of Vaughan UFMP monitoring plan.*

Indicator	Method	Re-assessment (iterative)	Current (Last Measure)	Target (Asp. Year)
City-wide canopy cover target	Canopy analyses (i.e., LiDAR + aerial imagery)	**Five years**	20% (2018)	**25% (2051)**
Canopy cover in the municipal RoW and in (non-forest) Parks	Canopy analyses (i.e., LiDAR + aerial imagery)		13% and 19%, respectively (2018)	**17% and 26%, respectively (2051)**
Resident satisfaction with urban forestry educational and steward-ship offerings and program outreach	Survey	**Five years**	12% (2022)	**60% (2034)**
Resident literacy across urban forestry program areas (i.e., % of the population with awareness of pruning cycle, pest management, protection processes, educational offerings, etc.)	Survey	**Five years**	60-90%, all pro-gram areas (2022)	**90%, all program areas (2034)**
Grid pruning cycle	Inventory data	**Ongoing**	>30-year (2022)	**Seven-year (2027)**
Frequency of street tree inventory updates	Inventory data	**Ongoing**	NA (2023)	**Seven-Year (2034)**
Trees in "poor" or worse condition	Inventory data	**Ongoing**	Unknown (2023)	**< 2.5% (2034)**
Average time to service completion (i.e., call to closure-non-emergency)	CRM data	**Ongoing**	~6 months (2023)	**2 months (2034)**
Number of CRM Calls for Tree Inspection/Obstruction/ Risk	CRM data	**Ongoing**	~5,100 annually (2022)	**2,000 annually (2034)**
Resident Satisfaction: Removal, Stumping & Replacement Timelines	Survey	**Five years**	34% (2022)	**80% (2034)**
Annual Tree Care Budget Per Unit	Financial data	**Ongoing**	$16.00 (2023)	**$23.30 (2034)**
Frequency of woodland inventory re-measurements	Inventory data	**Ongoing**	NA (2023)	**Five-year (2027)**
% of woodlots with a "Safe and Enjoyable Human Use" score of "poor" or "very poor"	WMP updates	**Five-year**	Unknown (2023)	**< 10% (2034)**
% of woodlots with a "Biodiversity Conservation" score of "poor" or "very poor"	WMP updates	**Five-year**	Unknown (2023)	**< 30% (2044)**
Annual Woodland Budget Per Hectare	Financial data	**Ongoing**	$0.00 (2023)	**$1,340 (2034)**

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Appendices

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Plan					
Awareness of the urban forest as a community resource	The urban forest is recognized as vital to the community's environmental, social, and economic well-being.	General ambivalence or negative attitudes about trees, which are perceived as neutral at best or as the source of problems. Actions harmful to trees may be taken deliberately.	Trees are widely acknowledged as providing environmental, social, and economic services but are not widely integrated in corporate strategies and policies.	Trees are widely acknowledged as providing environmental, social, and economic services and urban forest objectives are integrated into other corporate strategies and policies.	Urban forest recognized as vital to the community's environmental, social, and economic well-being. Widespread public and political support and advocacy for trees, resulting in strong policies and plans that advance the viability and sustainability of the entire urban forest.
Relative tree canopy cover	Achieve desired degree of tree cover, based on potential or according to goals set for entire municipality and for each neighbourhood or land use.	The existing canopy cover for entire municipality is <50 percent of the desired canopy.	The existing canopy is 50 percent-75 percent of desired.	The existing canopy is >75 percent-100 percent of desired.	The existing canopy is >75 percent-100 percent of desired - at the individual neighborhood level as well as overall municipality.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Clear and defensible urban forest canopy assessment and goals	Urban forest policy and practice is driven by comprehensive goals municipality-wide and at the neighbourhood or land use scale informed by accurate, high-resolution assessments of existing and potential canopy cover.	No assessment or goals.	Low-resolution and/or point-based sampling of canopy cover using aerial photographs or satellite imagery – and limited or no goal setting.	Complete, detailed, and spatially explicit, high-resolution Urban Tree Canopy (UTC) assessment based on enhanced data (such as LiDAR) – and limited or no goal setting.	The City has a complete, detailed, and spatially explicit high-resolution Urban Tree Canopy (UTC) assessment accompanied by a comprehensive set of goals, all utilized effectively to drive urban forest policy and practice municipality-wide and at neighbourhood or smaller management level.
Interdepartmental and municipal agency cooperation on urban forest strategy implementation	Ensure all relevant municipal departments and agencies cooperate to advance goals related to urban forest issues and opportunities.	Little cooperation and conflicting among departments **and/or** agencies often leading to poor outcomes for trees.	Common goals but limited cooperation among departments **and/or** agencies and mixed outcomes for trees.	Municipal departments, affected agencies and urban forest managers recognize potential conflicts and reach out to each other on an informal but regular basis.	Formal interdepartmental working agreements or protocols for all projects that could impact municipal trees.
Municipality-wide urban forest management plan	Develop and implement a comprehensive urban forest management plan for public and private property.	No plan.	Existing plan limited in scope and implementation.	Recent comprehensive plan developed and implemented for publicly owned forest resources, including trees managed intensively (or individually) and those managed extensively, as a population (e.g., trees in natural areas).	Strategic, multi-tiered plan with built-in adaptive management mechanisms developed and implemented for public and private resources.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Municipal infrastructure asset management	Integrate green infrastructure assets into the municipal asset management system to support valuing and accounting for natural assets in the City's financial planning to build climate resilient infrastructure.	No recognition of value of natural or human-made elements that provide ecological and hydrological functions (green infrastructure).	Local government recognizes the value of green infrastructure but does not yet have information to include them in an asset management system.	Green infrastructure assets have been partially or fully inventoried and some assets are included in an asset management system, with the intent to ultimately capture all assets in the consolidated financial statements of the municipality.	Green infrastructure assets are inventoried and included in an asset management system and on the consolidated financial statement of the municipality.
Municipal-wide biodiversity or woodland management strategy	Acquire and restore publicly-owned natural areas in pursuit of meeting municipal-wide biodiversity and woodland management goals.	No or very limited planning and stewardship of natural areas.	Area specific management plans focused on management, restoration, and protection of natural areas.	Municipal-wide urban forest, parks or natural areas strategy guiding management, restoration, and protection of the existing natural areas network.	Biodiversity strategy or equivalent in effect to manage, restore and existing and acquire future natural areas network throughout the municipality.
Municipal urban forestry program capacity	Maintain sufficient well-trained personnel and equipment – whether in-house or through contracted or volunteer services – to implement municipality-wide urban forest management plan.	Team severely limited by lack of personnel and/or access to adequate equipment. Unable to perform adequate maintenance, let alone implement new goals.	Team limited by lack of staff and/or access to adequate equipment to implement new goals.	Team able to implement many of the goals and objectives of the urban forest management plan.	Team able to implement all of the goals and objectives of the urban forest management plan.
Urban forest funding to implement a strategy	Maintain adequate funding to implement the urban forest strategy.	Little or no dedicated funding.	Dedicated funding but insufficient to implement the urban forest strategy or maintain new assets as they are added to the inventory.	Dedicated funding sufficient to partially implement the urban forest strategy and maintain new assets as they are added to the inventory.	Sustained funding to fully implement the urban forest strategy and maintain new assets as they are added to the inventory.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Partner					
Citizen involvement and neighbourhood action	Citizens and groups participate and collaborate at the neighbourhood level with the municipality and/or its partnering NGOs in urban forest management activities to advance municipality-wide plans.	Little or no citizen involvement or neighborhood action.	Community groups are active and willing to partner in urban forest management, but involvement and opportunities are ad hoc.	Several active neighborhood groups engaged across the community, with actions coordinated or led by municipality and/or its partnering NGOs.	Proactive outreach and coordination efforts by the City and NGO partners result in widespread citizen involvement and collaboration among active neighbourhood groups engaged in urban forest management.
Involvement of large private land and institutional land holders (e.g., schools)	Large private landholders to embrace and advance city-wide urban forest goals and objectives by implementing specific resource management plans.	Large private landholders are generally uninformed about urban forest issues and opportunities.	Landholders manage their tree resource but are not engaged in meeting municipality-wide urban forest goals.	Landholders develop comprehensive tree management plans (including funding strategies) that advance municipality-wide urban forest goals.	As described in "Good" rating, plus active community engagement and access to the property's forest resource.
Urban forest research	Research is active and ongoing towards improving our understanding of the urban forest resource, the benefits it produces, and the impacts of planning, policy, design and management initiatives.	No urban forest research.	Isolated academic research occurs in the municipality's urban forest.	The municipality supports and has input on academic research occurring in its urban forest and knowledge transfer occurs.	The urban forest is a living laboratory - in collaboration with public, private, NGO and academic institutions - integrating research and innovation into managing urban forest health, distribution, and abundance.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Regional collaboration	There is cooperation and interaction on urban forest plans among neighbouring municipalities within the region, and/ or within regional agencies.	Municipalities have no interaction with each other or the broader region for planning or coordination on urban forestry.	Some neighboring municipalities and regional agencies share similar policies and plans related to trees and urban forest.	Some urban forest planning and cooperation across municipalities and regional agencies.	Widespread regional cooperation resulting in development and implementation of regional urban forest strategy.
Protect					
Policy or regulations regulating the protection and replacement of private and City trees	Secure the benefits derived from trees on public and private land by enforcement of municipality-wide policies and practices including tree protection.	No or very limited tree protection policy.	Policies in place to protect public trees and employ industry best management practice.	Policies in place to protect public and private trees with enforcement but lack integration with other municipal policy to enable effective tree retention.	Urban forest strategy and integrated municipal-wide policies that guide the protection of trees on public and private land, and ensure they are consistently applied and enforced.
Policy or regulations for conservation of sensitive ecosystems, soils, or permeability on private property through development	Secure the benefits derived from environmentally sensitive areas by enforcement of municipality-wide policies in pursuit of meeting biodiversity and connectivity goals.	No or very limited protection of natural features.	Policies in place to protect natural features and areas, whether privately or publicly owned, but no or otherwise very limited enforcement success.	Policies in place to protect natural features and areas, whether privately or publicly owned, and which have effective enforcement processes, but which lack integration with other municipal policies to enable effective tree retention.	Biodiversity strategy or equivalent integrated with the broad municipal policy direction(s) to guide natural features and areas protection and to ensure regulations are consistently applied.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Internal protocols guide City tree or sensitive ecosystem protection	Ensure all relevant municipal departments follow consistent tree or ecosystem protection protocols for capital design and construction activities.	No protocols guiding City tree or ecosystem protection for capital design and construction activities.	Informal and inconsistent processes followed for City tree or ecosystem protection for capital design and construction activities.	Established protocols for City tree or ecosystem protection for capital design and construction activities but outcomes are inconsistent or sometimes unachievable.	Established protocols for City tree or ecosystem protection for capital design and construction activities are consistently followed and outcomes are successful.
Standards of tree protection and tree care observed during development or by local arborists and tree care companies	Consulting arborists and tree care companies understand city-wide urban forest goals and objectives and adhere to high professional standards.	Limited understanding or support for tree protection requirements.	General understanding or support for tree protection requirements but large variation in the quality of information and services provided.	General understanding or support for tree protection requirements and generally consistent quality of information and services provided.	Advocacy for tree protection requirements, engagement with City staff on improving processes and standards, and generally consistent quality of information and services provided to high professional standards.
Cooperation with utilities on protection (and pruning) of City trees	All 3rd party utilities employ best management practices and cooperate with the City to advance goals and objectives related to urban forest issues and opportunities.	Utilities take actions impacting urban forest with no municipal coordination or consideration of the urban forest resource.	Utilities inconsistently employ best management practices, rarely recognizing potential municipal conflicts or reaching out to urban forest managers and vice versa.	Utilities employ best management practices, recognize potential municipal conflicts, and reach out to urban forest managers on an ad hoc basis – and vice versa.	Utilities employ best management practices, recognize potential municipal conflicts, and consistently reach out to urban forest managers and vice versa.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Grow					
City tree planting and replacement program design, planning and implementation	Comprehensive and effective tree selection, planting and establishment program that is driven by canopy cover goals and other considerations according to the UFMP.	Tree replacement and establishment is ad hoc.	Some tree planting and replacement occurs, but with limited overall municipality-wide planning and insufficient to meet replacement requirements.	Tree replacement and establishment is directed by needs derived from an opportunities assessment and species selection is guided by site conditions, tree health and climate adaptation considerations.	Tree planting and replacement is guided by strategic priorities and is planned out to make progress towards targets set for canopy cover, diversity, tree health and climate adaptation within the timeframe of the strategy.
Development requirements to plant trees on private land	Ensure that new trees are required in landscaping for new development or, where space is lacking, there is an equivalent contribution to tree planting in the public realm.	Landscaping requirements do not address trees on private land.	Developments are generally required to provide replacement but the outcomes are often in conflict with public trees and other infrastructure due to space limitations and not connected to meeting canopy cover targets.	Developments are required to provide replacement trees or, where space is not adequate according to soil volume available, provide cash-in-lieu for equivalent tree planting on public land. The requirement is not connected to meeting canopy cover targets.	Developments are required to provide a minimum density of trees per unit measure or, where space is not adequate according to soil volume available, provide adequate cash-in-lieu for equivalent tree planting on public land. Planting density is determined based on meeting a municipal-wide canopy cover target.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Streetscape and servicing specifications and standards for planting trees	Ensure all publicly owned trees are planted into conditions that meet requirements for survival and maximize current and future tree benefits.	No or very few specifications and standards for growing sites.	Specifications and standards for growing sites exist but are inadequate to meet urban forest goals.	Specifications and standards exist and are adequate to meet urban forest goals but are not always achieved.	All trees planted are in sites with adequate soil quality and quantity, and with sufficient growing space to achieve their genetic potential and life expectancy, and thus provide maximum ecosystem services.
Equity in planting program delivery	Ensure that the benefits of urban forests are made available to all, especially to those in greatest need of tree benefits.	Tree planting and outreach are not determined equitably by canopy cover or need for benefits.	Planting and outreach includes attention to low canopy neighborhoods or areas.	Planting and outreach targets neighborhoods with low canopy and a high need for tree benefits.	Equitable planting and outreach at the neighbourhood level are guided by strong citizen engagement in identified low-canopy/high-need areas.
Forest restoration and native species planting	Encourage the appreciation of climate suitable native vegetation by the community and ensure native species are widely planted to enhance native biodiversity and connectivity.	Voluntary use of climate suitable native species on publicly and privately-owned lands.	The use of climate suitable native species is encouraged on a site-appropriate basis in public and private land development projects.	Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects but are not integrated across all policy or guided by a connectivity analysis.	Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects and through tree by-law.

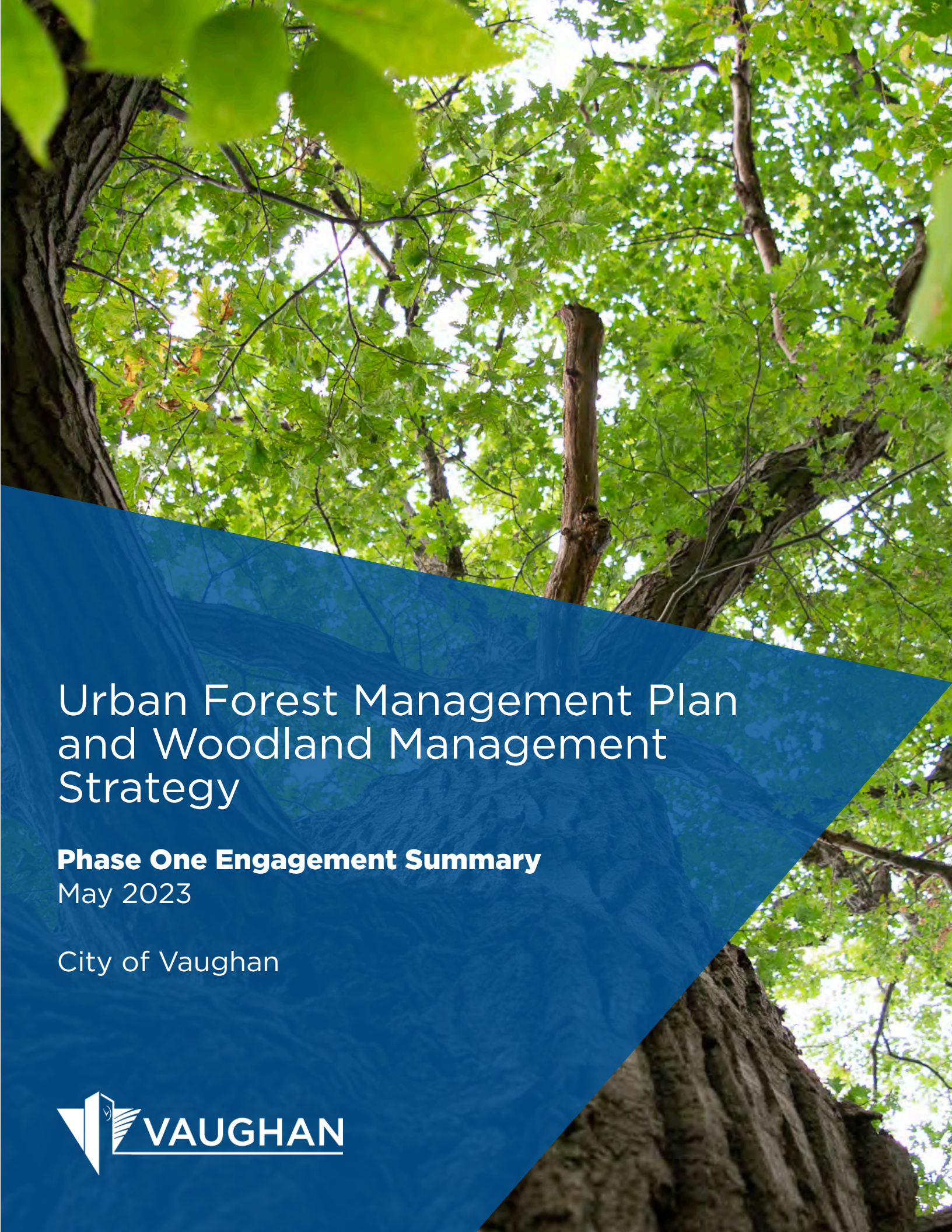
Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Selection and procurement of stock in cooperation with nursery industry	Diversity targets and climate adaptation/ mitigation objectives guide tree species selection and nurseries proactively grow stock based on municipal requirements.	Species selection is not guided by diversity targets or climate adaptation/ mitigation objectives.	Species selection is guided by diversity and climate adaptation/ mitigation but required stock is rarely available from nurseries and acceptable substitutes reduce diversity.	Species selection is guided by targets for diversity and climate adaptation/ mitigation and required stock or acceptable substitutes are usually available from nurseries.	Species selection is guided by targets for diversity and climate adaptation/ mitigation and required stock is secured ahead of the planned planting year from contract or in-house nurseries.
Ecosystem services targeted in tree planting projects and landscaping	Incorporate ecosystem services objectives into public and private tree planting projects to improve urban tree health and resilience, carbon sequestration, stormwater management and cooling.	Ecosystem services not considered in planting projects or intentionally designed into vegetated landscapes.	Ecosystem services, such as stormwater interception, occasionally incorporated into City or private land planting projects and landscape designs.	Guidelines in place for planting projects and landscape designs on public and private land to deliver specific ecosystem services.	Ecosystem services targets are defined for the urban forest and policy requires planting project and landscape designs on public and private land to contribute to meeting targets.
Manage					
Tree inventory	A current and comprehensive inventory of intensively managed trees to guide management, including data such as age distribution, species mix, tree condition and risk assessment.	No inventory or spatially indiscreet inventory.	Partial inventory of publicly-owned trees in GIS.	Complete inventory of street trees and intensively managed park trees in GIS but inconsistently updated.	The municipal tree inventory is complete, is GIS-based, supported by mapping, and is continuously updated to record growth, work history and tree condition.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Natural areas inventory	A current and comprehensive inventory of sensitive and modified natural ecosystems and their quality mapped to Provincial standards to provide standardized ecological information to support decision-making.	No municipal inventory of natural areas.	Natural areas inventoried in GIS but not recently updated and attribute information not to a standard that can support decision-making.	Natural areas inventoried in GIS and with standard and complete attribute information to support decision-making but not updated in the last 5 years.	Natural areas inventoried in GIS and with standard and complete attribute information to support decision-making and updated in the last 5 years.
Maintenance of intensively managed trees	Maintain all publicly owned intensively managed trees for optimal health and condition in order to extend longevity and maximize current and future benefits.	Intensively managed trees are maintained on a request/ reactive basis.	Intensively managed trees are maintained on a request/ reactive basis. Limited systematic (block) pruning and/ or immature trees are structurally pruned.	All intensively managed trees are systematically maintained on a cycle determined by workload and resource limitations. All immature trees are structurally pruned.	All mature intensively managed trees are maintained on an optimal pruning cycle. All immature trees are structurally pruned.
Publicly owned tree species condition assessment	Current and detailed understanding of condition and risk potential of all publicly owned trees that are managed intensively (or individually).	Condition of urban forest is unknown.	Sample-based tree inventory indicating tree condition and risk level.	Complete tree inventory that includes detailed tree condition ratings.	Complete tree inventory that is GIS-based and includes detailed tree condition as well as risk ratings.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Tree risk management	Comprehensive tree risk management program fully implemented, according to ANSI A300 (Part 9) "Tree Risk Assessment" standards, and supporting industry best management practices.	No coordinated tree risk assessment or risk management program. Response is on a reactive basis only.	Some areas within the city are prioritized for risk assessment and management. Little annual budget is available to develop a more proactive inspection program.	Priority areas of the City are inspected on a regular schedule and operational standards and budgets are in place for responding to and managing tree risks within an appropriate timeframe.	A comprehensive risk management program is in place, with all public lands inspected on defined schedules and operational standards and budgets in place for responding to and managing tree risks within an appropriate timeframe.
Emergency response planning	A response plan guides call-out procedures, resources available and the clean-up response for extreme weather and earthquake.	Response plan not documented or not current.	Response plan is documented and includes call-out procedures, roles and responsibilities but lacks details to prioritize hazards and clean-up.	Response plan includes call-out procedure, roles and responsibilities, and criteria for prioritizing tree hazards and removing debris is in place.	A comprehensive response plan is in place and a response drill occurs annually.
Pest and Disease Management	An Integrated Pest Management (IPM) plan guides treatment responses to existing and potential pest, disease and invasive species threats to the urban forest.	No integrated pest management plan and no pest management.	No or otherwise outdated integrated pest management plan and reactive pest management.	An integrated pest management plan is in place and implemented.	A comprehensive pest management program is in place, with detection, communication, rapid response and IPM practiced.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Species diversity	Establish a genetically diverse population across the municipality as well as at the neighbourhood scale.	Five or fewer species dominate the entire tree population across municipality, **or** species proportions are unclear due to inventory gaps.	No single species represents more than 10 percent of the total tree population; no genus more than 20 percent, and no family more than 30 percent.	No single species represents more than 5 percent of total tree population; no genus more than 10 percent; and no family more than 15 percent.	At least as diverse as "Good" rating (5/10/15) municipality-wide - and at least as diverse as "fair" (10/20/30) at the neighborhood level.
Age diversity (size class distribution)	Provide for ideal age distribution for all "intensively" managed trees – municipality-wide as well as at neighbourhood level.	Even-age distribution, **or** highly skewed toward a single age class (maturity stage) across entire population, **or** tree age distribution is unclear due to inventory gaps.	Some uneven distribution, but most of the tree population falls into a single age class.	Total tree population across municipality approaches an ideal age distribution of 40 percent immature, 30 percent semi-mature, 20 percent mature, and 10 percent old.	Total population approaches that ideal distribution municipality-wide as well as at the neighborhood level.
Species suitability	Establish a planted tree population suited to the urban environment and adapted to the overall region.	Fewer than 50 percent of planted trees are from species considered suitable for the area, **or** species suitability is unclear due to inventory gaps.	>50 percent-75 percent of planted trees are from species suitable for the area.	More than 75 percent of planted trees are suitable for the area.	Virtually all planted trees are suitable for the area.
Waste biomass utilization	A closed system diverts all urban wood and green waste through reuse and recycling.	Wood waste from the urban forest is not utilized.	Wood waste from the urban forest is utilized as mulch or biofuel.	Wood waste from the urban forest is utilized as mulch or biofuel and sometimes high value pieces are milled and stored for later use or sold on to local value-added industries.	Low value wood waste from the urban forest is utilized as mulch or biofuel and all high value pieces are milled and stored for later use or sold on to local value-added industries.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Knowledge of trees on private property	Understand the extent, location, and general condition of privately-owned trees.	No information about privately owned trees.	Aerial, point-based or low-resolution assessment of tree canopy on private property, capturing broad extent.	Detailed Urban Tree Canopy analysis of the urban forest on private land, including extent and location, integrated into a municipality-wide GIS system.	The City has an i-Tree Eco analysis of private trees as well as detailed Urban Tree Canopy analysis of the entire urban forest integrated into a municipality-wide GIS system.



Urban Forest Management Plan and Woodland Management Strategy

Phase One Engagement Summary
May 2023

City of Vaughan

VAUGHAN

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SCOPE OF THE ENGAGEMENT

The City of Vaughan is home to a diverse urban forest that spans a range of land uses and ownership types. Land use change and development activity associated with the City's rapid growth over recent decades has exerted significant pressure on Vaughan's urban forest. At the same time, issues such as climate change, invasive pests, and diseases, have increasingly been a source of urban forest stress. The City is now developing an Urban Forest Management Plan (UFMP) to guide the long-term management of the urban forest as a critical community resource.

Engagement

Two rounds of public engagement are planned to help inform the development of UFMP. Phase 1 of public engagement, occurred from March to April 2023, and was designed to help inform the vision, principles, and goals of the UFMP.

The second phase of engagement will take place in June 2023, and will present draft components of the UFMP and solicit feedback from the community on how the UFMP direction captures and addresses key concerns; this will include exploring which goals and strategies are prioritized through the full draft of the UFMP.

Objectives for public engagement

The project team aims to achieve the following objectives through two phases of public engagement:

- To inform the public about:
    - The status of our urban forest and woodlands (i.e., forested areas > 0.2 hectares in area)
    - The role of the urban forest in the community, including the unique environmental, economic, and social values it supports
    - The challenges facing urban forest management within the city
- To involve the community in developing a long-term urban forest vision that captures the community's perspective on the city's urban forest
- To consult the community to identify opportunities to preserve and protect, grow, and enhance our urban forest
- To build community awareness, support, and advocacy for our urban forest and woodlands and the Urban Forest Management Plan and Woodland Management Strategy

ENGAGEMENT ACTIVITIES

The public was invited to provide input through an online survey, mapping tool, and a virtual open house from March to April 2023. The public was invited to participate in additional community events including an art contest and an Earth Hour Event to learn more about the urban forest and share their ideas about urban forest management. Details on Phase 1 engagement opportunities are outlined in Table 1.

Table 1 Summary of engagement opportunities provided in Phase 1

Time	Engagement Opportunities	# of Participants
March-April 2023	Survey	493 participants
March-April 2023	Mapping tool: Map Vaughan's trees	49 participants
March-April 2023	Art contest	49 submissions
March 25, 2023	Earth hour event	±350 attendees
April 3, 2023	Virtual open house	7 participants
April 25, 2023	Stakeholder workshop	10 stakeholder organizations

Communications

Information on engagement opportunities was communicated via several available online and in-person platforms to reach as many people as possible. Table 2 provides a summary of the communication/promotional avenues used in the first phase of public engagement.

On Vaughan's project page, 49 "engaged" participants contributed to one or more feedback tools, 72 "informed" participants visited multiple project pages, contributed to a tool or downloaded documents, and 233 "aware" visitors viewed the project page.

Table 2 Summary of communication tactics and platforms used in Phase 1

Launch date (duration)	Communication tactics
March 21, 2023	Project webpage on vaughan.ca and Have Your Say, Vaughan
March 21, 2023 (for two weeks)	Banner on the homepage of the City website
March 21, 2023 (for two weeks)	Graphic on our digital sign network (see example of graphic used in Appendix A)
March 21, 2023 (for two weeks)	Graphic on TV screens at City Hall and community centres (see example of graphic used in Appendix A)
March 21, 2023	Public service announcement
March 21, April 3 and April 17, 2023	Council communications packages
March 23, 2023	Special edition of the Vaughan Engagement eNewsletter
March 24	Blurb in the Economic Development eNewsletter
March 21 and 25, 2023	In-person events (Blue Willow and Earth Hour)

Launch date (duration)	Communication tactics
March 21 to April 2, 2023	On-hold message for people who call into the City's call centre
March 29 to April 5, 2023	Social media ads
March 30	Media coverage by NRU
April 2023	Vaughan Engagement eNewsletter
April 13, 2023	UFMP Newsletter #1

WHO WE HEARD FROM

We heard from 493 survey respondents, 49 mapping tool participants, 12 attendants of the virtual open house, and representatives from the 10 organizations at the stakeholder workshop. An art contest and earth hour event provided residents in Vaughan additional opportunities to learn more about the urban forest and the Urban Forest Management Plan project.

Survey demographics

Of the survey respondents:

- 89% reside in Vaughan
- 45% own a property or operate a business in Vaughan
- 78% are 25-64 years old: 36% are 25-44 years old, 43% are 45-64 years old
- 40% or their household member(s) were born outside of Canada,18% are ESL (English as a Second Language), 11% identify themselves as racialized person
- 33% have children (age under 18) and 22% have seniors (age 65+) in their household.

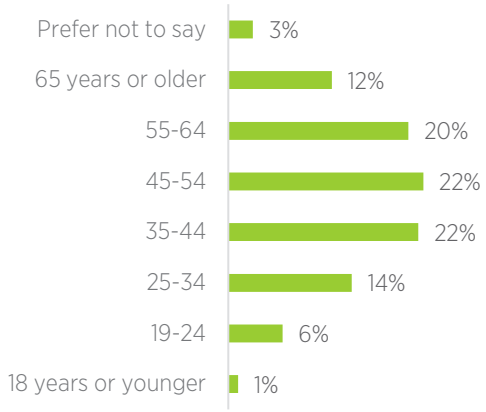


Figure 1. Age of respondents (357 responses)

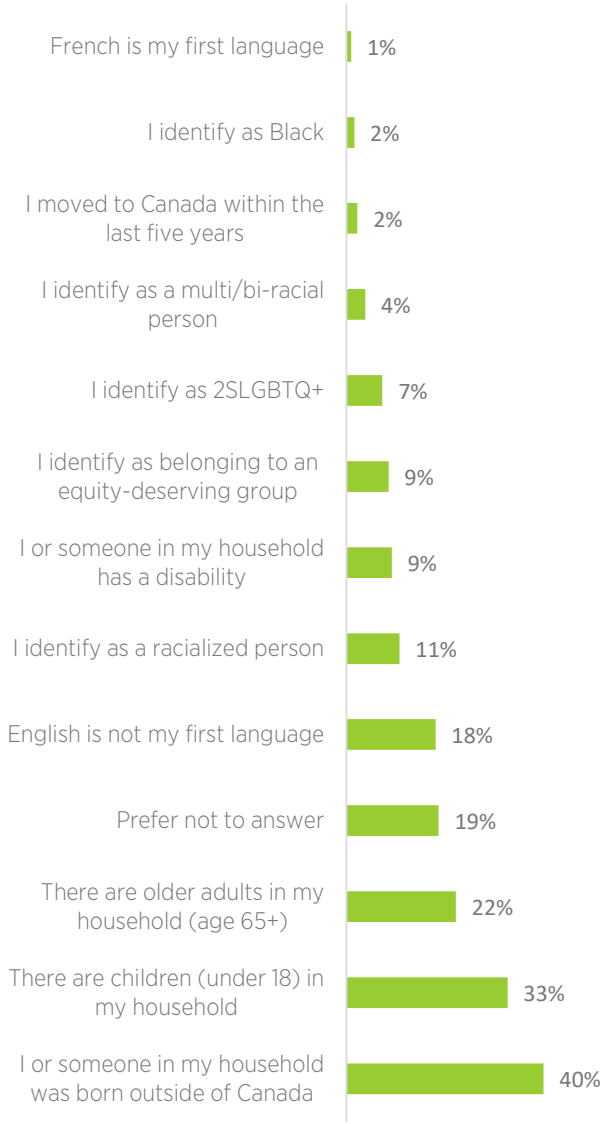


Figure 2. Cultural background of respondents (315 responses)

Stakeholder workshop

10 stakeholder organizations attended the online workshop. Stakeholders included members of:

- Toronto and Region Conservation Authority
- Mackenzie Ridge Ratepayers
- Invasives Species Centre
- York Region Catholic District School board
- Millwood Ratepayers'
- SpringFarm Ratepayers Association (SFRA)
- Association of Land Surveyors
- Woodbridge Agricultural Society
- Forests Ontario
- LEAF

WHAT WE HEARD

Key findings from the first phase of public engagement are summarized in this section for each engagement tool:

- Online survey
- Mapping tool
- Stakeholder workshop

The detailed engagement results are available in the Appendices (Appendix B: Detailed Survey Results and Appendix C: Stakeholder Workshop Boards).

Online survey

The online survey focused on five key topics:

- Understanding how the urban forest is valued and what the community's vision for it by 2042
- Preferences for street trees (size and distribution)
- Priorities for urban forest management
- Satisfaction with and preferred urban forest service levels
- Stewardship of the urban forest

Valuing and visioning the urban forest

Most respondents (33%) ranked climate benefits of the urban forest (e.g., shade and cooling of streets and buildings) as the most important value to them, followed by health and social benefits (21% of respondents), ecological benefits (20%), and environmental benefits (17%) (Figure 3). Economic benefits, such as increasing property values and attracting more tourists, were ranked as lower importance by respondents. It was voted by 56% of respondents as the least important benefit.

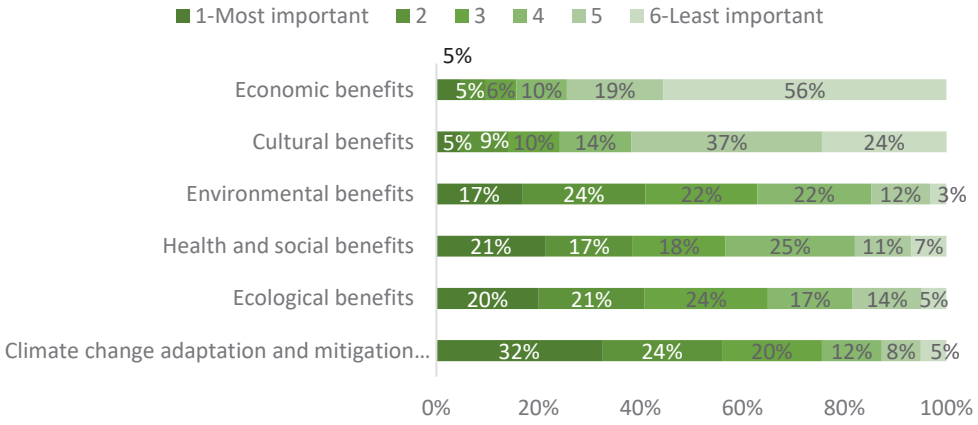


Figure 3. Respondent ranking of urban forest benefits by participants (total respondents: 434)

Respondents were asked to imagine what they would like Vaughan's urban forest to look like in 2042. 90% of participants would like to increase Vaughan's tree canopy cover in the future, with only 1% (4 people) indicating a preference for a less tree canopy. The responses were analyzed by counting the number of occurrences of a set of key terms as they appeared in respondents' answers. These in turn will be used to inform key themes for the vision (illustrated in Figure 4). Besides the term "**tree**" (mentioned 137 times), "**green**" (50 times) and "**canopy**" (42 times) were the most used to describe respondents' desire for more green space and larger tree canopy for **recreational uses** (24 times), **biodiversity and "wildlife" habitat** (22 times), **aesthetics** (22 times), "**shade**" and "**cool[ing]**" (20 times), and clean "**air**" (7 times) and "**water**" (4 times). Terms "**lush**" (32 times), "**mature**" (31 times), "**health**" (31 times) and "**native**" (16 times) indicate respondents' preference for a healthy, large, mature urban forest of native species.

Figure 4. Word cloud showing the most common words used by respondents to describe their vision of the urban forest by 2042

> "I'd like for Vaughan to have trees everywhere and prioritize nature. Sidewalks should have natural canopy cover to incentivize walking."
>
> - Survey respondent

Preferences for street trees

Eighty-six percent of survey respondents indicated that having a tree in their boulevard is very important to them. Three percent of respondents are of the position that boulevard trees are not important (2%) or slightly important (1%). This is mainly because of concern that trees can damage property (47%) and pose safety hazards (33%). The rest 11% think boulevard trees are important or moderately important to them.

Respondents were also asked to make two selections from the photos presented in Figure 5; the first being the photo that most resembles their street now and the second being the photo that depicts what they would like their street to resemble.

A. Few or no trees

B. Regularly spaced, small trees

C. Regularly spaced, medium-sized trees

D. Mixed spacing and species (different types of trees), medium sized trees

E. Regularly spaced, large trees

F. Mixed species (different types of trees) and spacing, large sized trees

Figure 5. Types of street tree planting presented to survey respondents

Most survey respondents currently live on a street with regularly spaced small trees (option B, 39%) or medium-sized trees with mixed species and spacing (option D, 27%). Overall, very few people (11%) live on streets with only large trees (option E and F). However, streets with large trees are preferred by most people (68%), especially with mixed species and spacing (option F, 50%). Only 5% of respondents would like to live on a street with small trees. Among them, 4% of respondents prefer streets with regularly spaced small trees, which is the most common streetscape on the streets where respondents currently live.

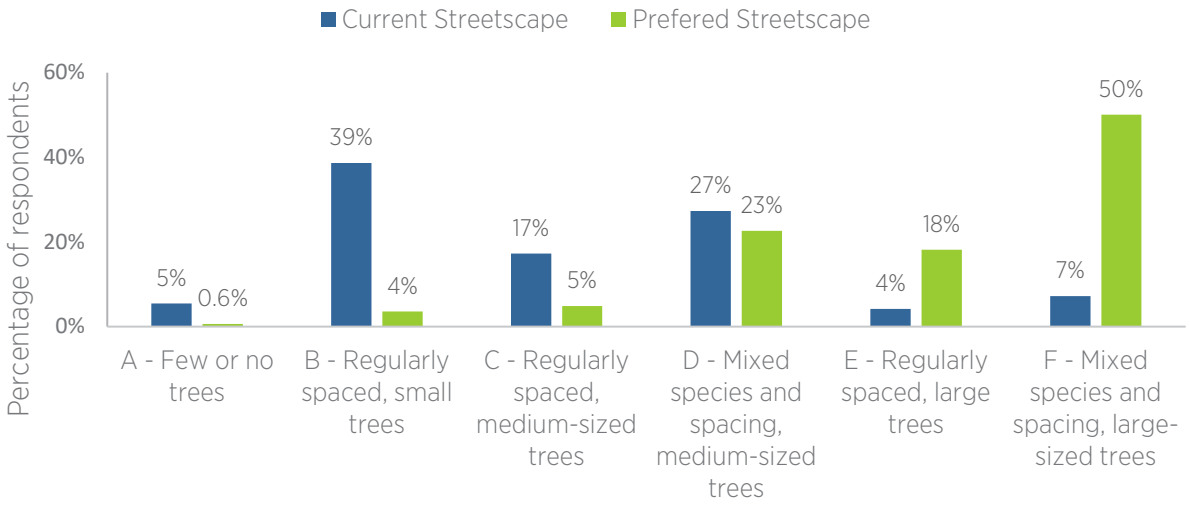


Figure 6. Respondents' current streetscape (458 responses) versus preferred streetscape (473 responses)

Priorities for urban forest management on City-owned land and private land

Most respondents feel that local residential streets are the most important locations where the City should prioritize for tree planting and replacement (selected by 61% of respondents), followed by developed trails and greenways (37%), regional roads/arterials (31%), and municipal collector roads (28%). Private land is considered as the least important location for tree planting and replacement. Only 17% of respondents believe the City should prioritize planting and replacement on private land (Figure 7).

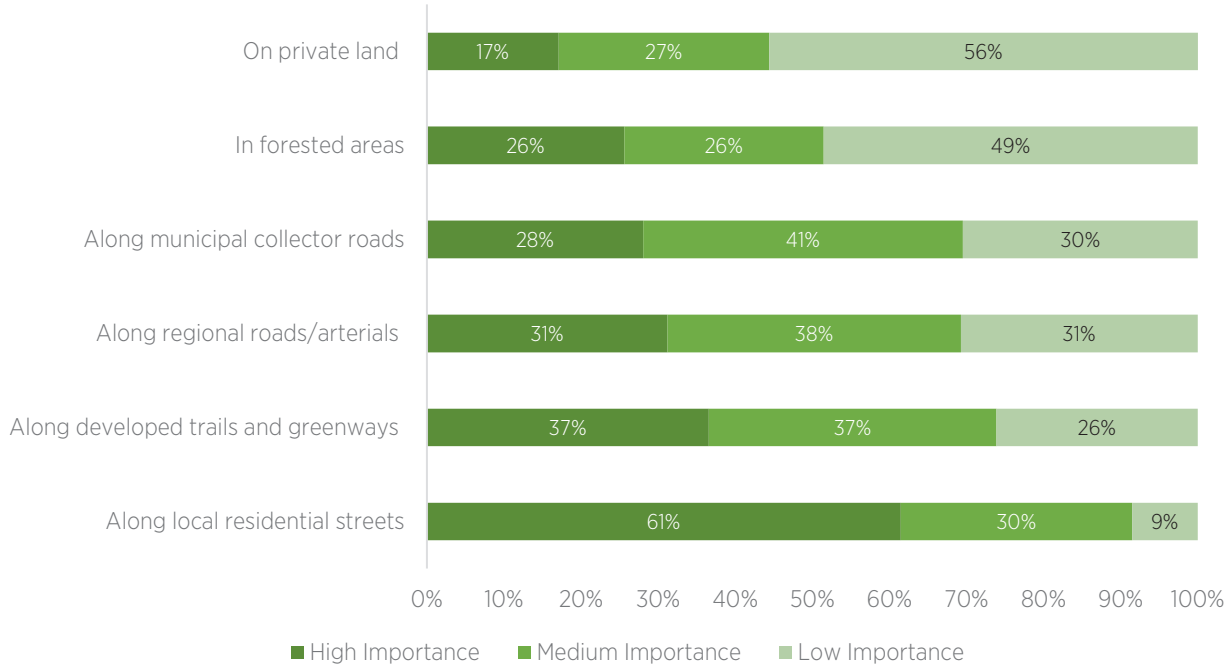


Figure 7. Ranking of areas where the City should prioritize tree planting and replacement (total respondents: 410)

"Plant significantly more trees in parks and create more trails within existing parks."

- Survey respondent

Respondents were asked to assign different levels of priority to six urban forestry actions on City-owned lands (Figure 8). Overall, most actions were ranked as medium-high priority or essential. Specifically, increasing penalties for public tree removals, planting more street and park trees, improving tree species selection, improving soil standards, and constructing new tree planting space where few trees exist now were identified as essential actions by over 40% of respondents. Creating more opportunities for residents to participate in tree planting and care was a relatively lower priority, identified by 24% of respondents.

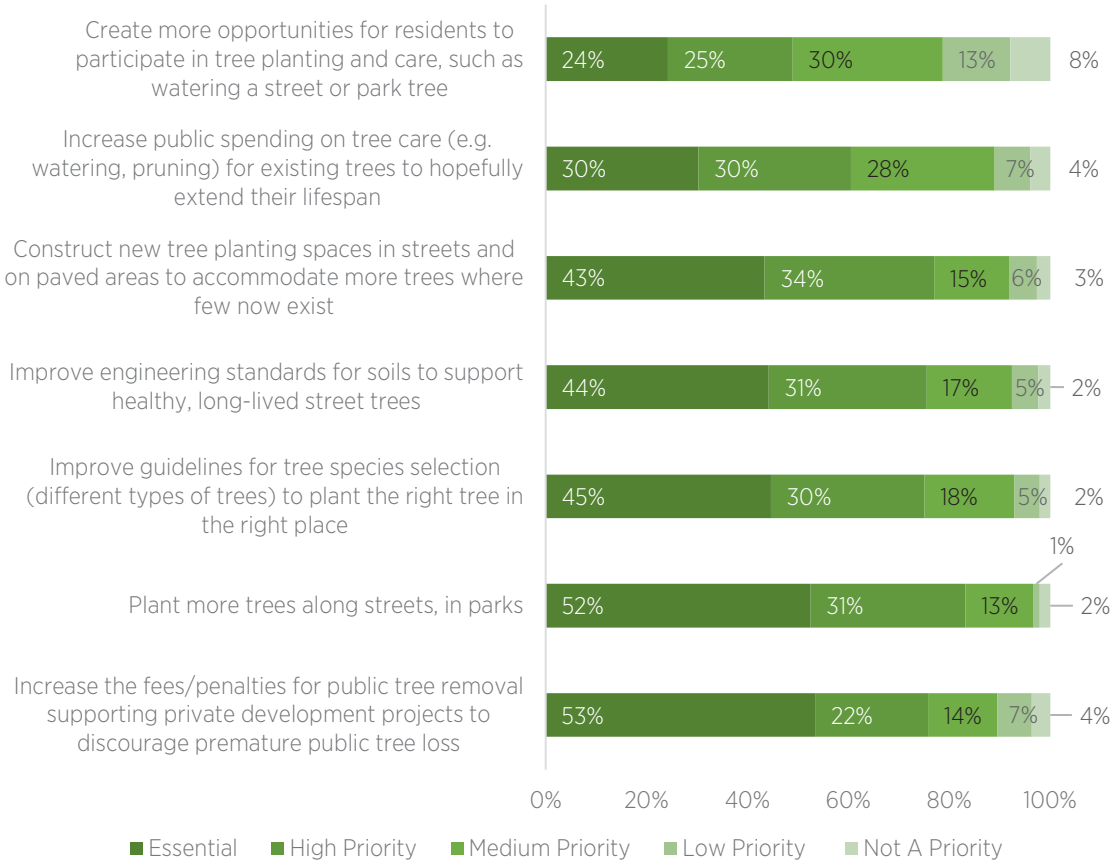


Figure 8. Priority ranking for seven urban forest actions on the City-owned land (total respondents: 381)

"Developers should be required to keep mature trees when building new subdivisions as replanting with an immature tree is not equivalent!"

- Survey respondent

Respondents were then asked to assign different levels of priority to eight urban forestry actions on private lands (Figure 9). All listed urban forestry actions on private land were considered as medium-high priority or essential by respondents. The top actions ranked as essential include requiring trees to be planted as green infrastructure (ranked "essential" by 55% of respondents), increasing planting requirements for new multi-family, subdivision, and commercial developments (53%), and protecting trees during construction by requiring supervision by qualified arboricultural professionals (50%). The lowest ranked action (considered more as a medium-priority action) is to allow small variation of setbacks or building heights with new development in exchange for positive urban forest outcomes, such as more planting space and parkland.

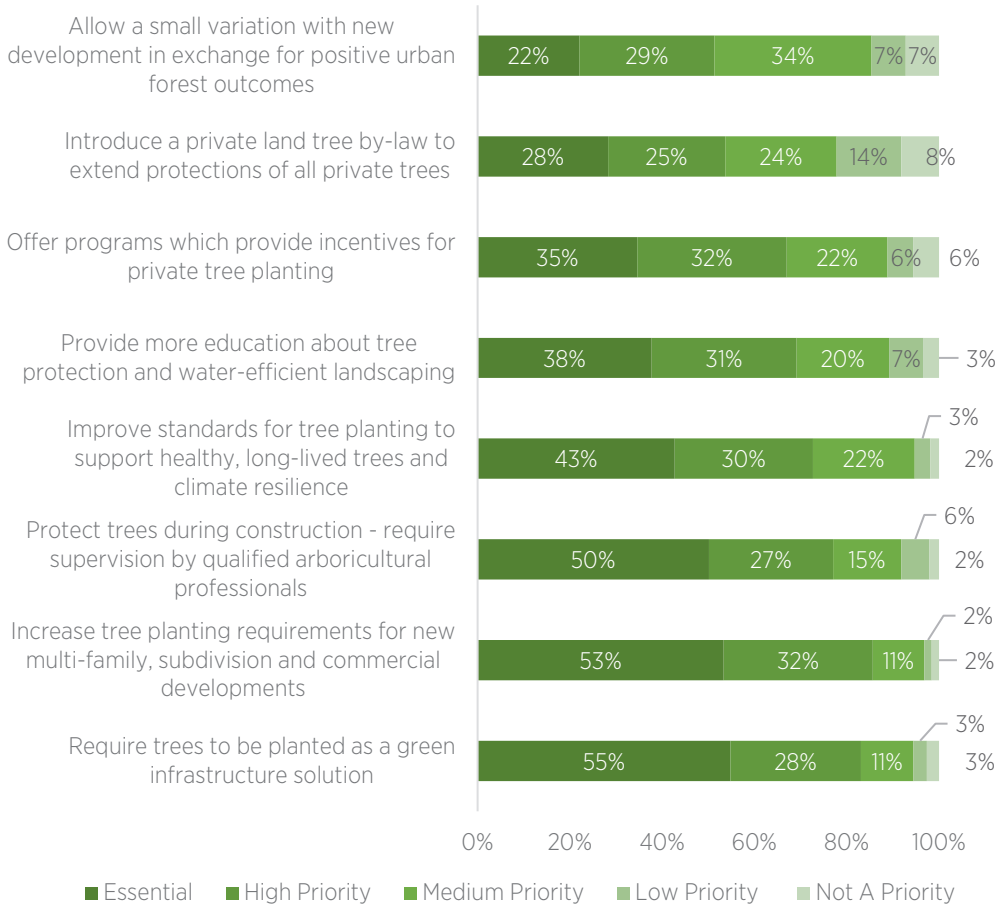


Figure 9. Priority ranking for eight urban forest actions on the private land (total respondents: 410)

Satisfaction with and preferred urban forest service levels

Respondents were asked to rank satisfaction levels with current service levels for trees provided by the City (Figure 10). A large proportion of respondents are not aware of City services in public education (36%) and pest and disease control (30%). Among people who are aware of various urban services provided by the City, they have very mixed levels of satisfaction. Participants are in general satisfied with tree pruning services (32% satisfied) but see opportunities to improve in services relating to public education (12% satisfied versus 27% dissatisfied) and tree planting and replacement (24% satisfied versus 36% dissatisfied). When it comes to tree and stump removal and pest and disease control, more respondents are neutral about these services (32% and 28% respectively) than being satisfied or dissatisfied.

Respondents also provided suggestions to improve the City's service levels. The most commonly suggested ideas are to increase the efficiency of tree replacement, inspection and pruning (38 respondents), improve tree maintenance (34 respondents), and introduce more environmental protection and development restrictions (31 respondents).

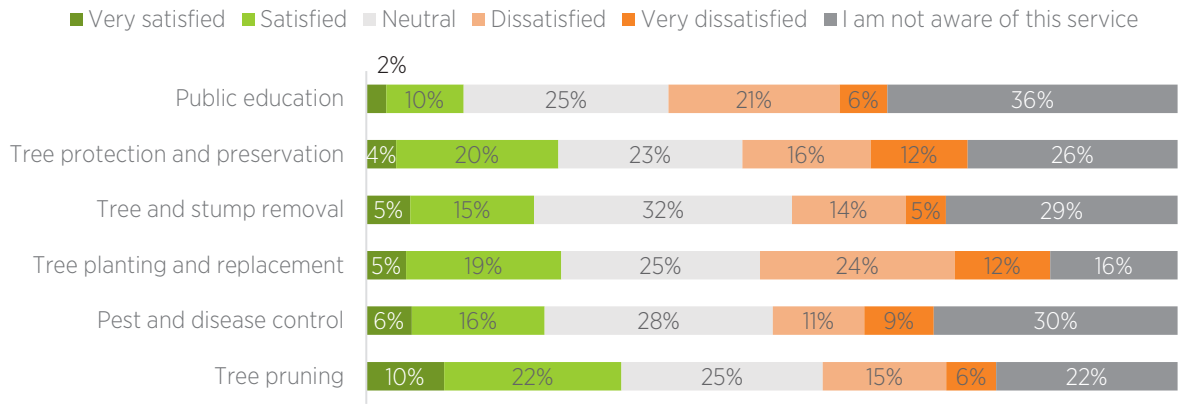


Figure 10 Satisfaction levels with current service levels for trees in parks and along streets (total respondents: 411)

Respondents were asked if they would be willing to pay for improved urban forest service levels by the City (Figure 11). While 21% of respondents wouldn't be willing to pay anything for improved services, most respondents (79%) would be willing to pay at least $5 per year per household to support the City to deliver service levels that they are satisfied with. Among them, 20% are willing to pay at least $100 more per household, per year.

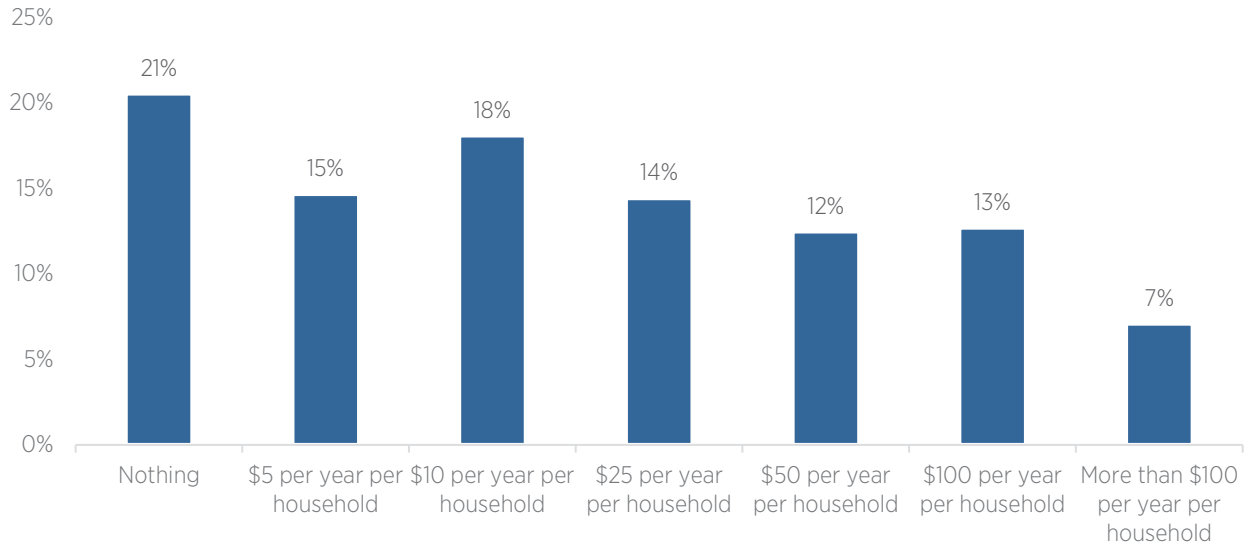


Figure 11. The amount of money respondents would be willing to pay for the City for improved service levels on public land (total respondents: 409)

Community stewardship of the urban forest

Community stewardship refers to activities that the community participates in to care for or contribute to the planning and management of the urban forest on public and private land. Of the 372 respondents, over half have pruned private tree(s) (60%), watered street tree(s) (57%), and planted private tree(s) (53%). About 10% have never participated in any stewardship activities before.

The top three barriers to community stewardship include:

- Lack of relevant information (e.g., how to participate in stewardship activities, what's available, etc.) (65%);
- Other priorities (21%); and
- Physical or mobility challenges (9%).

Mapping tool

Residents were invited to use the online mapping tool to identify and share places that they feel are alive and well or which, in their opinion, are need improvement. A total of 139 locations were identified: 115 (83%) were places needing improvement, 20 (14%) were places that are alive and well, and 4 (3%) were areas that respondents both appreciate and see opportunity for improvements. Locations were submitted by 45 participants. Where in some cases a single respondent submitted multiple locations, respondent locations were weighted in the figures following (Figure 9 and 10); all unique respondent submissions have a common weight of one divided amongst however many submissions they made.

Alive and well

Most of the alive and well places were in or near a park, such as Mackenzie Glen District Park, Marita Payne Park, and forested areas near Humble River (Figure 12). Most people highly value the locations for the opportunity to recreate (e.g., walk the dog and exercise) (35%) and see and support biodiversity and wildlife (30%). Other respondents appreciate the overall look and view of the space (20%).

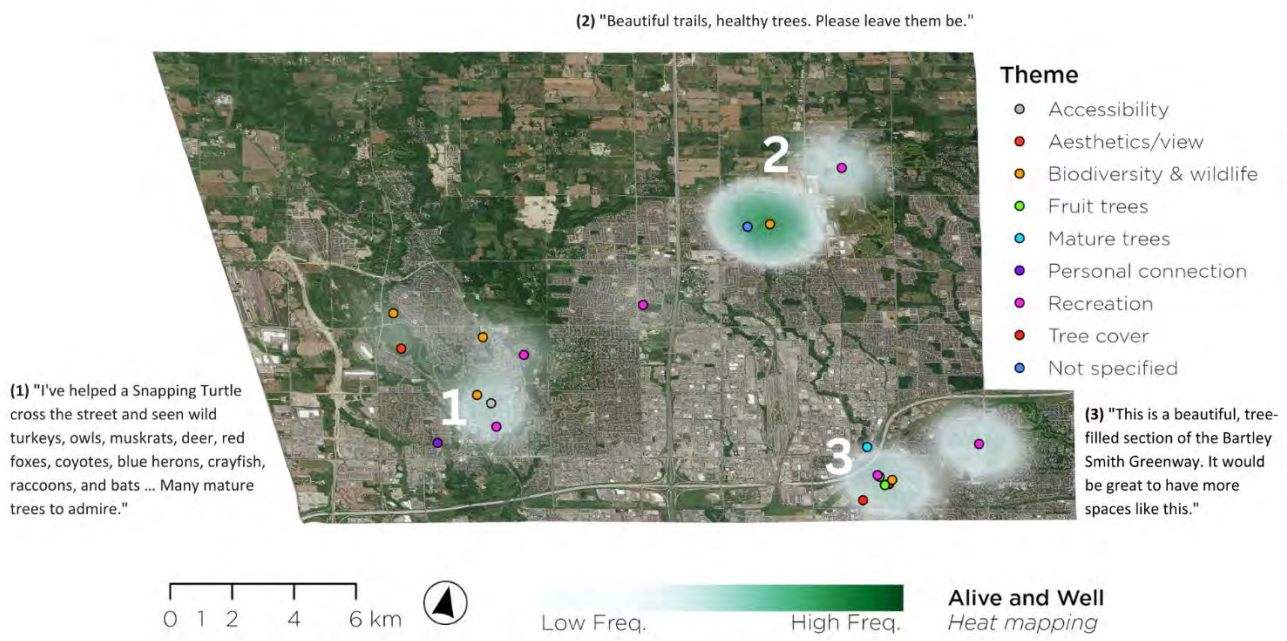


Figure 12 Alive and well urban forest places identified in the online mapping tool

Needing improvement

Urban forest places needing improvement are shown on Figure 13. Residential areas near Mackenzie Glen District Park were the most common areas for improvement. Other hotspots for improvement were identified in the western Vaughan near Kortright conservation area, along the greenway in the southwestern part of the city, and in residential areas in the southern and southeastern parts of the city. The most common improvement expressed by respondents was adding more trees (including replacing removed or dead trees; 23%) and improving urban forest management practices (especially addressing issues regarding littering and avoiding over-trimming understory; 21%). People also had suggestions on where trails and walkways could be extended, connected, and improved (9%).

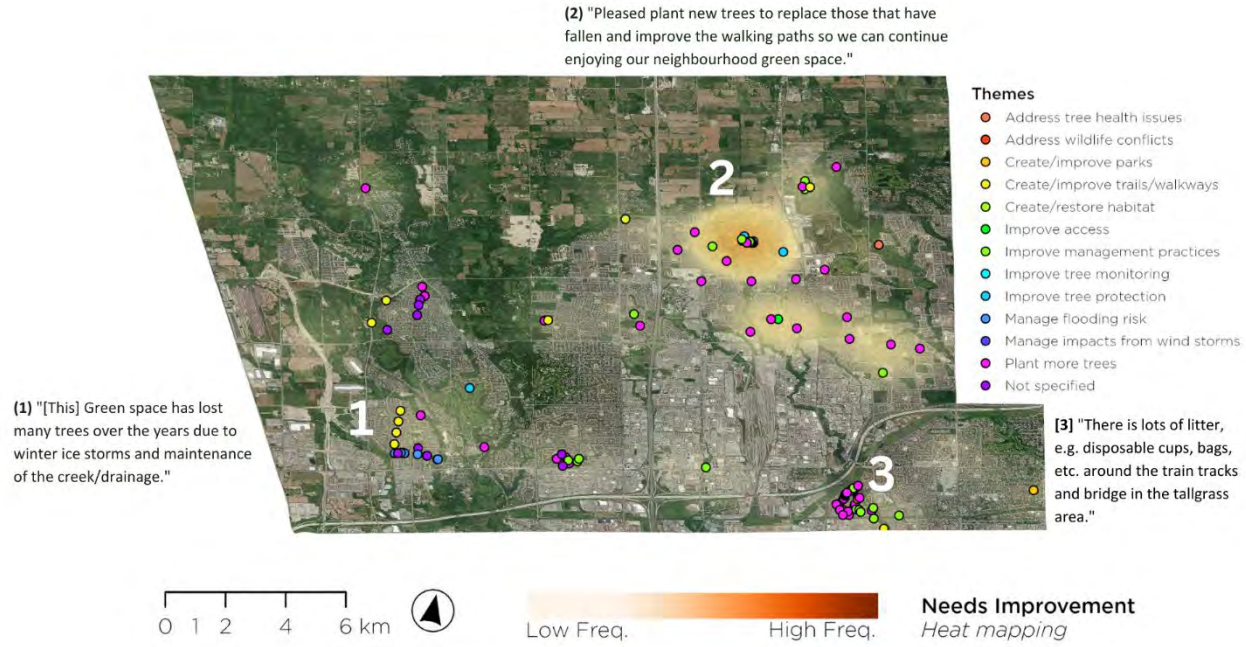


Figure 13 Urban forest places needing improvements identified in the online mapping tool

Virtual open house

The virtual open house on April 3rd was another channel where community members could watch a presentation about the state of the urban forest, ask questions to the project team, and to share their thoughts on how to improve Vaughan's urban forest. Twelve (12) participants attended the open house. Through live polling available during the event, participants indicated they most valued the environmental (e.g., rainwater management and air cleaning) and climate benefits (e.g., shade and cooling benefits) the most, whereas they considered economic and cultural values (e.g., increased property value and aesthetic values of trees) less important (Figure 14).

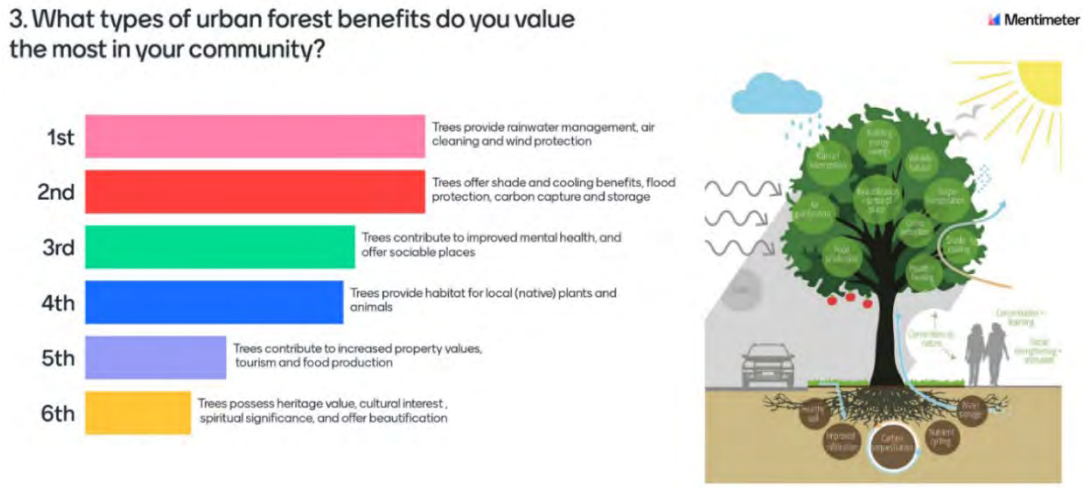


Figure 14. The urban forest benefit that participants value the most (total respondents: 7).

Participants also shared their opinion on the current levels of urban forest service by the City. Overall, they were somewhat neutral to dissatisfied with most of the tree services, such as tree pruning and protection (Figure 15). Participants were the least satisfied with public education related service, indicating a key area for future improvement.

Figure 15. Participants' satisfaction levels of the City's current levels of urban forest services.

Stakeholder workshop

On April 25, 16 members of ten targeted stakeholder groups attended workshop about the Urban Forest Management Plan. Participants were representatives from other levels of government, environmental/non-profits, ratepayers associations, school boards, and professional organizations. The project team presented an overview of the state of the urban forest and facilitated a conversation to hear about opportunities and challenges facing Vaughan's urban forest using four urban forest themes:

- Growing
- Managing
- Protecting
- Partnering

Participants were asked to rank five management objectives developed from those urban forest themes (Figure 16). Among 14 respondents to this question, seven believed that tree and forest protection and preservation should be the priority in urban forest management, followed by tree planting, reforestation and tree replacement (6 participants). Most participants saw pest, disease and invasive controls and tree pruning and maintenance as lower priorities, compared to other management objectives.

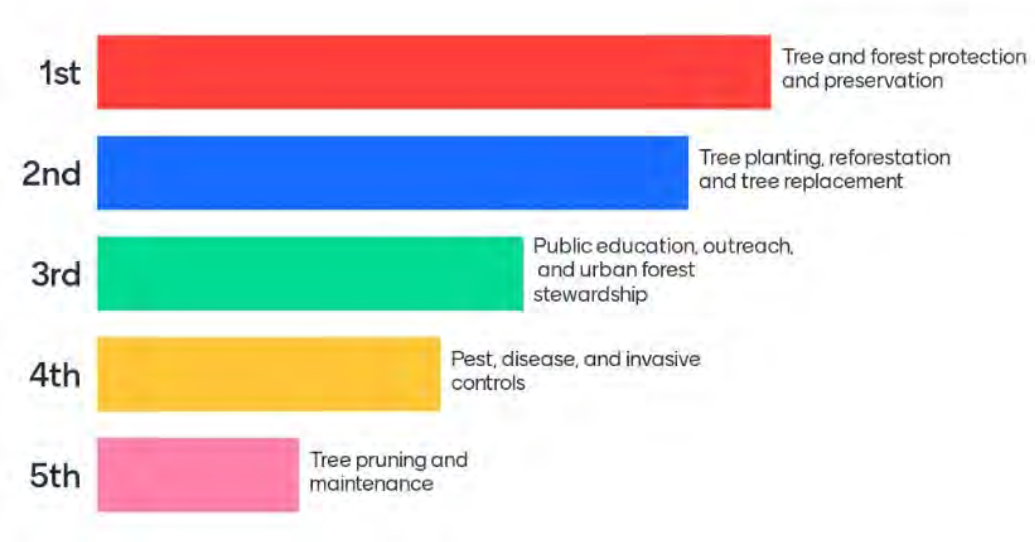


Figure 16. Ranking of the urban forest management objectives by workshop participants (total respondents: 14)

On the topic of planting and managing the urban forest, participants discussed the challenges of competing interests and needs for space (e.g., trees versus development), limited seedling stock and increasing seedling prices. Several improvement opportunities were identified on both public and private land. Participants saw the opportunity to increase planting on City-owned properties, such as parks, stormwater management ponds, and schools. They also suggested tree planting and care programs for residents and businesses to grow the urban forest on private land. Participants

identified that non-profit organizations (e.g., LEAF) could play a crucial role in managing the tree planting programs for local communities.

The major concern regarding tree protection was the removals of trees due to development impacts. Participants identified opportunities to improve tree outcomes through revisiting tree protection measures, fines for illegal tree removals, regulations to prioritize habitat connectivity through development, replanting conditions to support tree replacement, and public education and stewardship opportunities.

The conversation around urban forest partnership was embedded in the discussions of other themes throughout the workshop. Specifically, participants saw opportunities for improving education and stewardship programming through leveraging the capacities of the City's partners like LEAF, the Region of York, school boards, and the TRCA.

SYNTHESIS OF FEEDBACK

The feedback received from the survey, mapping tool, virtual open house and stakeholder workshop will be used to inform the drafting of the Plan's visions, goals, and priorities. Highlighted from the community inputs will specifically go towards drafting:

- A vision for the urban forest
- Goals related to:
    - Growing
    - Managing
    - Protecting
    - Stewarding

The tables also describe how each key statement (i.e., "what we heard") will be considered in the development of the UFMP.

SUMMARY OF FEEDBACK FOR THE URBAN FOREST PLANNING AND LONG-TERM VISION

What we heard	How it will be considered
• The most valued benefits provided by the urban forest are climate, environmental, and ecological benefits. o Mapping tool participants particularly valued the urban forest for recreational, ecological (support biodiversity and wildlife), and aesthetic values. • Survey respondents envisioned Vaughan's 2042 urban forest as expanding, with healthy, large, and mature trees of native species that provides a wide variety of climate, environmental and ecological benefits.	The project team will incorporate this input when drafting the UFMP vision and goals. The strategy will emphasize the benefits most valued by the community and will address the issues cited by participants as needing improvement.

SUMMARY OF FEEDBACK FOR GROWING THE URBAN FOREST

What we heard	How it will be considered
• Survey respondents wanted an increasing tree canopy cover in the future. • Both survey respondents and stakeholder workshop participants believed that tree planting, reforestation and tree replacement	The draft UFMP's canopy cover target will take that preference into account.

is one of the most important management objectives and actions.	
• Stakeholder workshop participants identified important opportunities to grow the urban forest through collaboration with regional and local organizations, business, community groups, and schools. • Survey respondents would like to see more trees being planted along streets and in parks, especially along local residential streets and developed trails and greenways. • On private land, respondents suggested to increase tree planting through green infrastructure projects, new multi-family, subdivision and commercial developments, and offer incentives for private tree planting. • There is an opportunity to increase community satisfaction through improving tree planting and replacement practices. • Respondents have a strong preference toward large trees with mixed species and spacing along streets	The draft UFMP will include recommendations for tree planting that incorporates community's value and preferences.

SUMMARY OF FEEDBACK FOR MANAGING THE URBAN FOREST

What we heard	How it will be considered
• Survey respondents expressed mixed levels of satisfaction towards current tree management services. They were overall satisfied with tree pruning services but neutral about pest and disease control and tree and stump removal. • Mapping tool participants would like more trees planted and better management practices applied to address current issues such as littering in forested areas and over-trimmed understory vegetation.	The project team will incorporate this input when developing the recommendations for tree management and include recommendations to clarify and improve services levels
• On City-owned land, most respondents supported the improvement of both tree	The draft UFMP will make recommendations to improve planting

species guidelines and soil engineering standards, construction of new tree planting spaces in streets and paved areas, and an increase in public spending on tree care for existing trees.	site construction standards to support the health and survival of trees given site and climate requirements.

SUMMARY OF FEEDBACK FOR PROTECTING THE URBAN FOREST

What we heard	How it will be considered
• More survey respondents were dissatisfied than satisfied by current urban forest service levels for tree protection and preservation.	The draft UFMP will consider strategies to improve tree protection and preservation that move the City towards meeting or exceeding current public expectations
• Stakeholder workshop participants considered tree and forest protection and preservation as the most important urban forest management objective. • On public land, most respondents considered increased fees and penalties for public tree removal as the most essential in urban forest action. • On private land, respondents recommended to enhance tree protection during construction (e.g., by requiring supervision by qualified arboricultural professionals), introduce a tree bylaw to extend protections of all private trees.	The draft UFMP will make recommendations that include policy tools and approaches to improve protection of trees on both public private land

SUMMARY OF FEEDBACK FOR STEWARDING OF THE URBAN FOREST

What we heard	How it will be considered
• Survey respondents were dissatisfied with public education services by the City. • Over half of the respondents had pruned, watered, or planted a tree. About 10% had never participated in any stewardship activities. • The biggest barriers to community stewardship are:	The draft UFMP will recommend ways to address barriers and encourage urban forest stewardship.

o Lack of relevant information o Other commitments and priorities o Physical or mobility challenges	
• Most respondents would like to see more opportunities to participate in tree planting and care (49% considered it as an essential or high priority action). • Stakeholder workshop participants saw opportunities to improve education and stewardship in tree and ground cover planting, invasive species management, and tree removals.	The draft UFMP will recommend ways for the City to encourage urban forest stewardship, including education on tree planting and care. Recommendations will also include ways to partner with local and regional stakeholders to increase and enhance engagement and stewardship opportunities.

NEXT STEPS

The findings from the first phase of community engagement will inform the development of the draft UFMP, including a long-term vision and priorities for implementation. Phase 2 of public engagement is expected to occur in June 2023 to gather feedback on the strategic framework of the UFMP.

LIST OF APPENDICES

Appendix A: Communication and Promotion Materials

Appendix B: Detailed Survey Results

Appendix C: Stakeholder Workshop Boards

APPENDICES

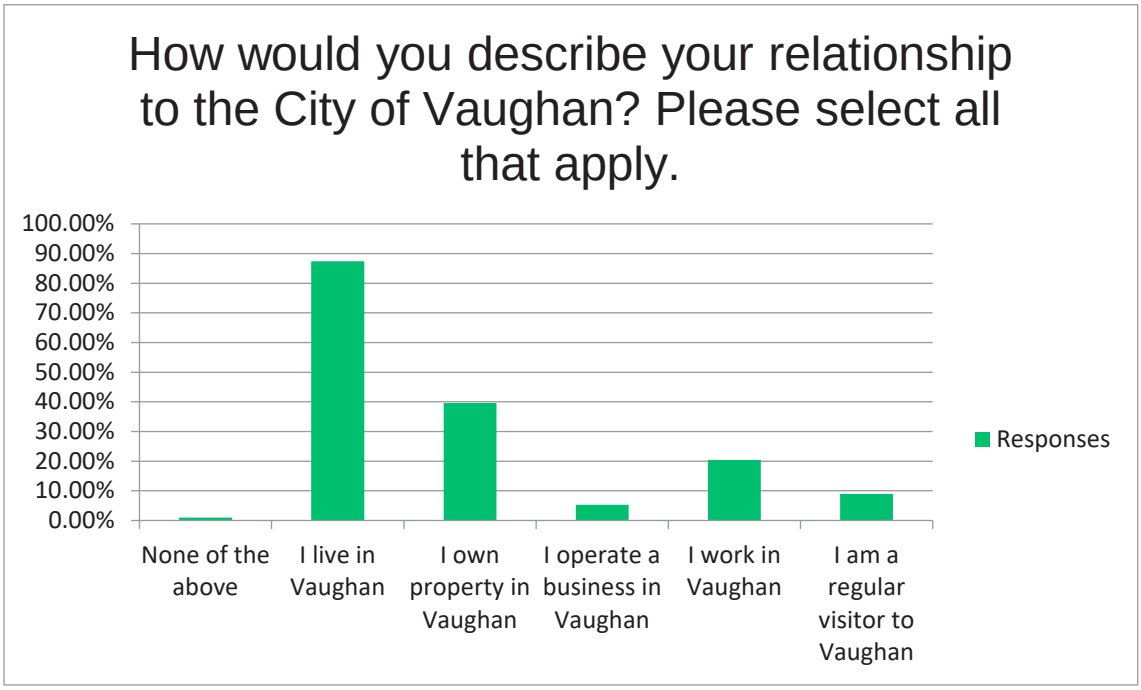
Appendix A – Sample Communication and Promotion Materials

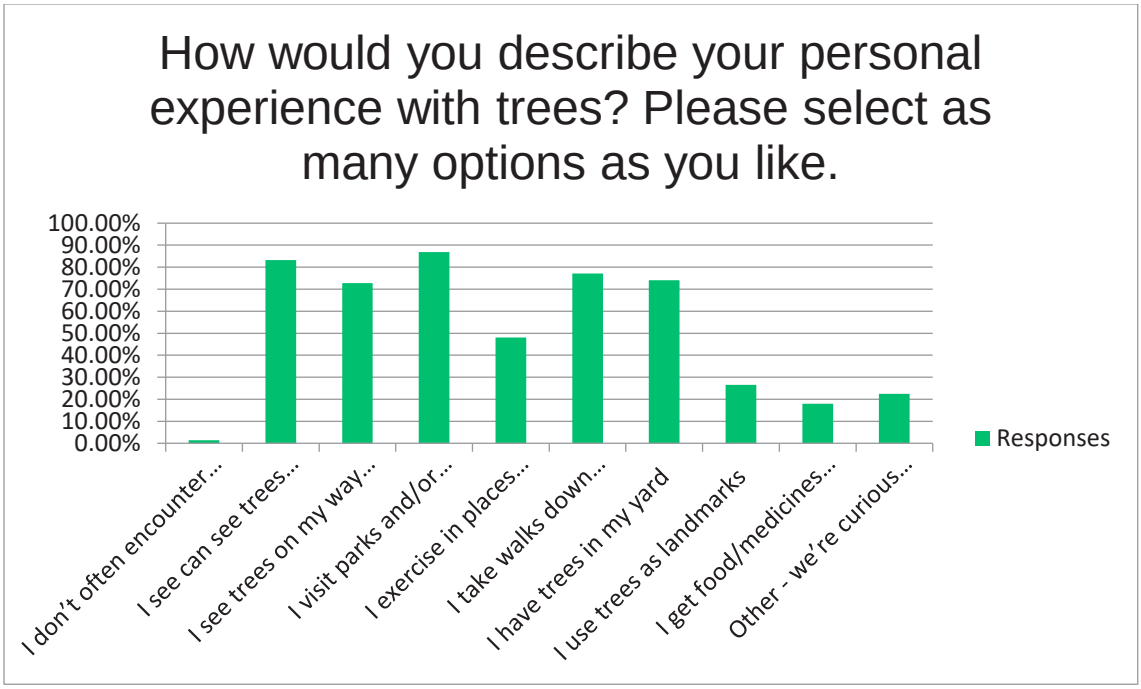
Figure A 1. Examples of graphic used for communication and promotion on various platforms

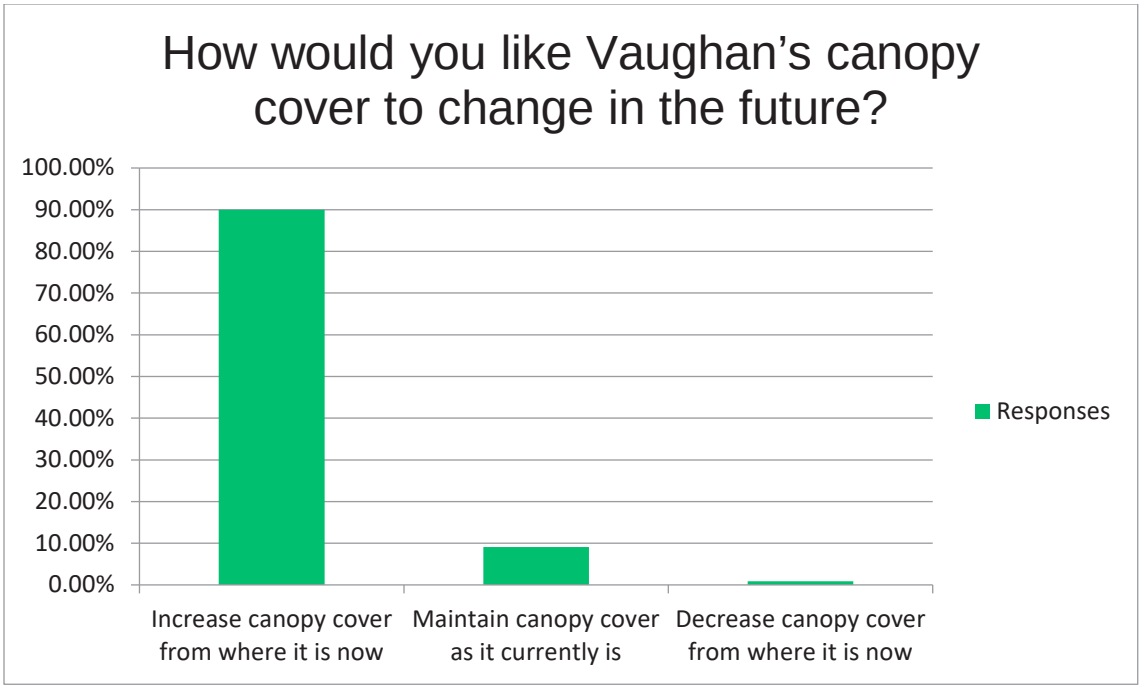
Top: graphic used for the City's digital sign network
Bottom: graphic used for TV screens at the City Hall and community centres

Appendix B – Detailed Survey Results

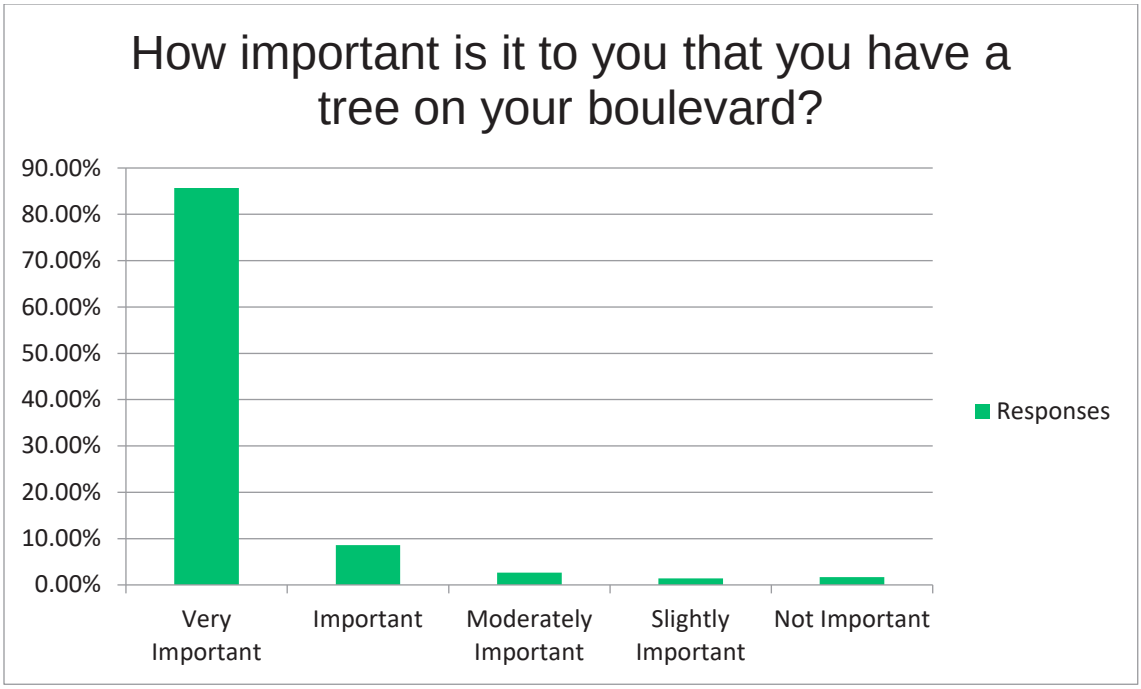
The section includes responses that are not covered/summarized in the main body of the report.

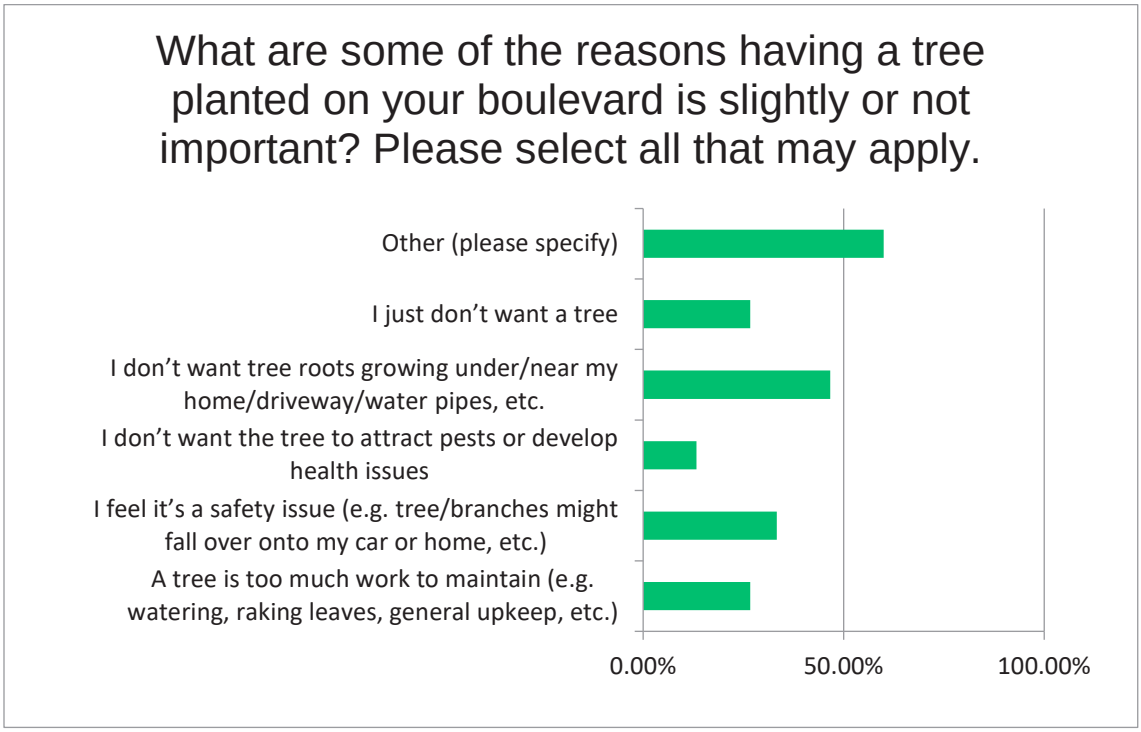


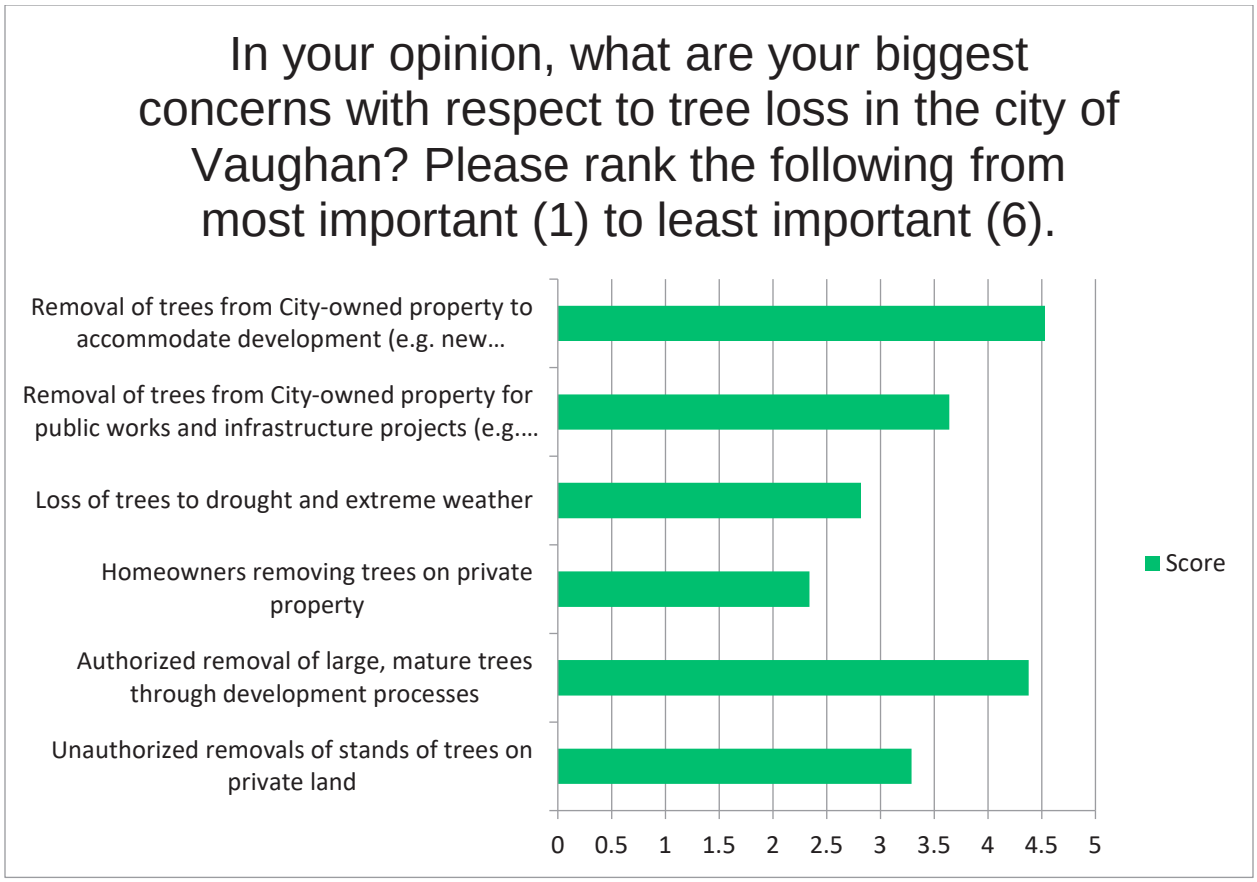



How would you like Vaughan's canopy cover to change in the future?
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Increase canopy cover from where it is now
Maintain canopy cover as it currently is
Decrease canopy cover from where it is now
Responses

If you were given a choice of tree to plant in your yard or on your street, what characteristics would be the most important for that tree to have?
1 - Most Important
2
3
4
5
6
7 - Least Important
Tolerance to climate change
Attractive to birds and pollinators (e.g. bees)
Maximizing benefits for environmental issues
Aesthetic (e.g. leaves turn colour in autumn)
Food production (e.g. fruit, nuts)
Tall, arching tree canopy
Resistance to pest and disease
0%
20%
40%
60%
80%
100%


How important is it to you that you have a tree on your boulevard?
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Very Important
Important
Moderately Important
Slightly Important
Not Important
Responses

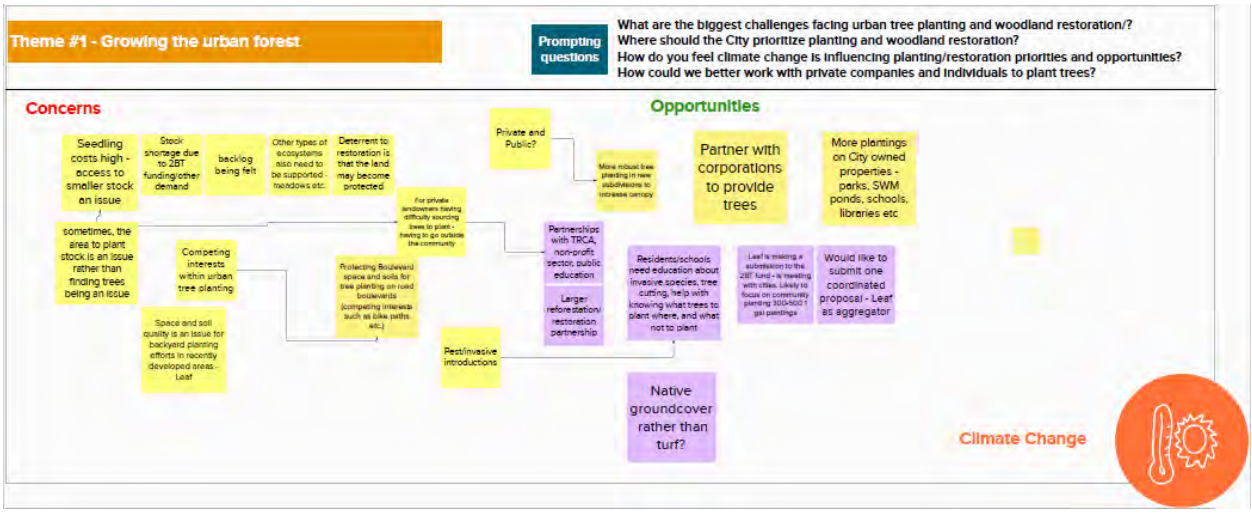

What are some of the reasons having a tree planted on your boulevard is slightly or not important? Please select all that may apply.
Other (please specify)
I just don't want a tree
I don't want tree roots growing under/near my home/driveway/water pipes, etc.
I don't want the tree to attract pests or develop health issues
I feel it's a safety issue (e.g. tree/branches might fall over onto my car or home, etc.)
A tree is too much work to maintain (e.g. watering, raking leaves, general upkeep, etc.)
0.00%
50.00%
100.00%


In your opinion, what are your biggest concerns with respect to tree loss in the city of Vaughan? Please rank the following from most important (1) to least important (6).
Removal of trees from City-owned property to accommodate development (e.g. new...
Removal of trees from City-owned property for public works and infrastructure projects (e.g....
Loss of trees to drought and extreme weather
Homeowners removing trees on private property
Authorized removal of large, mature trees through development processes
Unauthorized removals of stands of trees on private land
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Score

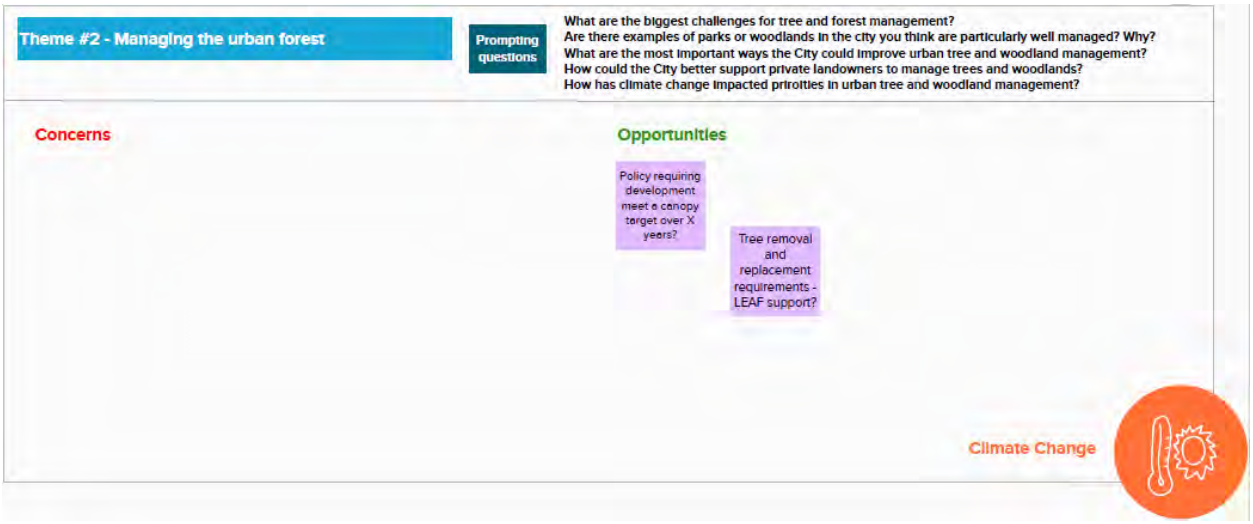
Appendix C – Stakeholder Workshop Boards

Stakeholder participants

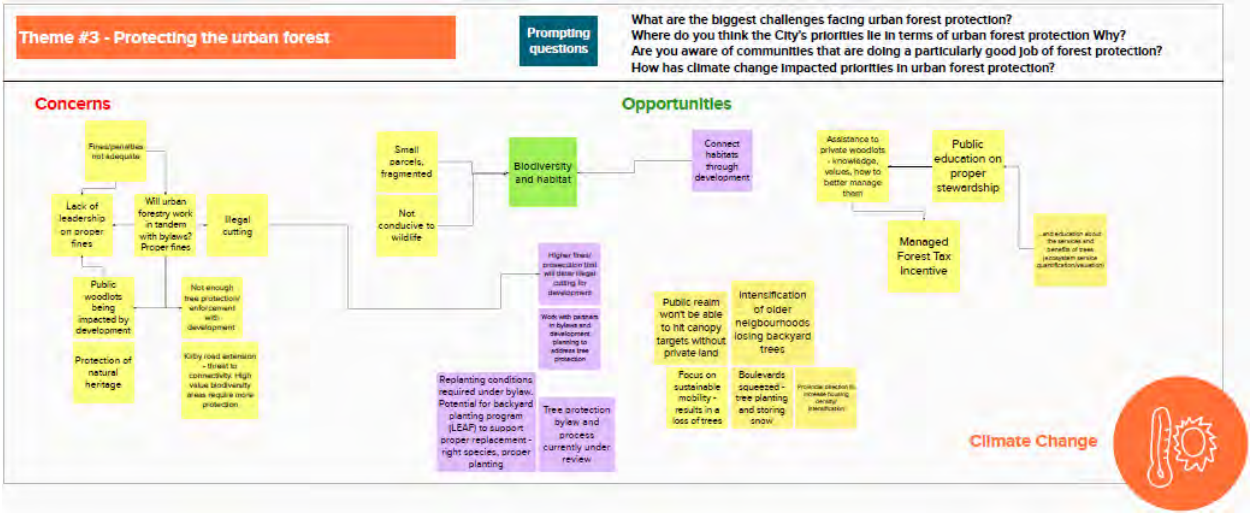
Theme #1 – Growing the urban forest



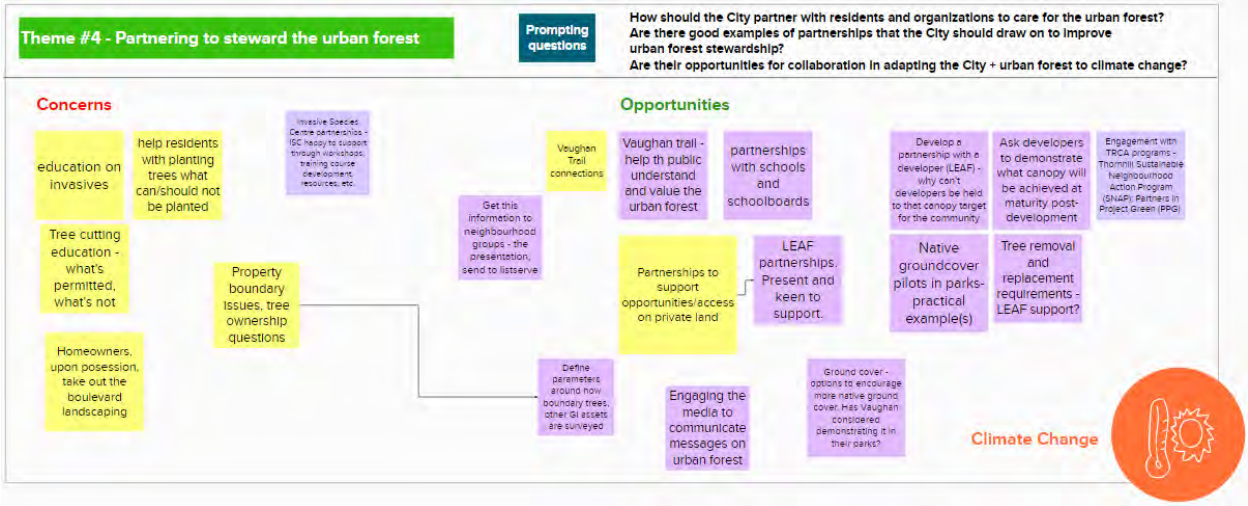
Theme #2 – Managing the urban forest

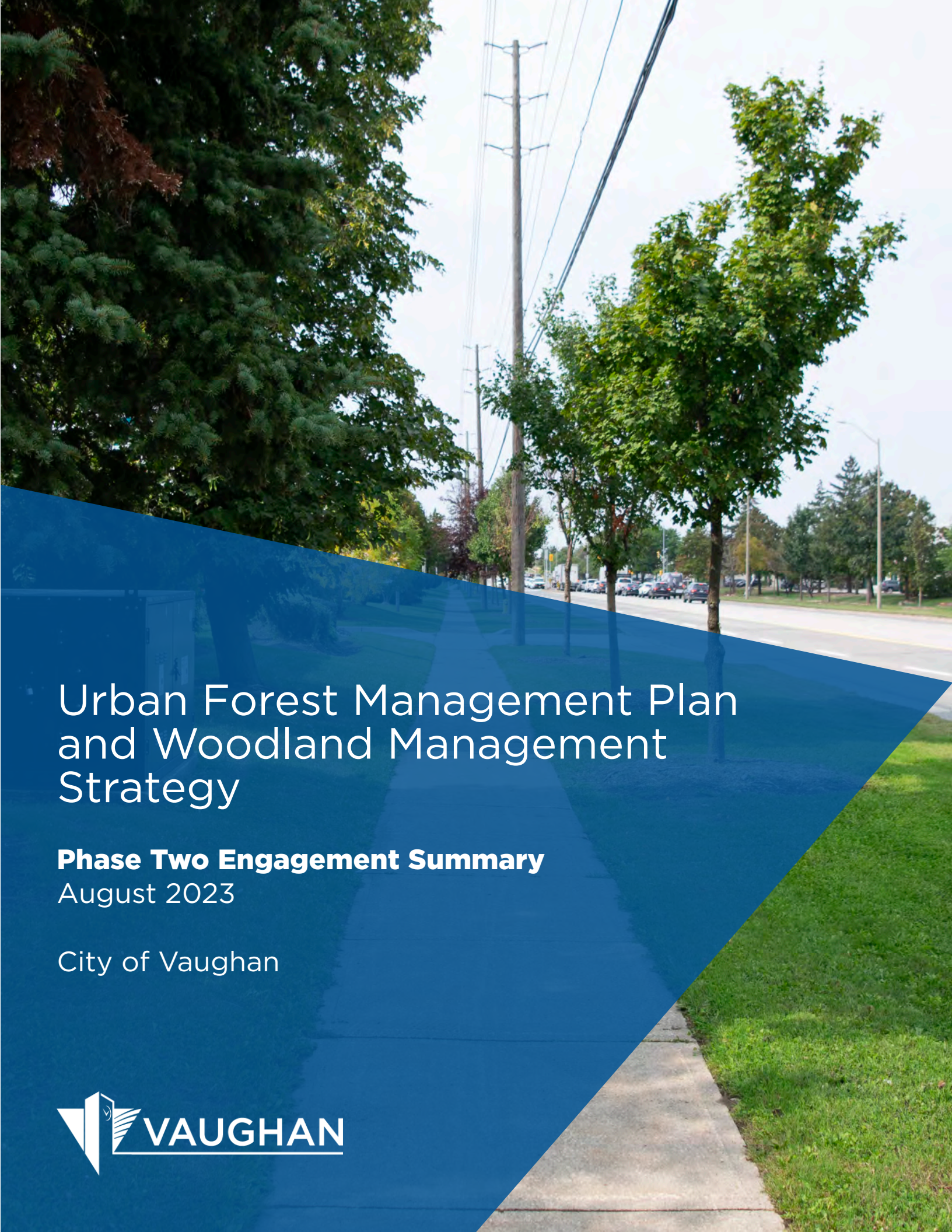


Theme #3 – Protecting the urban forest



Theme #4 – Partnership to steward the urban forest





Urban Forest Management Plan and Woodland Management Strategy

Phase Two Engagement Summary
August 2023

City of Vaughan

VAUGHAN

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SCOPE OF THE ENGAGEMENT

The City of Vaughan is home to a diverse urban forest that spans a range of land uses and ownership types. Land use change and development activity associated with the City's rapid growth over recent decades has exerted significant pressure on Vaughan's urban forest. At the same time, issues such as climate change, invasive pests, and diseases, are evolving sources of urban forest stress. The City is now developing an Urban Forest Management Plan (UFMP) and supporting Woodland Management Strategy (WMS) to guide the long-term management of the urban forest as a critical community resource.

Engagement

Public engagement to help inform the development of the UFMP and WMS was split into two phases. Phase 1 of public engagement occurred from March to April 2023 and was designed to help inform the vision, principles, and goals of the UFMP.

The second phase of engagement took place in June 2023, and involved presenting the strategic framework for both the UFMP and WMS and seeking feedback from the community on how the UFMP proposed directions capture and addresses key concerns. This included exploring which goals and strategies are prioritized in the final version of the UFMP and WMS.

Objectives for public engagement

The project team aims to achieve the following objectives through two phases of public engagement:

- To inform the public about:
    - The status of our urban forest and woodlands (i.e., forested areas > 0.2 hectares in area)
    - The role of the urban forest in the community, including the unique environmental, economic, and social values it supports
    - The challenges facing urban forest management within the city
- To involve the community in developing a long-term urban forest vision that captures the community's perspective on the city's urban forest
- To consult the community to identify opportunities to preserve and protect, grow, and enhance our urban forest
- To build community awareness, support, and advocacy for our urban forest and woodlands and the Urban Forest Management Plan and Woodland Management Strategy

PHASE 2 ENGAGEMENT ACTIVITIES

The public was invited to provide input through an online survey, community open house, and two stakeholder workshops in June 2023. Details on Phase 2 engagement opportunities are outlined in Table 1.

Table 1. Summary of online engagement opportunities offered in Phase 2

Time	Engagement Opportunities	# of Participants
June 2023	Survey	117
June 15 and 27 2023	Targeted Stakeholder Workshops	13

Communications

Information on engagement opportunities was communicated through several online and in-person platforms to reach as wide an audience as possible. Table 2 provides a summary of the communication/promotional avenues used in the second phase of public engagement.

Table 2. Summary of in-person engagement opportunities offered in Phase 2

Time	In-Person Engagement Opportunities
June 8 2023	Community Open House
June 13 to June 16	Pop up event - Civic Resource
June 16 to June 19	Pop up event - Bathurst Clark
June 19 to June 21	Pop up event - Pierre Berton
June 21 to June 23	Pop up event - Ansley Grove
June 23 to June 26	Pop up event - Vellore Village
June 26 to June 28	Pop up event - Maple
June 28 to June 30	Pop up event - Pleasant Ridge
June 30 to July 4	Pop up event - Dufferin Clark

Table 3 Summary of communication tactics and platforms used in Phase 2

Launch date (duration)	Communication tactics
May 25	Updated project webpage on vaughan.ca and Have Your Say, Vaughan
May 25 for two weeks; June 5 for two weeks	Banner on the homepage of vaughan.ca
May 25 for two weeks; June 5 for two weeks	Graphic on our digital sign network
May 25 for two weeks; June 5 for two weeks	Graphic on TV screens at City Hall and community centres
May 25, June 5	Public service announcements
May 25, June 5 – we had two go out June 5 (one with the PSA, one announcing the art contest winners), and June 22	Council communications packages
June 5 for two weeks	Synthia message
June 5 to June 30	Paid social media ads and organic social media
May 29, June 14	Vaughan Engagement eNewsletter
June 20	UFMP eNewsletter (to project mailing list)

WHO WE HEARD FROM

In Phase 2 we heard from 117 survey respondents, representatives from 10 organizations at the stakeholder workshops, and an estimated 111 people at pop-up events.

Survey demographics

Of the survey respondents:

- 96% reside in Vaughan
- 78% are 25-64 years old: 36% are 25-44 years old, 43% are 45-64 years old
- 33% of respondents or their household member(s) were born outside of Canada, 16% of respondents speak English as a non-native language and 10% identify themselves as racialized person
- 26% have children (age under 18) and 19% have seniors (age 65+) in their household

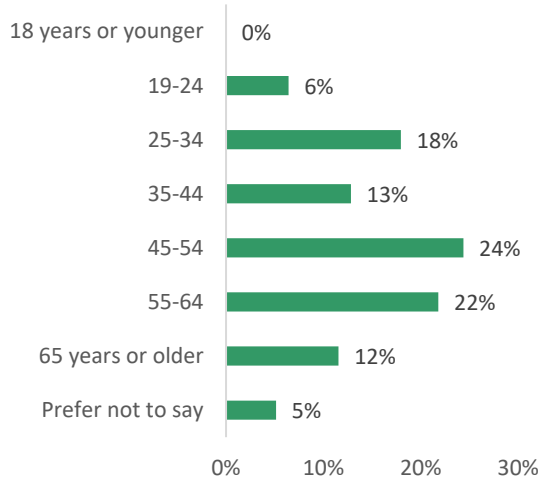


Figure 1. Age of respondents (357 responses)

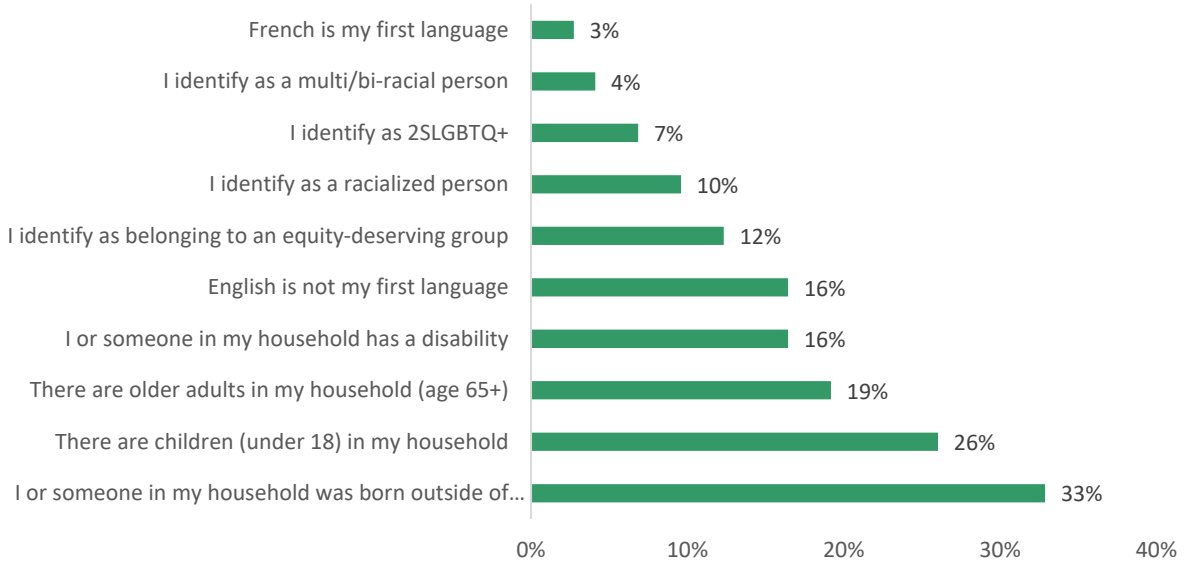


Figure 2. Cultural background of respondents (315 responses)

Stakeholder workshop

13 participants from 10 stakeholder organizations attended the online workshop. Stakeholders included members of:

- Toronto and Region Conservation Authority
- LEAF
- OLS
- Nature Canada
- Forests Ontario
- Ontario Woodlot Association
- WSP
- Castle Point Land Development
- Smart Cities Remington Group
- The local land development community

WHAT WE HEARD

Key findings from the second phase of public engagement are summarized in this section for the following engagement methods:

- Online survey
- Stakeholder workshop
- Pop-up events

Online survey

The online survey collected feedback on the draft UFMP strategic framework and work done to date. The survey asked community members to provide input to help prioritize the draft UFMP goals and supporting strategies. Prior to completing the survey, 72% of respondents had reviewed the proposed UFMP and WMS strategic framework, and 91% identified that they understood the content. The survey covered four sections:

- Vision
- Targets
- Goals and Strategies
- Open ended thoughts

The detailed survey results are available in Appendix A.

Vision

Survey respondents were presented with the following draft vision statement:

"Our vision is for a healthy and sustainable urban forest canopy that supports biodiversity, human health and recreation, and community climate resilience to provide a greener future for generations to come."

84% of respondents agree with the draft vision statement (Figure 3). When asked if the vision, goals and strategies provide a good direction for the management of the City's urban forest overall, 22% strongly agreed, and 56% somewhat agreed.

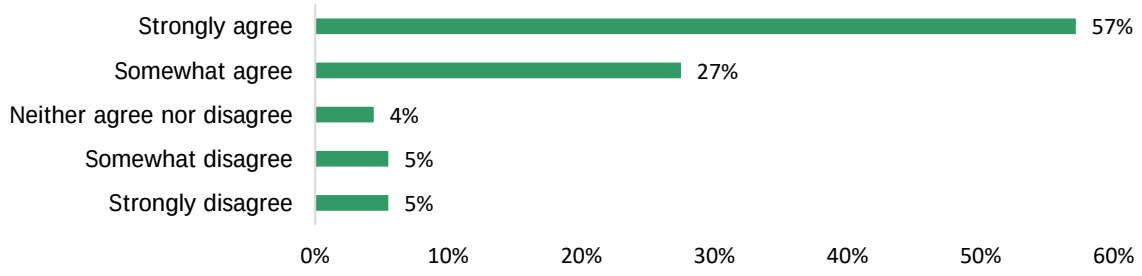


Figure 3. Respondent perspective on draft vision statement (91 responses)

The top three themes from the survey regarding improving the vision statement and urban forest management in Vaughan are:

- Protection and Preservation: There is a strong emphasis on protecting and preserving the existing forest canopy, woodlots, and green spaces in Vaughan. Suggestions included to reduce ambiguity in the vision statement.
- Community Engagement and Stewardship: Adding a stewardship component in the vision statement was identified in several responses. Respondents emphasized the need for community members to recognize the importance of tree preservation, support healthy urban forests, and actively participate in tree care initiatives.
- Climate Change Resilience: Respondents stress the importance of addressing climate change and enhancing resilience within the UFMP. This includes implementing climate adaptation and mitigation strategies to protect the community from the effects of climate change and promoting a greener future.

Targets

In May of 2021, York Region released a State of the Forest Report that suggested that an appropriate canopy cover target for Vaughan might be between 25% and 35%. With the knowledge that Vaughan's 2019 city-wide canopy cover was 20%, 90% of respondents would like to increase the City's urban forest canopy and 85% are in favor of introducing a canopy target.

The York Region's State of the Forest Report also suggested a woodland canopy target of 14% to 17%. The woodland target differs from the canopy target in that it only considers woodland (i.e., forest) canopy. 92% of respondents support increasing the area of its woodlands and 84% support introducing a woodland canopy target.

The leading theme among those who did not support urban forest and/or woodland canopy increases and targets was a need to balance canopy coverage with other community outcomes, such as housing and development.

Strategy prioritization

The draft UFMP developed 5 goals and 14 strategies to guide urban forest management in Vaughan for the long-term future. The goals cover different aspects of planning and management that all work towards achieving the vision of the Plan.

Respondents identified protecting trees and woodlands for future generations (goal 4) as a high priority (40% selected as most important), while increasing community stewardship (goal 5) was noted as the least important (65% selected as least important) (Figure 4).

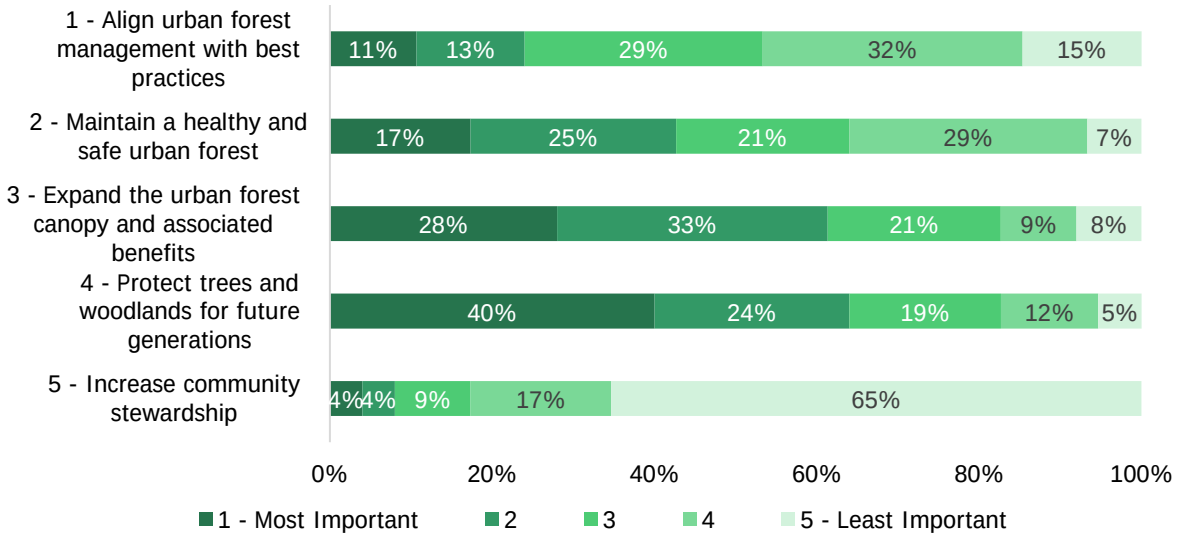


Figure 4. Respondent ranking relative importance of draft goals (75 responses)

Respondents were also asked how they would prioritize strategies associated with each urban forest management goal. This information helps the project team understand which strategies survey respondents believe are the most effective and important to achieve each goal.

Goal #1 - Align urban forest management with best practices.

Respondents were asked to prioritize strategies when thinking about the management of the urban forest, the implementation of this plan, and the integration of this plan into other city initiatives and departments. A sustainable urban forestry program aligned with best practices was a high priority action, chosen by 56% of respondents as highest priority (Figure 5).

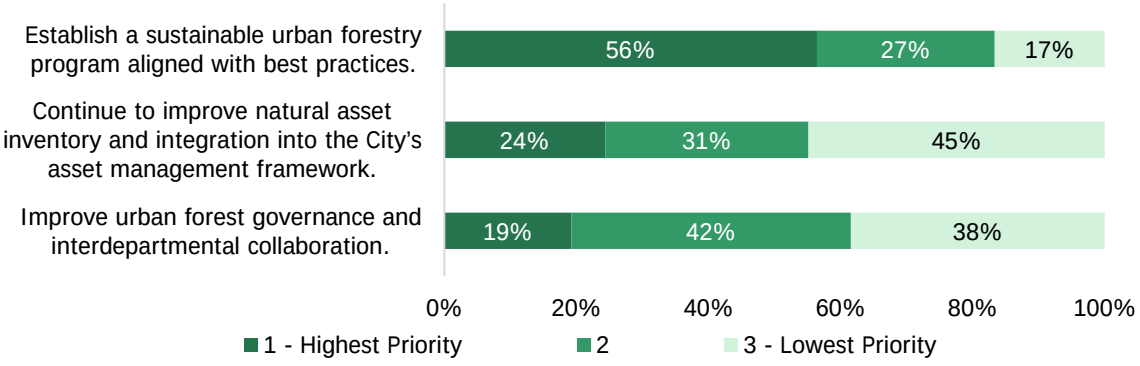


Figure 5. Respondent ranking of Goal #1 strategy priorities (78 responses)

Goal #2 - Maintain a healthy and safe urban forest.

When asked to prioritize strategies when thinking about maintenance and monitoring of the urban forest, respondents identified a transition from reactive to more proactive urban forest

maintenance as a high priority (Figure 6). Minimizing the risk of pest, disease and invasive species impacts to the urban forest was identified as a medium priority by respondents with an equal number of respondents selecting it as first, second, and third priority for goal 2 actions.

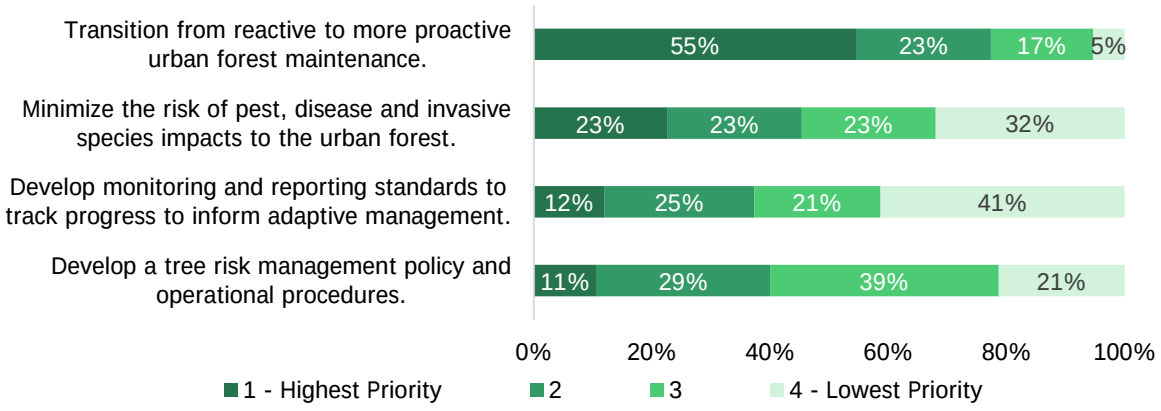


Figure 6. Respondent ranking of Goal #2 strategy priorities (75 responses)

Goal #3 - Expand the urban forest canopy and associated benefits.

Goal 3 strategies focused on tree establishment, replacement, and enhancement. Increasing tree planting rates to compensate for loss and achieve the canopy cover target was identified as a high priority, and restoring and expanding woodlands to enhance biodiversity and connectivity was a medium to high priority (Figure 7).

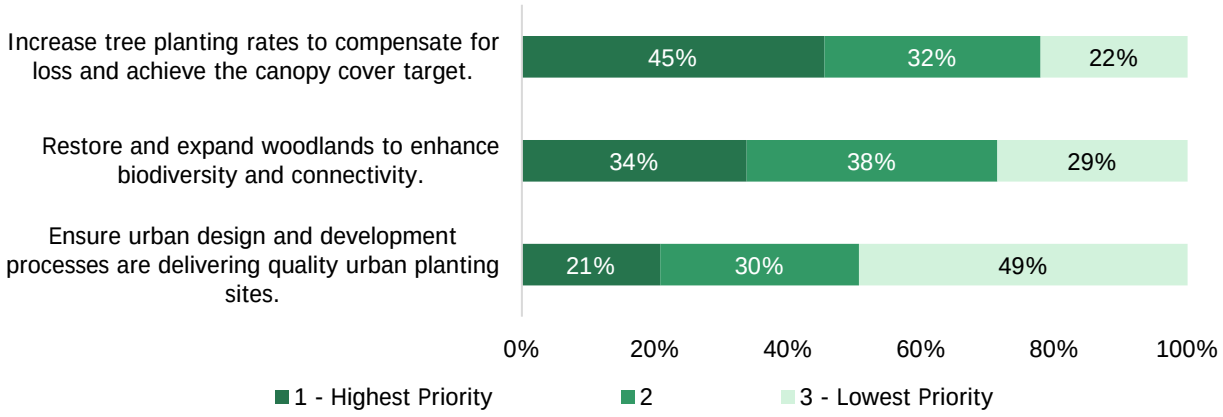


Figure 7. Respondent ranking of Goal #3 strategy priorities (77 responses)

Goal #4 - Protect trees and woodlands for future generations.

When asked to prioritize strategies when thinking about tree preservation and protection in Vaughan, tree protection outcomes on private land was a higher priority than on private land (Figure 8).

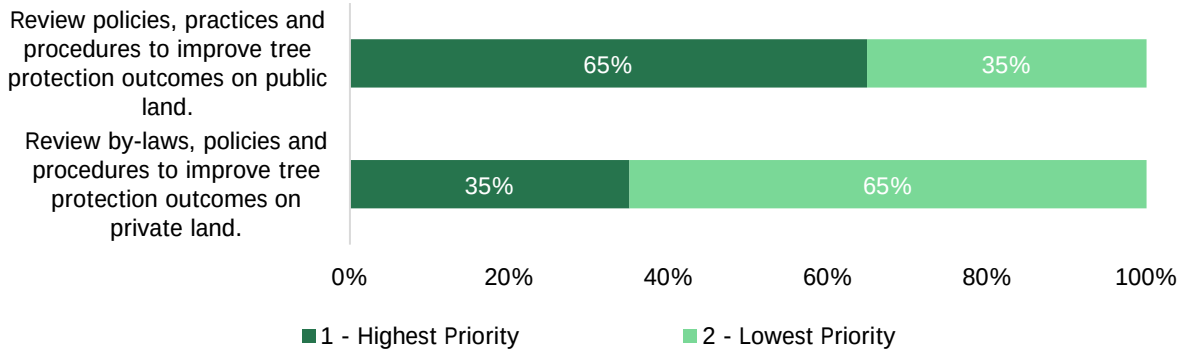


Figure 8. Respondent ranking of Goal #4 strategy priorities (57 responses)

Goal #5 - Increase community stewardship.

Survey respondents assigned higher priority to improving awareness of urban forest benefits and proper care compared to strengthening partnerships to expand the urban forest, when asked about goal 5 and urban forest engagement and collaboration (Figure 9).

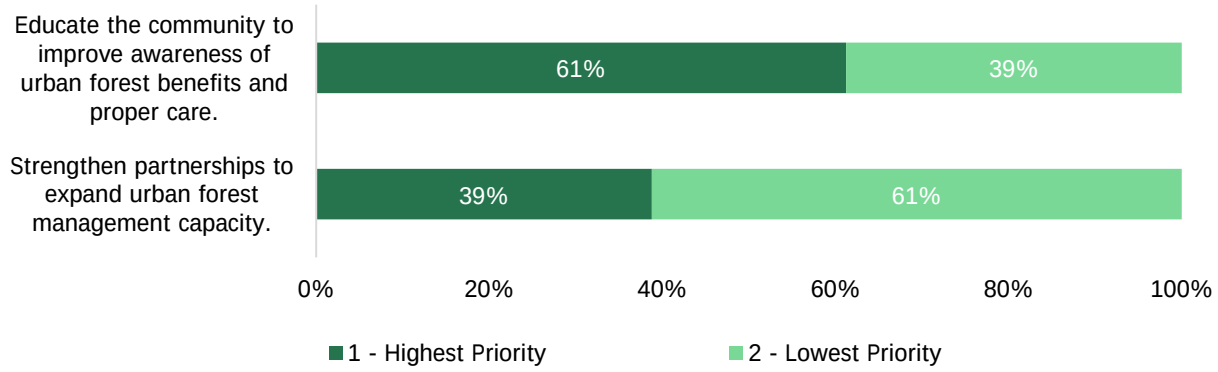


Figure 9. Respondent ranking of Goal #5 strategy priorities (49 responses)

Open ended thoughts

Having reviewed the proposed goals and strategies, respondents were asked to comment on the strategic framework for Vaughan's UFMP, including the vision, goals, actions, or anything else coming to mind. Top themes from responses were:

- Planting Guidelines and Requirements: Several responses highlight the need to protect and preserve existing urban canopy cover, woodlands, and green spaces. Planting guidance that emphasizes that prioritizes the benefits of large, mature trees are prioritized among responses.
- Community Stewardship and Partnership: A number of responses emphasized the importance of engaging the community, including schools and educational institutions, in tree-related initiatives. There is a desire for increased awareness and outreach efforts to

involve residents in the City's vision and to promote ongoing stewardship to increase City capacity for tree planting and maintenance.

- Importance of Trees and Forests: Many responses express the significance of trees and forests in terms of their environmental benefits, such as mitigating climate change, providing habitats for wildlife, offering recreational spaces for communities, and contributing to overall well-being in Vaughan.
- Tree Preservation during development: Several responses stress the need for responsible land development practices that prioritize tree preservation. Expanding development and roads that cause tree clearing is a concern among survey respondents.
- Enforcement and ongoing evaluation of best practices: There are calls for implementing bylaws, fines for illegal tree cutting, and preventing the destruction of trees during land development.

Other responses touched on climate change and tree suitability and proactive and ecologically sustainable pest control.

Stakeholder Workshops

Stakeholder workshops were held on June 15 and 27, 2023 to give targeted stakeholder groups, including other levels of government, non-profit and professional organizations an opportunity to comment on the draft Plan. 13 participants from 10 groups attended the workshops. The project team presented stakeholders with an overview of the work done to date, and the strategic frameworks for both the UFMP and the WMS. Through an online facilitated discussion, participants identified priority strategies and commented on opportunities, benefits, gaps and challenges in the strategic framework, as well as its implementation.

Stakeholder comments on the UFMP and WMS framework focused on expanding urban forest canopy, with participants raising comments about private planting subsidies, managing the urban forest, maintenance, planting guidelines, and developing community partnerships. For example, participants noted that LEAF currently provides education and training opportunities for community members and both LEAF and Nature Canada have been involved with local organization and groups to promote tree equity through planting in the region. Participants also suggested creating a centralized tree planting and care resource written for the public, either through partnership or independently, as a way to increase stewardship of the urban forest.

Tree management was also a theme among participants. Participants suggested improving site design to benefit tree growth, introducing a broader range of tree protection measures, and revisiting the bylaw to discuss how to protect small trees and trees planted on private property.

Concerning the WMS, stakeholder discussion gravitated towards biodiversity conservation and habitat. Specifically, climate change resilience, seed sourcing, and invasive species management were identified as components to steer the development of the WMS.

Community Open House

A community open house was held on June 8, 2023 at Vaughan City Hall. The open house was underattended. As a result, staff decided to engage community members through several pop-up events at community locations over the following two weeks. Public engagement and the collection of feedback through the pop-up events was more fruitful.

Pop-up events

Eight pop-up events were held at public facilities across the community (see Table 2). These pop-up events provided members of the community with another opportunity to have their priorities and values heard. Through poster board and small one-on-one discussions, members of the community were invited to identify their priority goals and strategies on the UFMP and WMS framework. Boards from pop-up events can be found in Appendix C. An estimated 111 members of the community engaged with the pop-up materials.

Figure 10. Draft Strategy prioritization from pop-up events. (111 responses)

28% of participants identified increasing tree planting rates to compensate for loss and achieve the canopy cover target as a priority strategy. 12% of participants identified restoring and expanding woodlands to enhance biodiversity and connectivity as their priority; this was the second most common priority area. 9% of participants selected strategies twelve or fourteen and 8% selected strategies four or six (Figure 11).

Summary of suggested revisions

Feedback received during phase 2 engagement shows a high satisfaction with the draft UFMP and priorities that are mostly aligned with the ones proposed in the draft plan. Responses collected during phase 2 engagement have been summarized to inform revisions to the draft UFMP.

The project team will consider the following updates to the draft UFMP:

- Increase the implementation priority of actions under:
  - Goal four to protect trees and woodlands for future generations (top priority from survey)
  - Goal three to expand the urban forest canopy and associated benefits (top priority from pop-up events)
- Reduce the implementation priority of actions under goal five, to increase community stewardship, while utilizing resources to help achieve actions under other goals
- Provide more content or emphasis on the following topics:
  - Protecting existing canopy cover, woodlands, and green spaces with planting guidelines that emphasize the retention and planting of large, mature trees
  - Improving partnerships with schools and educational institutions to foster stewardship
  - Enhancing responsible land development practices that proactively prioritize tree preservation
  - Increasing bylaw enforcement to ensure that best practices are adopted

These suggested revisions will be considered along with input from Council, staff, and the project team to finalize Vaughan's draft Urban Forest Management Plan and present it to Council for adoption.

LIST OF APPENDICES

Appendix A: Detailed Survey Results

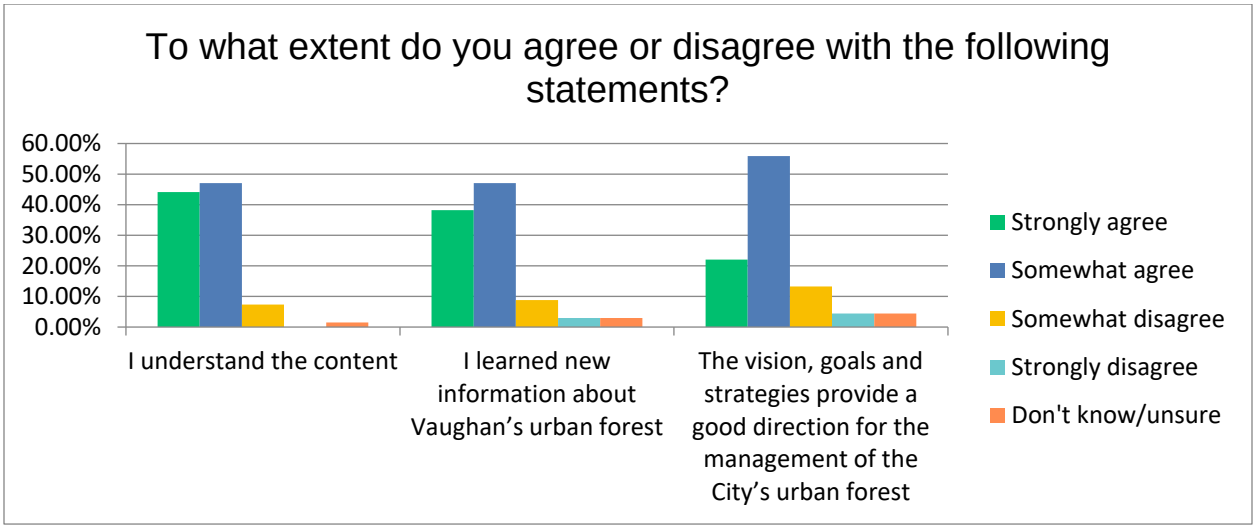
Appendix B: Stakeholder Workshop Boards

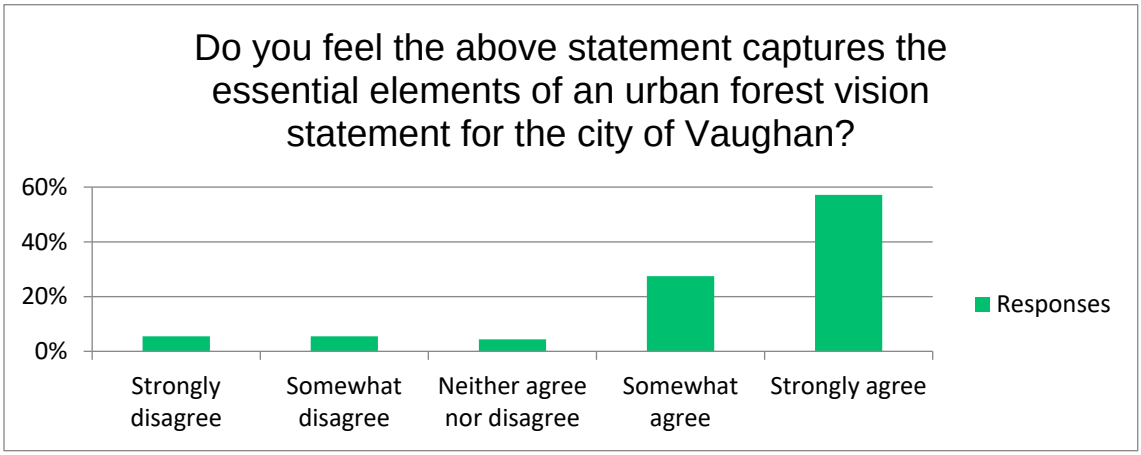
Appendix C: Pop-up Event Boards

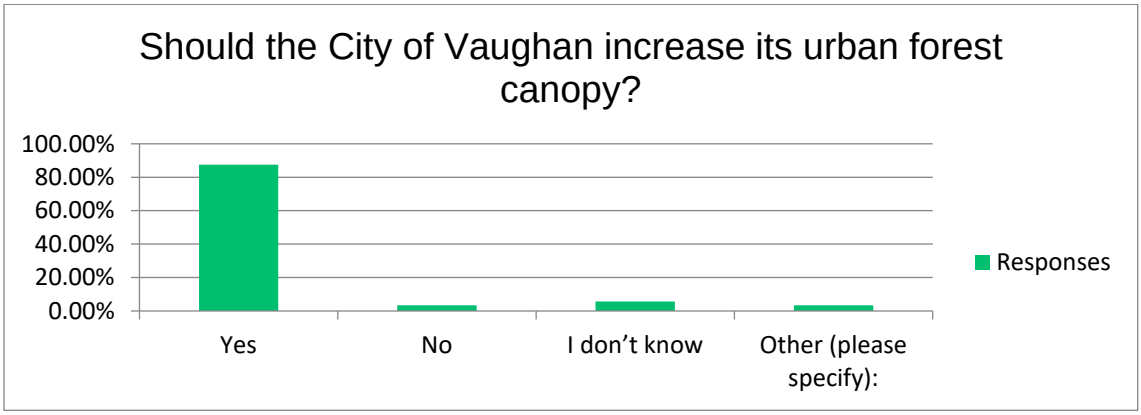
APPENDICIES

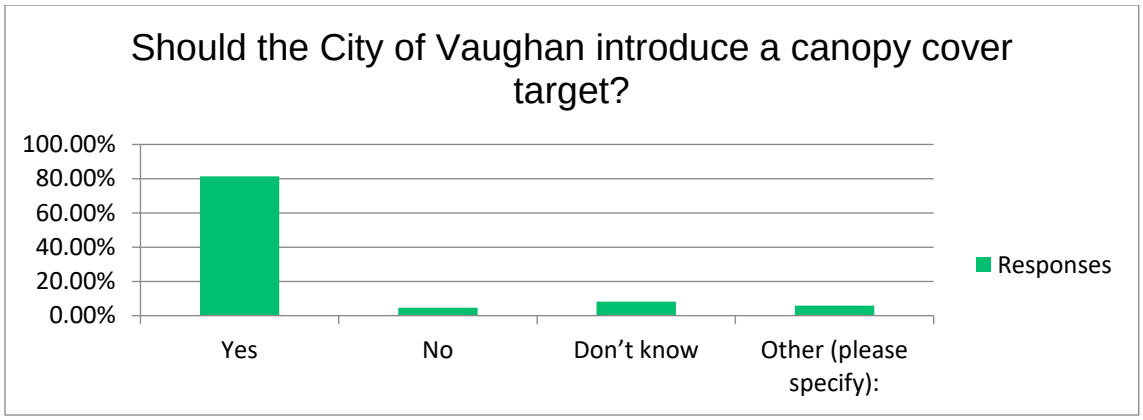
Appendix A - Detailed Survey Results

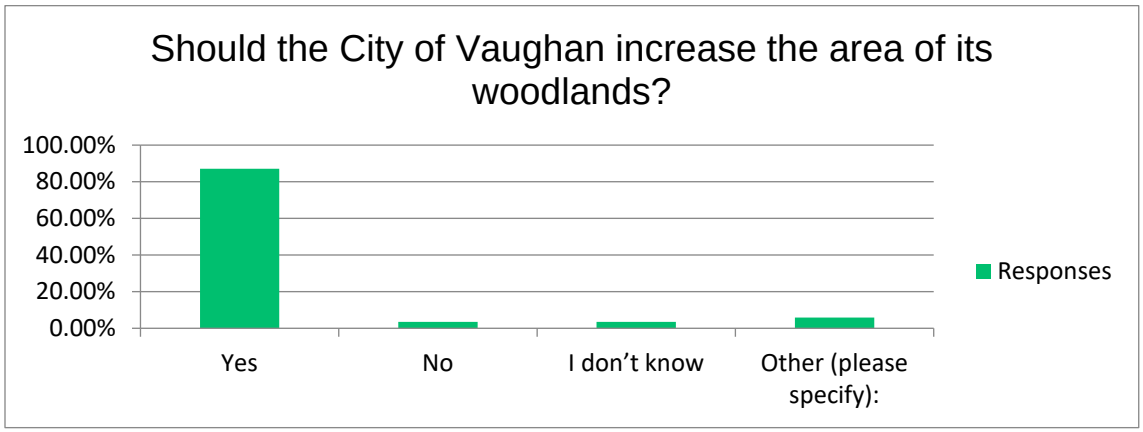
This section includes responses that are not covered/summarized in the main body of the report.

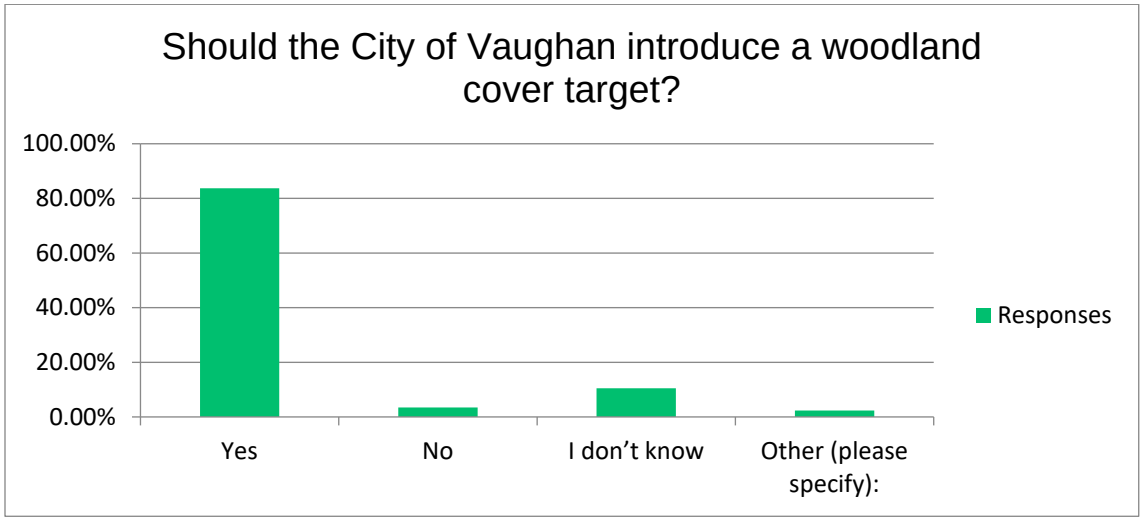


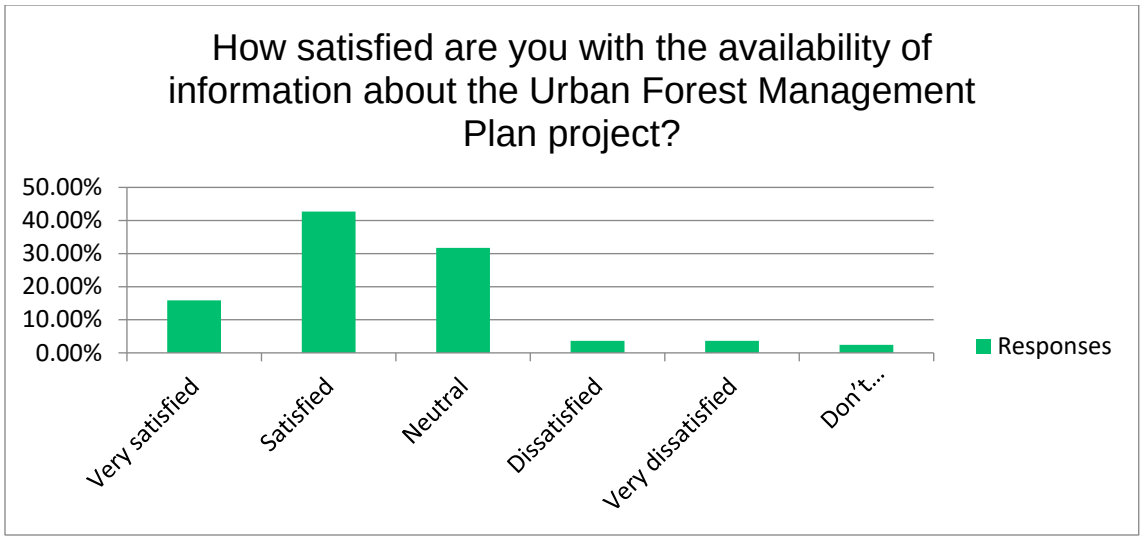


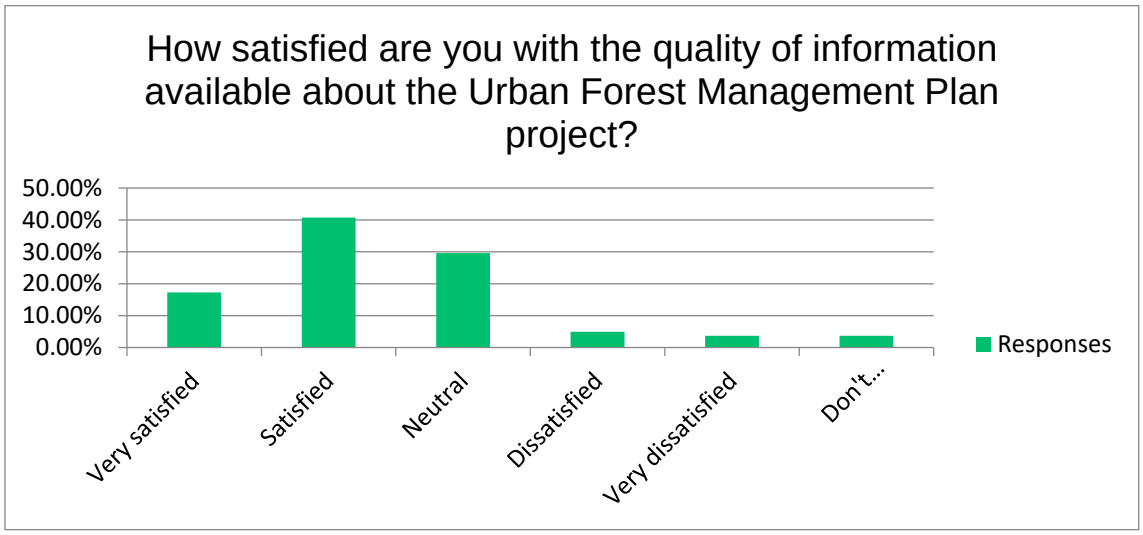


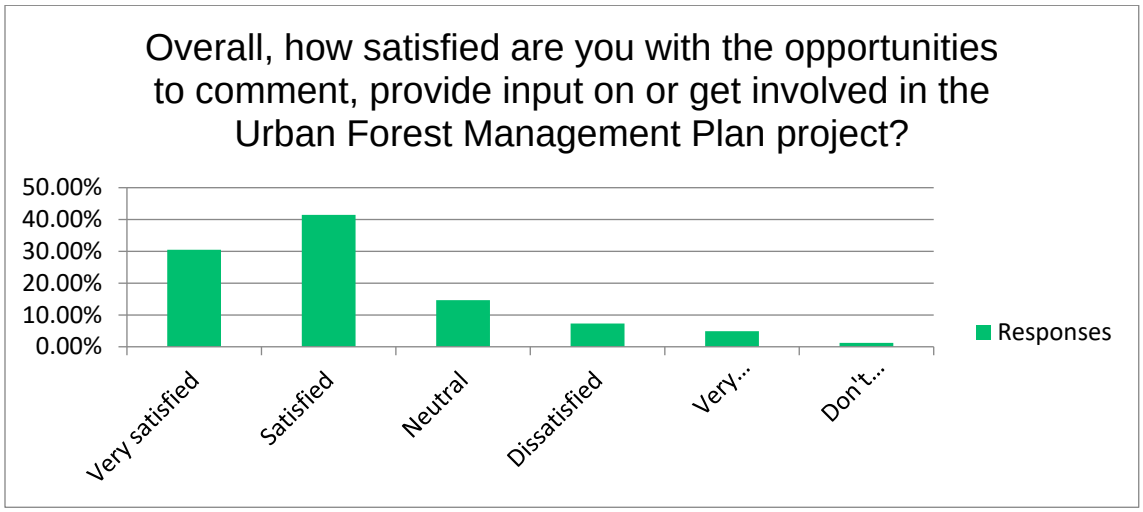

Should the City of Vaughan introduce a canopy cover target?
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Yes
No
Don't know
Other (please specify):
Responses


Should the City of Vaughan increase the area of its woodlands?
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Yes
No
I don't know
Other (please specify):
Responses


Should the City of Vaughan introduce a woodland cover target?
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Yes
No
I don't know
Other (please specify):
Responses


How satisfied are you with the availability of information about the Urban Forest Management Plan project?
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied
Don't...
Responses

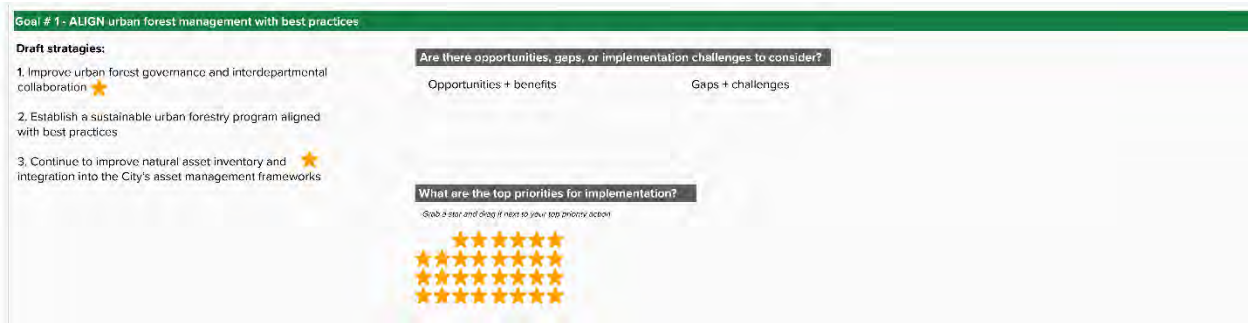

How satisfied are you with the quality of information available about the Urban Forest Management Plan project?
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Very satisfied
Satisfied
Neutral
Dissatisfied
Very dissatisfied
Don't...
Responses


Overall, how satisfied are you with the opportunities to comment, provide input on or get involved in the Urban Forest Management Plan project?
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Very satisfied
Satisfied
Neutral
Dissatisfied
Very...
Don't...
Responses

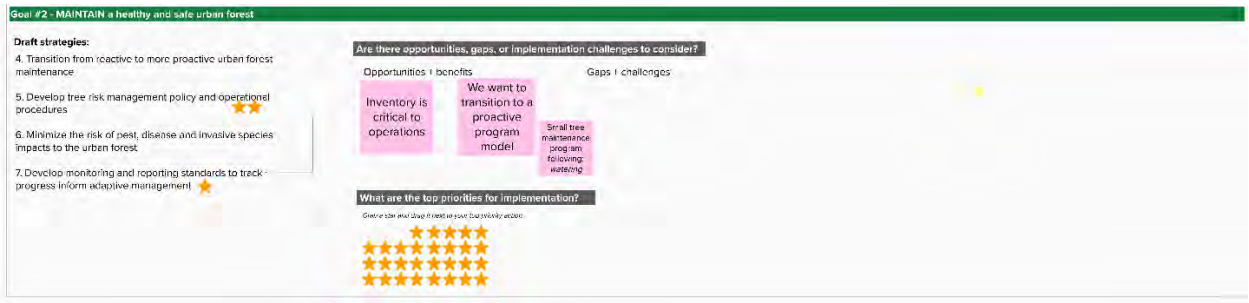
Appendix B – Stakeholder Workshop Boards

This section includes feedback material from stakeholder participants.

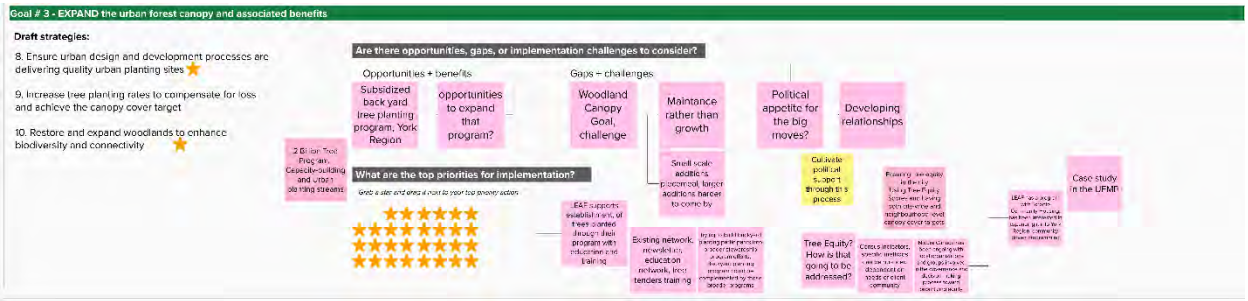
Goal #1 – Align urban forest management with best practices



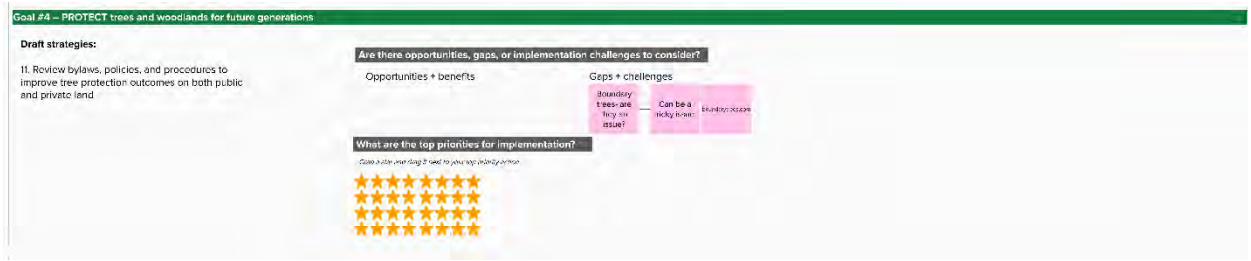
Goal #2 – Maintain a healthy and safe urban forest



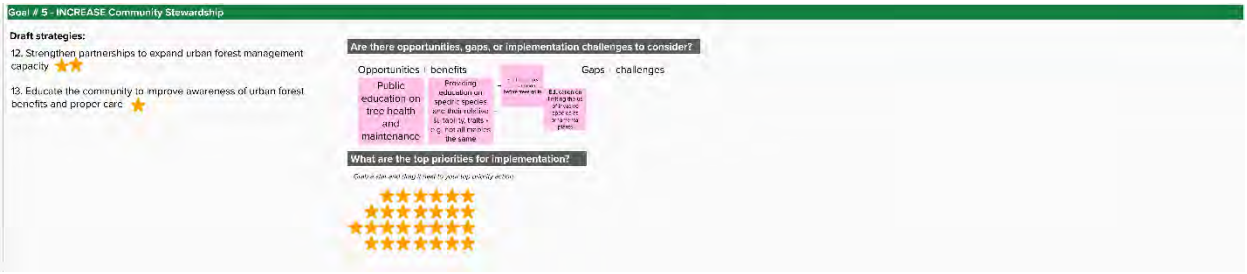
Goal #3 – Expand the urban forest canopy and associated benefits



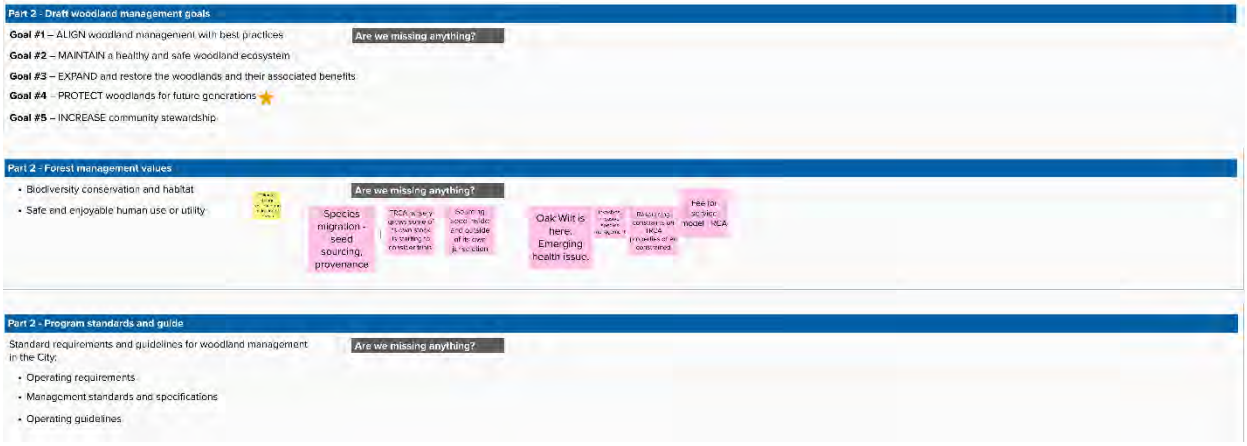
Goal #4 – Protect trees and woodlands for future generations



Goal #5 – Increase community stewardship



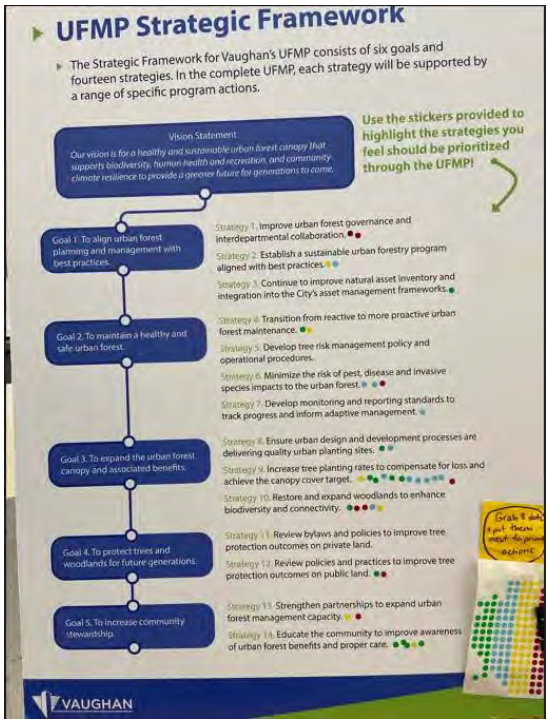
Woodland management



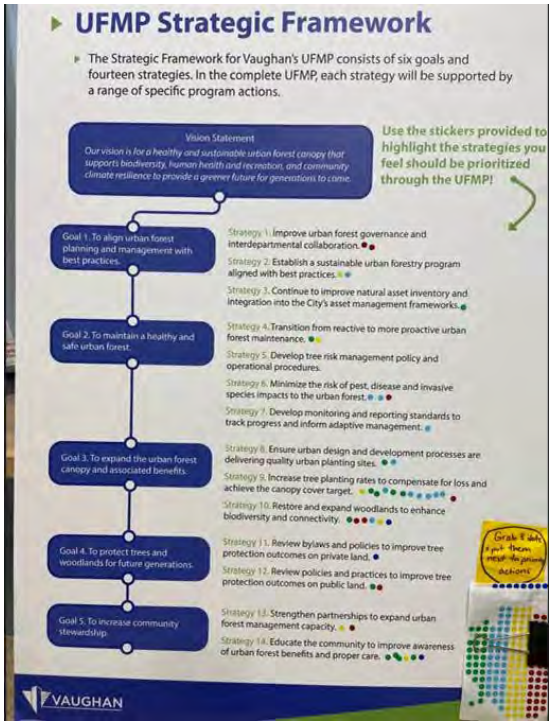
Appendix C – Pop-up Event Boards

This section includes event boards from pop-up engagement events.

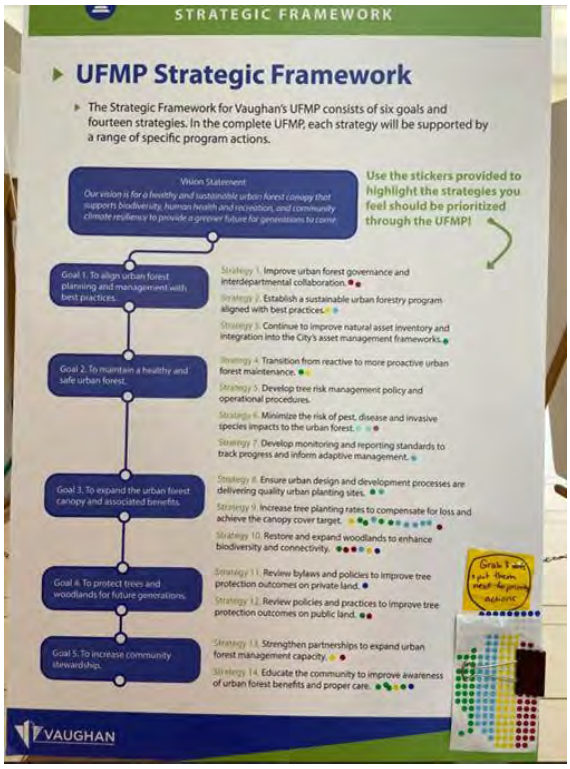
Civic Resource Library



Bathurst Clark Resource Library

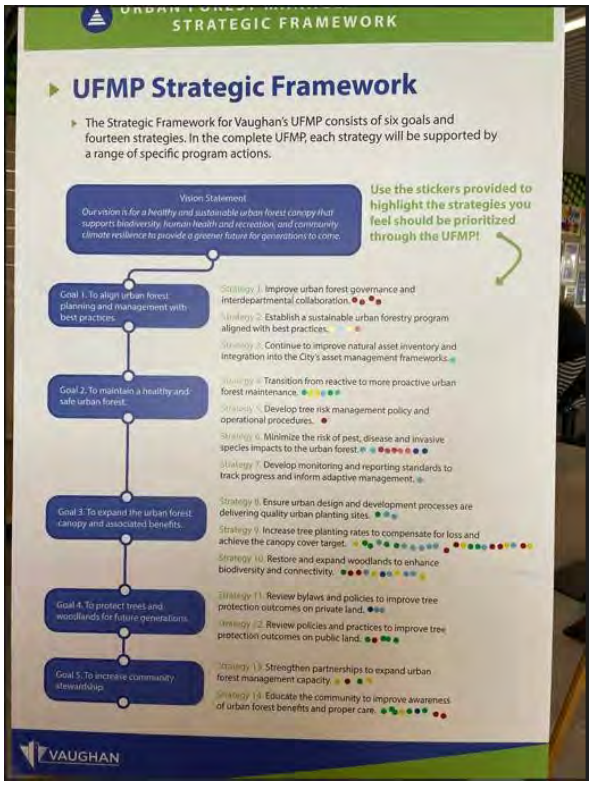


Pierre Berton Resource Library

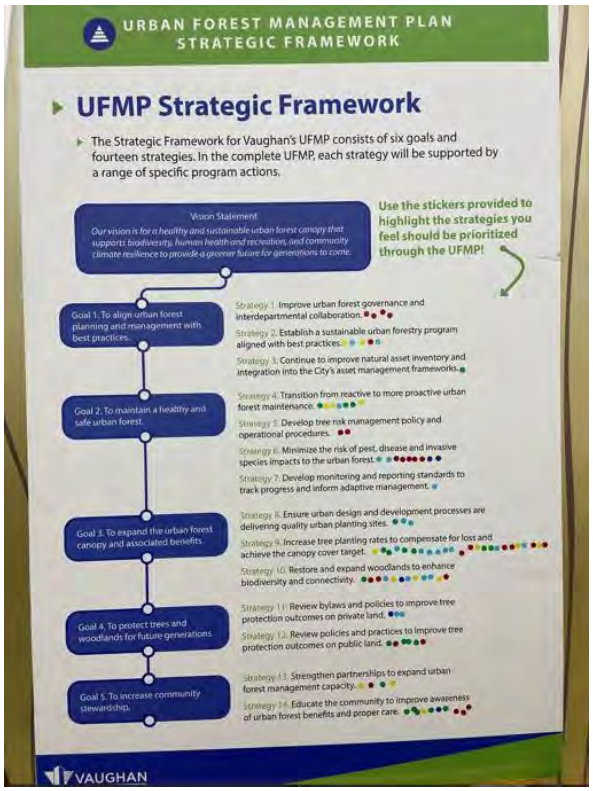


Ansley Grove Library

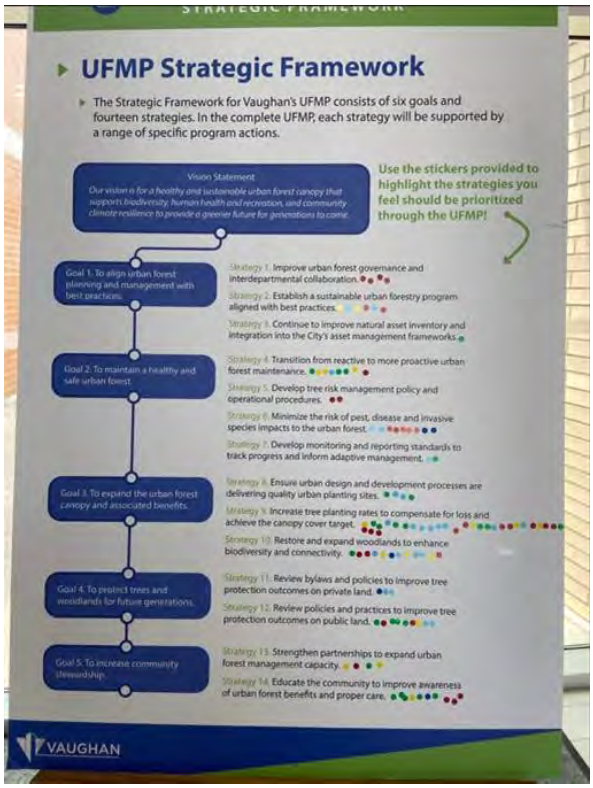
Vellore Village Library



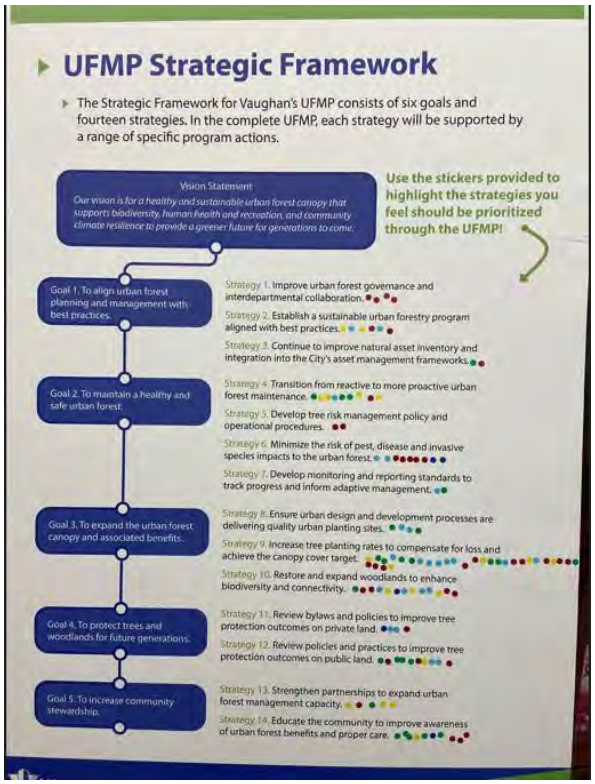
Maple Library

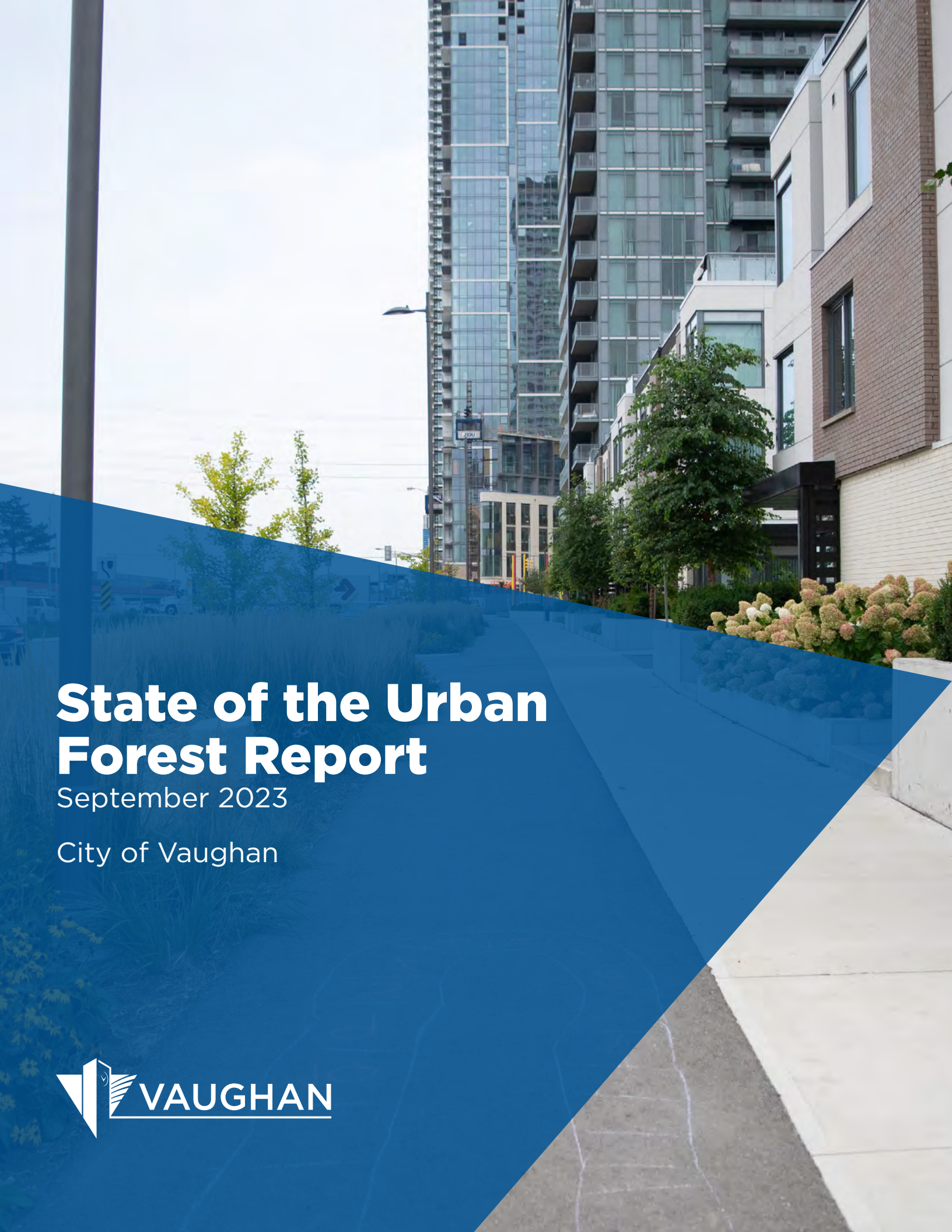


Pleasant Ridge Library



Dufferin Clark Library





State of the Urban Forest Report

September 2023

City of Vaughan

VAUGHAN

Project Team Acknowledgment

Diamond Head Consulting Ltd. (DHC) prepared this State of the Urban Forest Report for the City of Vaughan. DHC acknowledges the participation and support of City of Vaughan departments and staff in preparing this document.

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Date:

September 2023 (v.1.2)

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Executive summary

This is Vaughan's first State of the Urban Forest Report. This document contains information, analysis, and benchmarking that the City of Vaughan will use to plan for the sustainable management of its urban forest. Additionally, the analysis serves as a reference point for assessing change in the urban forest, supporting comparison against evolving urban forest conditions.

The urban forest is made up of every tree and forest ecosystem contained within the Vaughan's boundary. Urban trees provide a wide range of benefits to visitors and residents of Vaughan. These benefits, often referred to as ecosystem services, include improved physical and mental health, urban habitat, clean air and water, carbon storage, stormwater interception, and relief from the urban heat island effect, to name just a few.

The City of Vaughan is in the process of developing its first Urban Forest Management Plan. This State of the Urban Forest Report contains analysis that will be used to inform the actions put forward through that document.

This Report's central analysis is detailed in Part 2, which contains analyses of the city's tree canopy (2019) using remote sensing datasets, and of the city's inventory of 130,000 street trees. The Report also briefly outlines the legislative and regulatory framework influencing tree management in Vaughan.

As of 2019, Vaughan's city-wide canopy cover was 20 percent. Two-thirds of the canopy area is contained to Vaughan's urban area, and the remainder to the rural area. The City is responsible for the management of 880 ha of tree canopy, constituting about 16 percent of all canopy in the city. Lands under the ownership and management of the Toronto and Region Conservation Authority contain 24 percent of the city's canopy area in woodland and natural ecosystems. **The City manages 130,000 street trees** and is responsible for the management of more than 180 ha of city-owned woodland.

In 2022, Vaughan's Forestry Group operated on a total operating budget of just over $1.7 million dollars. This represents a lower operating budget compared to some nearby peer communities on a per capita basis. This level of operational investment means that the Forestry Group maintains its street tree population reactively (responding to more than 5,000 service requests per year), rather than proactively, and that virtually no maintenance occurs within woodland areas.

When assessed against a set of criteria and indicators for sustainable urban forest programs, **the City's program scored "Fair" in 2023**, indicating core elements of an urban forest program are in place, but opportunities to achieve a healthier, more sustainable urban forest exist. The full criteria and indicator assessment is provided through Appendix A.

Quick Facts

- 20 percent city-wide canopy cover in 2019
- 16 percent of Vaughan's total canopy is on City-owned land, 24 percent is on Toronto and Region Conservation Authority owned-land, and the remaining 60 percent is on private or other ownership
- ±130,000 street trees
- 25 percent of street trees are maple (*Acer*), 10 percent are Norway maple (*Acer platanoides*)
- Estimated street tree structural replacement value of $110 million

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Appendix B: Woodlot Height-Area Frequency Plots
Appendix C: Version History

Glossary of key terms

Biodiversity	Biodiversity encompasses all living species on Earth and their relationships to each other. This includes the differences in genes, species and ecosystems.
Canopy cover	A measure of the extent of the urban forest based on the amount of ground covered by the foliage of trees when viewed from above.
Ecosystem services	The many and varied benefits to humans provided by the natural environment and from healthy ecosystems. Recreation potential, shade, water filtration, and pollination are all examples of ecosystem services associated with the urban forest.
Green infrastructure	Natural and human-made community assets that support ecological and hydrological functions and processes.
Tree equity	When all people experience the benefit of trees and the urban forest in proportion to their needs.
Urban forest	All trees and their ecosystems within the City of Vaughan, including trees in private yards, public parks, conservation areas, environmental buffers, open spaces as well as those along boulevards and roadways, and in wetlands, natural areas, and the city's vast woodland communities.
Urban forest program	A set of activities performed by the City and community partners to plan, grow, manage, protect, and steward the urban forest, as well as all related policies, equipment, resources and knowledge.
Woodland	Groupings of trees consistent with the definitions put forward under the *Forestry Act*, *Municipal Act*, and *City of Vaughan Official Plan*; meeting a minimum area of 0.2 ha.
Woodlot	The City of Vaughan is home to 25 community woodlots, supporting a range of management values and more than 180 ha of combined woodland area.

Part 1. Introduction

The City of Vaughan is a vibrant and diverse metropolitan area, covering more than 270 km^2 in the heart of south-central Ontario. The city is comprised of a mosaic of urban, suburban, rural, and naturalized landscapes, supporting a broad range of land uses. The city is now home to more than 320,000 people[1], and welcomes millions of visitors each year.

Vaughan's urban forest includes more than 5,400 ha of tree and forest canopy, and provides the community with considerable value, supporting rich recreation and leisure opportunities, and contributing to the community's urban character and quality of life.

This State of the Urban Forest Report provides a snapshot of Vaughan's urban forest, consisting of a summary of its current extent, composition and value, existing management practices, as well as the key challenges it faces.

The 2023 State of the Urban Forest report is organized into the following sections:

Introduction: provides an overview of why we need the urban forest and how it benefits the community of Vaughan.

The Urban Forest: highlights findings about the current status of Vaughan's urban forest in terms of its distribution, condition, and importance to our community.

Vaughan's Urban Forestry Program: summarizes Vaughan's Forestry program and available Forestry resources.

Regulatory Context: describes the legislative, regulatory, and policy frameworks that inform urban forest management within the city.

Peer City Comparison: compares Vaughan's urban forest and management program with that of a set of peer communities.

Program Report Card: provides a "report card" scoring of Vaughan's urban forest management program based on a series of established criteria and indicators.

1.1 What is the Urban Forest and Who Manages it?

Vaughan's urban forest includes all trees and their ecosystems within the city's municipal area. This includes trees in private yards, public parks, and in conservation areas, as well as those along boulevards and roadways, and in wetlands, natural areas, and the city's woodland communities. The urban forest also includes the soils, plant and animal communities that co-exist with trees and tree canopy in urban environments.

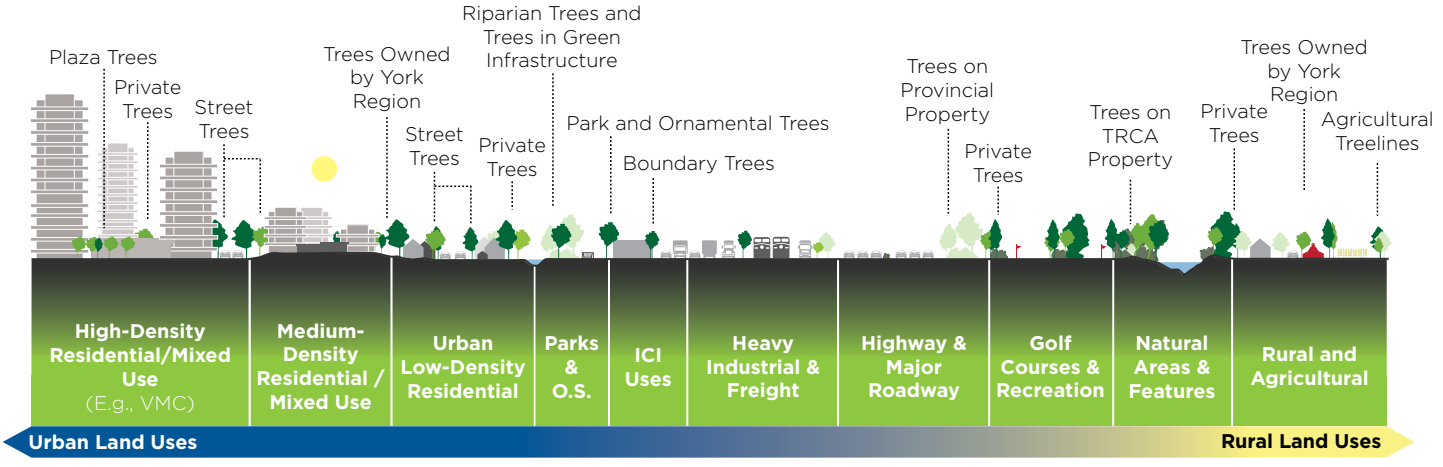
Urban forests are dynamic, living systems. The current composition, health and extent of Vaughan's urban forest is the product of past management and events that have impacted the urban forest to this point.

The urban forest is part of Vaughan's **green infrastructure**, supporting much of the city's biodiversity, cleaning air and water, and improving the quality and livability of the city's diverse neighbourhoods (Figure 1-1).

Vaughan's urban forest spans both public and private land and, as a result, its management is a shared responsibility.

The City manages trees on City-owned lands, such as those growing in parks and open space, in woodlands, and along roadways. On non-City lands, trees are managed by property owners and other land managers. The City does regulate some activities affecting private trees through the Tree Protection By-law and through development processes, but management of private tree canopy is largely out of the City's jurisdiction.

Figure 1-1. *While Vaughan's urban forest spans a range of land uses, this document is scoped around the city's forested parks and intensively managed street trees.*



1.2 What are the Benefits?

The urban forest provides important benefits for the health and livability of the community. Those benefits, sometimes called **ecosystem services**, have been widely studied, and include providing habitat for wildlife[2], stabilizing steep slopes, storing and sequestering carbon[3], and urban cooling[4], to name a few. Ecosystem services are often classified into four main classes:

Cultural – describing the values held by people related to beautification, sense of place, mental and physical health, spirituality, recreation, and tourism.

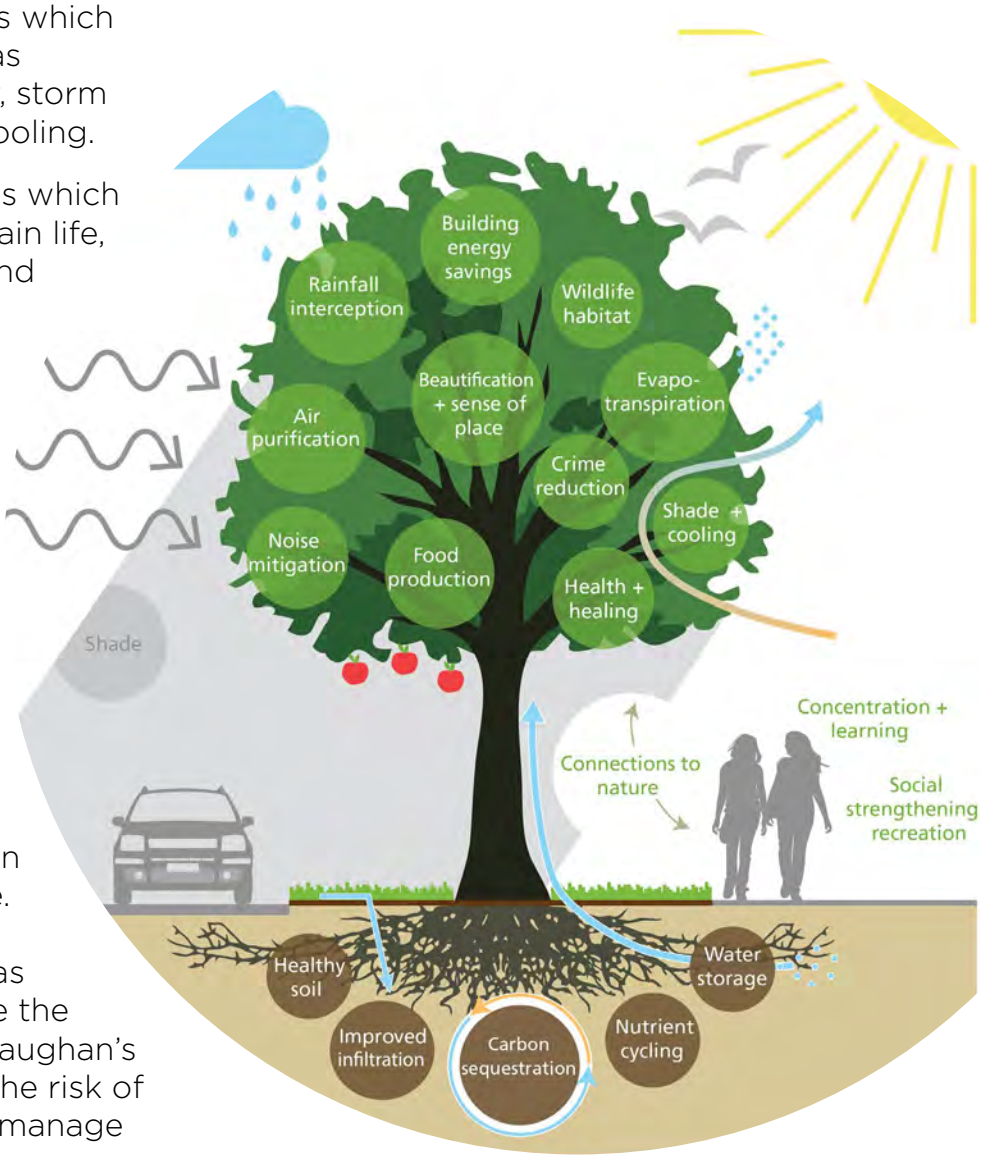
Regulating – describing services which regulate the environment such as pollination, air and water quality, storm water interception, and urban cooling.

Supporting – describing services which support the conditions to maintain life, including habitat, biodiversity, and enabling natural processes.

Provisioning – describing the tangible products of trees and forest products such as medicines, fruits, and nuts (and could include sawlogs/ pulpwood).

The urban forest is a crucial community asset, just like engineered infrastructure assets such as roadways, pipes, and sewers. Proper management of the urban forest can have several co-benefits that reduce the pressure on the City's engineered infrastructure. For instance, increasing tree cover and pervious surfaces in urban areas can reduce surface runoff, minimize the volume of water moving through Vaughan's stormwater system, and decrease the risk of localized flooding. It is essential to manage and maintain the urban forest as a valuable community asset to realize these benefits fully. Neglecting the urban forest can result in several negative impacts, such as reduced biodiversity, compromised human health, and increased maintenance costs for the City's engineered infrastructure.

On June 4, 2019 the City of Vaughan joined a growing number of its peer communities in declaring a climate emergency.[5] Urban trees and the services they provide are an important part of the City's response to climate change.



1.3 How do we Measure Urban Forest Values?

Measurement of the services generated by the urban forest and its associated value is not straight forward. Fortunately, readily available tools, such as the USDA's i-Tree suite of software, support some standard and quantifiable measures through which ecosystem services can be evaluated.

The USDA's i-Tree Eco software was to estimate the ecosystem services generated by Vaughan's tree canopy, as well as it's associated financial value. City-wide estimates of ecosystem services are estimated based on the composition of an inventory of 100 sample plots stratified to capture the broad range of urban forest conditions present within Vaughan (Table 1-1). Vaughan's street tree inventory was used to attain ecosystem service estimates for the value of those trees, specifically (Table 1-2).

The results indicate that Vaughan's canopy stores nearly half a million tons of carbon (with an estimated value of $103 million), and sequesters more than 14,200 additional tons of carbon every year (with an estimated value of $2.7 million per year) (Table 1-1). Carbon pricing is based on the Candian Beyond carbon storage and sequestration, Vaughan's urban forest provides more than $3.2 million in air-quality-related services annually.

Vaughan's street tree inventory also provides significant benefits, although on a smaller scale. Vaughan's street trees store an estimated 24,000 tons of carbon (valued at $5.6 million), and sequester an additional 750 tons every year (with an estimated value of $180,000 per year) (Table 1-2). Additionally, the street trees

Table 1-1. *City of Vaughan ecosystem services generated by all canopy cover within Vaughan. (i-Tree Eco)*

i-Tree Eco Ecosystem Service Estimates (i.e., All Trees in the City)		
Ecosystem Service	**Service Estimates**	**Dollar Value ($)**
Carbon & Stormwater		
C Sequestered annually in trees (t)	14,200	$2,682,000
C stored in trees (t)	542,000	$102,291,000
Avoided runoff (L)	1,221,268,000	$2,839,000
Air Quality		
CO removed annually (t)	5.4	$8,000
NO2 removed annually (t)	19.7	$14,500
O3 removed annually (t)	194.6	$960,000
PM10 (t)	/	/
PM2.5 (t)	13	$2,230,000
SO2 removed annually (t)	2	/
Total air pollution removed (t/year)	234.7	$3,215,000
	Total Annual Service Value	**$6,428,000**
	Total Stored Carbon Value	**$102,291,100**

generate over $300,000 in extra ecosystem services annually. i-Tree Eco estimated the structural value of the City's tree inventory at $110 million. Structural value is intended to capture the hypothetical cost to replace the entire inventory with trees of similar condition and size.

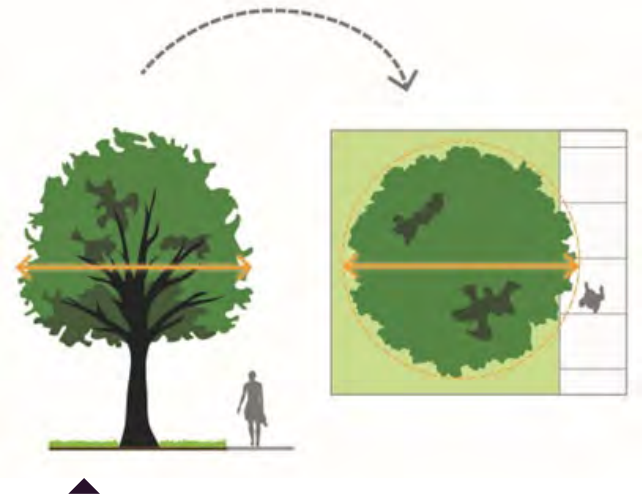
It is important to note that the i-Tree software only provides quantitative estimates for a limited set of ecosystem services, and there are many other cultural, regulating, provisioning, and supporting services provided by urban forests that cannot be easily valued. While the estimates in Table 1-1 and Table 1-2 provide a measurable estimate of some key services, the full range of services provided by Vaughan's urban forest, and their associated financial value, is likely much higher than what is reported here.

Table 1-2. *City of Vaughan ecosystem services generated by the City's tree inventory. (i-Tree Eco)*

i-Tree Eco Ecosystem Service Estimates (i.e., Inventory Trees Only)		
Ecosystem Service	**Service Estimates**	**Dollar Value ($)**
Carbon & Stormwater		
C Sequestered annually in trees (t)	750	$179,000
C stored in trees (t)	24,000	$5,670,000
Avoided runoff (L)	55,880,000	$130,000
Air Quality		
CO removed annually (t)	0.4	Negligible
NO2 removed annually (t)	0.9	/
O3 removed annually (t)	9.5	$53,000
PM10 (t)	/	/
PM2.5 (t)	0.4	$81,000
SO2 removed annually (t)	0.1	/
Total air pollution removed (t/year)	11.3	$135,000
	Total Annual Service Value	**$444,000**
	Total Stored Carbon Value	**$5,670,000**
	Total Structural Replacement Value	**$110,000,000**

Part 2. The Urban Forest

Vaughan's urban forest has undergone significant change over the last few centuries. The landscape once consisted of abundant stands of hardwoods, forb meadows, and mixed woodland communities. Today, isolated remnants of those native systems make up part of a larger mosaic of landscapes that, together with exotic species, constitute Vaughan's urban forest. This section presents baseline metrics on Vaughan's urban forest extent, composition, and structure.



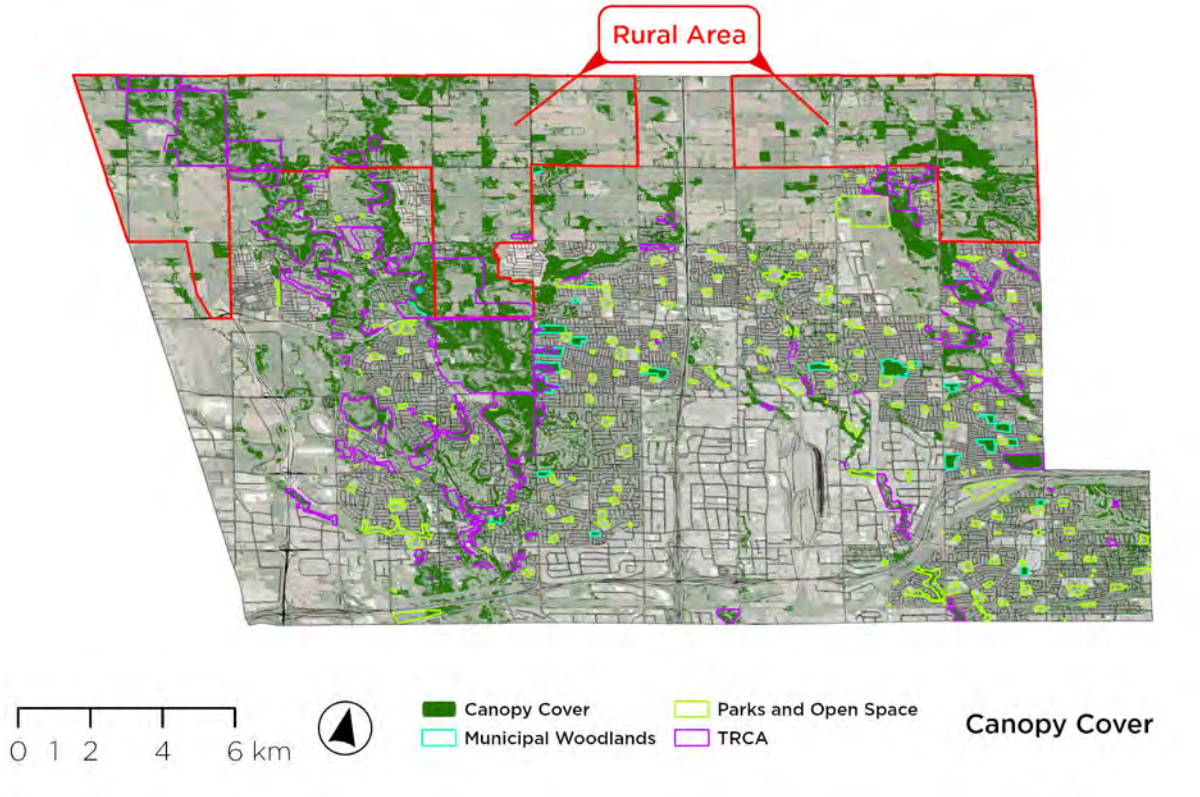
What is Tree 'Canopy'?

A tree's canopy refers to the leafed area sitting atop the trunk. Canopy area is often used area covered by a trees canopy as viewed from above, and is a common metric used in strategic initiatives such as this, as it is a relatively accessible indicator which generally corresponds to the scale, standards, and level of resources available to a management program.

2.1 Tree Canopy

Canopy cover is a common measure of the extent of an urban forest. Many jurisdictions track canopy cover over time to monitor change in the extent of their urban forest, and to inform management planning. As part of the analysis completed in support of this Report, Vaughan's canopy cover was

Figure 2-1. *City of Vaughan canopy cover mapping.*



measured using a combination of LiDAR data and satellite imagery (both from 2019, Figure 2-1). In the future, LiDAR-supported canopy mapping can be repeated to measure canopy cover change over time.

Vaughan's Canopy

In 2019, Vaughan's city-wide canopy cover was estimated to be 20 percent, measuring more than 5,400 ha Seventy-one percent of Vaughan's total canopy area is in the urban boundary and 29 percent is located within the rural area. Canopy cover over the urban and rural areas is estimated to be 18 percent and 26 percent, respectively. This Report has summarized canopy coverage by two-hectare grid (Figure 2-3), census dissemination area (DA) (Figure 2-4), neighbourhoods (Figure 2-5), by ward (Table 2-2), and by generalized land use (Table 2-2). The Region of York's 2021 State of the Forest report recommended a 25% to 35% target canopy cover target for the City of Vaughan, and a woodland cover of 14% to 17%.[6]

How Does Vaughan Measure Up?

Several of Vaughan's peer communities in south-central Ontario have also completed assessments of canopy cover using a range of methods (Figure 2-2). Municipal canopy cover amongst Vaughan's peer communities tends to range from 20 to 30 percent, averaging 24 percent. Communities with rural areas tend to have higher city-wide canopy coverage, where explicitly measured (e.g., Burlington has included rural canopy in their measurement, Hamilton has not). Rural areas tend to inflate community-wide canopy cover measures given the reduced intensity of urban land uses typical of rural landscapes. A more detailed peer city comparison is provided in Part 5 of this Report.

Figure 2-2. *A comparison of Vaughan's urban forest canopy and that of a selection of peer communities.*

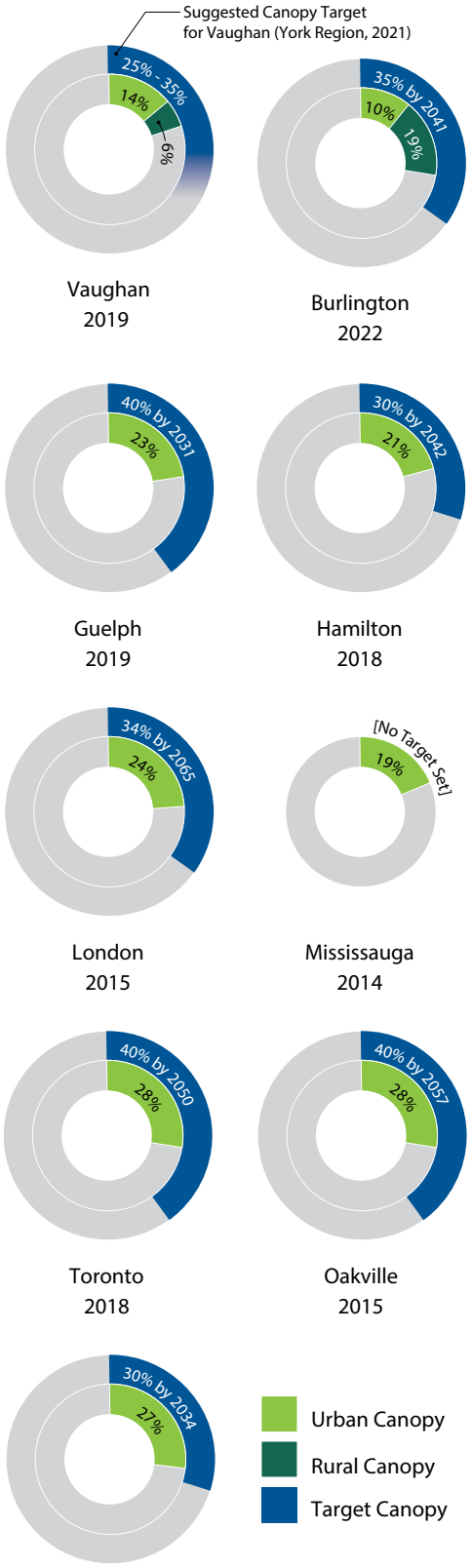


Figure 2-3. *City of Vaughan canopy cover mapping by two-hectare grid.*

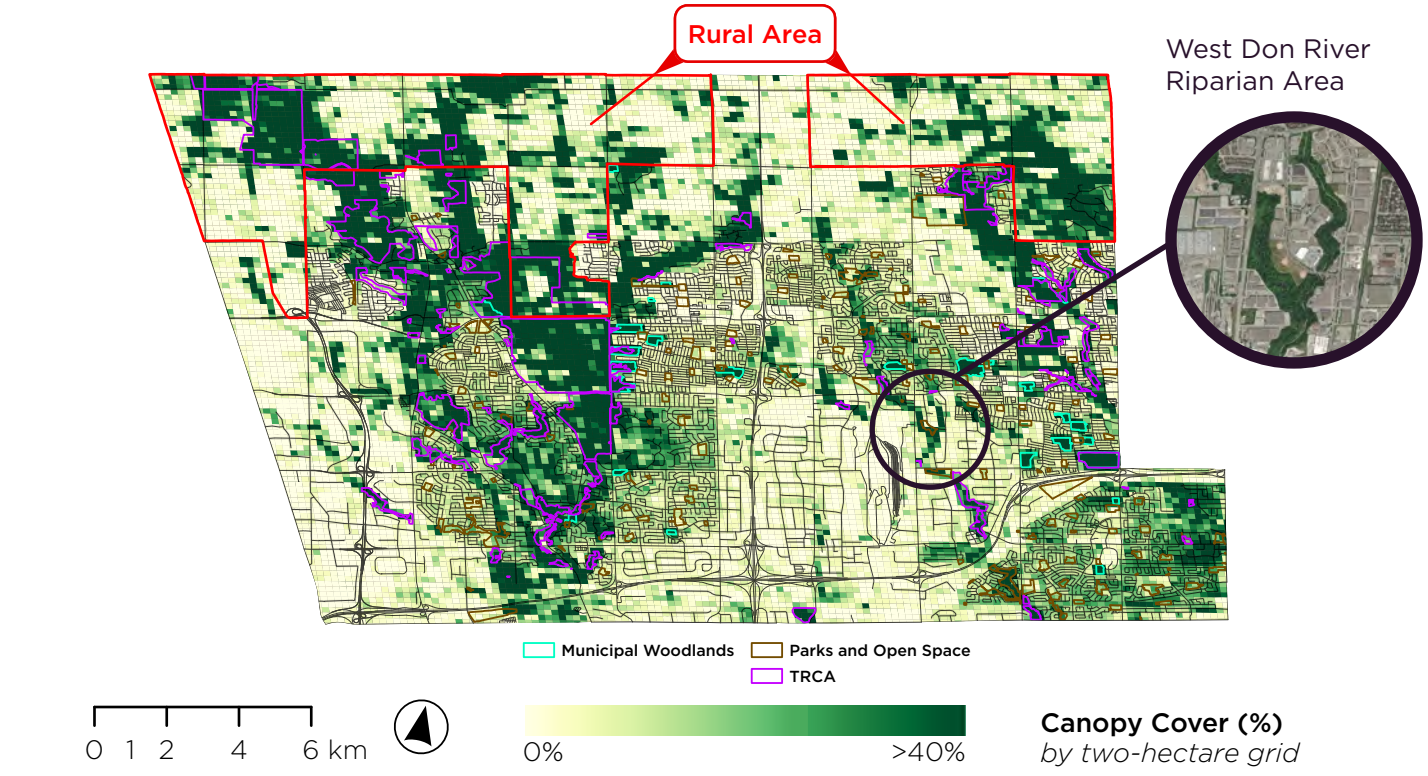
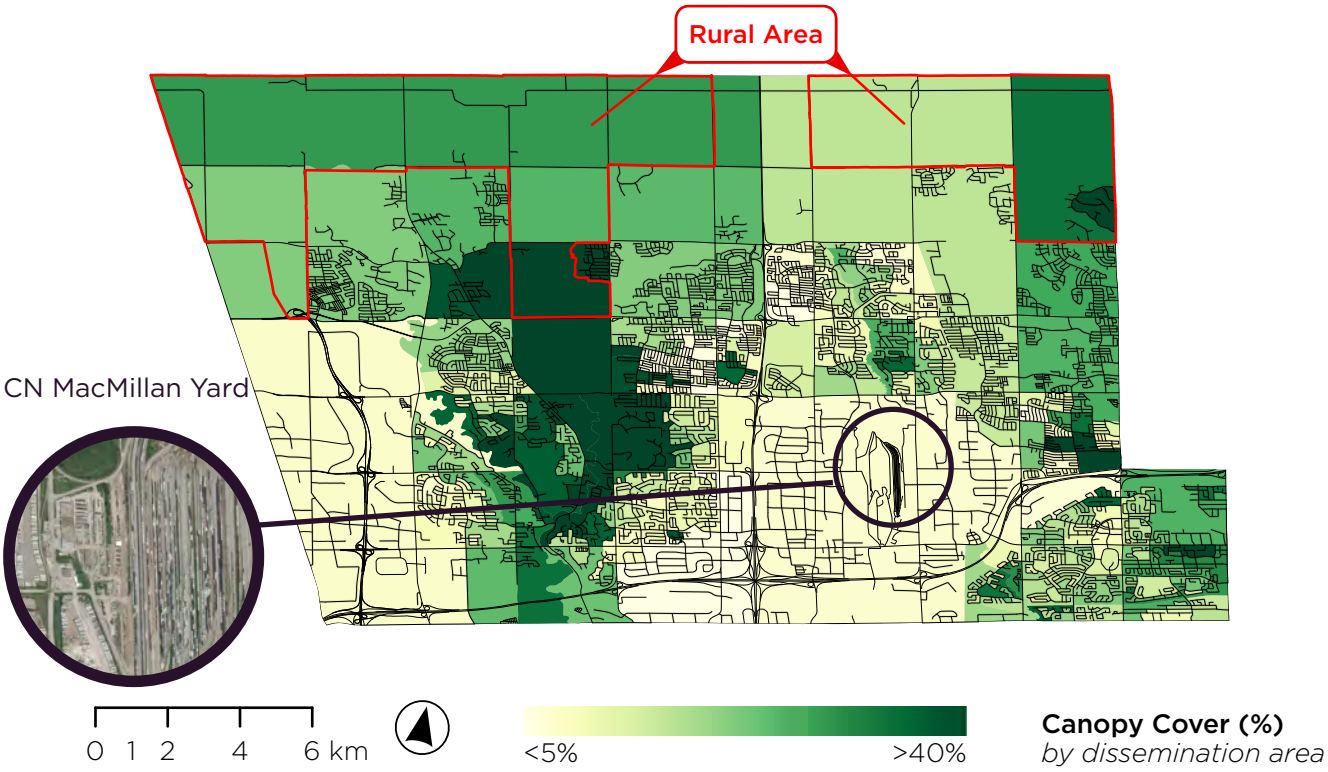


Figure 2-4. *City of Vaughan canopy cover mapping by census DA.*



Canopy Mapping

Figure 2-3 and Figure 2-4 depict canopy cover mapped by two-hectare grid and by census DA, respectively. Both give similar insight into the high-level distribution of canopy cover across Vaughan's municipal area. Dissemination Areas (DA) are a spatial unit used by Statistics Canada and are typically drawn to capture between 400 to 700 residents.[7] The boundaries are typically sensitive to natural, political, and human-constructed barriers (such as the road network). Both Figure 2-3 and Figure 2-4 illustrate that Vaughan's canopy cover is concentrated in woodlands and river valley corridors; including features like the Don River, Humber River and Byod Conservation Park. Areas of low canopy cover are most identifiable in Vaughan's industrial areas, and in particular those in and around the CN MacMillan Yard in the south-east of the city (Figure 2-4).

Neighbourhoods

Vaughan's neighbourhoods with highest tree canopy cover are Woodbridge Centre (35 percent), Woodbridge South East (28 percent), Woodbridge North (27 percent), and Kleinburg (27 percent) (Figure 2-5). These neighbourhoods have a higher proportion of natural landcovers, including woodland areas. In contrast, the neighbourhoods of Woodbridge East, South of Maple, and Woodbridge West feature predominantly industrial and commercial type uses and each have canopy cover below 10 percent (Figure 2-5).

Figure 2-5. *City of Vaughan canopy cover mapping by neighbourhood.*

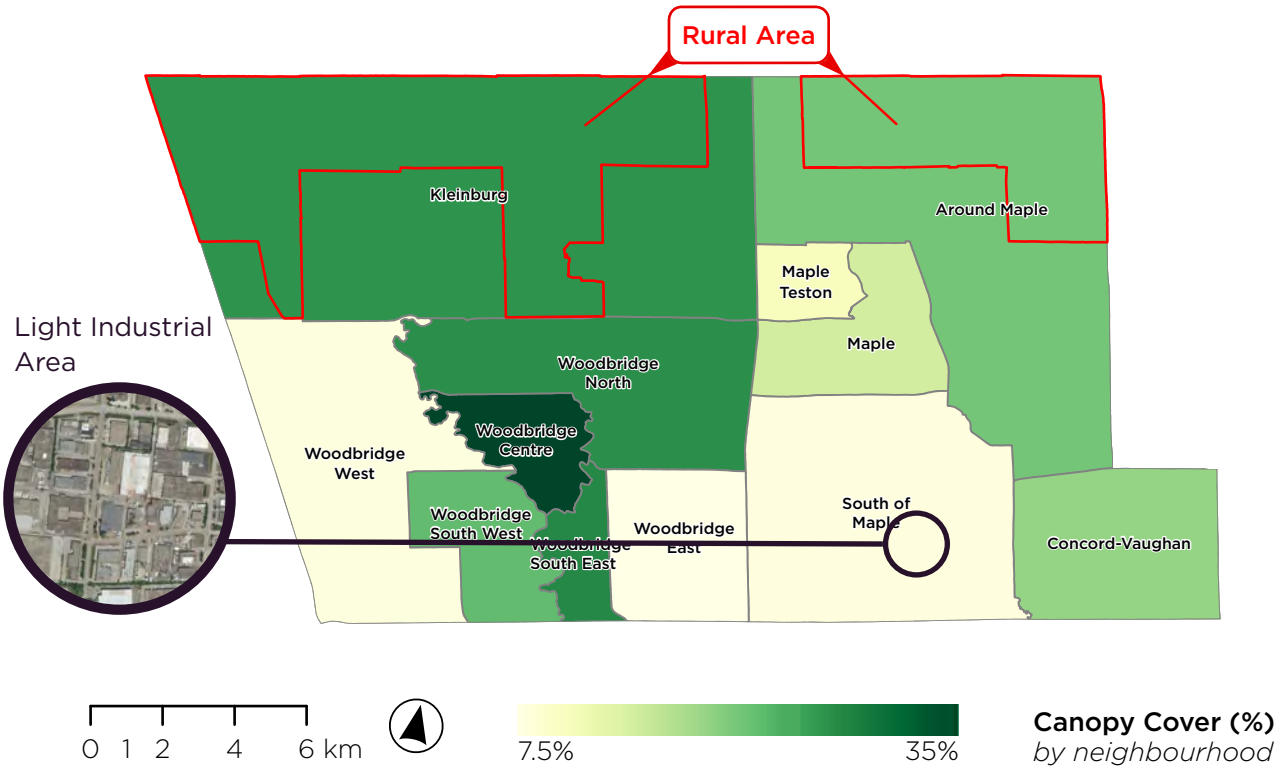
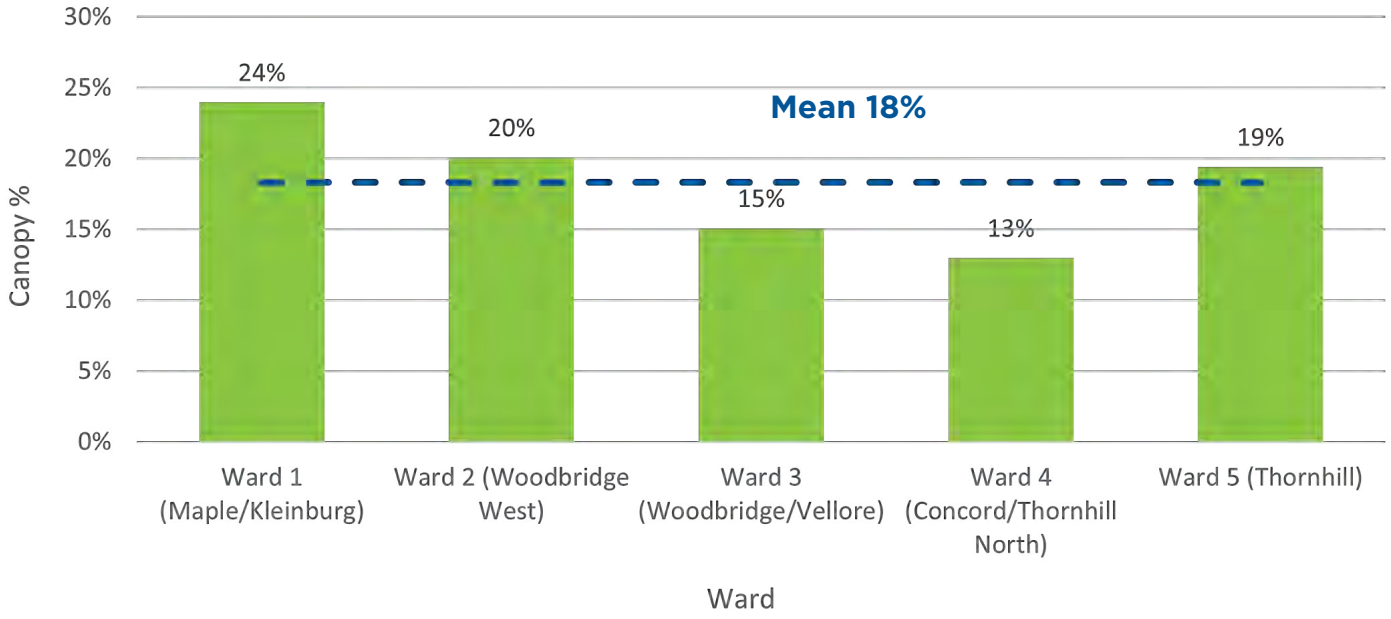


Figure 2-6. *City of Vaughan canopy cover by ward.*



Ward

By municipal electoral Ward, Vaughan's Ward 1 has the highest canopy cover (24 percent) in the city, given it largely corresponds to Vaughan's rural area (Figure 2-6). In terms of Vaughan's urban wards, Ward two sits at 20 percent canopy cover, benefiting from the contributions of woodland features such as Boyd Conservation Park and the Humber River Valley. Ward 5 has 19 percent canopy cover, Ward 3 has 15 percent, and Ward 4 has 13 percent. Mean canopy cover by Ward is 18 percent (Figure 2-6).

Ownership

By ownership, 16 percent of Vaughan's total canopy area is on City-owned land, 24 percent is on Toronto and Region Conservation Authority-owned land, and the remaining 60 percent falls into private or other ownership classes (Table 2-1). Most tree canopy on TRCA lands is woodland canopy (more under Section 2.3).

Table 2-1. *City of Vaughan canopy area by ownership.*

Ownership	Land Area (ha.)	Canopy Area (ha.)	Canopy Coverage (%)	Proportion of Total Vaughan Canopy Area (%)
City	3,829	884	23%	16%
TRCA	2,091	1,291	62%	24%
Other (Incl. Private)	21,537	3,260	15%	60%
Total	**27,435**	**5,435**	**100%**	**100%**

Consolidated Land Use

To identify relationships between built form and tree canopy, a consolidated land use layer was created based on the City's Official Plan[8].

The largest land use in Vaughan is low-rise residential, which covers more than 4,800 ha but has an average canopy coverage of only 12 percent, bringing down the city-wide canopy cover average (Table 2-2). More than 60 percent of Vaughan's canopy is located within the Natural Area land use, which prioritizes conservation and protection of woodlands and other natural ecosystems.

Canopy cover in the rural area is 26 percent, higher than the urban area, which averages 18 percent.

Canopy Composition

Vaughan's canopy cover was classified as either coniferous or deciduous tree types using a machine learning classifier. The results of this analysis found 81 percent of the city's canopy was deciduous and 19 percent coniferous (Figure 2-7). Vaughan's coniferous trees are concentrated along riparian corridors and in river valleys (e.g., East and West Humber River).

Table 2-2. *City of Vaughan canopy area and coverage by consolidated land use.*

Consolidated Land Use	Area (ha)	Overstory Count (est.)	Canopy Area (ha)	Canopy Cover (%)	Crown Density (tree/ha)
Urban Area					
Low-Rise Residential	4,854	253,822	579	12%	52
Natural Area	3,989	394,787	2,208	55%	99
Public Roads	3,715	199,499	407	11%	54
Employment	3,055	45,774	96	3%	15
Secondary Plans	2,744	52,408	222	8%	52
Commercial Plaza (+ Theme Park)	886	21,744	53	6%	25
Infrastructure and Utilities	761	23,716	68	9%	31
Parks and Open Space	558	31,095	109	20%	56
Private Open Spaces	463	15,273	61	13%	33
High-Rise	108	3,693	12	11%	34
Institutional	53	1,052	3	6%	20
Sub-total	**21,349**	**1,047,693**	**3,834**	**18%**	**43**
Rural Area					
Rural/Agricultural	3,570	90,374	390	11%	25
Natural Area	2,069	197,885	1,102	53%	96
Infrastructure and Utilities	199	9,021	42	21%	45
Public Roads	183	13,840	38	21%	75
Low-Rise Residential	32	1,723	6	19%	53
Secondary Plans	32	3,670	23	70%	114
Sub-total	**6,086**	**316,513**	**1,601**	**26%**	**68**
Total	**27,435**	**1,364,206**	**5,435**	**20%**	**52**

Figure 2-7. *City of Vaughan deciduous and coniferous tree mapping.*

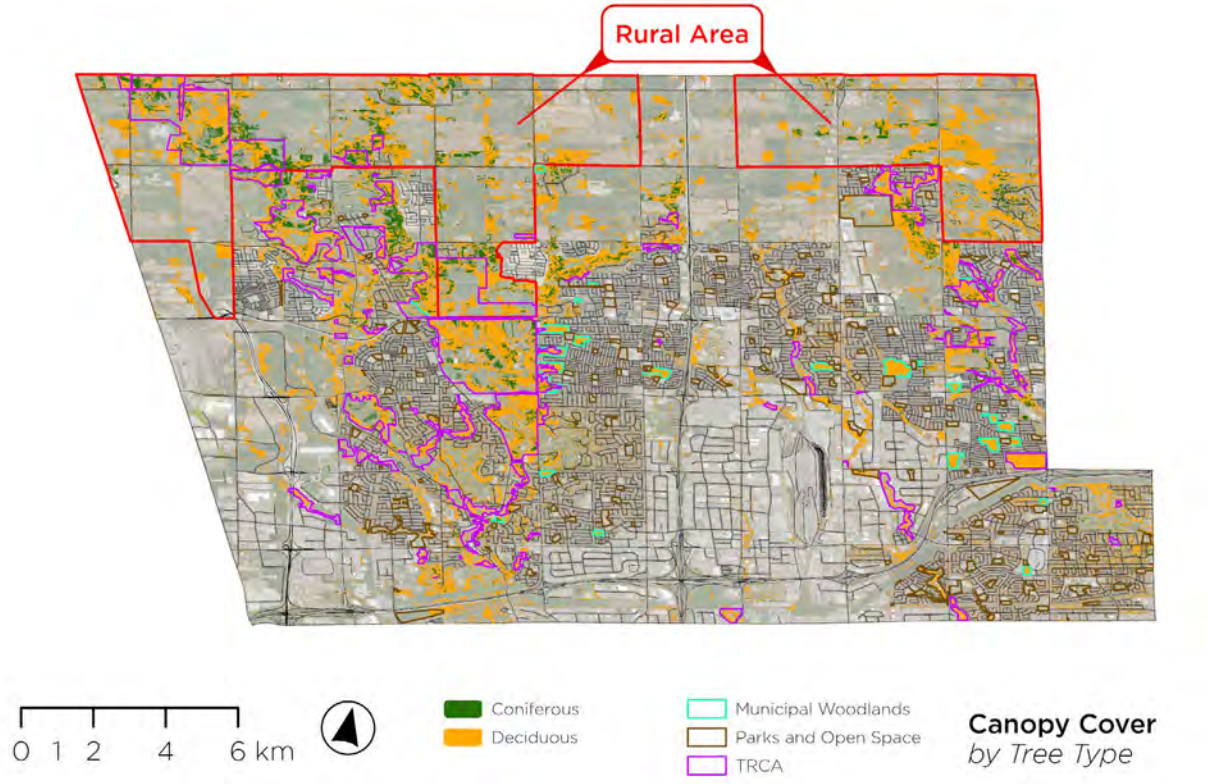
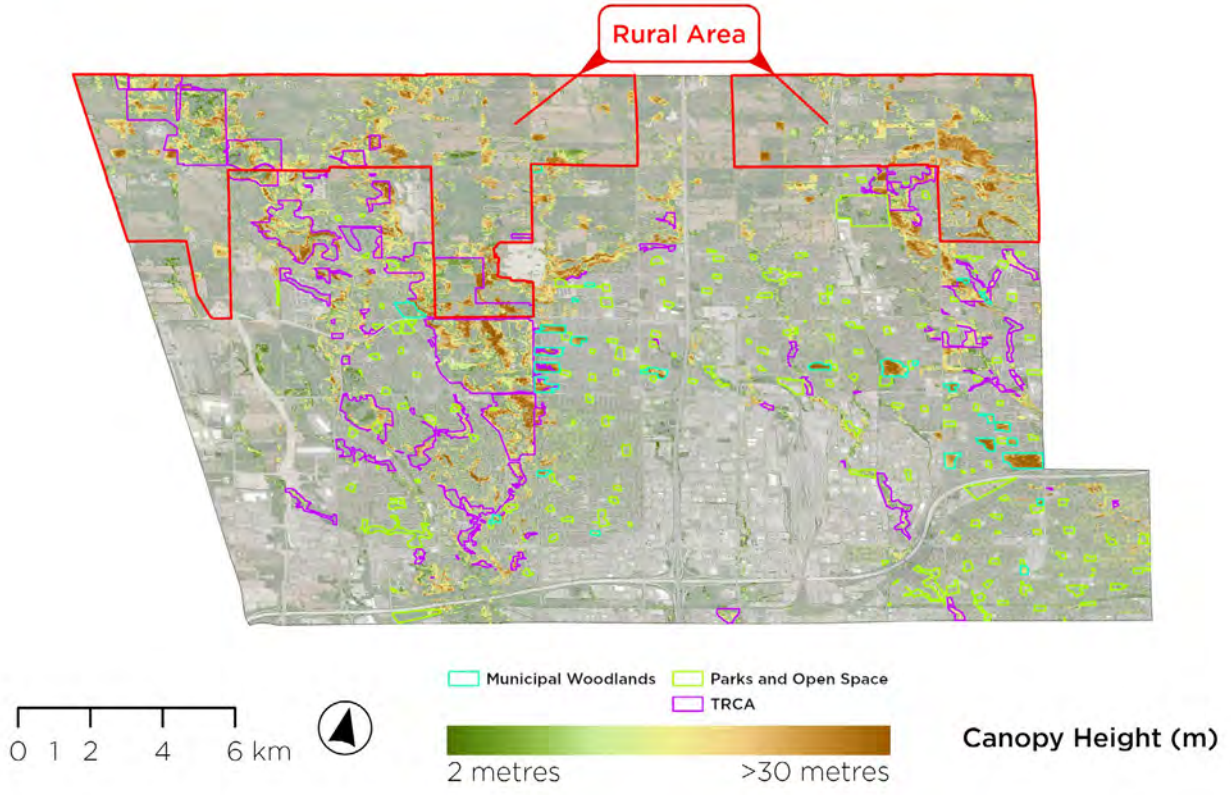


Figure 2-8. *City of Vaughan canopy height mapping.*



Canopy Height

The average tree height across all trees in Vaughan is 13 meters. Figure 2-8 shows the tallest trees in Vaughan identified from LiDAR data, with a maximum height of approximately 43 meters. These tall trees are primarily located within the city's woodlands and riparian corridors throughout the city.

Land Surface Temperature

The cooling effect of trees on urban environments has been well documented by the scientific literature. In Vaughan, the warmest temperatures recorded on June 16, 2021 were found in areas with low tree canopy and high impervious cover, such as industrial areas. Conversely, forested areas along river valleys and within city woodlands were observed to be up to 14°C cooler compared to highly impervious areas with mostly buildings and roads, as illustrated in Figure 2-9.

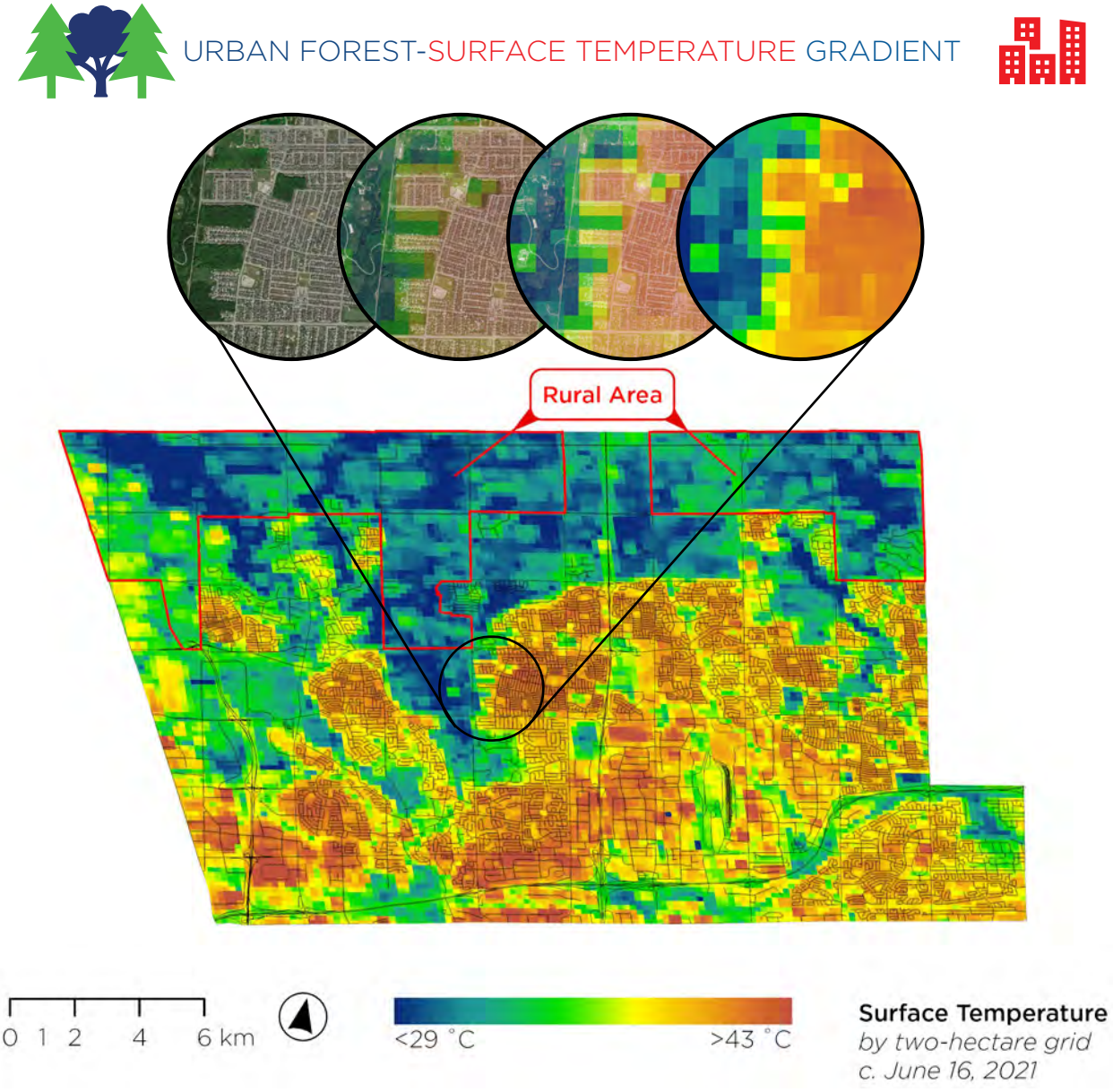


Figure 2-9. *Mean maximum recorded surface temperature on June 16, 2021.*

2.2 Street Tree Inventory

Vaughan's Parks, Forestry and Horticulture Operations Department maintains an inventory of more than 130,000 trees as of January 2023 (Figure 2-10). These trees are primarily located along streets, not including regional roads. The inventory was established in 2015 and has not been updated since that time.

There are limitations to analyses completed using the inventory due to the inventory's age and lack of regular maintenance. Tree condition or other inventory values may not be current. Similarly, age, diameter and tree condition are likely to be out of date.

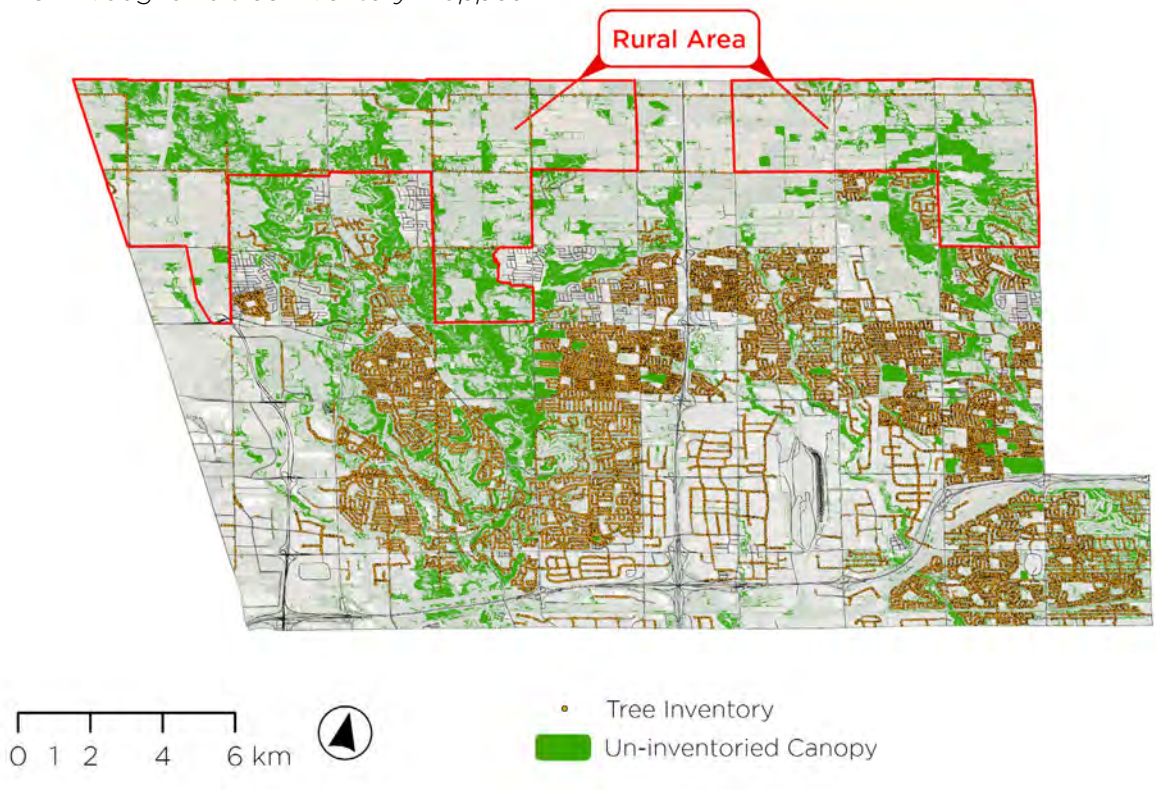
Tree Condition

The accuracy of condition ratings in Vaughan's inventory is presently uncertain. Ninety-one percent of Vaughan's inventoried trees have a condition rating of either "good" or "fair" at present, and six percent "excellent" (Figure 2-11). All large municipal tree inventories contain some trees in "poor" or worse condition. This finding is likely an indicator that Vaughan's street tree condition values are not accurate. Updated information is needed to quantify the condition of trees in Vaughan's inventory.

Age and Size Diversity

The inventory of Vaughan's street trees does not include specific age measurements, but the diameter at breast height (DBH) can provide a rough estimate of age. While

Figure 2-10. *Vaughan's tree inventory mapped.*



the relationship between tree diameter and age varies across species and sites, understanding the size and approximate age distribution still provides insights for management.

Figure 2-11 shows that most trees in Vaughan are small or young. In fact, more than 80 percent of street trees in Vaughan have a diameter of less than 30 cm. About four percent of the tree inventory does not have a measured DBH.

This size information, combined with the composition of the inventory (which includes many medium-to-large stature species), indicates a young tree population. Tree planting with development in recent decades is likely the driver of this trend.

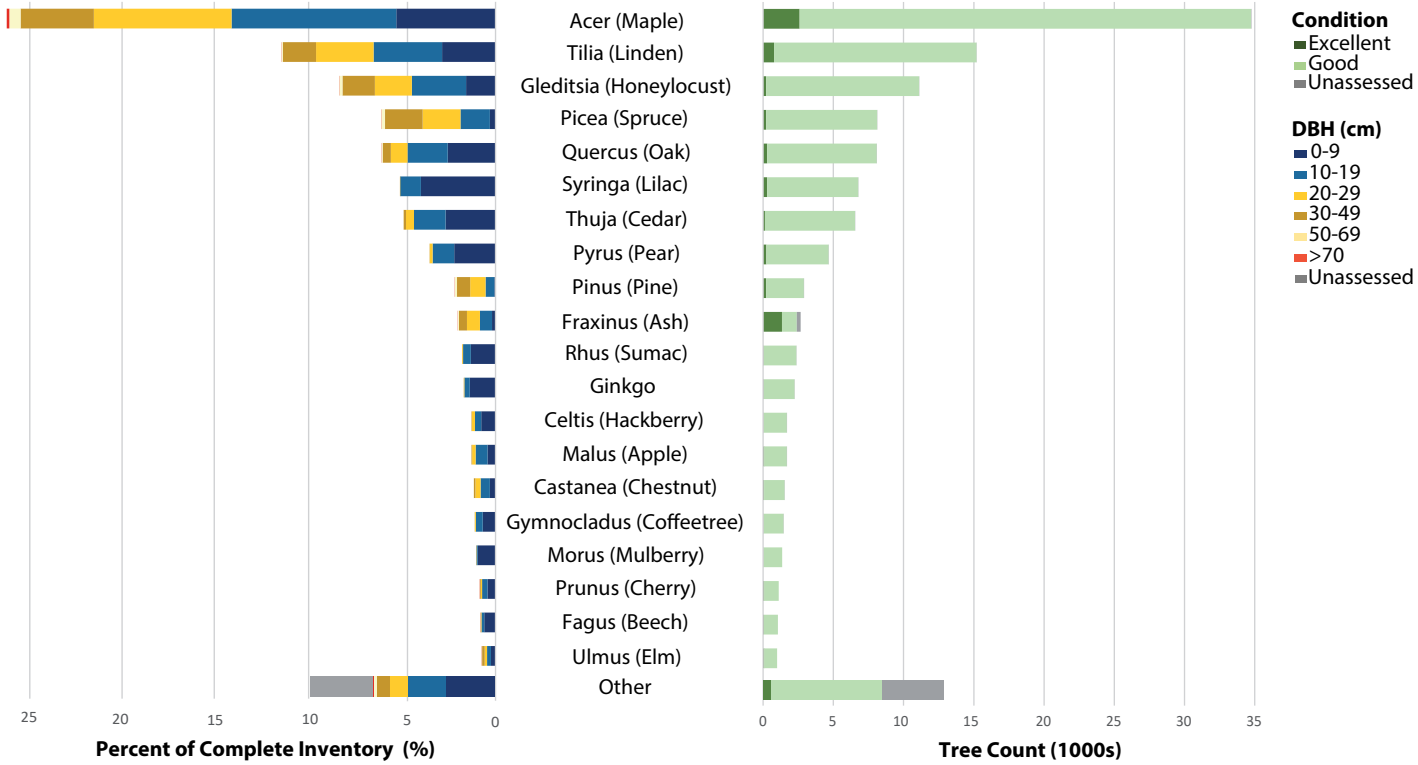
While having a high proportion of young trees can support a stable urban forest population over time, an excessively high percentage could signal challenges in managing the urban forest, including in retaining large, mature trees in the city.

Species Diversity

Nearly 70 percent of Vaughan's trees belong to the seven most populous genera (Figure 2-11). Maple (*Acer*) alone represents more than 26 percent of the city's tree inventory, followed by linden (*Tilia*, 12 percent) and honeylocust (*Gleditsia triacanthos*, 9 percent). Norway maple (*Acer platanoides*) constitutes more than 10 percent of Vaughan's street trees; ivory silk lilac (*Syringa reticulata*) and little-leaf linden (*Tilia cordata*) both exceed five percent.

Figure 2-12 displays Vaughan's street tree diversity using an adaptation of the 'Shannon-Wiener index'[9] to measure of relative species abundance within the tree population. Areas of dark **purple** correspond to high relative species diversity while lighter areas indicate the opposite.

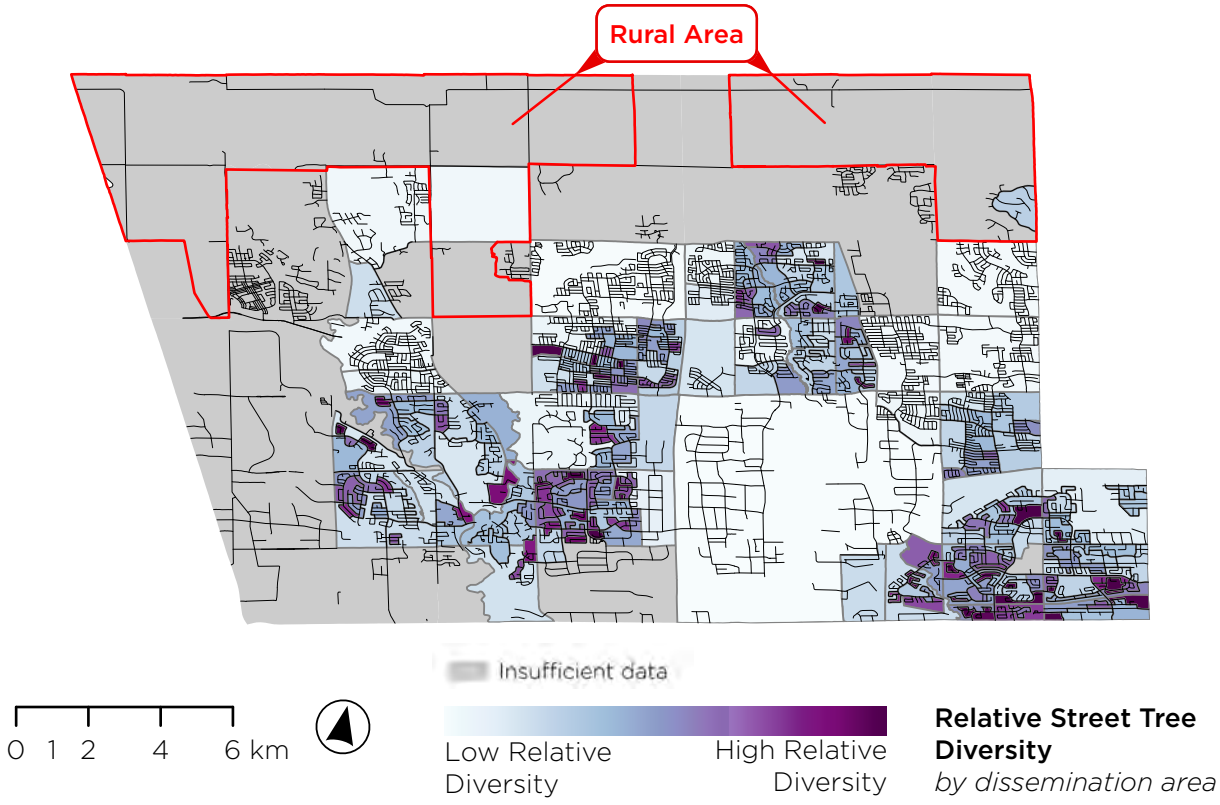
Figure 2-11. *Vaughan's tree inventory by proportion and count of species, diameter classes, and tree condition.*



High relative diversity areas tend to be in older subdivisions, where the original trees have been retained and new species have been added over time. In contrast, newer subdivisions and industrial areas tend to have relatively low diversity.

Maintaining urban tree diversity is important as it helps to ensure the resilience of the urban forest against pests and pathogens that target specific tree species. Ontario has experienced several devastating invasive pests and diseases, such as chestnut blight, Dutch elm disease, and Emerald Ash Borer. These experiences underscore the significance of maintaining diversity in urban trees. Asian long-horned beetle is a pest of concern, which attacks various host plants but primarily targets species in the maple genus, which make up over a quarter of Vaughan's tree population. Black knot infestation of cherry trees has also been prevalent, resulting in the removal of cherry trees on the list of tree planting species in 2012.

Figure 2-12. *Vaughan's relative street tree diversity mapping by census DA.*



Street Tree Density

Figure 2-13 maps the density of street trees in Vaughan by census DA. Street tree density in Vaughan ranges from less than ten trees per kilometre to more than 200. The city's residential neighbourhoods stand out as having relatively high street tree densities as compared to its commercial and industrial uses.

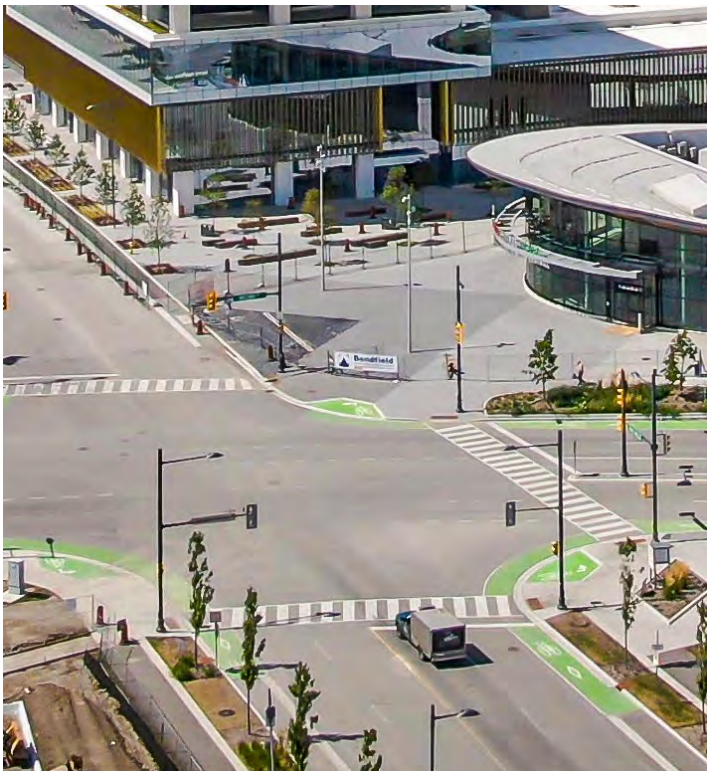
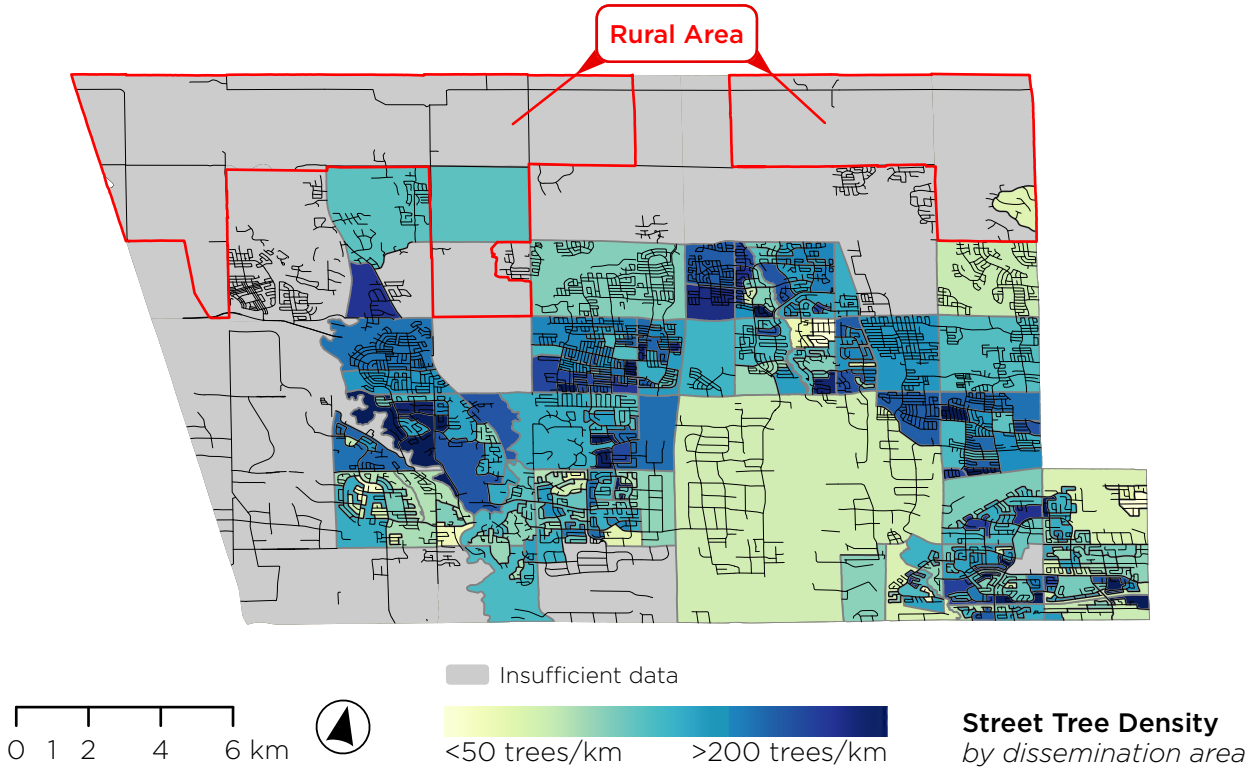


Figure 2-13. *Vaughan's street tree density mapping by census DA.*



2.3 Woodland Ecosystems

The City of Vaughan is located in Ontario's Mixedwood Plains ecozone, consisting of the Lake Erie-Lake Ontario ecoregion in the southwestern corner of the province (known as the Carolinian ecoregion) and the transitional Lake Simcoe-Rideau ecoregion between the deciduous Carolinian ecoregion of the south and the coniferous boreal shield ecoregions of the north.[10]

Local climate is characterized by an average daily mean summer temperature of 20°C and a winter temperature of -5°C. It experiences four distinct seasons, with annual precipitation averaging 800 mm, with higher precipitation during the spring, summer, and fall compared to winter.

The Mixedwood Plains ecozone is primarily composed of mixed and tolerant hardwood forests, which are some of the most biodiverse in Canada, despite being heavily impacted by human development and habitation. The Carolinian ecoregion, which is the most densely populated in Canada, has mostly second-growth forests that are fragmented by agricultural and urban uses; less than 13 percent of the land is covered by native deciduous woodlands. In contrast, the Lake Simcoe-Rideau ecoregion has deciduous, coniferous, and mixed forests covering 16 percent, 5 percent, and 9 percent of the land, respectively.

The Carolinian ecoregion is a predominantly deciduous forest, and is characterized by species such as sugar and red maple, yellow birch, beech, red oak, hawthorn, and basswood. Remnant Carolinian trees can also be found in isolated pockets, such as butternut, blue ash, sycamore, Shumard Oak, Pawpaw, and cucumber tree.

The Lake Simcoe-Rideau forest is home to transitional forests and communities, containing both character conifers, such as eastern white pine, red pine, white cedar, black spruce, tamarack, and eastern hemlock, as well as hardy deciduous species shared with the Carolinian ecoregion to the south.

Although once abundant in the region, instances of healthy ash, elm, chestnut and butternut have each been significantly reduced over the last century, their scarcity a constant reminder of the challenges the region has faced with invasive forest pests and disease.

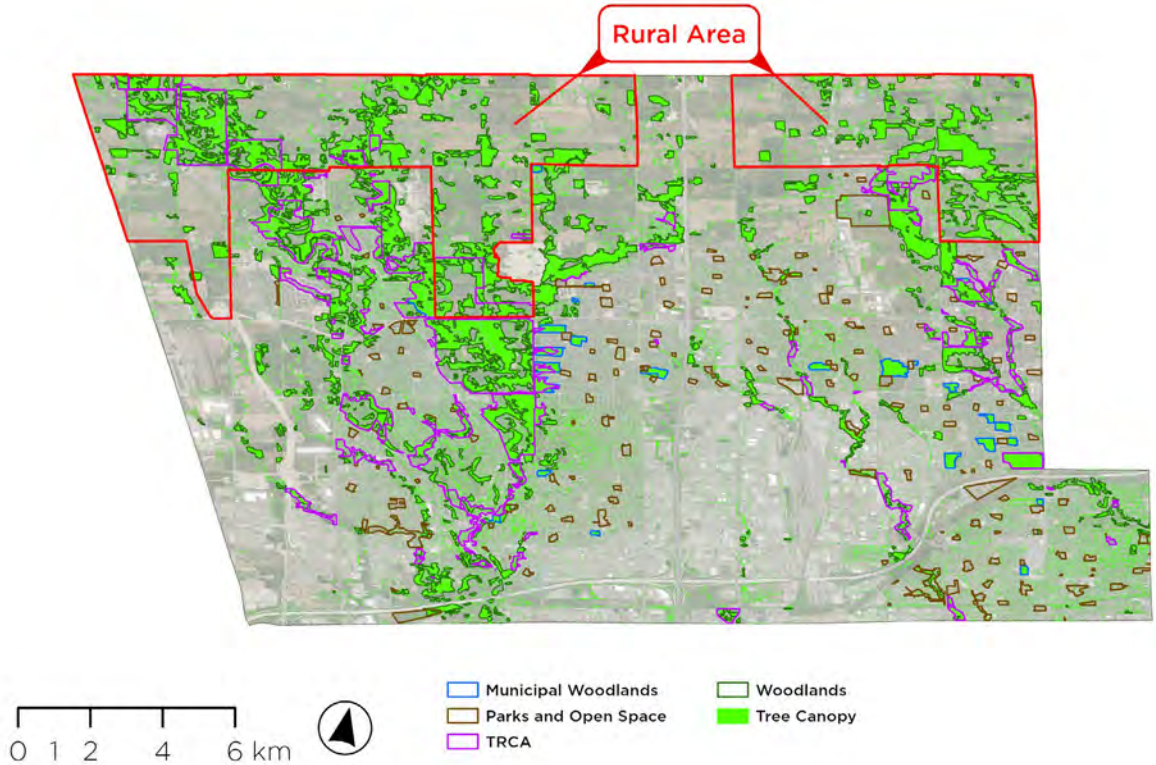
Grassland ecosystems occur only in isolated pockets, with species such as big bluestem, little bluestem, sundial lupine, and New Jersey tea. Characteristic fauna in the area include the green heron, eastern kingbird, white-tailed deer, Virginia opossum, Midland painted turtle, yellow perch, and banded killifish. Many of Ontario's species at risk can be found in the Lake Erie-Lake Ontario ecoregion.

Vaughan's Woodlands

The City of Vaughan has around 3,300 ha of woodland canopy, representing 60 percent of the city's total canopy area (Figure 2-14). More than 85 percent of woodland canopy is protected through designations in the City's Official Plan.

The Toronto and Region Conservation Authority currently manages nearly 2,100 ha of woodland within the City, currently sustaining more than 1,000 ha of woodland canopy (Figure 2-15). The top four forest communities make up more than 25 percent of the canopied landcover within the TRCA's landholdings. However, the TRCA has identified some issues in their managed

Figure 2-14. *Mapping of Vaughan's woodland canopy and other canopy area.*



ecosystems, such as the presence of exotics, unauthorized trails, and illegal dumping.

Vaughan's Woodlots

Vaughan has 27 community "woodlots" that are managed by the City. The canopy height information for each woodlot was broken into four height classes, and the number of trees and woodlot canopy area belonging to each of the four canopy classes were plotted (Appendix B). These plots, coupled with historic imagery, provide insight into the structure and history of these woodlots.

The following page depicts the height distributions of four of Vaughan's woodland areas, and historic imagery. The subsequent paragraphs explain how disturbances and management actions may have influenced woodlot composition and structure through time. Field study would provide more insight into the age and history of these woodlots.

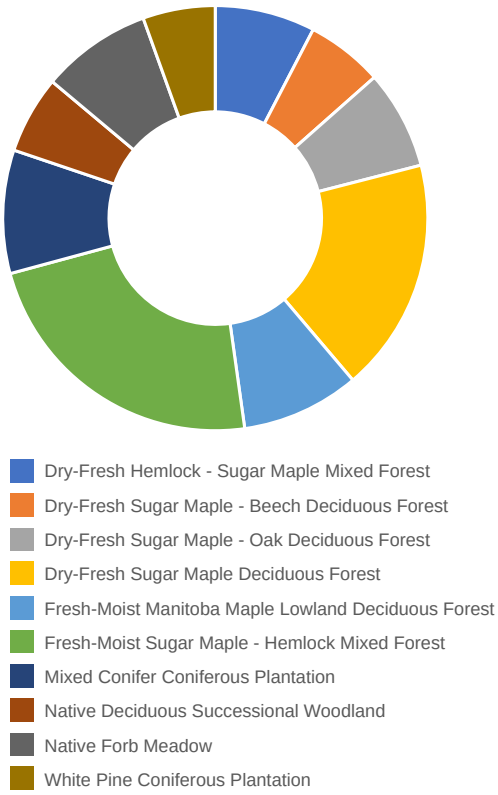


Figure 2-15. *Canopy under TRCA ownership by ecosystem type.*

William T. Foster Woods

William T. Foster Woods was agricultural land until 1992 when it was established as a park and handed over to the TRCA for management. TRCA-led efforts have contributed to gradual canopy growth, and the park's canopy-height distribution is consistent with young/pioneer forest growth.

Frank Robson Woodlot

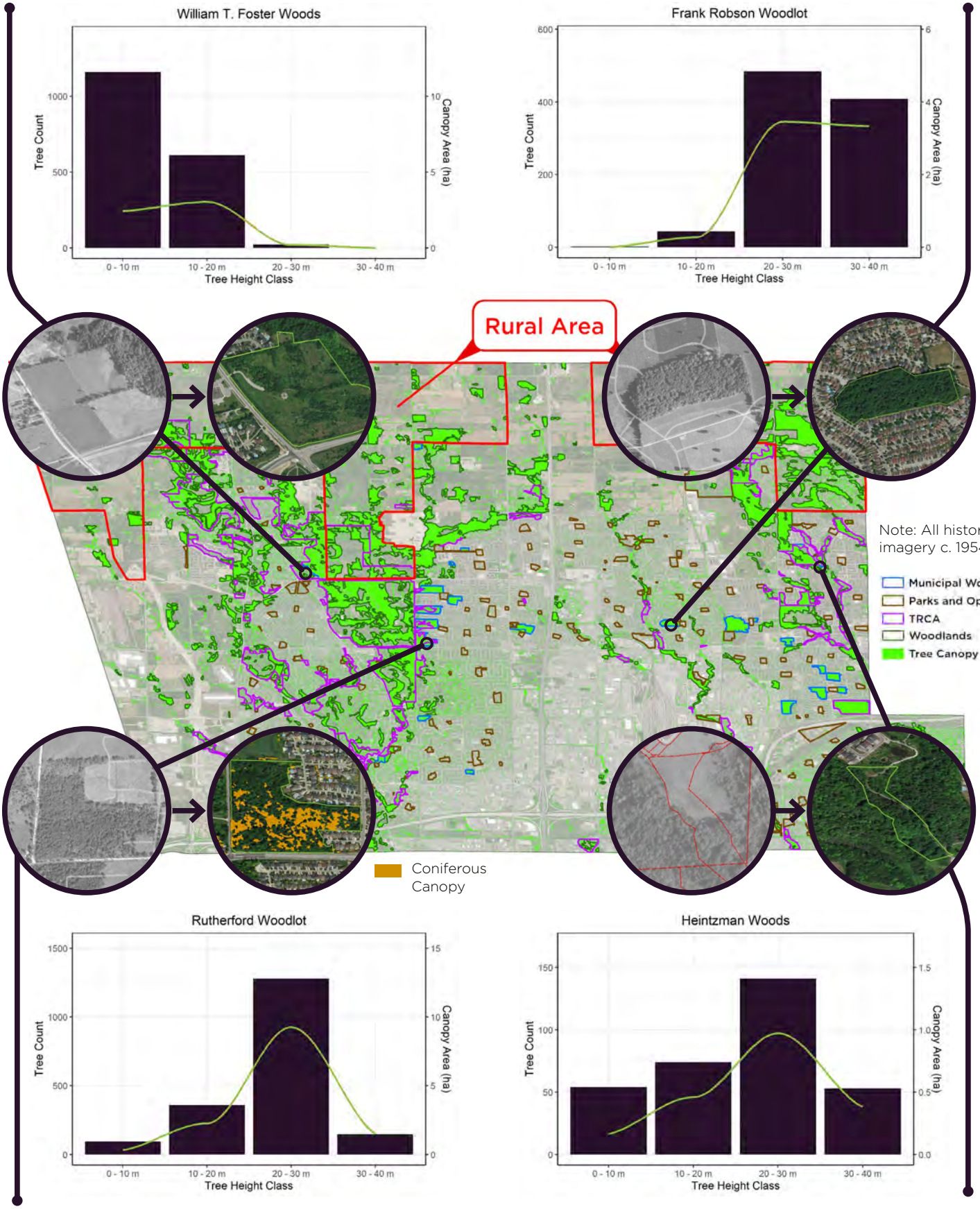
Frank Robson Woodlot has persisted since at least 1954 and shows relatively old forest growth. The woodlot pre-dates the first residential subdivisions nearby.

Rutherford Woodlot

The Rutherford Woodlot has also persisted since at least 1954 and predates nearby residential subdivisions. Rutherford's canopy contains a significant amount of coniferous cover, and has more trees in shorter height classes. A stream runs through the woodlot, which may explain the higher proportion of coniferous canopy versus other woodlots; conifers in the Mixedwood Plains are more common on fresh and moist sites.

Heintzman Woods

The Heintzman Woods have been returning to a secondary forest state since 1954, but show a more uneven stand structure due to repeated human disturbance within different areas of the woodlot.


William T. Foster Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class
Frank Robson Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class
Rural Area
Note: All historic imagery c. 1954
Municipal Woodlands
Parks and Open Space
TRCA
Woodlands
Tree Canopy
Coniferous Canopy
Rutherford Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class
Heintzman Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

Part 3. Vaughan's Urban Forestry Program

3.1 Staff

Vaughan's Urban Forestry Group has a compliment of 14 full-time staff (14 FTE) and two part-time workers (1 FTE), including:

One Manager of Urban Forestry, who manages the full range of urban forestry staff and the overall program.

Two Forestry Inspectors who undertake tree inspections, customer service, and development application review.

Three Forestry Coordinators who coordinate staff and aspects of the program.

Six Arborists who undertake scheduled and responsive tree maintenance activities.

Three Forestry Labourers who provide additional labour capacity where arboricultural expertise is not needed.

In 2022, staff time was supplemented by approximately 2,500 contract crew hours. The City is dependent on contract crews in meeting its base service request volumes.

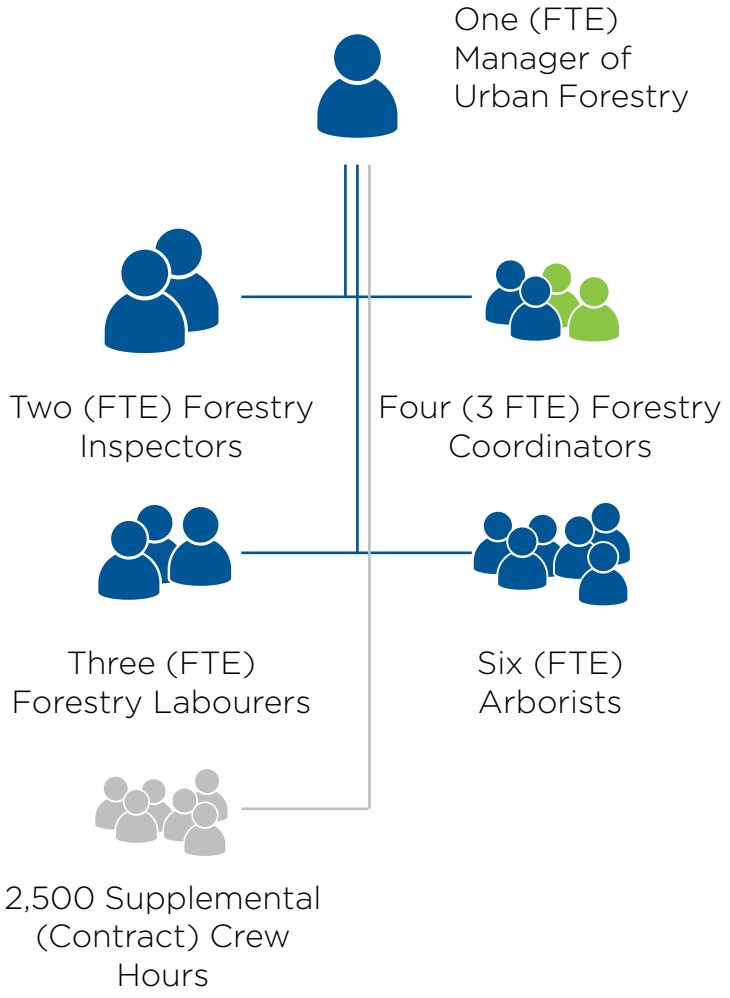


Figure 3-2. *Forestry Group organizational structure.*

3.2 Key Service Areas

Vaughan's management program encompasses several key service areas:

Tree Pruning, being the removal of tree limbs from public trees for reasons ranging from hazard abatement to sight-line conflicts and clearance issues.

Forestry Permitting and Plan Review, being the review of 300-400 applications for tree removal a year, review of applications for minor variance, development applications, permits, curb cut applications, internal infrastructure delivery projects, and tree inspections of new subdivisions prior to municipal assumption.

Emergency and Storm Response, being the process of cleanup and hazard abatement following a major storm or weather event.

Tree Removal, being the removal of public trees for motivations ranging from end of life to infrastructure conflicts.

Tree Planting and Replacement, being the planting of new trees or replacement of trees that were previously removed.

Tree Risk Assessment, refers to the processes in place to monitor, respond to, and mitigate tree risk at an acceptable standard.

Gaps and Exclusions in Service Areas

TRCA Woodlands are managed by the Conservation Authority, and includes more than 2,000 ha of managed woodland area across within the city. It is often not obvious to the public if a woodland is managed by the City or Conservation Authority.

Woodland Inventory and Management is not currently budgeted for and the quality and condition of City-managed woodlands is largely not confirmed.

Regional Roads: Vaughan Forestry is not presently responsible for the management of any assets owned by the Region of York. This includes tree maintenance, planting, and removal along any of the regional roads within the municipality.

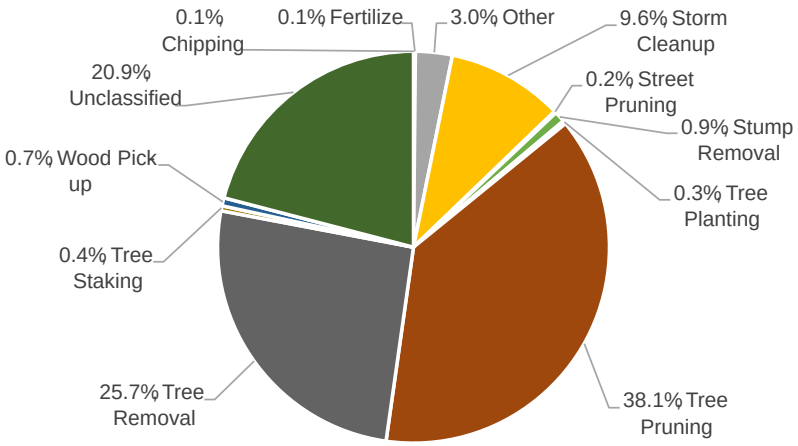
Inventory Management: While an operational aspect in many forest management programs, maintenance of the City's tree inventory in Vaughan does not occur.

3.3 Service Requests

In 2022, Forestry received over 5,100 service requests, with the majority related to tree pruning (38 percent), tree removal (over 25 percent), and storm cleanup (10 percent). More than 20 percent of service requests were not assigned a service class (Figure 3-3).

At present, the City of Vaughan meets a lead time of approximately 24 weeks from the time of inspection to the resolution of the work order. Storm events, such as the May 2022 derecho, can contribute to a swell of service requests that further extends service lead times, often pushing request resolution as far as 30 weeks back, on average, from date of inspection.

Figure 3-3. *Forestry work orders by classification.*



3.4 Budget

In 2022, Vaughan's Forestry Group operated on a total operating budget of just over $1.7 million dollars. Expenses amounted to just under $2.3 million, and revenues and transfers just over $500,000 (Figure 3-4). Sixty-one percent of the City's operating expenses were staff wages and labour costs. Twenty-three percent were paid out to contract crews and labour. Remaining expenses were associated with materials, supplies, and administrative expenditures.

Forestry is currently dependent on contract labour support to meet maintenance demands from service requests.

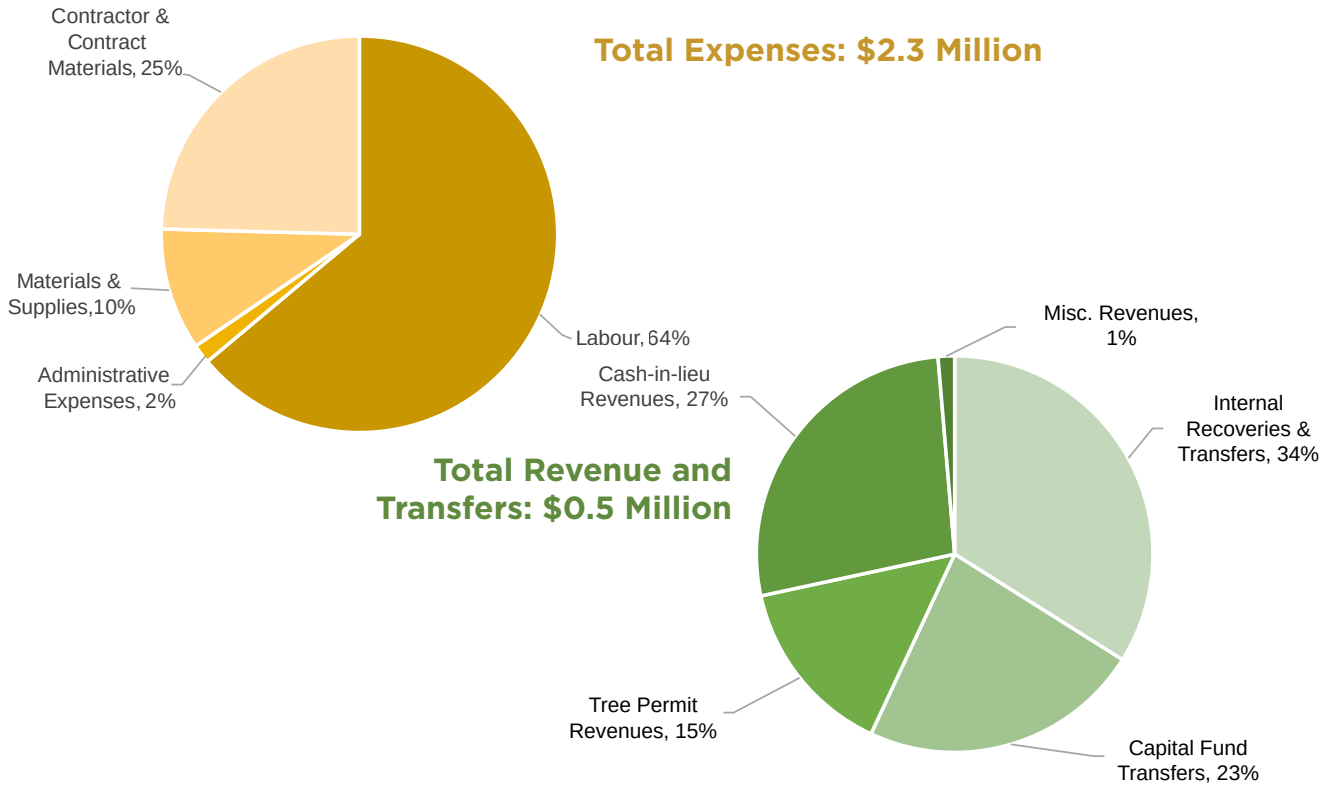
In terms of revenues and transfers in 2022, 34 percent were internal recoveries and transfers, and an additional 23 percent were capital fund transfers. Tree permit revenues made up approximately 15 percent of operating revenues, and associated cash-in-lieu proceeds made up an additional 27 percent.

3.5 Key Challenges

Resourcing

Program resourcing is the budget and staff resources available to support the maintenance, protection, management and growth of the city's urban forest. An urban forest management program can only be as effective as capacity permits. Like all modern cities, Vaughan actively invests in its urban forest, and as such makes decisions on program elements which are supported, or which are not, based on the level of funding made available. Every decision to resource or not resource an aspect of an urban forest management program has impact on the City's ability to optimize the management of the urban forest toward greater community benefit.

Figure 3-4. *Forestry group expenditure, revenues and transfers.*



At present, Vaughan's urban forest management program is almost exclusively reactive. Reactive programs tend to be less efficient in managing the urban forest because issues are only addressed when they become known to staff. Proactive programs, on the other hand, enhance urban forest outcomes by providing a regular maintenance regimen for all intensively managed trees, thereby reducing the frequency of preventable tree health issues and resolving problems before the trees reach a state of irreversible decline.

Pests, Disease and Invasives

In urban areas, insects, diseases, and invasive flora and fauna pose significant threats to the health of trees. Addressing these issues requires a considerable amount of the City's resources, including budgets and staff time. For instance, the Emerald Ash Borer (EAB) led to the removal of almost 9,000 public ash trees in Vaughan since its arrival in 2008, but Vaughan's EAB response has now officially ended. However, other pests and diseases continue to pose a threat to the urban forest.

Some of the current pest and disease threats to Vaughan's urban forest include the Asian long-horned beetle, oak wilt, spongy moth, hemlock woolly adelgid, and beech bark disease. Climate change has made the life cycles of insect pests faster, increasing their rate of development, reproduction, and overwinter survival. Moreover, environmental stressors can leave trees more vulnerable to pest infestations and diseases. For example, oak wilt is often transmitted through insect vectors that target stressed host plants.

Maintaining a diverse urban forest in terms of species composition is one of the most robust, passive forms of pest management. Forest pests and disease tend to have varied degrees of preference

Figure 3-5. *Small sampling of current exotic pests and disease of concern to Ontario. From left-to-right: EAB, hemlock woolly adelgid, Asian long-horned beetle (ALB), spongy moth (formerly gypsy moth), picnic beetle (not itself invasive, but a common vector for oak wilt), spotted lanternfly, and beech bark disease.*

toward specific species, genera, or families of plant. Higher urban forest diversity reduces the likelihood of a single pest negatively impacting large swaths of the city's trees, and can also work to reduce the spread of pests by making host plants less abundant in the urban landscape. However, diversification of Vaughan's urban forest is limited by the range of species that tolerate urban environments, and by the species that are commercially available for purchase. In woodlands, species diversity is also limited to ecologically appropriate native species.

Climate Change

A changing climate poses a significant risk to Vaughan's urban forest. Long-term changes in growing season temperature and precipitation may impact the range of species suitable for planting in the city, or could support conditions which could change the range or local life-cycle of forest pests and disease. Extreme weather will bring its own management challenges.

Significant storm events will introduce greater tree risk, and can result in months of clean up when they occur, draining program capacity. The May 21, 2022 derecho storm saw 1,000 service calls and cleanup required in 800 locations across Vaughan. Recurring and intense drought can contribute to tree stress and decline, and can make trees more susceptible to other sources of stress.

Proactive maintenance, including tree pruning and a structural young tree program can improve urban forest resilience to extreme weather, reducing the operational burden of response while promoting climate adaptation and mitigation. Healthy and well-managed trees will be stronger, less likely to be damaged by winds, less susceptible to secondary sources of stress, and provide essential benefits for public safety and climate adaptation.

The urban forest also itself provides adaptation and mitigation services[11,12]. Services such as stormwater absorption and urban heat island reduction can help manage some of the more severe impacts of climate change, while services such as carbon sequestration and energy reduction actively reduce the emissions originating from the City of Vaughan and the activities taking place within it.

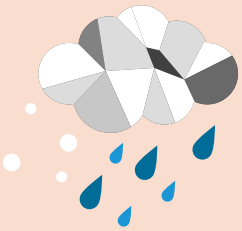
Data and Monitoring

Vaughan is committed to maintaining high standards for public data, as evidenced by its recent receipt of three International Organization of Standardization (ISO) certifications from the World Council on City Data (WCCD). These certifications include a Platinum ISO 37120 certification for both 2020 and 2021, as well as the ISO 37122 Early Adopter Smart Cities certification. The WCCD is a global leader in standardized

FUTURE CLIMATE WILL BE...

WARMER

- Warmer average temperatures
- More hot days (above 30 °C)
- Milder winters
- More frequent and longer heat waves
- Longer, warmer growing seasons



WETTER

- Increased annual precipitation, especially in the winter
- Increased frequency of heavy precipitation events

WILDER

- Potential changes in frequency and intensity of extreme weather events
- More freezing rain, hail
- More high wind gusts

THIS IS LIKELY TO LEAD TO...

MORE ISSUES WITH PESTS AND INVASIVE SPECIES

Pests may reproduce more rapidly and more often.

MORE EXTREME WEATHER EVENTS

Heat, extreme precipitation, flooding, ice storms or other events may happen more often.

data that helps create smart, sustainable, resilient, and prosperous cities. Achieving Platinum certification is a significant accomplishment, as it represents the highest level of certification offered by the WCCD[13].

Urban forest inventory datasets are crucial for evidence-based decision-making in urban forestry. A comprehensive street tree inventory is essential for scheduling proactive pruning, watering, and monitoring cycles, managing risk, and analyzing changes in the urban forest over time. Field plots in woodland areas provide valuable insights into long-term stand development, mortality, and recruitment, particularly given the effects of climate change.

Vaughan's street tree inventory last underwent a comprehensive update in 2016 and has not been maintained since. Additionally, the City does not have a formalized woodland monitoring program. Without current inventory and monitoring records to support proactive management and urban forest planning, the City cannot shift to a proactive management paradigm and will be unable to optimize the quality and life-cycles of its urban forest assets, nor to proactively manage tree risk.

Development Standards

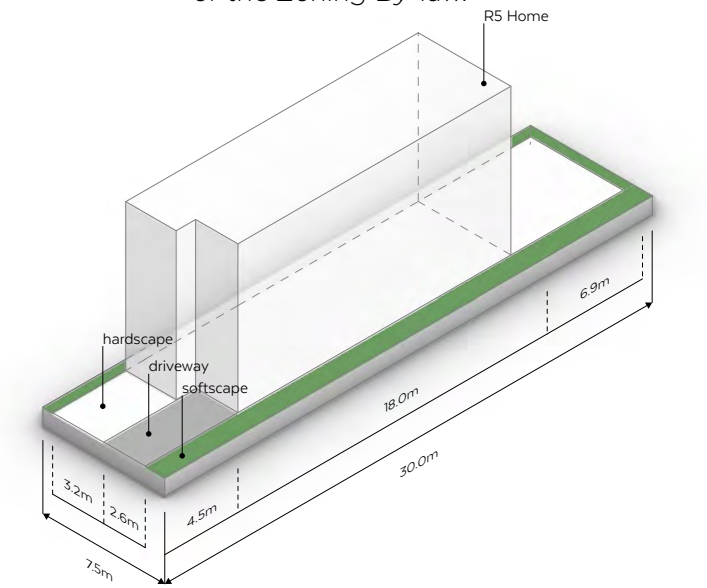
In the 1970s, Vaughan was a community of only 15,000 people.[14] However, over the past 50 years, the population has grown to over 320,000 residents, with millions of visitors each year. Most of this growth has been characterized by low-density, suburban built forms, similar to other Ontario communities that experienced a housing boom.

Moving forward, the development of intensification centres such as the Vaughan Metropolitan Centre (VMC) will consist of both intensification and greenfield development, both of which pose challenges for integrating the urban forest.

Intensification creates competition between trees and other critical infrastructure in limited public space, while greenfield development on small lots with minimal setbacks leaves little room for trees on both public and private property (Figure 3-1).

The core challenge in supporting continued growth is finding a balance between preserving or creating green space while accommodating higher-density development and affordable housing. While there is no single solution, the City must carefully consider the trade-offs in allowing developments that do not support the retention or replanting of trees that will be large at maturity. Once trees, or the space for them, are gone, it becomes expensive and difficult to reintroduce them.

Figure 3-1. *Hypothetical built form of a low-density development within the City's R5 Zone aligned with the requirements of the Zoning By-law.*



R5 Home
Hypothetical as-of-right built form.

Driveway Area: 14.5m^2 // 6%
Hardscape Area: 53.3m^2 // 24%
Softscape Area: 57.4m^2 // 25%
Building Footprint: 99.5m^2 // 45%

Encroachment and Enforcement

Vaughan's street trees and city-owned public woodlands are municipal assets. When private uses encroach upon city-owned land, it can threaten or complicate the maintenance of these assets. Typically, encroachment on public trees falls into one of two categories: encroachment into boulevards or encroachment into woodland areas.

In Vaughan, encroachment into woodland areas commonly takes the form of unauthorized trails or the unauthorized expansion of private uses, such as yards, into public woodlands. Encroachment into woodlands can harm the natural qualities of the ecosystem and reduce the community benefits that are generated by natural ecosystems. Additionally, it can set a negative precedent that neighbouring landowners may use to guide their own landscaping decisions.

Similar to other cities, Vaughan permits some types of encroachment into the boulevard space adjacent to private properties. However, according to the City's Encroachment By-law (034-2017), encroachment that interferes with City operations or modifies or interferes with City infrastructure, including trees, is prohibited.

Some types of boulevard alterations, such as excessive mulching, hardscaping, constructing deep planters, and using semi-permeable membranes over trees and roots, can harm tree health and reduce the lifespan of boulevard trees. Additionally, hardscaping can make it difficult for the City to replace trees without damaging the resident-installed hardscape.

The City has various mechanisms in place to address encroachment issues, depending on the specific circumstances. However, it is preferred that private landowners adhere to the City's policies and regulations on authorized forms of encroachment.

If you are unsure of the legal limit of your property line, please contact the City before starting any work.

What Constitutes Encroachment?

Encroachment is any unauthorized incursion of private use into a public land or use. As it relates to the City's public trees and woodlands, encroachment most commonly takes place in boulevard spaces, and often takes the form of hardscaping and/or planters around trees, which can significantly reduce a tree's expected service life.

Part 4. Regulatory Context

The City of Vaughan's management of its urban forests is subject to a variety of legislation, regulations, policies, standards, and guidelines. (Figure 4-1). This section provides a primer on the legislative and regulatory materials that apply within the city.

Term of Council Service Excellence Strategic Plan (2022-2026)

The Strategic Plan outlines the City's vision, mission, and values, as well as strategic key activities for the coming term of council. Environmental sustainability is a priority in the current strategic plan, with an emphasis on improving the stewardship of green infrastructure, supporting sustainability initiatives, and investing in climate resilience.

Guiding Policy and Plans

Planning policy establishes the broad types of use and activities that can be governed through specific regulations and standards, such as by-laws. Ontario's policy framework for urban development and intensification broadly allows for a growing population while protecting the province's critical

Figure 4-1. *While Vaughan's urban forest spans a range of land uses, this document is scoped around the City's forested parks and intensively managed street trees.*

environmental features, rural landscapes, and agri-food networks.

High-level policy direction is provided by documents such as the Provincial Policy Statement, Growth Plan for the Greater Golden Horseshoe, Oak Ridges Moraine Conservation Plan, and Greenbelt Plan, which are built on by the York Regional Official Plan and the City of Vaughan Official Plan.

The **York Regional Official Plan** addresses important matters, including provincially mandated growth, regional priorities, key opportunities and challenges, and places particular emphasis on forest protection and enhancement. This includes:

- Increasing woodland cover to 25 percent of York Region's total land area (3.4.25), and canopy cover to 40 percent (3.4.26);
- Policy requiring local municipalities to develop an Urban Forest Management Plan, together with York Region, which may include additional local woodlands for protection (3.4.29);
- Policy requiring local municipal official plans to include appropriate policies to prepare and enact tree-cutting by-laws in accordance with provisions in the *Municipal Act* (3.4.34);
- Policies requiring the development of a woodland compensation plan for the removal of woodlands not deemed significant (3.4.32);
- Integration with provincial mapping and policy; (3.4.4) and
- Several other policy outcomes related to a sustainable natural environment.

The **City of Vaughan Official Plan** sets out the City's vision and growth direction until 2031, with policies related to land use, transportation, infrastructure, environment, urban design, and community services. The urban forest's ecological, climate, and social values are recognized in the plan, with policies aimed at managing and enhancing this resource. Policies that are most relevant to urban forest management include:

- Requiring an urban forest inventory and forest management plan for forest resources in urban areas (3.3.3.5);
- Responding to climate change by growing the urban forest and undertaking carbon sequestration and storage audits to reduce "air emissions"/ greenhouse gas emissions (3.7.1.2);
- Improving the public realm through provision of street trees and landscaping (9.1.1.2);
- Providing a high-quality network of connected public green spaces, and a network of natural areas (9.1.1.7);
- Policies to establish urban greening targets (e.g., urban forest canopy) for Vaughan Metropolitan Centre and key development areas, streetscape improvement, and tree planting details in site plan control processes (10.1.1.4).

Associated Plans, Policies and Guidelines

The management of urban forests in the City of Vaughan is influenced by a substantial collection of plans, policies, and guidelines. These documents typically implement guiding policy documents like the Official Plan. Several of these documents and their relation to urban trees are outlined below.

The **Asset Management Plan (Urban Forestry)** aims to provide a financial and technical roadmap for managing the City's urban forest assets. This includes street

trees, park trees, woodlots, and open spaces. The recommendations cover tree/asset inventory, health condition assessments, maintenance approaches, levels of service frameworks, risk assessments, funding models, and training, communication, and knowledge sharing.

Green Directions Vaughan (GDV) was first approved by Council in 2009 as the City's community sustainability plan. It guides the community to a more sustainable future by addressing environmental, cultural, and economic values. In 2009, an updated GDV was adopted by Council and describes the City's environmental priorities and outlines a new set of sustainability actions. Actions specific to the urban forest and trees are focused on stormwater management (as part of infrastructure), provision of greenspace to support a growing population, and streetscape improvement. The City also approved a list of indicators to track progress on the implementation, which include greenspace and urban tree canopy.

The **York Region Climate Change Action Plan** charts a path for reduced emissions and prepares for York Region's future climate. The plan identifies goals and actions to achieve reduced emissions as well as to withstand and respond to current and future climate change impacts. Although the urban forest is not specifically mentioned, the Action Plan suggests actions to assess the vulnerability and ecosystem services of natural systems to inform adaptive planning.

Implementing By-laws and Policies

Several other implementing By-laws and standards influence urban forest management and are summarized below.

Zoning By-law: establishes minimum standards for landscape buffers, lot coverage, landscaped areas and building setbacks, which are major determinants of tree retention and replacement. Outstanding appeals mean the City is assessing new development applications on the basis of

conformity with two zoning By-laws (By-law 1-88, as amended and 001-2021, as amended).

City of Vaughan Tree Protection By-law (052-2018): applies to the City's urban area (with some exceptions) and includes provisions for public and private tree protection (>20 cm diameter breast height), replacement, and maintenance on public and private property. When a property owner wants to cut a tree, or a smaller-scale development is planned (e.g., building permits, pools, accessory buildings etc.) the private tree By-law applies, and a permit is required.

Site Plan Control By-law (123-2013): allows the City to evaluate the designs of buildings and sites, access, and landscaping (e.g., tree/vegetation size and type) prior to development approval to ensure new development design is appropriate and safe.

Encroachment By-law (034-2017): outlines rules to prevent any landscaping, vegetation, and natural or man-made objects from being located on the public boulevard or City parks or open spaces, prior to obtaining an encroachment permit. The By-law also applies to foliage extending into a Sight Triangle to be trimmed back to the property line, which may have implications to the planting and management decisions of private trees.

Tree Protection Protocol: identifies the procedure and standards required by the City to protect public and private trees through other development review processes, as enabled through provincial planning legislation. The protection protocol provides directions on evaluating

the impacts of development on trees, assessing tree permit applications, and tree preservation and management practices.

Sustainability Metrics Program: offers a set of tools to evaluate the sustainability performance of development proposals and encourage builders/developers to achieve a minimum level of performance. Metrics and requirements are set for urban tree canopy and shaded walkways/sidewalks, conservation of healthy mature trees on development sites, soil quantity and quality for new trees, and planting of native plants (trees, shrubs, etc.) to support pollinators.

York Region Forest Conservation By-law: generally requires a permit for tree removal in woodlands and woodlots throughout the Region. Some activities/removals are exempt. The By-law does provide criteria for the sizes and tree densities that constitute a woodland or woodlot as used in the By-law. The Forest Conservation By-law does not protect individual trees outside woodland or woodlot features.

York Region Construction Design Guidelines and Standards: are a series of documents that provides guidance on street designs, including specific guidelines on street trees and horticultural design, such as tree species selection and soil requirement.

Ontario Regulation 166/06: enables the Toronto and Region Conservation Authority to regulate work within valley and stream corridors, wetlands and associated areas, and the Lake Ontario waterfront. Projects are required to obtain a permit prior to development and establish an inventory of tree species with over 10 cm DBH within the proposed development area.

Ontario Regulation 588/17: sets out requirements for municipal asset management planning to help municipalities better understand their infrastructure needs and inform infrastructure planning and investment decisions. In compliance with O.Reg 588/17, the City integrated some urban forest asset classes into its asset management planning process for the first time in 2023.

Recent Regulatory Changes of Note

Recent changes to the Planning Act and associated provincial policy, such as those under Bill 109, Bill 108, Bill 23, and more recently, Bill 97, have both significantly impacted planning and land use paradigms within the Province and have influenced the powers of municipalities, conservation authorities and upper-tier municipalities in regulating development processes. These changes have broadly impacted the amounts of land the City can require as parkland through new development, increased as-of-right density associated with certain types of use, have exempted some applications from the site plan approval processes and others from requirements for landscaping plans. Numerous significant changes to Provincial planning policy has have been brought into force; these are said to provide greater flexibility in the planning process at the local level. The implications of these moves to urban forest management are yet unclear. In response to the planning landscape in flux, the City will need new policies and regulations in place to continue to ensure the protection of and consideration for natural features in development processes.

Part 5. Peer City Comparison

Benchmarking Vaughan against other municipalities that share geographic, economic, social, and/or demographic similarities to the city helps to generate insights into how the City's program compares to that of its peers. In Table 5-1, Vaughan has been compared to six peer communities, five of which are located in south-central Ontario and share similarities to Vaughan in terms of: population, density, land area, and/or woodland communities.

The comparison is divided into four themes of urban forest management: planning, planting, management, and protection.

The information in Table 5-1 was compiled through a review of publicly accessible materials from the six peer communities. These materials included urban forest management reports, tree policy documents, tree protection by-laws, corporate budgets and municipal websites.

Table 5-1. *City of Vaughan peer city comparison.*

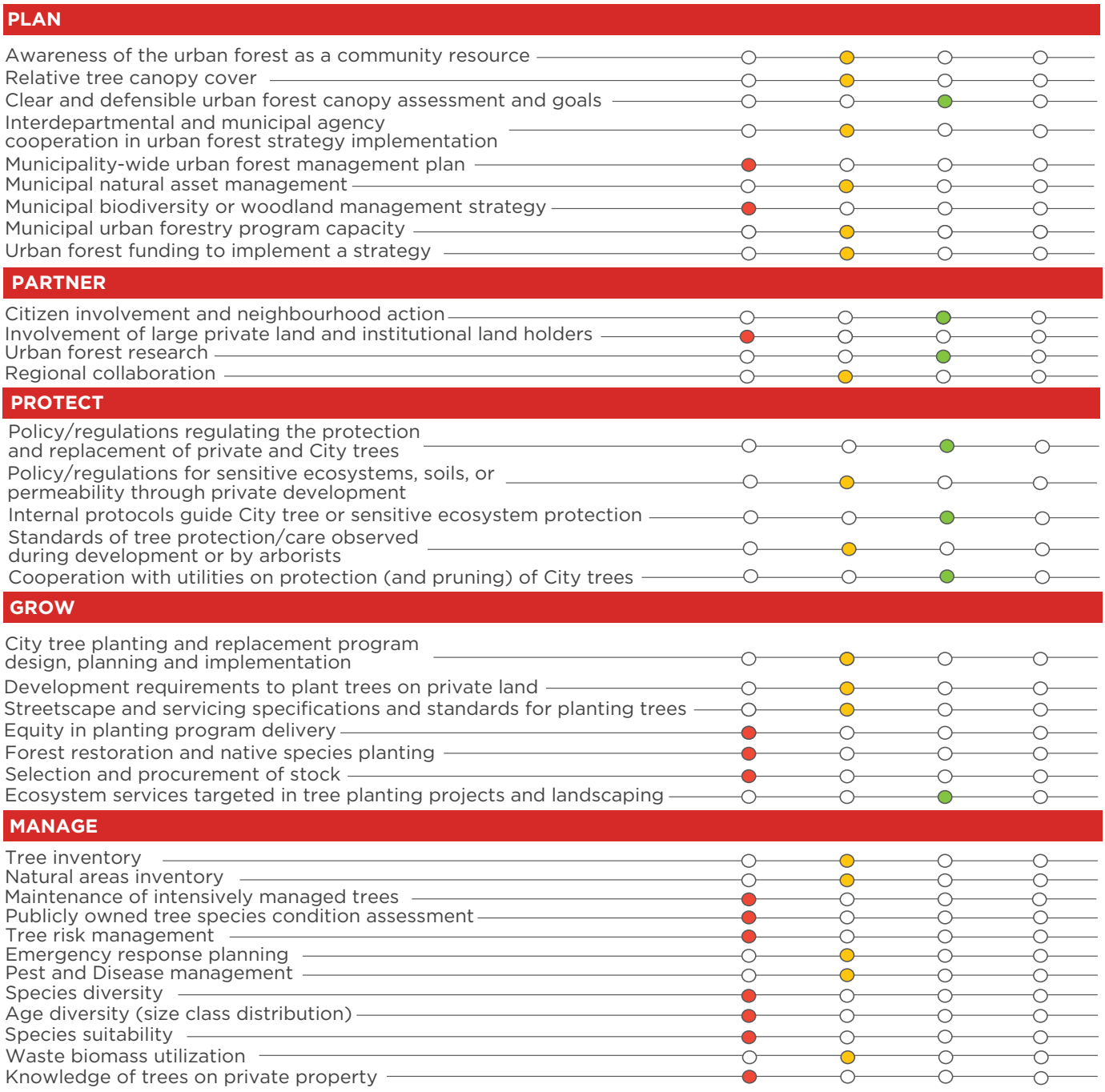
	Vaughan	Surrey	Oakville	Hamilton	Brampton	Burlington	London
Population (2021)	323,103	568,322	213,759	569,353	656,480	186,948	422,324
Pop density (people per km^2)	1,186	1,798	1,538	509	2,469	1,004	1,004
Land area (km^2)	272	316	139	1,118	266	186	420
PLAN							
Canopy Cover (Year)	20% (2019)	32% (2014)	28% (2015)	21% (2018)	18% (2015)	30% (2018)	24% (2015)
No. Inventoried Public Trees	130,000	104,000	170,000	420,000	NA	71,000	135,000
ISA-Certified Arborists On Staff?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operational Budget ($ millions)	$1.7	$4.8	$4.3	$15.1 (Forestry & Hort.)	$30.9 (Parks Maint. & Forestry)	$3.7	$15.8
Capital Tree Planting Budget ($ 000's thousands)	$1,000	Not reported	$800	$100	$2,700	$800	$225
Approximate $/ resident toward operating budget	$5.38	$8.45	$20.11	$26.52	$47.06	$19.78	$37.41
PLANTING							
Annual new public trees (Year)	2,000	4,475	Not reported	13,793 (2020)	±5,000-7,000 (Annually)	1,650 (2020)	±5,000 (Annually)
Regular woodland restoration/ planting events	No	Yes	Yes	No	No	No	Yes

	Vaughan	Surrey	Oakville	Hamilton	Brampton	Burlington	London
MANAGE							
Street Tree inventory Completeness	Out of Date	Current	Current	Current	Update Underway	Current	Current
Pruning Target	Reactive (22-Year)	5-Year	10-Year	7-Year	5 to 7-Year	7-Year	10-Year
Management Strategy/Plan	In Dev.	Yes	Yes	Yes	Yes	Yes	Yes
Formal Woodland Monitoring/ Management Program	No	No	Yes	No	No	No	Yes
PROTECT							
Public Tree By-law	Yes	Yes	Yes	Public Trees Only	Yes	Yes	Yes
Private Tree By-law	20cm DBH	20cm DBH	15cm DBH	None.	30cm DBH	20cm DBH	50cm DBH
Tree Protection Guidelines Document	Yes	No	No	Yes	No	No	No
Significant/ Heritage Tree clause	No	Yes	No		No	Yes	No
PARTNER							
Formalized urban forest stewardship program(s) backed by municipal resources	No	Yes	Yes	No	Yes	No	Yes
Opportunities for citizen science/ monitoring	No	Third-party	Yes	No	No	No	No
Reconciliation approach in parks and land management approach in parks and land management	Informal	Informal	Informal	Informal	Informal	Informal	Informal

Part 6. Program Report Card

Vaughan's urban forestry program has been evaluated within an urban forest sustainability framework first proposed by Clark and Matheny (1998)[15] and then updated by Leff in 2016.[16] These frameworks define a set of performance indicators which work to establish the current and optimal state of different element urban forest programs.

The criteria have been adapted to reflect local contexts. A full description of the criteria and indicators can be found under Appendix A.



Next Steps

The Urban Forest Report Card is a performance baseline that can be re-assessed each time a new State of the Urban Forest Report is prepared. Recommendations considered for the Vaughan's Urban Forest Management Plan will aim to shift the City's urban forest management program towards good and optimal ratings.

This Report comes at the end of the first round of engagement on the UFMP. A second round of engagement is set to take place in June 2023, and will provide an opportunity for residents and the public an additional opportunity to engage on the UFMP and WMS project. Visit haveyoursay.vaughan.ca/urbanforest for the latest information.

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Part 8. Appendices

Appendix A: Urban Forestry 'Report Card'

The criteria and indicators table is based on the following sources:

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The Sustainable Forestry Initiative has released a draft of its upcoming certification standard for urban forests. Once adopted, this standard is expected to become widely adopted in North America and may be useful for future comparison or progress reporting:

- Sustainable Forestry Initiative: SFI Urban and Community Forest Sustainability Standard (2021). Available online at: https://www.forests.org/wp-content/uploads/SFI-Urban-and-Community-Forest-Sustainability-Standard-%E2%80%93-November-1-2021.pdf

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Clear and defensible urban forest canopy assessment and goals	Urban forest policy and practice is driven by comprehensive goals municipality-wide and at the neighbourhood or land use scale informed by accurate, high-resolution assessments of existing and potential canopy cover.	No assessment or goals.	Low-resolution and/or point-based sampling of canopy cover using aerial photographs or satellite imagery – and limited or no goal setting.	Complete, detailed, and spatially explicit, high-resolution Urban Tree Canopy (UTC) assessment based on enhanced data (such as LiDAR) – and limited or no goal setting.	The City has a complete, detailed, and spatially explicit high-resolution Urban Tree Canopy (UTC) assessment accompanied by a comprehensive set of goals, all utilized effectively to drive urban forest policy and practice municipality-wide and at neighbourhood or smaller management level.
Interdepartmental and municipal agency cooperation on urban forest strategy implementation	Ensure all relevant municipal departments and agencies cooperate to advance goals related to urban forest issues and opportunities.	Little cooperation and conflicting among departments **and/or** agencies often leading to poor outcomes for trees.	Common goals but limited cooperation among departments **and/or** agencies and mixed outcomes for trees.	Municipal departments, affected agencies and urban forest managers recognize potential conflicts and reach out to each other on an informal but regular basis.	Formal interdepartmental working agreements or protocols for all projects that could impact municipal trees.
Municipality-wide urban forest management plan	Develop and implement a comprehensive urban forest management plan for public and private property.	No plan.	Existing plan limited in scope and implementation.	Recent comprehensive plan developed and implemented for publicly owned forest resources, including trees managed intensively (or individually) and those managed extensively, as a population (e.g., trees in natural areas).	Strategic, multi-tiered plan with built-in adaptive management mechanisms developed and implemented for public and private resources.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Plan					
Awareness of the urban forest as a community resource	The urban forest is recognized as vital to the community's environmental, social, and economic well-being.	General ambivalence or negative attitudes about trees, which are perceived as neutral at best or as the source of problems. Actions harmful to trees may be taken deliberately.	Trees are widely acknowledged as providing environmental, social, and economic services but are not widely integrated in corporate strategies and policies.	Trees are widely acknowledged as providing environmental, social, and economic services and urban forest objectives are integrated into other corporate strategies and policies.	Urban forest recognized as vital to the community's environmental, social, and economic well-being. Widespread public and political support and advocacy for trees, resulting in strong policies and plans that advance the viability and sustainability of the entire urban forest.
Relative tree canopy cover	Achieve desired degree of tree cover, based on potential or according to goals set for entire municipality and for each neighbourhood or land use.	The existing canopy cover for entire municipality is <50 percent of the desired canopy.	The existing canopy is 50 percent-75 percent of desired.	The existing canopy is >75 percent-100 percent of desired.	The existing canopy is >75 percent-100 percent of desired - at the individual neighborhood level as well as overall municipality.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Partner					
Citizen involvement and neighbourhood action	Citizens and groups participate and collaborate at the neighbourhood level with the municipality and/or its partnering NGOs in urban forest management activities to advance municipality-wide plans.	Little or no citizen involvement or neighborhood action.	Community groups are active and willing to partner in urban forest management, but involvement and opportunities are ad hoc.	Several active neighborhood groups engaged across the community, with actions coordinated or led by municipality and/or its partnering NGOs.	Proactive outreach and coordination efforts by the City and NGO partners result in widespread citizen involvement and collaboration among active neighbourhood groups engaged in urban forest management.
Involvement of large private land and institutional land holders (e.g., schools)	Large private landholders to embrace and advance city-wide urban forest goals and objectives by implementing specific resource management plans.	Large private landholders are generally uninformed about urban forest issues and opportunities.	Landholders manage their tree resource but are not engaged in meeting municipality-wide urban forest goals.	Landholders develop comprehensive tree management plans (including funding strategies) that advance municipality-wide urban forest goals.	As described in "Good" rating, plus active community engagement and access to the property's forest resource.
Urban forest research	Research is active and ongoing towards improving our understanding of the urban forest resource, the benefits it produces, and the impacts of planning, policy, design and management initiatives.	No urban forest research.	Isolated academic research occurs in the municipality's urban forest.	The municipality supports and has input on academic research occurring in its urban forest and knowledge transfer occurs.	The urban forest is a living laboratory - in collaboration with public, private, NGO and academic institutions - integrating research and innovation into managing urban forest health, distribution, and abundance.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Municipal infrastructure asset management	Integrate green infrastructure assets into the municipal asset management system to support valuing and accounting for natural assets in the City's financial planning to build climate resilient infrastructure.	No recognition of value of natural or human-made elements that provide ecological and hydrological functions (green infrastructure).	Local government recognizes the value of green infrastructure but does not yet have information to include them in an asset management system.	Green infrastructure assets have been partially or fully inventoried and some assets are included in an asset management system, with the intent to ultimately capture all assets in the consolidated financial statements of the municipality.	Green infrastructure assets are inventoried and included in an asset management system and on the consolidated financial statement of the municipality.
Municipal-wide biodiversity or woodland management strategy	Acquire and restore publicly-owned natural areas in pursuit of meeting municipal-wide biodiversity and woodland management goals.	No or very limited planning and stewardship of natural areas.	Area specific management plans focused on management, restoration, and protection of natural areas.	Municipal-wide urban forest, parks or natural areas strategy guiding management, restoration, and protection of the existing natural areas network.	Biodiversity strategy or equivalent in effect to manage, restore and existing and acquire future natural areas network throughout the municipality.
Municipal urban forestry program capacity	Maintain sufficient well-trained personnel and equipment – whether in-house or through contracted or volunteer services – to implement municipality-wide urban forest management plan.	Team severely limited by lack of personnel and/or access to adequate equipment. Unable to perform adequate maintenance, let alone implement new goals.	Team limited by lack of staff and/or access to adequate equipment to implement new goals.	Team able to implement many of the goals and objectives of the urban forest management plan.	Team able to implement all of the goals and objectives of the urban forest management plan.
Urban forest funding to implement a strategy	Maintain adequate funding to implement the urban forest strategy.	Little or no dedicated funding.	Dedicated funding but insufficient to implement the urban forest strategy or maintain new assets as they are added to the inventory.	Dedicated funding sufficient to partially implement the urban forest strategy and maintain new assets as they are added to the inventory.	Sustained funding to fully implement the urban forest strategy and maintain new assets as they are added to the inventory.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Internal protocols guide City tree or sensitive ecosystem protection	Ensure all relevant municipal departments follow consistent tree or ecosystem protection protocols for capital design and construction activities.	No protocols guiding City tree or ecosystem protection for capital design and construction activities.	Informal and inconsistent processes followed for City tree or ecosystem protection for capital design and construction activities.	Established protocols for City tree or ecosystem protection for capital design and construction activities but outcomes are inconsistent or sometimes unachievable.	Established protocols for City tree or ecosystem protection for capital design and construction activities are consistently followed and outcomes are successful.
Standards of tree protection and tree care observed during development or by local arborists and tree care companies	Consulting arborists and tree care companies understand city-wide urban forest goals and objectives and adhere to high professional standards.	Limited understanding or support for tree protection requirements.	General understanding or support for tree protection requirements but large variation in the quality of information and services provided.	General understanding or support for tree protection requirements and generally consistent quality of information and services provided.	Advocacy for tree protection requirements, engagement with City staff on improving processes and standards, and generally consistent quality of information and services provided to high professional standards.
Cooperation with utilities on protection (and pruning) of City trees	All 3rd party utilities employ best management practices and cooperate with the City to advance goals and objectives related to urban forest issues and opportunities.	Utilities take actions impacting urban forest with no municipal coordination or consideration of the urban forest resource.	Utilities inconsistently employ best management practices, rarely recognizing potential municipal conflicts or reaching out to urban forest managers and vice versa.	Utilities employ best management practices, recognize potential municipal conflicts, and reach out to urban forest managers on an ad hoc basis – and vice versa.	Utilities employ best management practices, recognize potential municipal conflicts, and consistently reach out to urban forest managers and vice versa.
Grow					

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Regional collaboration	There is cooperation and interaction on urban forest plans among neighbouring municipalities within the region, and/ or within regional agencies.	Municipalities have no interaction with each other or the broader region for planning or coordination on urban forestry.	Some neighboring municipalities and regional agencies share similar policies and plans related to trees and urban forest.	Some urban forest planning and cooperation across municipalities and regional agencies.	Widespread regional cooperation resulting in development and implementation of regional urban forest strategy.
Protect					
Policy or regulations regulating the protection and replacement of private and City trees	Secure the benefits derived from trees on public and private land by enforcement of municipality-wide policies and practices including tree protection.	No or very limited tree protection policy.	Policies in place to protect public trees and employ industry best management practice.	Policies in place to protect public and private trees with enforcement but lack integration with other municipal policy to enable effective tree retention.	Urban forest strategy and integrated municipal-wide policies that guide the protection of trees on public and private land, and ensure they are consistently applied and enforced.
Policy or regulations for conservation of sensitive ecosystems, soils, or permeability on private property through development	Secure the benefits derived from environmentally sensitive areas by enforcement of municipality-wide policies in pursuit of meeting biodiversity and connectivity goals.	No or very limited protection of natural features.	Policies in place to protect natural features and areas, whether privately or publicly owned, but no or otherwise very limited enforcement success.	Policies in place to protect natural features and areas, whether privately or publicly owned, and which have effective enforcement processes, but which lack integration with other municipal policies to enable effective tree retention.	Biodiversity strategy or equivalent integrated with the broad municipal policy direction(s) to guide natural features and areas protection and to ensure regulations are consistently applied.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Streetscape and servicing specifications and standards for planting trees	Ensure all publicly owned trees are planted into conditions that meet requirements for survival and maximize current and future tree benefits.	No or very few specifications and standards for growing sites.	Specifications and standards for growing sites exist but are inadequate to meet urban forest goals.	Specifications and standards exist and are adequate to meet urban forest goals but are not always achieved.	All trees planted are in sites with adequate soil quality and quantity, and with sufficient growing space to achieve their genetic potential and life expectancy, and thus provide maximum ecosystem services.
Equity in planting program delivery	Ensure that the benefits of urban forests are made available to all, especially to those in greatest need of tree benefits.	Tree planting and outreach are not determined equitably by canopy cover or need for benefits.	Planting and outreach includes attention to low canopy neighborhoods or areas.	Planting and outreach targets neighborhoods with low canopy and a high need for tree benefits.	Equitable planting and outreach at the neighbourhood level are guided by strong citizen engagement in identified low-canopy/high-need areas.
Forest restoration and native species planting	Encourage the appreciation of climate suitable native vegetation by the community and ensure native species are widely planted to enhance native biodiversity and connectivity.	Voluntary use of climate suitable native species on publicly and privately-owned lands.	The use of climate suitable native species is encouraged on a site-appropriate basis in public and private land development projects.	Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects but are not integrated across all policy or guided by a connectivity analysis.	Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects and through tree By-law.

Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
City tree planting and replacement program design, planning and implementation	Comprehensive and effective tree selection, planting and establishment program that is driven by canopy cover goals and other considerations according to the UFMP.	Tree replacement and establishment is ad hoc.	Some tree planting and replacement occurs, but with limited overall municipality-wide planning and insufficient to meet replacement requirements.	Tree replacement and establishment is directed by needs derived from an opportunities assessment and species selection is guided by site conditions, tree health and climate adaptation considerations.	Tree planting and replacement is guided by strategic priorities and is planned out to make progress towards targets set for canopy cover, diversity, tree health and climate adaptation within the timeframe of the strategy.
Development requirements to plant trees on private land	Ensure that new trees are required in landscaping for new development or, where space is lacking, there is an equivalent contribution to tree planting in the public realm.	Landscaping requirements do not address trees on private land.	Developments are generally required to provide replacement but the outcomes are often in conflict with public trees and other infrastructure due to space limitations and not connected to meeting canopy cover targets.	Developments are required to provide replacement trees or, where space is not adequate according to soil volume available, provide cash-in-lieu for equivalent tree planting on public land. The requirement is not connected to meeting canopy cover targets.	Developments are required to provide a minimum density of trees per unit measure or, where space is not adequate according to soil volume available, provide adequate cash-in-lieu for equivalent tree planting on public land. Planting density is determined based on meeting a municipal-wide canopy cover target.

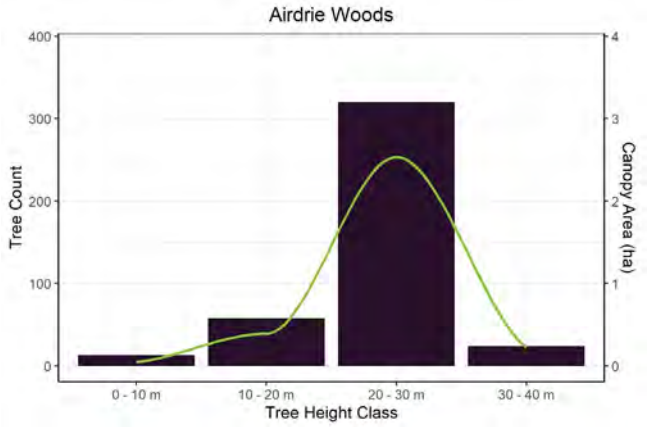
Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Natural areas inventory	A current and comprehensive inventory of sensitive and modified natural ecosystems and their quality mapped to Provincial standards to provide standardized ecological information to support decision-making.	No municipal inventory of natural areas.	Natural areas inventoried in GIS but not recently updated and attribute information not to a standard that can support decision-making.	Natural areas inventoried in GIS and with standard and complete attribute information to support decision-making but not updated in the last 5 years.	Natural areas inventoried in GIS and with standard and complete attribute information to support decision-making and updated in the last 5 years.
Maintenance of intensively managed trees	Maintain all publicly owned intensively managed trees for optimal health and condition in order to extend longevity and maximize current and future benefits.	Intensively managed trees are maintained on a request/ reactive basis.	Intensively managed trees are maintained on a request/ reactive basis. Limited systematic (block) pruning and/ or immature trees are structurally pruned.	All intensively managed trees are systematically maintained on a cycle determined by workload and resource limitations. All immature trees are structurally pruned.	All mature intensively managed trees are maintained on an optimal pruning cycle. All immature trees are structurally pruned.
Publicly owned tree species condition assessment	Current and detailed understanding of condition and risk potential of all publicly owned trees that are managed intensively (or individually).	Condition of urban forest is unknown.	Sample-based tree inventory indicating tree condition and risk level.	Complete tree inventory that includes detailed tree condition ratings.	Complete tree inventory that is GIS-based and includes detailed tree condition as well as risk ratings.

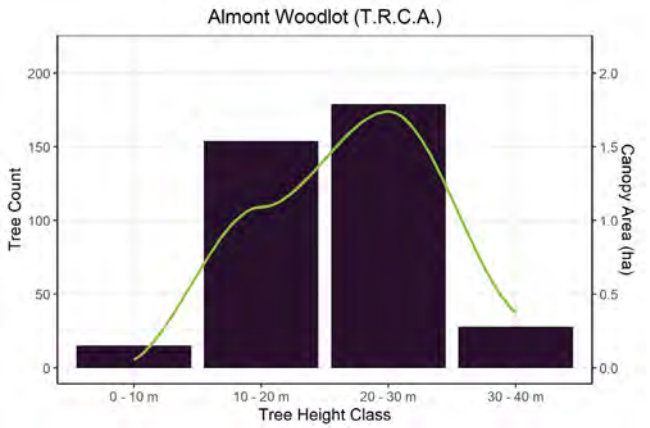
Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Selection and procurement of stock in cooperation with nursery industry	Diversity targets and climate adaptation/ mitigation objectives guide tree species selection and nurseries proactively grow stock based on municipal requirements.	Species selection is not guided by diversity targets or climate adaptation/ mitigation objectives.	Species selection is guided by diversity and climate adaptation/ mitigation but required stock is rarely available from nurseries and acceptable substitutes reduce diversity.	Species selection is guided by targets for diversity and climate adaptation/ mitigation and required stock or acceptable substitutes are usually available from nurseries.	Species selection is guided by targets for diversity and climate adaptation/ mitigation and required stock is secured ahead of the planned planting year from contract or in-house nurseries.
Ecosystem services targeted in tree planting projects and landscaping	Incorporate ecosystem services objectives into public and private tree planting projects to improve urban tree health and resilience, carbon sequestration, stormwater management and cooling.	Ecosystem services not considered in planting projects or intentionally designed into vegetated landscapes.	Ecosystem services, such as stormwater interception, occasionally incorporated into City or private land planting projects and landscape designs.	Guidelines in place for planting projects and landscape designs on public and private land to deliver specific ecosystem services.	Ecosystem services targets are defined for the urban forest and policy requires planting project and landscape designs on public and private land to contribute to meeting targets.
Manage					
Tree inventory	A current and comprehensive inventory of intensively managed trees to guide management, including data such as age distribution, species mix, tree condition and risk assessment.	No inventory or spatially indiscreet inventory.	Partial inventory of publicly-owned trees in GIS.	Complete inventory of street trees and intensively managed park trees in GIS but inconsistently updated.	The municipal tree inventory is complete, is GIS-based, supported by mapping, and is continuously updated to record growth, work history and tree condition.

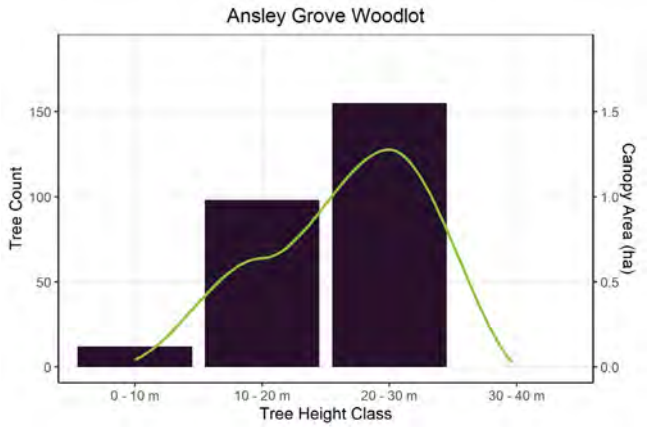
Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Age diversity (size class distribution)	Provide for ideal age distribution for all "intensively" managed trees – municipality-wide as well as at neighbourhood level.	Even-age distribution, **or** highly skewed toward a single age class (maturity stage) across entire population, **or** tree age distribution is unclear due to inventory gaps.	Some uneven distribution, but most of the tree population falls into a single age class.	Total tree population across municipality approaches an ideal age distribution of 40 percent immature, 30 percent semi-mature, 20 percent mature, and 10 percent old.	Total population approaches that ideal distribution municipality-wide as well as at the neighborhood level.
Species suitability	Establish a planted tree population suited to the urban environment and adapted to the overall region.	Fewer than 50 percent of planted trees are from species considered suitable for the area, **or** species suitability is unclear due to inventory gaps.	>50 percent-75 percent of planted trees are from species suitable for the area.	More than 75 percent of planted trees are suitable for the area.	Virtually all planted trees are suitable for the area.
Waste biomass utilization	A closed system diverts all urban wood and green waste through reuse and recycling.	Wood waste from the urban forest is not utilized.	Wood waste from the urban forest is utilized as mulch or biofuel.	Wood waste from the urban forest is utilized as mulch or biofuel and sometimes high value pieces are milled and stored for later use or sold on to local value-added industries.	Low value wood waste from the urban forest is utilized as mulch or biofuel and all high value pieces are milled and stored for later use or sold on to local value-added industries.
Knowledge of trees on private property	Understand the extent, location, and general condition of privately-owned trees.	No information about privately owned trees.	Aerial, point-based or low-resolution assessment of tree canopy on private property, capturing broad extent.	Detailed Urban Tree Canopy analysis of the urban forest on private land, including extent and location, integrated into a municipality-wide GIS system.	The City has an i-Tree Eco analysis of private trees as well as detailed Urban Tree Canopy analysis of the entire urban forest integrated into a municipality-wide GIS system.

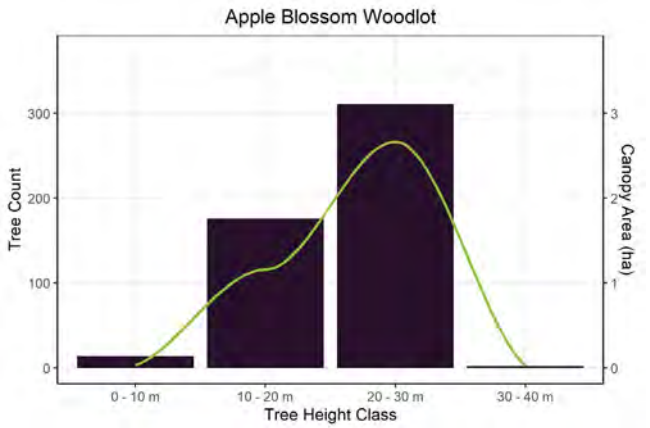
Assessment Criteria	Objective	Indicators for Urban Forestry Performance			
		Poor	Fair	Good	Optimal
Tree risk management	Comprehensive tree risk management program fully implemented, according to ANSI A300 (Part 9) "Tree Risk Assessment" standards, and supporting industry best management practices.	No coordinated tree risk assessment or risk management program. Response is on a reactive basis only.	Some areas within the city are prioritized for risk assessment and management. Little annual budget is available to develop a more proactive inspection program.	Priority areas of the City are inspected on a regular schedule and operational standards and budgets are in place for responding to and managing tree risks within an appropriate timeframe.	A comprehensive risk management program is in place, with all public lands inspected on defined schedules and operational standards and budgets in place for responding to and managing tree risks within an appropriate timeframe.
Emergency response planning	A response plan guides call-out procedures, resources available and the clean-up response for extreme weather and earthquake.	Response plan not documented or not current.	Response plan is documented and includes call-out procedures, roles and responsibilities but lacks details to prioritize hazards and clean-up.	Response plan includes call-out procedure, roles and responsibilities, and criteria for prioritizing tree hazards and removing debris is in place.	A comprehensive response plan is in place and a response drill occurs annually.
Pest and Disease Management	An Integrated Pest Management (IPM) plan guides treatment responses to existing and potential pest, disease and invasive species threats to the urban forest.	No integrated pest management plan and no pest management.	No or otherwise outdated integrated pest management plan and reactive pest management.	An integrated pest management plan is in place and implemented.	A comprehensive pest management program is in place, with detection, communication, rapid response and IPM practiced.
Species diversity	Establish a genetically diverse population across the municipality as well as at the neighbourhood scale.	Five or fewer species dominate the entire tree population across municipality, **or** species proportions are unclear due to inventory gaps.	No single species represents more than 10 percent of the total tree population; no genus more than 20 percent, and no family more than 30 percent.	No single species represents more than 5 percent of total tree population; no genus more than 10 percent; and no family more than 15 percent.	At least as diverse as "Good" rating (5/10/15) municipality-wide - and at least as diverse as "fair" (10/20/30) at the neighborhood level.

Appendix B: Woodlot Height-Area Frequency Plots

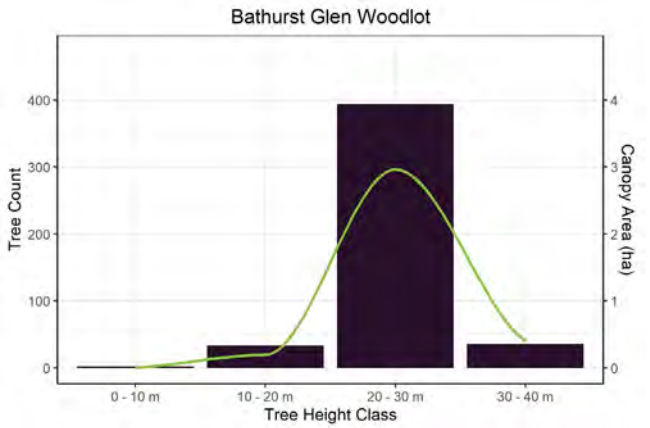

Airdrie Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

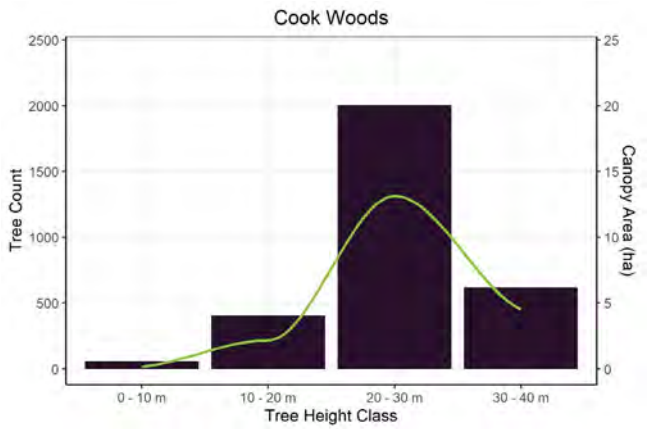

Almont Woodlot (T.R.C.A.)
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

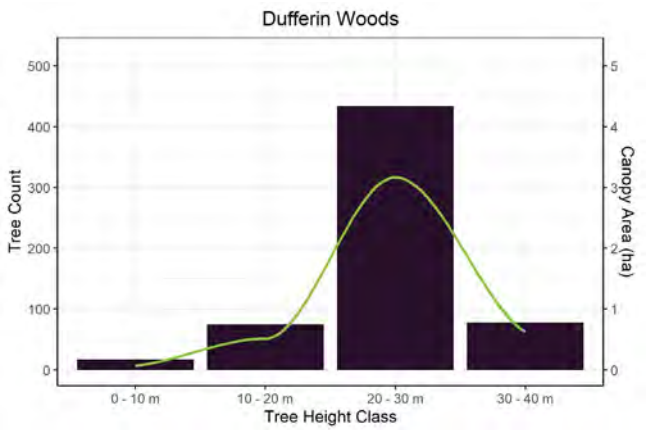

Ansley Grove Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

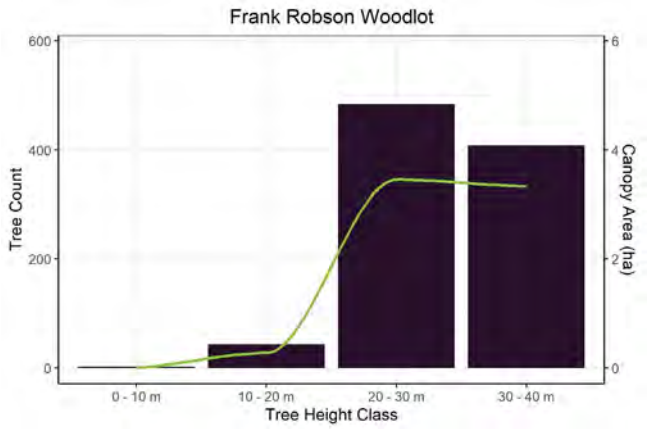

Apple Blossom Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

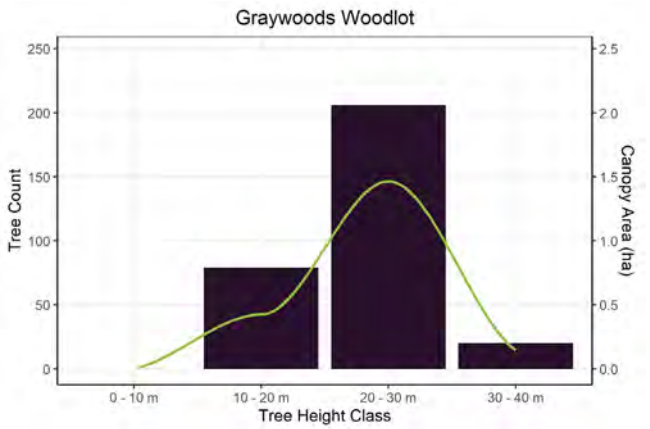
Autumn Hill Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

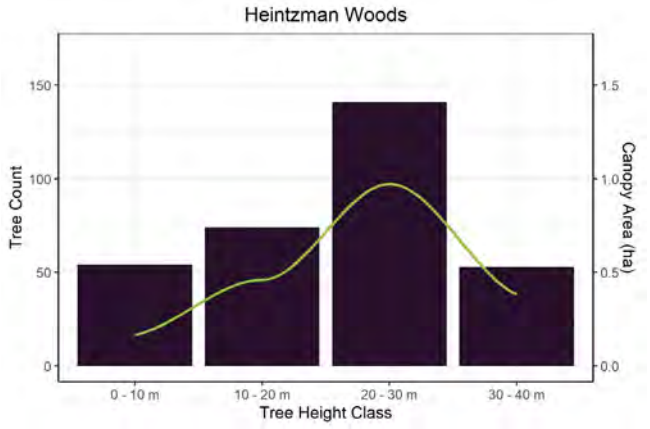

Bathurst Glen Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

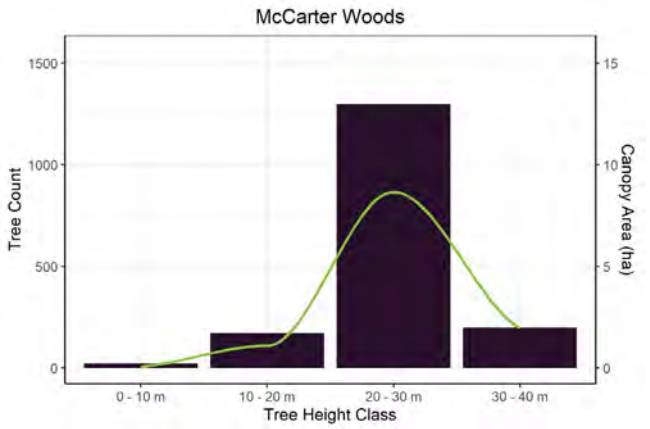

Cook Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class


Dufferin Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

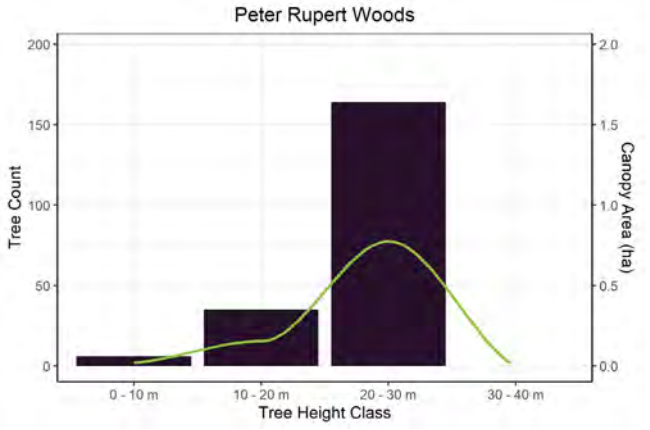

Frank Robson Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class


Graywoods Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

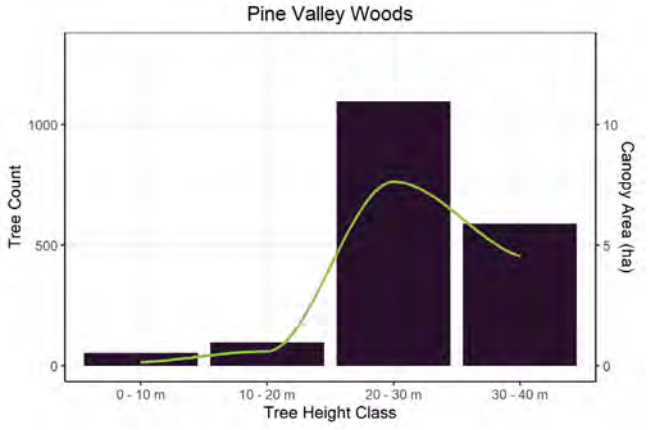

Heintzman Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

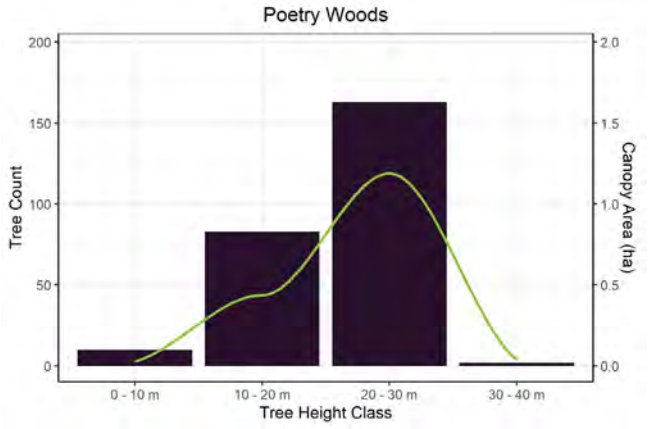

McCarter Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

Millwood Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

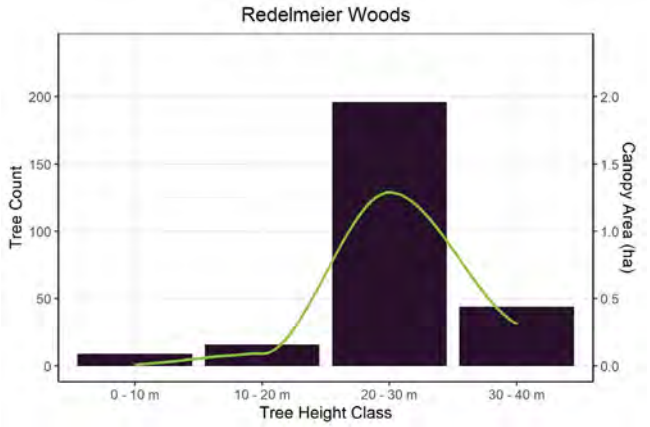

Peter Rupert Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

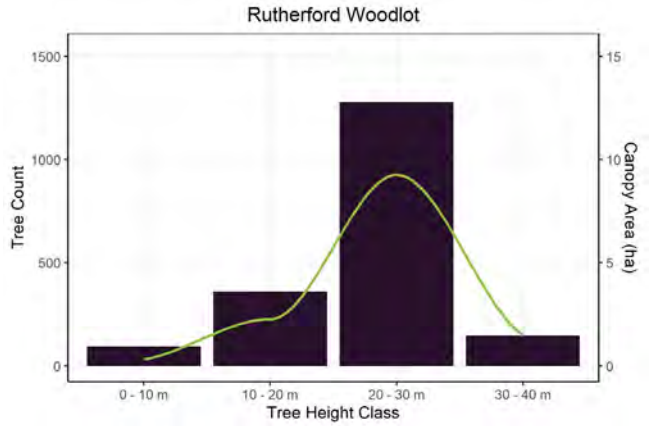
Pierre Berton Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

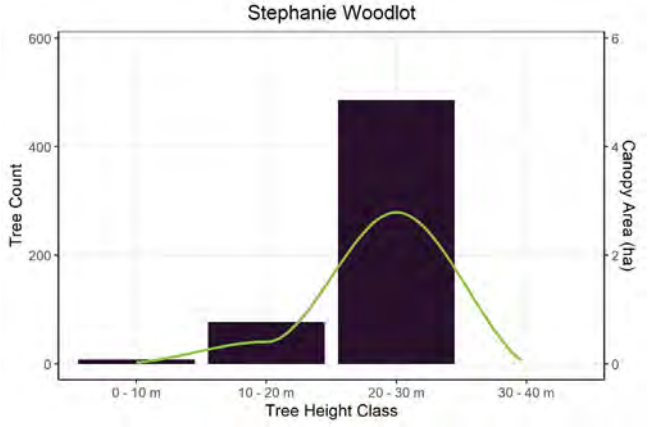

Pine Valley Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

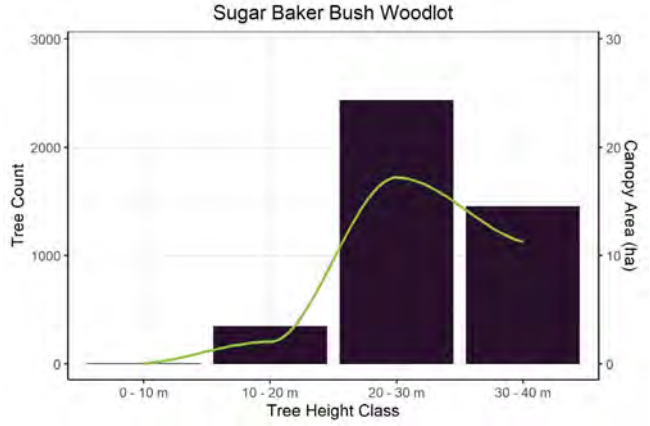

Poetry Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

Promenade Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

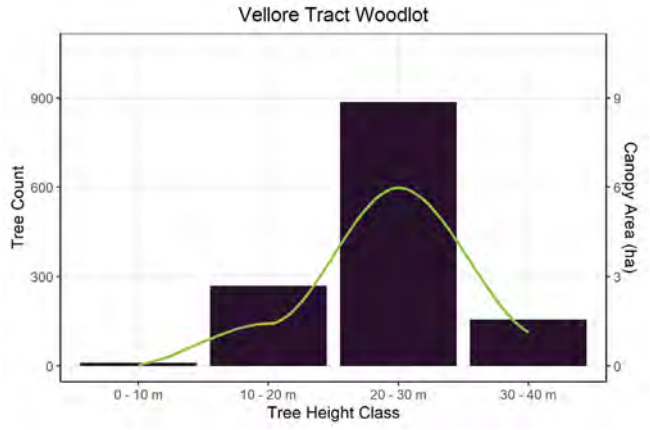

Redelmeier Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

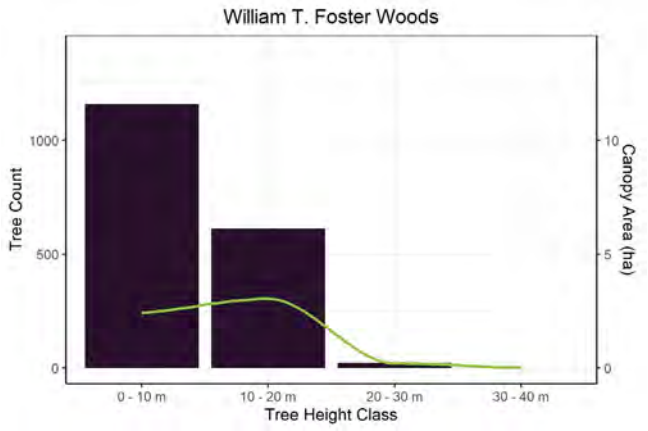

Rutherford Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

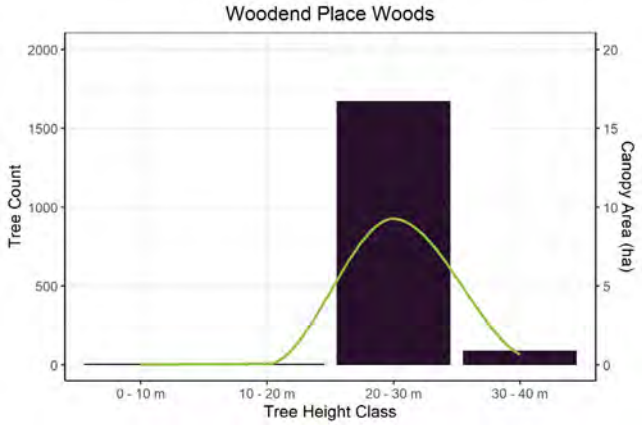

Stephanie Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

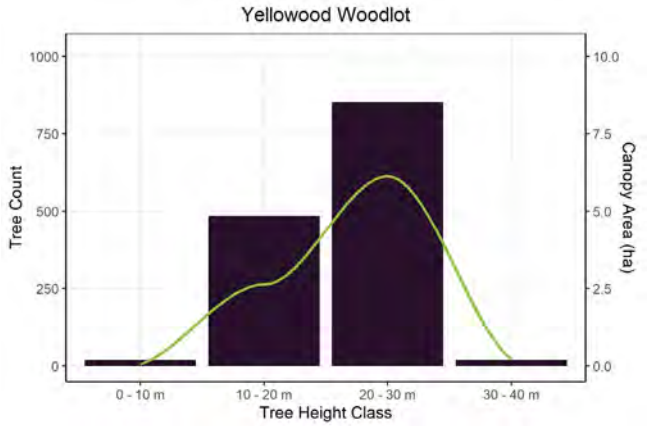

Sugar Baker Bush Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

Thornhill Woods
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class


Vellore Tract Woodlot
Tree Count
Canopy Area (ha)
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class


William T. Foster Woods
Tree Count
Canopy Area (ha)
0
500
1000
0
5
10
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class


Woodend Place Woods
Tree Count
Canopy Area (ha)
0
500
1000
1500
2000
0
5
10
15
20
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class


Yellowood Woodlot
Tree Count
Canopy Area (ha)
0
250
500
750
1000
0.0
2.5
5.0
7.5
10.0
0 - 10 m
10 - 20 m
20 - 30 m
30 - 40 m
Tree Height Class

Appendix C: Version History

Version 1.0: June 2023

- *original publication.*

Version 1.2: September 2023

Changes:

- *pg.4 Correction - dollar value ($) for C Sequestered annually in trees (t).*
- *pg.4 Correction - dollar value ($) for C stored in trees (t).*
- *pg.4 Correction - software reference.*

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VAUGHAN

Attachment 2

Woodland Management Strategy

March 2024

City of Vaughan

VAUGHAN

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Land Acknowledgment

We respectfully acknowledge that the City of Vaughan is situated in the Territory and Treaty 13 lands of the Mississaugas of the Credit First Nation. We also recognize the traditional territory of the Huron-Wendat and the Haudenosaunee. The City of Vaughan is home to many First Nations, Métis and Inuit people today. As representatives of the people of the City of Vaughan, we are grateful to have the opportunity to work and live in this territory.

Project Team Acknowledgment

The development of this Woodland Management Strategy was achieved through the joint collaboration of the City's project management team and external technical professionals.

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The Strategy at a Glance

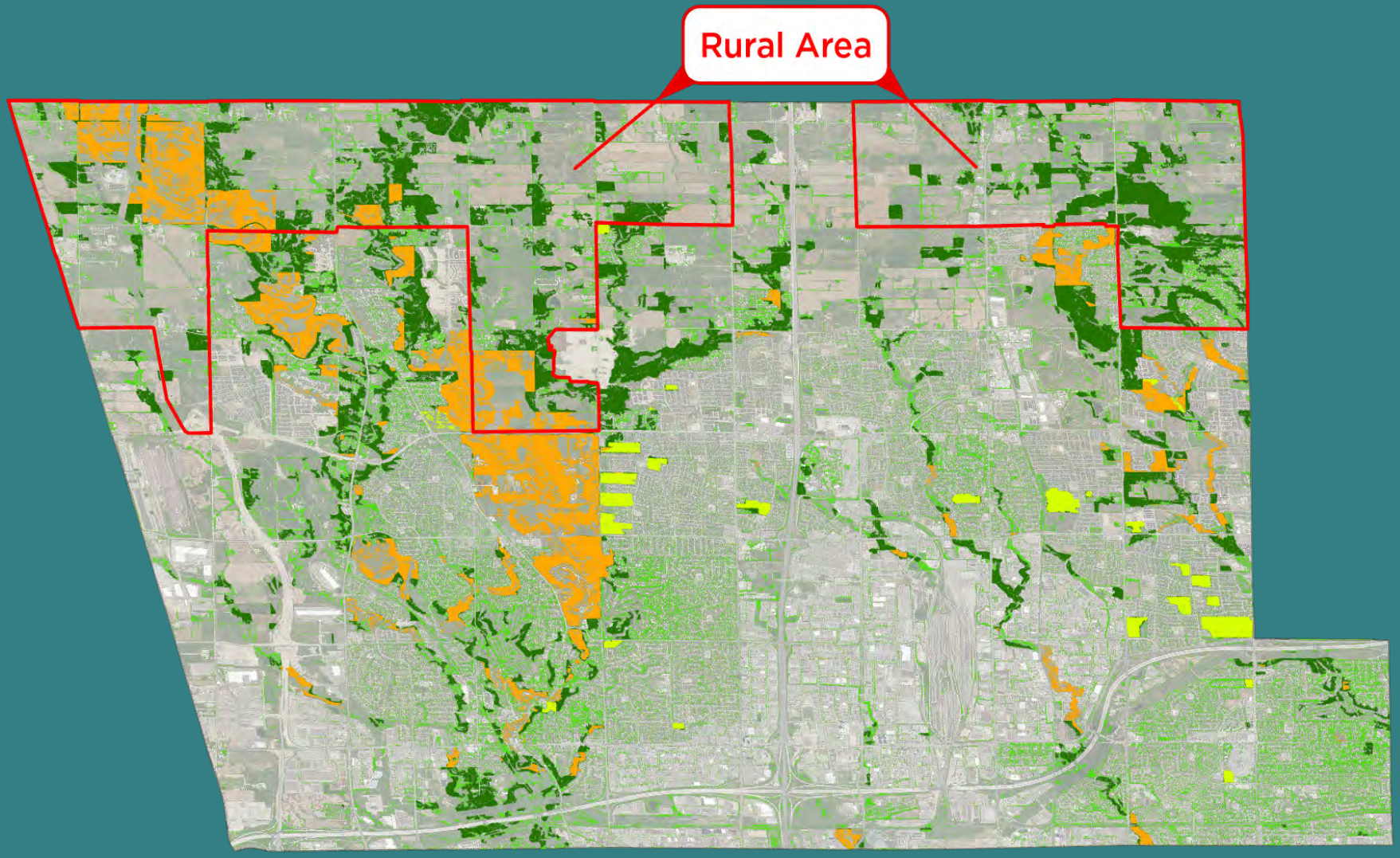
This document is Vaughan's first woodland management strategy (WMS). Woodlands are natural forested areas defined by the City's Official Plan in alignment with Ontario's *Forestry Act* and *Municipal Act*. Woodlands occur across the City on public and private property. Among woodlands, the City directly owns and manages 27 community "woodlots" that are a special focus for this document.

Vaughan is home to approximately 3,300 hectares of woodland area. Nearly 6% (200 hectares) is owned and managed by the City in one of 27 woodlots. Woodlands occupy 12% of Vaughan's land area, contributing more than half of the total tree canopy cover. Despite playing a crucial role in providing various social, cultural, and ecological services to residents and visitors, woodlands in the City have not been managed proactively. Emerging pressures from urbanization, globalization, and climate change pose challenges to the resilience of these vital community assets. A coordinated and evidence-based approach to woodland management is needed to address these challenges.

This Strategy consists of four main parts:

In **Section 1**, the Woodland Management Strategy is introduced. A broad overview of the City's woodlands is provided with the history of their management, and relevant regulatory and ecological contexts.

In **Section 2**, the strategic framework for the Woodland Management Strategy is identified. This section presents the various program actions, each categorized under one of five goal areas, along with a set of supporting objectives, indicators, and targets. **Section 2** identifies the necessary



0 1 2 4 6 km

- City of Vaughan-owned woodlot
- Woodland owned by Toronto and Region Conservation Authority
- Other woodland (e.g. private ownership or other agency)
- Other tree canopy (non-woodland)

resources, general management actions, and support structures that the City must establish to support an ongoing proactive management program.

In **Section 3**, the document outlines the City's approach to management planning for its own woodlots, a crucial element of sustainable forest management within the City's organization. While **Section 2**'s Strategic Framework outlines actions at a city-wide level to support all woodlands, it lacks specific guidance for managing individual woodlots owned and managed by the City. **Section 3** addresses this gap by detailing the woodlot management planning framework piloted for the Sugar Baker Bush Woodlot Management Plan. Woodlot management plans, or WMPs, are needed to translate the principles of sustainable woodland management from the WMS into operational guidance. The City will look to prepare a WMP for each woodlot and pursue cyclical updates to ensure its management is adaptive. The Woodlot Management Planning framework is illustrated on the subsequent page.

Section 4 identifies various program standards and guidelines to support the development and implementation of the City's woodlot management activities, but is also a resource for other landowners and managers responsible for woodlands in Vaughan.

Vaughan's Woodlot Management Planning Framework

27 Woodlots in Vaughan managed to achieve a balance of

2 Core Forest Management Values
1) Biodiversity Conservation
2) Safe and Enjoyable Human Use

The weighting of the criteria and indicators varies among woodlot types, reflecting the differing significance of indicators to the long-term management goals of each type of woodlot.

4 Woodlot Types

1 Recreational Woodlot

2 Lowland/ Riparian Woodlot

3 Upland Woodlot

4 Remnant Woodlot

Long-term Management Objectives

Issues raised through criteria & indicator assessment inform short-term management prescriptions.

Criteria and indicators are employed to generate scores for the City's two core management values. These scores serve as a condition assessment for each woodlot.

16 Criteria and Indicators

Used to assess long-term woodlot management objectives.

13 for Biodiversity Conservation

- Invasive Species
- Unauthorized Encroachment
- Regeneration
- Supercanopy Trees
- Coarse Woody Debris
- Snags
- Uncommon Trees & Rare Woodlands Communities
- Mast Trees
- Woodland Connectivity
- Woodland Size
- Species at Risk
- Relative Biodiversity
- Interior Forest Habitat

3 for Safe and Enjoyable Human Use

- Recreation Quality
- Risk Management
- Surface Water Drainage

Short-term Management Prescriptions

Shortcomings raised through the criteria & indicator assessment are used to craft short-term management prescriptions. These prescriptions are aligned with long-term management objectives.

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Definitions

Coarse woody debris (CWD) Large pieces of deadwood resting on or above the forest floor. See also **log**.

Diameter at Breast Height (DBH) As defined in Vaughan's Tree Protection By-law 052-2018, as amended.

Free to Grow (FTG) A description of a forest stand that meets stocking, height and/or height growth rate, as specified in a silvicultural prescription, and is judged to be essentially healthy and free from competing vegetation.

Interior Forest Habitat Woodland habitat setback more than 100 m from the nearest forest edge.

Links The shortest path between a wooded patch and each of its closest neighbours. Links exist both within woodlands (i.e., a measure of fragmentation) and between woodlands (i.e., a measure of connectivity city-wide). Barriers and cost of movement were not considered in the simplified links measure used in this report and the associated WMPs.

Log For the purpose of measuring **coarse woody debris**, a length of CWD at least 3m long and 7.5cm in diameter at the small end.

Rare Woodland Community Any white oak swamp, bur oak swamp, red maple-hemlock swamp, white cedar-hemlock swamp, oak-hickory deciduous stand, mixed oak deciduous stand, hickory deciduous stand, sugar maple-black maple stand, hackberry stand, red spruce stand. Non-exclusive list. Adapted from Hamill, 2001[1].

Species, Exotic Any species which is not a **native species**. This may include species from other parts of the world, other parts of North America, or other parts of Ontario.

Species, Invasive Any species considered by the City of Vaughan to pose a threat to environmental health and ecosystem integrity.

Species, Native Any species which is naturally occurring in Vaughan's native ecosystems.

Species, Non-woody Any species of plant that does not grow persistent woody tissue.

Species, Woody Any species of plant that grows persistent woody tissue

Stem Of a tree, any primarily upright portion of the plant from which branches or foliage may be grown.

Tree Any woody plant meeting the definition of a **Tree** as defined by the City of Vaughan's Tree Protection By-law 052-2018, as amended.

Tree, Cavity Cavity trees are dead or dying trees that have one or more holes in the trunk or main branches. Cavities can also be found in some healthy trees, such as basswoods. These dead or dying trees serve many purposes for wildlife, and can be used for nesting and raising young, protection from predators, a place to store food, hibernation and roosting.

Tree, Mast Any white oak, red oak, beech, cherry, hickory, basswood, butternut, black walnut, ironwood, or serviceberry having a dbh of 25 cm or greater.[1] Mast trees are important ecological species in that they produce significant crops of food for wildlife.

Tree, Snag Refers to a standing, dead or dying tree, often missing a top or most of the smaller branches. Snags are standing dead trees that provide feeding, nesting and perching opportunities for birds such as woodpeckers and hawks, and mammals such as squirrels and raccoons.

Tree, Uncommon Any bitternut hickory, butternut, black walnut, bur oak, white oak, ironwood, gray birch, black maple, or hackberry. Non-exclusive list. Adapted from Hamill, 2001[1].

Tree, Supercanopy Refers to any living tree with a dbh of 50 cm or greater.[1] Supercanopy trees are large, living trees that emerge above the main canopy of a stand. They create vertical structural diversity in the forest and are used by wildlife as lookouts, refuges, perches, and landmarks.

Woodland The City of Vaughan Official Plan defines a woodland as any area of at least 0.2 hectares having a minimum density of trees dependent on the tree size. The definition excludes cultivated forests like tree farms and orchards. This is a legal definition that extends from Ontario's Municipal Act and Forestry Act. In practice, 'woodland' refers to any natural or semi-natural forest found on public or private property. See Section 1.2 for more information.

Woodlot The City of Vaughan uses the term 'woodlot' to refer to specific woodlands that are owned and managed by the City. This is not a legal definition, but is used by the Department of Park, Forestry, and Horticulture Operations and the community. Vaughan is home to 27 City-owned woodlots, supporting a range of values and nearly 200 ha of woodland canopy.

List of Acronyms

ALB Asian long-horned beetle

AMP Asset Management Plan

BAF basal area factor

BBD beach bark disease

Btk *Bacillus thuringiensis kurstaki*

CWD coarse woody debris

DBH diameter breast height

DED dutch elm disease

EAB emerald ash borer

ELC ecological land classification

EOMF Eastern Ontario Model Forest

WMP Woodlot Management Plan

FTG free to grow

GIS geographic information system

HWA hemlock wooly adelgid

ICI industrial, institutional, and commercial land uses

LDD *Lymantria dispar dispar* (i.e., spongy moth)

MFTIP Managed Forest Tax Incentive Program

MTSA major transit station areas

NHS natural heritage system

OS open space land uses

OPFA Ontario Professional Foresters Association

OWA Ontario Woodlot Association

SAR species at risk

SCT supercanopy tree

SFM sustainable forest management

SOUF State of the Urban Forest (Report)

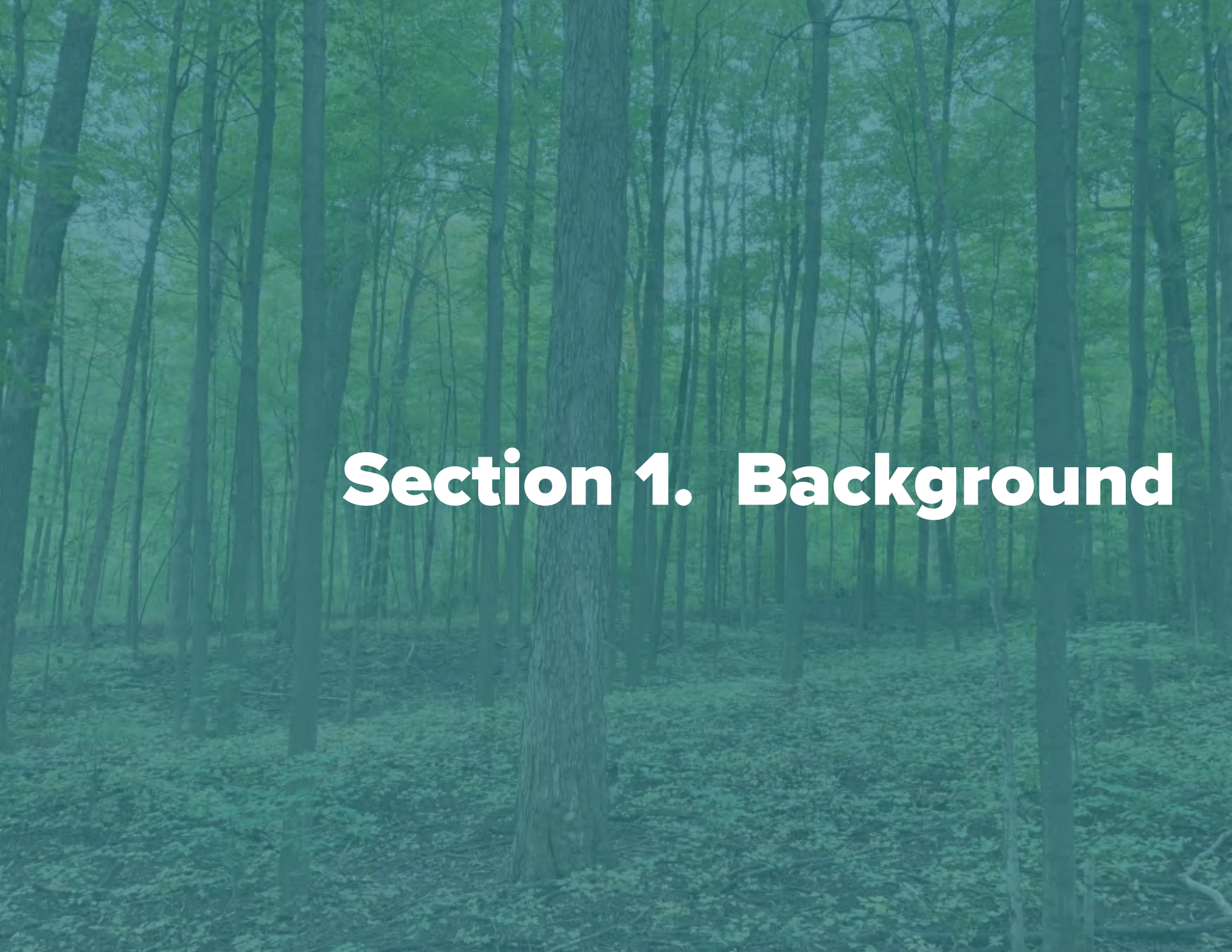
TRAQ Tree Risk Assessment qualification

UAV unmanned aerial vehicle

UFMP Urban Forest Management Plan

WMP Woodlot Management Plan

WMS Woodland Management Strategy



Section 1. Background

1.1. Introduction

The City of Vaughan has developed its first Woodland Management Strategy (WMS), designed to provide sustainable direction for the management of Vaughan's community woodlands over the coming two decades.

The WMS complements the City's Urban Forest Management Plan (UFMP), prepared concurrently with this Strategy in 2024. While the UFMP offers guidance on all facets of urban forest management taking place within the City, the WMS provides detailed recommendations and strategic guidance concerning woodlands in Vaughan, with a focus on the 27 woodlots owned and managed by the City (**Figure 1-1**).

Urban woodlands serve a broad range of human-centric and environmental roles within our community. Despite their diverse values, woodland management in Vaughan has not historically been supported by a coordinated direction or consistent level of funding. This document aims to address that gap by presenting the first comprehensive approach for woodland management in the City's history, charting a course towards holistic and sustainable woodland management for the City.

WMS Overview

The Strategy is divided into four sections, each addressing part of a sustainable approach to woodland management within the City of Vaughan.

Section 1 serves as an introduction to the woodland management strategy, providing a broad overview of woodlands in Vaughan, their values, and their current management.

Section 2 covers the strategic framework of the WMS, outlining a variety of specific program actions, each categorized under one of five goals and accompanied by a set of supporting objectives.

Section 3 outlines the City's strategy for Woodlot Management Planning, a critical element of sustainable forest management. Woodlot management plans translate the principles of the WMS into operational guidance for specific woodlots. The framework was applied to Vaughan's Sugar Baker Bush woodlot, and is intended to be applied to the City's remaining 26 woodlots over time.

Section 4 identifies specific program standards and guidelines that can support the development and implementation of woodlot management plans or woodland management planning by others in the City.

Vaughan's UFMP and WMS

Vaughan's UFMP covers all trees within the city, while the WMS is designed to guide management of woodlands with a focus on the City's woodlots. While the two documents align, the WMS offers more detailed actions tailored to the specific needs of Vaughan's woodlands.

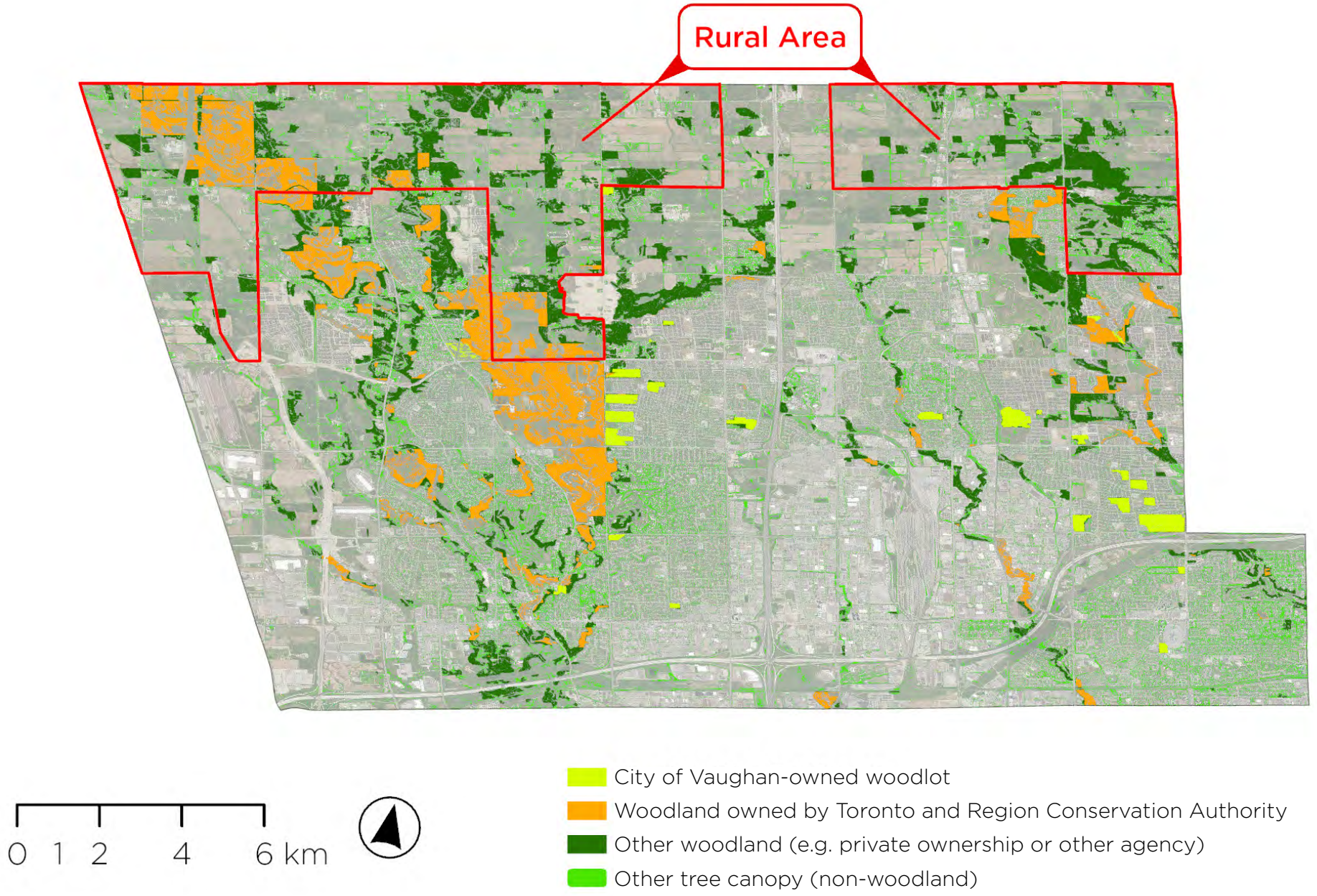


Figure 1-1. *Vaughan canopy, woodland, and woodlot mapping.*

1.2. What is a Woodland?

In practice, a woodland refers to any natural or semi-natural forest. However, in the Province of Ontario, the term is defined by legislation and carries policy implications. Under the *Forestry Act*, "woodlands" refers to land with at least:

(a) 1,000 trees of any size, per ha,
(b) 750 trees measuring over 5 cm in diameter, per ha,
(c) 500 trees measuring over 12 cm in diameter, per ha, or
(d) 250 trees measuring over 20 cm in diameter, per ha,
(e) but excludes orchards or Christmas tree plantations.

Under the *Municipal Act*, the *Forestry Act* definition applies, but with the added criteria of being 1 hectare or more in area. York Region uses the definition but applies it to areas of at least 0.2 hectares in size, a criteria repeated by Vaughan's Official Plan. Woodlands described in the WMS are areas of natural or semi-natural forest at least 0.2 hectares in size, regardless of whether they currently meet tree density requirements in the Forestry Act definition.

This recognizes the diversity of forest ecosystems that may be managed in the City for their forest value.

Despite the WMS having a focus on the City's role in woodland management, the reality is that woodlands span a range of land uses and take on many forms within Vaughan. Woodlands exist across public and private ownership structures, span the urban-rural divide, and can be found in subdivisions, along streams and riparian areas, and integrated into land uses such as open space, parks, and golf courses.

Some directions in the WMS recommend the City partner or coordinate management activities with other agencies to promote whole-system thinking about woodlands in the City. Where appropriate, guidance in the WMS can be used by other actors responsible for woodland management in Vaughan.

Vaughan contains a diversity of woodlands on public and private property

1.3. Why Are Woodlands Important?

Well-managed urban woodlands provide a multitude of benefits to all Vaughan's residents, whether human or part of our natural biodiversity. These advantages, commonly referred to as ecosystem services, encompass activities such as carbon storage and sequestration,[2] stormwater interception and attenuation,[3] the creation of wildlife habitats, urban cooling,[4] and many others. Ecosystem services are typically categorized into four main groups:

Cultural services refer to those that contribute positively to mental and physical well-being, including spiritual values, recreational offerings, and tourism.

Regulating services pertain to the regulation of the natural and built environment, encompassing activities such as pollination, air and water quality regulation, stormwater attenuation, and urban cooling. Vaughan's urban woodlands play a critical role as an element in the city-wide stormwater management network.

Supporting services are those that contribute to the conditions necessary for healthy ecosystems. These include vital processes such as the soil nutrient cycle and photosynthesis.

Provisioning services encompass the tangible products derived from woodlands, including medicines, fruits, nuts, and wood products (such as timber).

Although not formally acknowledged in Vaughan's current approach to asset management, woodlands are an important municipal asset. Similar to engineered infrastructure like roadways and sewers, woodlands offer community benefits. Therefore, it is essential to manage woodland assets on City property in a way that achieves optimal balance between public investment in their maintenance and the community benefits supported.

1.4. Who is responsible for Woodlands?

Vaughan's Forestry Operations Division, under Parks, Forestry and Horticulture Operations, is the primary agent responsible for the management of woodlands on City property. However, many internal City departments and external actors play a role in or otherwise influence management outcomes in woodlands on City property and elsewhere.

Internal Agents

Historically, Forestry Operations has had no dedicated resources to support woodland management, resulting in entirely reactive management of woodlands on City property. Woodland management by the City of Vaughan primarily consists of monitoring the severity of pest outbreaks in collaboration with partners, and mitigating hazardous trees where they are known to exist.

Other City divisions such as Parks Infrastructure, Planning and Development manage public assets within or interfacing with woodlands (e.g., trails infrastructure). Interventions to maintain, expand, or enhance these assets can impact woodland ecosystems, and in many cases involve activities that should be considered woodland management, like tree removal.

Divisions such as Policy Planning and Special Programs and Infrastructure Planning and Corporate Asset Management both develop and administer strategic initiatives and projects that impact woodlands and their management. Planning policy is one of the key mechanisms through which woodlands are protected in the City of Vaughan. Environmental Services is responsible for the management of the City's stormwater management infrastructure, of which riparian and other woodlands serve as a critical component.

External Agents

A range of actors external to the City also participate in woodland management within the City. The Province of Ontario is responsible for the administration of a policy framework for woodland protection within Vaughan through the Natural Heritage System. These include policy documents such as the Provincial Policy Statement, the Growth Plan, and the Oak Ridges Moraine Conservation Plan.

The Ministry of Transportation (MTO) and private rail corporations together own a large amount of land within the City (more than 1,100 hectares). These are some of the most sparsely treed lands in the City and present opportunities for woodland growth.

York Region administers the policies of its own Official Plan and Forest Conservation By-law, and affords additional layers of woodland protection. York is responsible for the management of all street trees lining arterial roads in Vaughan, and is widely recognized as a disciplinary leader in urban forest management.

The Toronto and Region Conservation Authority holds a major role in woodland management with the City of Vaughan, having ownership over 1,000 hectares of woodland canopy and managing more than 2,100 hectares of land area within the City. These landholdings contain roughly 25% of all canopy area within the City of Vaughan. Many of the City's woodlots are contiguous to large TRCA

woodlands such as the Boyd Conservation Area. The City actively works with the TRCA to ensure woodland management practices are aligned, and that resource use toward sustainable management is coordinated between organizations. On some lands, TRCA also has the authority to regulate, requiring approval before tree removal can take place.

Local Enhancement & Appreciation of Forests (i.e., LEAF) is a non-profit organization that broadly supports community education and outreach. LEAF administers such programs as the backyard tree planting program; where residents can have a tree planted for a relatively low fee. LEAF is leader in Ontario's urban forestry non-profit space, and offers an important partner to Forestry Operations in continuing to build community interest, education, and capacities.

Various other partner organizations such as Vineland Research and Innovation Centre, the Ontario Woodlot Association and Eastern Ontario Model Forests, and the Ontario Urban Forest Council, and the International Society of Arboriculture (Ontario Chapter). Each support important relationships, often supporting knowledge exchange and expertise, program capacity, supporting outreach, program reputation, or developing resources.

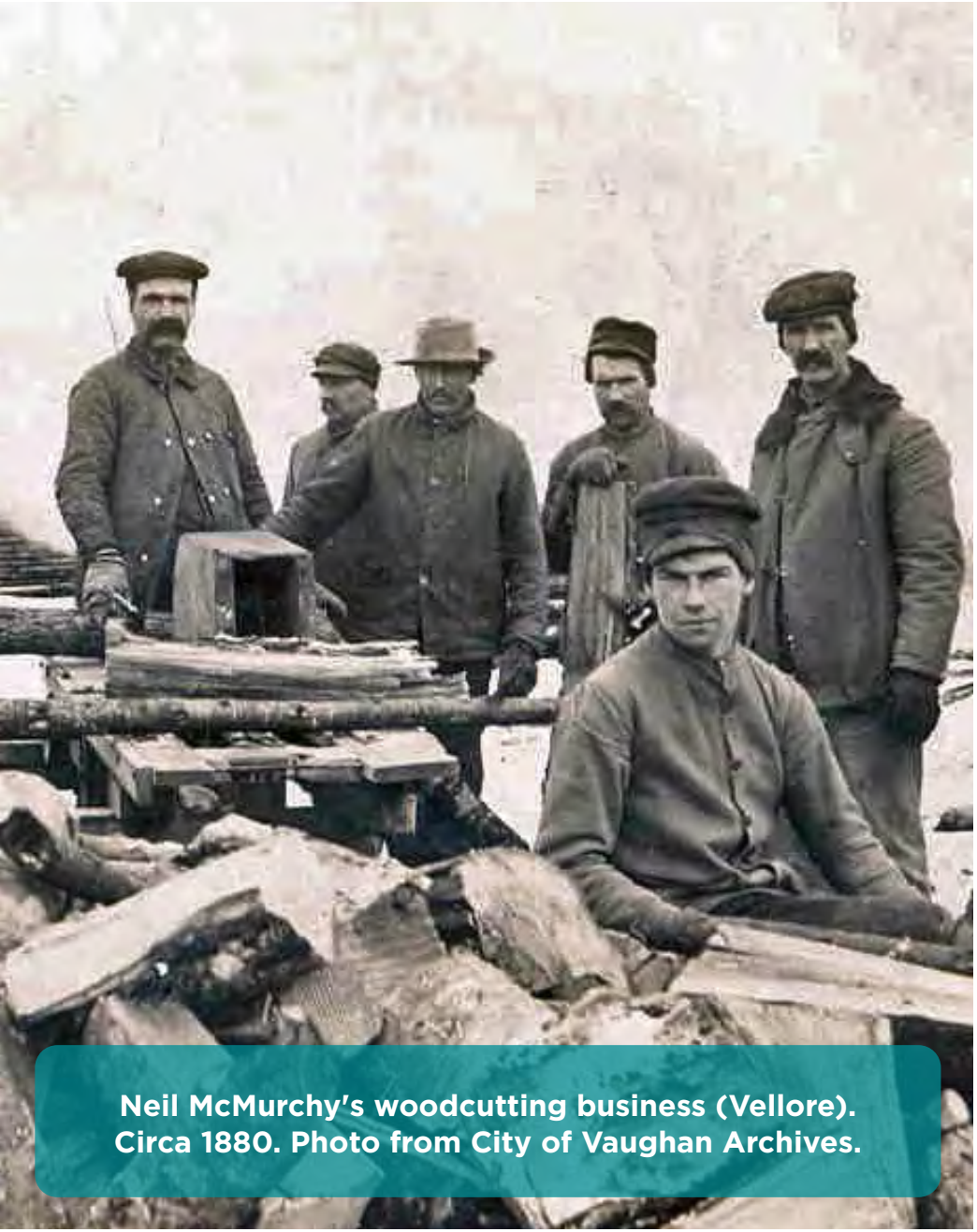
1.5. Our Woodlands, Through Time

From the Anishinaabeg to the Haudenosaunee, Attawandaron confederation, and the Métis, Indigenous communities have thrived on these lands. Indigenous Peoples have engaged hunting, fishing, and foraging within the forests and waters of this area long before the arrival of colonial settlers. The 17th century saw the influx of Europeans, triggering conflict and the displacement of Indigenous Peoples from what is now south-central Ontario.

The 19th century witnessed a surge in new settlements, drastically increasing Canada's population from a few hundred thousand in the early 1800s to an estimated five million at the turn of the 20th century.[5] This growth led to the widespread transformation of natural landscapes, with settlers clearing forests for timber export and agriculture. Sawmills, like those established at Edgeley, Elder Mills, and Kleinburg, now part of Vaughan, played a pivotal role in these activities.

Extensive conversion of land to support agricultural production depleted soils across the province over the 19th century, leaving lands susceptible to wind erosion, and in some areas exposing dried, infertile sands. Some estimates put the area of degraded soils at its worst as high as 150,000 ha within Ontario—an area 50% larger than the Greater Toronto Area (GTA) today.[6] The government responded to the issue of erosion and declining agricultural productivity over the next century with legislation, education programs, and tree planting initiatives. As a consequence of this history, most of Vaughan's existing woodlands are considered "second-growth", having regenerated after earlier land clearing or another disturbance.

Colonial settlement also introduced new plant species to Vaughan, driven by residents seeking familiar resources. Apples were introduced sometime in the 19th century. Buckthorn,[7] a highly invasive species in modern times, was introduced as an ornamental shrub for fence rows and windbreaks in agricultural fields. In fact, many of the



Neil McMurchy's woodcutting business (Vellore). Circa 1880. Photo from City of Vaughan Archives.

invasive plants that now impact Vaughan's woodlands were introduced as ornamental or agricultural plants.

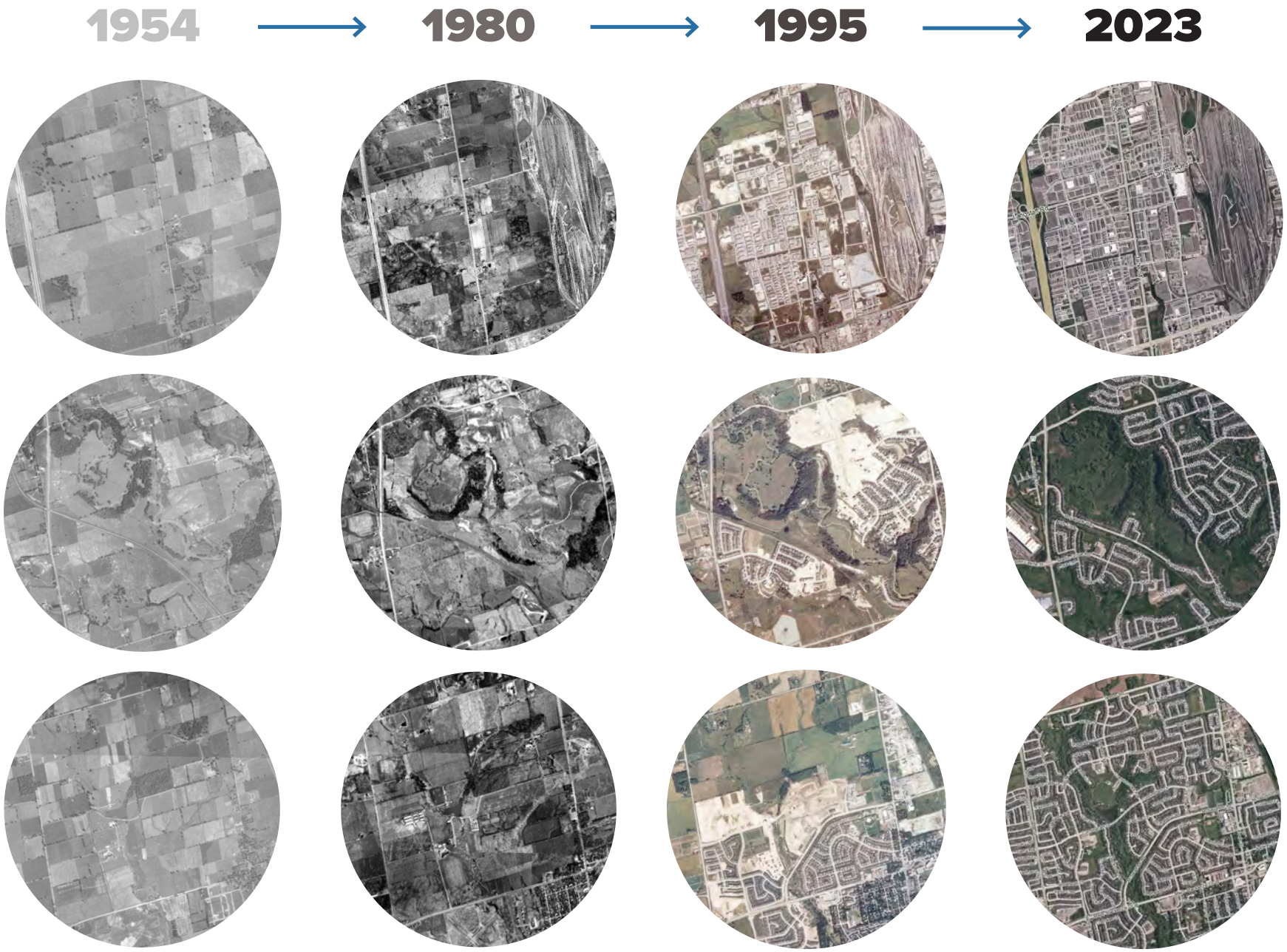
The latter half of the 20th century was marked by Vaughan's shift from an agricultural area to an urban community. Increased trans-oceanic shipping heightened the introduction of exotic pests and diseases. The introduction of exotic pests and disease has had a devastating impact on tree species like chestnut, elm, and ash. Billions of native trees have been lost over the past century to pests and disease not originally found on this continent. New exotic threats are still emerging, such as the Emerald Ash Borer, Japanese beetle, and most recently, Oak wilt (confirmed in Canada for the first time in June of 2023).[8]

The 21st century also brings new challenges, including climate change, globalization, and urban intensification. The modern challenges demand a coordinated and adaptive approach to woodland management. An evidence-driven regimen promotes sustainable, healthy ecosystems. By securing the services provided by Vaughan's woodland ecosystems now, we can ensure that they are preserved for the present and future generations.

1.6. Regulatory Context

The management of woodlands in the City of Vaughan is subject to a range of legislation, regulations, policy, standards, and guidelines. Key amongst these are by-laws which regulate tree and woodland removal—Vaughan's Tree Protection By-law (052-2018) and York Region's Forest Conservation Bylaw (2013-68). Both of these documents regulate tree removal within Vaughan's woodland areas, as well as any criteria associated with permit issuance. It is important to recognize that where the management

Vaughan Through the Years



of woodlands is concerned, activities undertaken or authorized by the City of Vaughan or York Region would be exempt from the requirements of each by-law. Vaughan or authorized contractors are, in most cases, the only entities authorized to undertake woodland management activities in the City's woodlots. Exemptions may apply where the work of other governmental organizations, Crown corporations or utilities corporations occurs in or adjacent to woodlots.

Other legislation can influence woodland management decisions and processes (e.g., Canada *Species at Risk Act* and Ontario *Endangered Species Act*, *Forester's Act*, and *Forestry Act*). The City undertakes due diligence respecting the requirements of those laws and/or any regulations in undertaking woodland management activities.

The Natural Heritage System

Few policy tools or regulations have the same influence on woodland management and protection as the Natural Heritage System (NHS). The NHS is the primary means through which "significant" environmental features such as woodlands are protected on both public and private land within Ontario. Through certain criteria, woodlands and other natural features can be identified as "significant" or not. *While all "significant" woodlands are woodlands, not all woodlands meet the policy criteria to be considered "significant"*.

The NHS is protected first through policy at the provincial level, which must then be conformed to through all lower levels of planning policy, including municipal. While the protection of the NHS is a broad requirement of communities in southern Ontario, local municipalities do

York Region's Significant Woodland Criteria (3.4.30):

That significant woodlands be verified on a site-by-site basis and shall include those woodlands meeting one of the following criteria:

a. Is 0.5 hectares or larger and:
   i. directly supports globally or provincially rare plants, animals or communities as assigned by the Natural Heritage Information Centre; or,
   ii. directly supports threatened or endangered species, with the exception of specimens deemed not requiring protection by the Province (e.g. as is sometimes the case with Butternut); or,
   iii. is within 30 metres of a provincially significant wetland or wetland including those identified on Map 4, waterbody, permanent stream or intermittent stream;

b. Is 2 hectares or larger and:
   i. is located outside of the Urban Area, Towns and Villages, or Hamlets and is within 100 metres of a Life Science Area of Natural and Scientific Interest, a provincially significant wetland or wetland including those identified on Map 4, significant valleyland, or fish habitat; or,
   ii. occurs within the Regional Greenlands System;I

c. Is south of the Oak Ridges Moraine and is 4 hectares or larger in size;

d. Is north of the Oak Ridges Moraine and is 10 hectares or larger in size;

e. On the Oak Ridges Moraine the woodland will be evaluated for significance based on the requirements of the Oak Ridges Moraine Conservation Plan and associated technical papers; or,

f. On lands in the Greenbelt Natural Heritage System, the woodland will be evaluated for significance based on the requirements of the Greenbelt Plan and associated technical papers; or,

g. On lands in the Lake Simcoe watershed, outside of the Greenbelt, the Oak Ridges Moraine Conservation Plan, and existing settlement areas, the woodland will be evaluated for significance based on the requirements of the Lake Simcoe Protection Plan and associated technical papers.

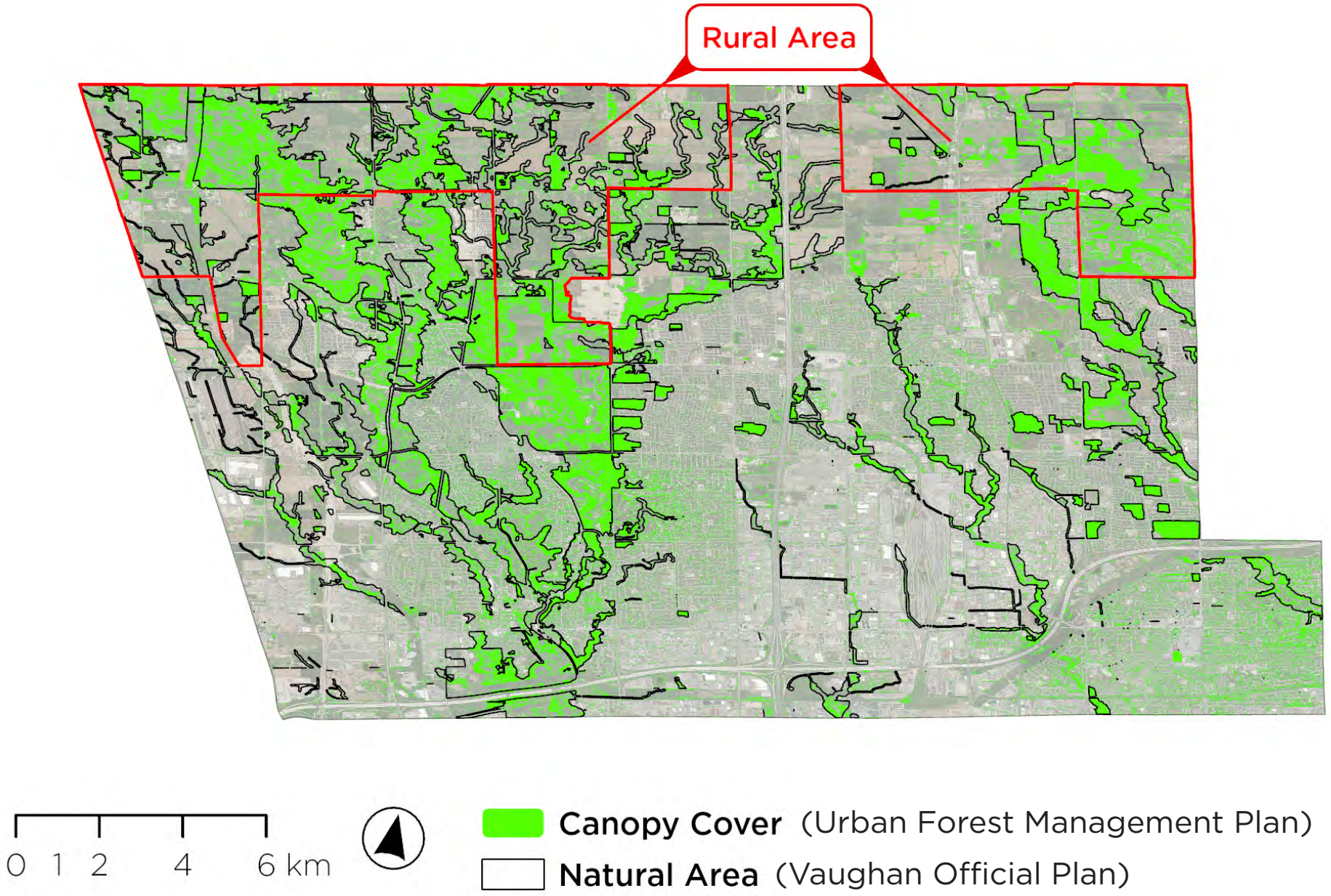


Figure 1-2. *Natural areas in Vaughan.*

have some influence over NHS mapping and woodland protection through NHS policy.

Vaughan's current Official Plan defers the definition of "significant" woodland to York Region. York Region uses a criteria-based policy definition for the establishment of significant woodlands (**previous page**). Despite strong policy language at the upper-tier level, many lower-tier municipalities in Ontario have chosen to further refine their implementation of natural heritage policy through definitions in their own Official Plans. York Region has also chosen to establish a canopy cover target of 40% and woodland cover target of 25% in its Official Plan. These targets and policies have implications for woodland management in the City of Vaughan, as a lower-tier municipality in York Region.

1.7. Vaughan's Woodland Communities

Among Ontario's three distinct ecological zones, Vaughan falls within the Mixedwood Plains, which is characterized by its Phanerozoic Calcareous bedrock, warm-to-hot summers, and cool winters (**Figure 1-3**). The Mixedwood Plains ecozone is the smallest in Canada, spanning the Quebec City-Windsor corridor and encompassing the densely populated region of Southern Ontario. The Mixedwood Plains is home to half of Canada's population, including the country's two largest cities, Toronto and Montreal. Additionally, the ecozone is home to one of the major storm tracks in North America.

Within the Mixedwood Plains ecozone, Vaughan is situated in the Lake Simcoe-Rideau ecoregion. Typical natural environments include upland forests of common deciduous trees like sugar maple, American beech, white ash, white

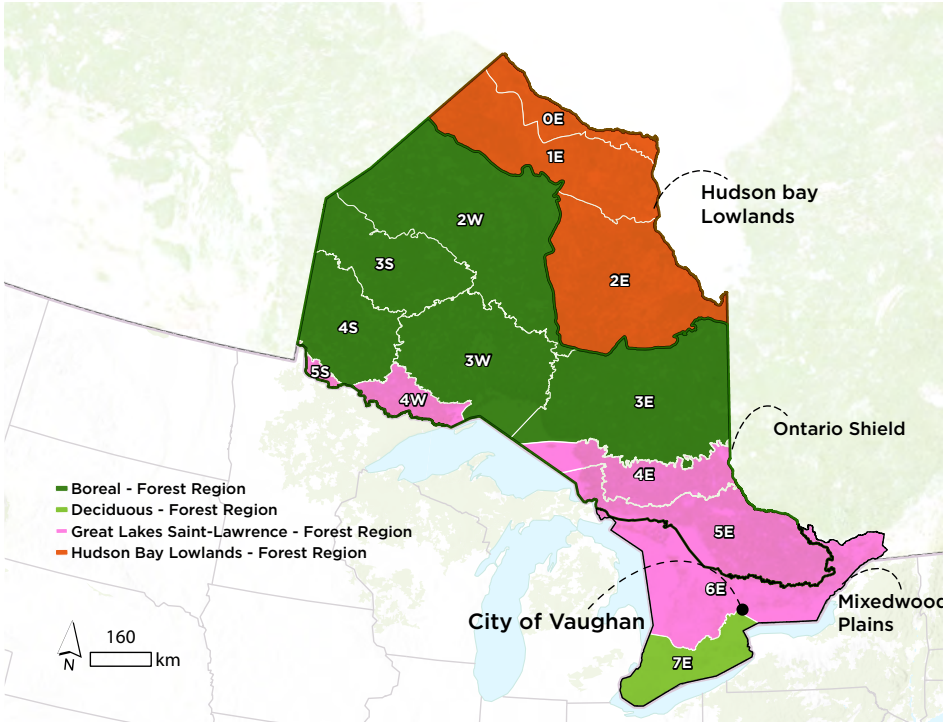


Figure 1-3. *Vaughan context map within forest regions.*

and red oak, trembling aspen, paper birch, yellow birch, black cherry, and butternut, with the coniferous eastern hemlock, white pine, and red pine sometimes found. Lowlands and riparian areas contain woodlands also, including forests of green ash, silver maple, red maple, yellow birch, black ash, and the conifers eastern white cedar, balsam fir and tamarack. The ecoregion is heavily populated and forests have been fragmented by suburban and agricultural development. Forest cover now occupies less than 20% of the ecoregion, though historically would have been much higher[9].

Grassland-associated ecosystems are present in limited, isolated areas. Plants thriving in these ecosystems include big bluestem, little bluestem, sundial lupine, and New Jersey tea. Because of Vaughan's proximity to the more southerly Carolinian forest type, distinctive species such as blue ash, red mulberry, sycamore, Shumard oak, pawpaw, and cucumber tree may on rare occasion be found in Vaughan's woodlands.

Wildlife making use of Vaughan's woodlands may include white-tailed deer, Northern raccoon, striped skunk, and woodchuck. Many birds also find homes in upland and lowland forests, including hairy woodpecker, field sparrow, wood thrush, and rose-breasted grosbeak. Woodlands near wetlands, rivers, and lakes protect amphibians like the northern leopard frog and red-spotted newt, as well as the riparian value for fish such as yellow perch, rainbow darter and pearl dace[10]

Vaughan's Woodland Canopy

Vaughan's 3,300 hectares of woodland canopy make up 60% of the city's total canopy area. Natural Heritage policy protects more than 85% of this area.

The Toronto Region Conservation Authority (TRCA) manages around 1,000 hectares of woodland canopy and 2,100 hectares of land area within the City. The remaining woodland canopy (around 1,200 hectares) is found on lands under the ownership and management of private landowners, crown corporations, or other levels of government.

Vaughan itself oversees the management of 27 unique community "woodlots" (**Figure 1-5**). These woodlots are not managed for their timber values, but to serve a balance of recreation and conservation functions. Vaughan's woodlots contain a collective 180 hectares of woodland area, and range in size from under 1 ha to more than 30 ha (**Figure 1-4**). More than half of the City's woodlots are greater than 10 ha in size.

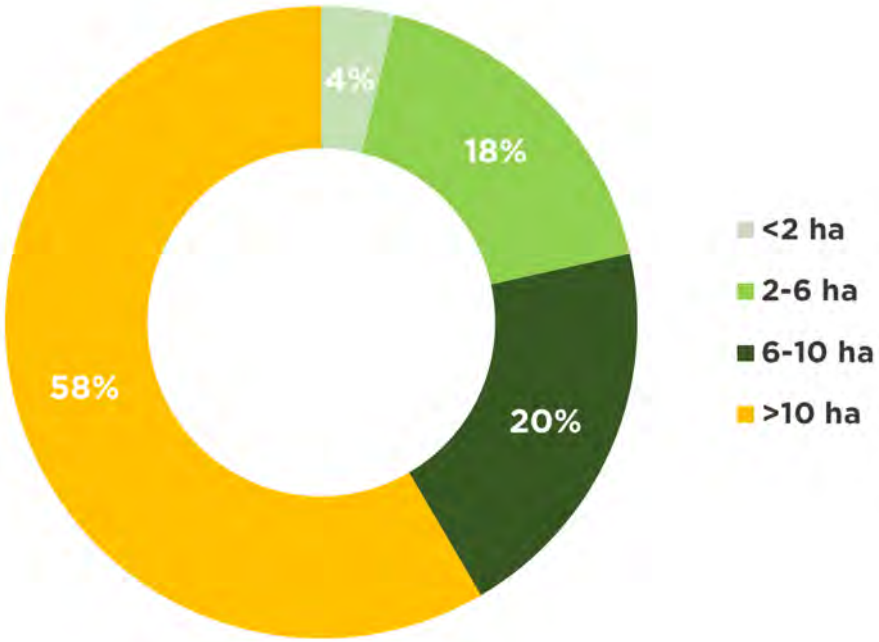


Figure 1-4. *Patch sizes of Vaughan's woodlots.*

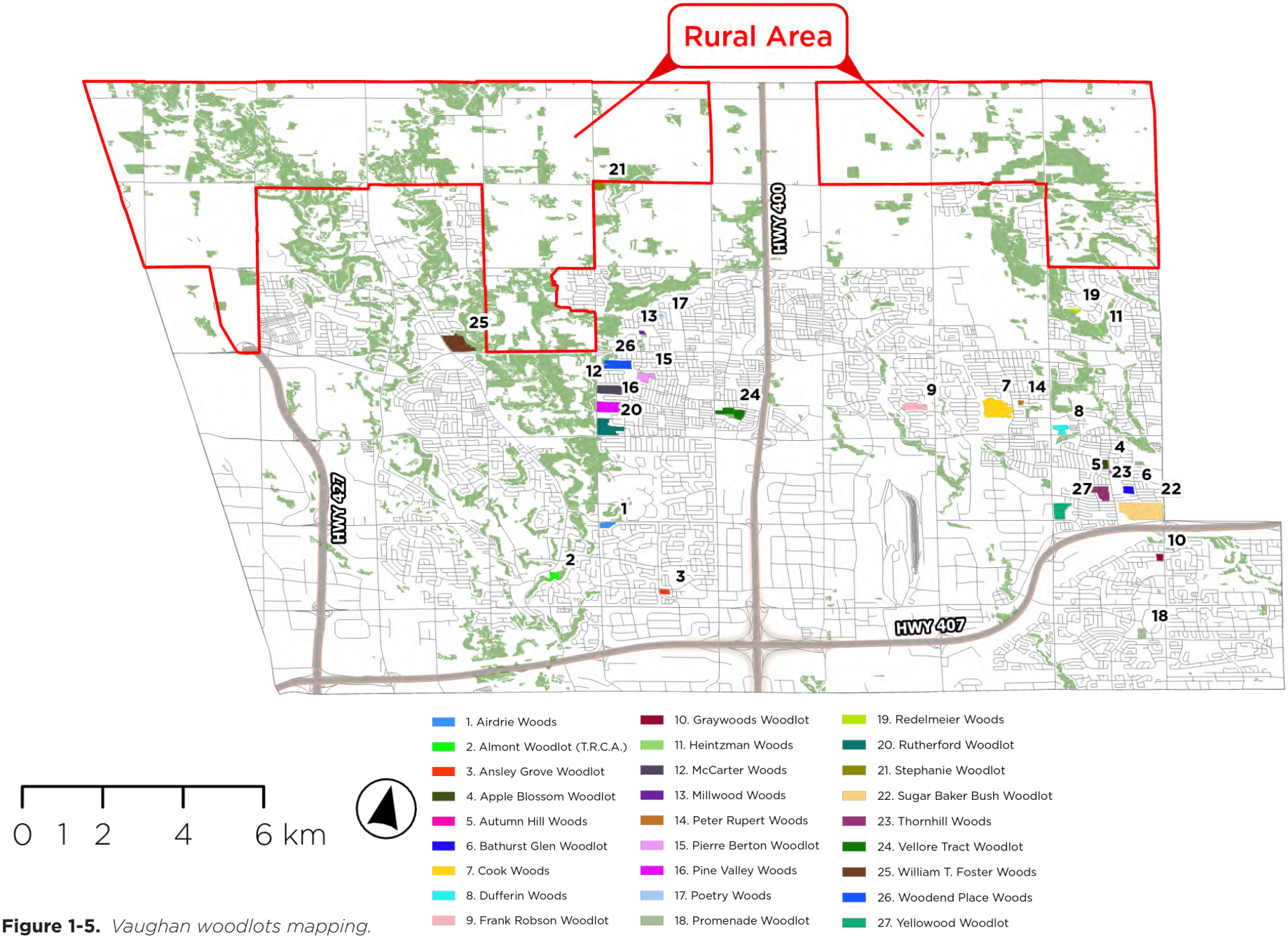


Figure 1-5. *Vaughan woodlots mapping.*

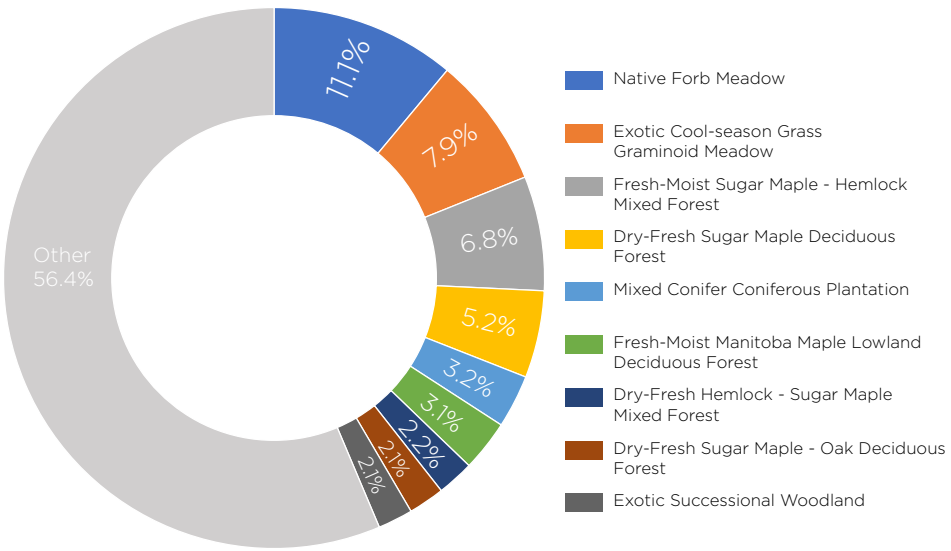


Figure 1-6. *Vaughan woodland communities by ecological land classification description.*

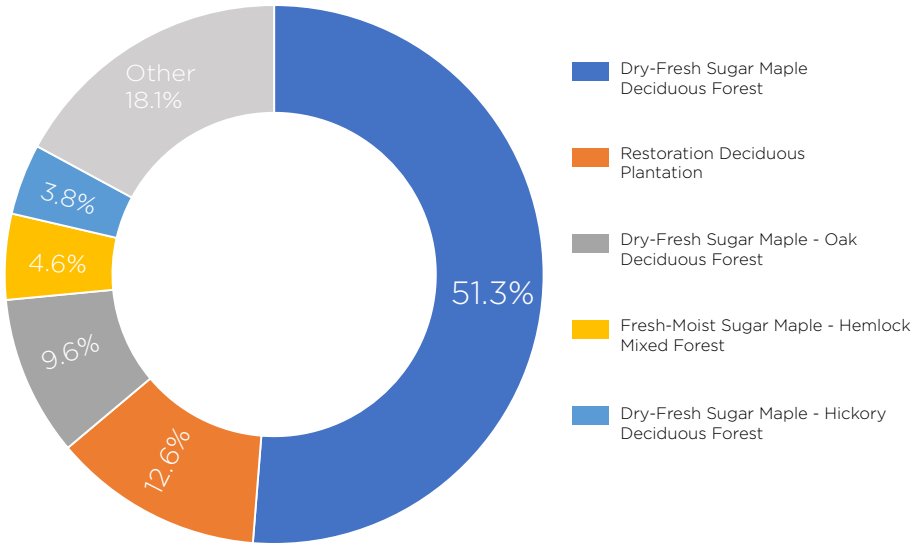


Figure 1-7. *Vaughan woodlot communities by ecological land classification description.*

Woodland Composition and Structural Qualities

In collaboration with York Region and the City of Vaughan, the Toronto and Region Conservation Authority supports a broad range of monitoring and mapping initiatives within regional watersheds. The TRCA leads biological inventories and assessments and administers a long-term fixed plot inventory program. Ecosite datasets available through the TRCA have informed the following analyses.

Within the City of Vaughan, woodlands are dominated by deciduous and mixed forest communities. The most abundant woodland community in the City is fresh-moist sugar maple - hemlock mixed forests (FOM6-1) which makes up nearly 7% of all (classified) woodland area (**Figure 1-6**). Dominant woody species in the FOM6-1 include sugar maple (*Acer saccharum* ssp. *saccharum*), and eastern hemlock (*Tsuga canadensis*). Common associates include American beech (*Fagus grandifolia*), eastern hop-hornbeam (*Ostrya virginiana*), yellow birch (*Betula alleghaniensis*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), white cedar (*Thuja occidentalis*), paper birch (*Betula papyrifera*) and dogwoods (*Cornus* sp.). Dry-fresh sugar maple deciduous forests (FOD5-1), a sugar maple-dominated community, are also relatively common (5% of mapped). Vaughan's most abundant communities are actually non-forest, including native forb meadows (CUM1-A) and exotic cool-season grass old field meadow (CUM1-B). The former, CUM1-A, is a community of native wildflower species like late goldenrod (*Solidago gigantea*) and native asters as well as native grasses. CUM1-B on the other hand, is a meadow community where invasive or exotic grasses and native species compete for space and resources.

Within in Vaughan's own woodlots dry-fresh sugar maple deciduous forests (FOD5-1) dominate (**Figure 1-7**). Deciduous plantations (CUP1-A) represent 12.6% of woodlots. These are most often stands where the decline of native overstory ash and/or elm have enabled invasive species such as buckthorn, boxelder, and garlic mustard to become established within the stand. Though their potential for restoration needs to be confirmed, these communities could be priorities for future restoration efforts. Dry-fresh sugar maple - oak deciduous forest make up 10% of City-owned woodlot area (**Figure 1-7**). These are generally upland sites where sugar maple and red oak (*Quercus rubra*) dominate in association with beech, hop-hornbeam and basswood (*Tilia americana*).

Mean canopy height in Vaughan's woodlots ranged from 9 m to 28 m, with several woodlots having trees up to 34 m tall. LiDAR-derived stem densities averaged 130 stems per hectare in woodlot areas, but ranged from just 50 to 420 stems per hectare.

Concerns

Datasets from the TRCA also provided some insight into the frequency and severity of common woodland health issues in Vaughan.

The data suggests that trash dumping is a concern in more than half of the City's woodlots. Further, more than 80% of woodlots are identified as containing unauthorized trails or instances of trail trampling. Patterns of dumping and unauthorized trail development appear to impact some woodland communities and woodlots more than others.

TRCA datasets also provided insight into the presence of invasive and exotic species in Vaughan's woodlots. Data suggests that about 60% of Vaughan's woodlands contain a "light" presence of exotic species, an additional 30% a "moderate" presence, and 2% "severe". European buckthorn (*Rhamnus cathartica*), garlic mustard (*Alliaria petiolata*), dog-strangling vine (*Vincetoxicum rossicum*) are each identified as a concern in city woodlots.

Boyd Conservation Park, photo by Simone Wessels-Bloom via Unsplash

1.8. Why do we need a Woodland Management Strategy?

Vaughan's woodlands face a range of contemporary challenges and threats. The City's historical management approach, characterized by its reactive nature, has lacked the resources necessary to formulate or implement a sustainable approach for the management of the City's woodland areas. Given that woodlands make up more than 60% of the City's total canopy area and represent a foundational element of our community fabric, a sustainable and coordinated approach to woodland management is now imperative.

The challenges confronting Vaughan's woodlands serve as the primary motivators for the goals and objectives outlined in the Strategic Framework detailed in **Section 2** of this document.

Improve Program Governance and Capacity

Woodland governance encompasses the broad structure of rules, relationships, systems, and processes through which woodland management is achieved and supported within the City. A lack of historic priority toward woodland governance has contributed to reduced investment in the management of these critical assets. Strengthening woodland governance in Vaughan could involve enhanced collaboration with partner organizations, dedicated resourcing for woodland management, and consideration of third-party certification. These measures could significantly fortify woodland governance within the City.

Abiding by the standards stipulated by third-party certification, such as that overseen by the Sustainable Forestry Initiative (SFI) could also play an important role in reinforcing improved woodland governance. Third-party certification of woodland management supports the establishment of public trust and enhances awareness of a City's program.

Case Study

The **Town of Oakville** was the first local municipality in Canada to have all of its woodlots achieve **Forest Stewardship Council® (FSC®) certification**.

Introduce Asset Management

Asset management is the mechanism through which the city plans for and finances maintenance activities for assets under the City's management. Traditionally, this has encompassed grey infrastructure, such as roads and sewers, but more recently, there has been an expansion to include recognition of natural assets into asset management planning under Ontario Regulation 588/17. Despite this, inclusion of natural assets within Vaughan's asset management approach are presently limited. This exclusion has played a role in the ad hoc management of Vaughan's woodlots to date.

The integration of woodlands into the City's asset management approach would enable the establishment of clear levels of service and supporting resource allocations.

Case Study

The **City of London** successfully integrated its urban forest assets into the corporate portfolio, valuing the urban forest at over $400 million in the 2019 Asset Management Plan. This includes $320 million for manicured park and street trees and $80 million for woodlands. The plan relies on a comprehensive inventory and assessments for street, park, and woodland assets. Woodland assets are valued at $67,300 per hectare, covering planning, preparation, soil restoration, plant propagation, and planting costs.

This approach highlights the financial value and holistic management urban trees and woodlands, serving as a model for other Canadian urban centers.

Manage the Impacts of Woodland Pests and Disease

Insects and diseases pose a significant challenge to native ecosystems, particularly in areas where the natural environment interfaces with urban development. Disease outbreaks and pest infestations can lead to significant tree mortality in woodland areas, creating potential hazards for the public, and having adverse effects on biodiversity and ecosystem function. Southern Ontario has grappled with the impacts of pests and diseases in the past. The cumulative effects of chestnut blight, Dutch elm disease (DED), and emerald ash borer (EAB) have resulted in the loss of billions of North American trees.

There are several pest and pathogens that pose an imminent and significant risk to Vaughan's native biodiversity. These include beech bark disease, hemlock woolly adelgid, Asian long-horned beetle, and most recently, oak wilt. While the host plants vary for each pest and disease, all have a preference for at least one native tree species in Vaughan's woodland ecosystems.

Establish Inventory, Monitoring, and Reporting Processes

In urban settings, woodlands are influenced by both human activities and broader environmental changes. Monitoring these changes is crucial to informed and effective management interventions.

Conducting repeated field-based inventories would provide important insights into changes in woodland health, composition, and structure over time. These ongoing measurements are critical for comprehending the scope of woodland health concerns and monitoring alterations in woodland composition and structure. Both the TRCA and York Region undertake periodic measurements of woodland assets under their care. These organizations offer

Case Study

Since 2014, the **Town of Oakville** has demonstrated proactive urban forestry management by annually auditing a third of its woodlands in a three-year rotation. These audits, focusing on pests, diseases, and disturbances, are transparently communicated through public "report cards," informing subsequent management actions. In 2019, Oakville allocated $216,000 in capital funding for audits and invasive control, exemplifying its commitment to urban woodland health and setting a proactive management example.

an important resource as Vaughan considers how to best support monitoring in its own woodland assets.

Respond to Invasive Plants

Invasive plants also pose a significant threat to urban woodlands. These species are non-native and have been introduced to Vaughan and south-central Ontario over decades past. Due to their adaptations and genetics, invasive species have a negative impact on Vaughan's native ecosystems once they become established. While the dynamics of these effects varies among species, most alter the natural competitive dynamics, favouring the invasive species and often at the expense of native biodiversity and plants. It's crucial to note that not all introduced plants are invasive. Many exotic species have been planted along Vaughan's streets and in parks, and most of these exotic species are not considered invasive.

The management of invasive species in Vaughan has historically lacked funding, and treatment (such as removal) has occurred only in rare and isolated instances. The TRCA and York Region each manage invasive species to varied degrees within their own woodlands, and there may as a result be opportunities for coordination moving forward. Other cities, such as Mississauga, have leveraged public capacities in implementing an enhanced woodland management program.

As invasive species become established in woodland settings, their competitive advantages enable them to increasingly replace and out-compete native plant species, leading to a degradation of local biodiversity and woodland health. It is best to address invasives as soon as possible, as the costs of abatement typically rise with their spread.

Native, Invasive, or Exotic?

The distinction between native, invasive, and exotic species can sometimes be unclear. Simply put, a native species is one naturally present in local ecosystems. An exotic species, in contrast, is any species not native, including those from different regions globally, other parts of North America, or other areas in Ontario. While exotic species don't contribute to native ecosystems in the same ways as native plants, they are **not always a threat** to native biodiversity. On the other hand, invasive species, like buckthorn, Norway maple, Manitoba maple, emerald ash borer, and invasive honeysuckles, are exotic species with **widely recognized negative impacts** in local ecosystems. Typically, invasive species possess a competitive advantage over native species and/or lack natural controls in the native ecosystem, allowing them to spread and negatively impact the ecology.

Utilizing exotic plants in woodland settings is inappropriate since they don't contribute to the local ecosystem as effectively as native plants. However, in non-native urban ecosystems, employing exotic species as ornamental plants is both widespread and advantageous, enhancing the genetic diversity of the urban forest and passively bolstering resilience against pests and diseases. **The use of recognized invasive plants is unsuitable in nearly all situations.** These plants pose a threat to local ecosystems and tend to "escape" into natural environments, even when employed as ornamental trees in urban settings.

A significant challenge arises when the City undertakes tree removal in woodland areas (e.g., to eliminate hazard trees), creating openings in the woodland canopy where invasive species can establish. In this scenario, tree removal in areas with known invasive species can often result in the proliferation of the invasive plant(s) if resources are not allocated to the removal of the invasive as well.

Invasive species are present in several of Vaughan's woodlots. Managing established invasive species in these stands can be challenging and demands an allocation of resources. The goal of managing invasive species is rarely to eradicate on a city-wide scale; instead, the objective of the City's woodland management program should be to limit the presence of invasive species below a threshold where they do not significantly diminish the native biodiversity and function of woodlot assets.

Establish a Risk Management Program

Tree risk management encompasses the identification, assessment, and ranking of potential risks associated with trees, whether in woodlands or urban areas. Tree risk management generally incorporates a combination of tree inspections, risk assessment, and management strategies, which may involve pruning, removal, or other interventions. It also includes measures to mitigate the risk to infrastructure, such as preventing damage to woodland trails or trail assets (e.g., bridges). The objective of tree risk management in woodland settings is to ensure that trees within woodlands do not present an unacceptable risk to the public and to minimize the potential for damage, while at the same time considering the impacts of risk management interventions on the health of the tree. Currently, the City manages an estimated 31 km of woodland edge, and 12 km of woodland trails.

Extreme weather is often a catalyst for tree failure events. Proactively identifying and mitigating high-risk trees ahead of storm events is the City's most effective mechanism for reducing the risk posed by woodland trees during these storms.

Case Study

The **City of Mississauga's Invasive Species Management Plan and Implementation Strategy** (ISMP&IS) offer a coordinated approach to efficiently manage terrestrial invasive species. This strategy aims to enhance the City's native biodiversity and overall ecological integrity in natural areas. The ISMP&IS in Mississauga strives to accomplish three core objectives:

1. Reduce the relative abundance of invasive species and increase ecological integrity,
2. Optimize resources through collaboration with partners and the public, and
3. Monitor the effectiveness of ISMP&IS.

A coordinated strategy, even when not as detailed as Mississauga's, provides advantages by informing the required resource levels to address the invasive species issue.

Grow the City's Woodland Areas

Achieving the City's 25% canopy cover target by 2051 necessitates more than 1,400 hectares of new canopy within Vaughan over the next 30 years. Modelling suggests that together, lands under TRCA or City ownership could support an additional 130 hectares of woodland canopy toward achievement of this goal.

Afforestation refers to the creation of a woodland in an area that has lacked recent tree cover. Afforestation projects typically yield substantial canopy contributions in the years following planting. However, compared with the planting of individual urban trees, these projects tend to be more resource-intensive and necessitate dedicated monitoring efforts to ensure their success.

Afforestation will need to be a fundamental component of the City's overall strategy to achieve a 25% canopy cover and 14% woodland cover target by 2051. Besides contributing to canopy growth, targeted afforestation efforts can enhance the ecological value of many of the City's woodlands, improving the connectivity and quality of urban habitat. It is crucial to recognize that not all ecosystems are forested. Certain wetland and tallgrass prairie varieties, which may include trees, do not maintain continuous canopy cover in the same manner as woodland communities. Despite this difference, these communities are equally important, and where present in Vaughan, they should be managed with consideration for their natural qualities and successional traits.

While the City can directly influence afforestation on public land, private land afforestation is at the owner's discretion. Given the substantial privately owned land in Vaughan, promising afforestation opportunities lie in these areas.

With over 4,400 hectares of non-forested rural land in Vaughan, afforestation potential exists, acknowledging that rural lands often serve other crucial roles, like agriculture. The City aims to collaborate with partners to promote access to subsidy programs, including the Managed Forest Tax Incentive Program (MFTIP) and Forests Ontario's 50 Million Trees program, encouraging woodland management and afforestation.

Guide Woodland Restoration

Often, the pressures acting on urban woodlands erode woodland health and/or condition through which the deterioration of woodland health can be reversed. Restoring degraded woodlands to functional ecosystems involves a multi-faceted approach. Elements of a restoration program can involve the removal of invasive species, tree planting, managing natural regeneration, and implementing measures to protect and enhance biodiversity.

In Vaughan, a typical restoration process often would involve removing invasive species and subsequently replanting those areas with a selection of native plants. Restoration specifications may include soil amendments to rebuild soil profiles and enhance site capacity in cases where soils have become degraded. Restoration processes serve as a critical woodland management tool, supporting native biodiversity and the positive ecological services associated with woodland environments.

Presently, the City lacks dedicated resources or a program to support a sustained restoration effort. Without dedicated funding for restoration projects, woodland restoration activities will likely continue to be undertaken only when external funding opportunities arise.

Protect Woodland Areas

Safeguarding woodlands involves two elements: (i) policy and regulatory safeguards preventing the conversion of woodland areas to non-woodland land uses, and (ii) safeguards against practical misuse, such as littering or encroachment.

The majority of Vaughan's woodlots are safeguarded through natural heritage policy. Woodlands correctly identified in natural heritage layers benefit from protection through provincial policy, typically rendering them ineligible for development. In addition, York Region administers a Forest Conservation By-law that extends certain protections to woodlands larger than 0.2 hectares.

Protection of woodlands against impacts such as encroachment and dumping is typically addressed through a combination of staff resources, enforcement action, and educational initiatives. While education can enhance public awareness of the harm caused by activities like dumping and encroachment, wilful misuse of woodlots will always necessitate enforcement action (where applicable) and subsequent remediation or restoration activities. Presently, Forestry Operations have no resources to administer a regular woodland management program. Consequently, instances of woodland misuse are addressed only as capacity permits. Educational programs that support community awareness of the challenges facing woodlands and their management are provided only on an opportunistic basis.

Support Community Education and Outreach

Community education and outreach can play an important role in bolstering the woodland management

Case Study

The **City of Mississauga's Garlic Mustard Task Force** (GMTF) aims to reduce the spread of garlic mustard in the City's parks and natural areas through community stewardship. The program has been running since 2018 and was recently formalized. City staff provide training on identifying and removing garlic mustard, as well as reviewing procedures for working safely outdoors. Volunteers are provided with the necessary supplies and work independently at an approved park of their choosing throughout the summer. A volunteer management system is used so that volunteers can self-report their own hours, and report on the amount of garlic mustard removed.

In 2021, the GMTF was supported by 18 volunteers across 10 parks. Almost 200 hours were spent removing 260 garbage bags of Garlic Mustard. Approximately 40 hours of City staff time was spent on program administration and training. The number of volunteers participating in the GMTF as well as the hours spent removing garlic mustard more than doubled in the following year.

capacities. Numerous challenges in woodlands are directly human-caused or influenced by human actions. Effectively addressing issues like unauthorized dumping and encroachment involves a significant component of community education, and can influence the demand for woodland management services experienced by municipal staff. Educational initiatives and outreach efforts also help to generate community backing for the city's woodland

Case Study

Oakville's **Forest Health Ambassador** program utilizes involved residents to monitor street trees in neighborhoods for invasive insects, diseases, and other forest health concerns. This initiative operates during the summer months, allowing ambassadors the flexibility to survey as many or as few trees as they wish at their convenience.

management program. By fostering an understanding of the challenges associated with woodland management and showcasing the city's management efforts, Vaughan would support a beneficial awareness among members of the community.

Build Stewardship Capacity

The success of a woodland management program can be enhanced by the presence of dedicated community stewards. Activities within woodland management can directly contribute to expanding program capacities and can also generate community enthusiasm for sustainable woodland management practices.

1.9. Climate Change

The Impacts

Climate change is anticipated to have significant impacts on woodland ecosystems and their sustainable management. Climate projections for the region generally forecast warmer, wetter, and more unpredictable weather throughout the year. Rising summer temperatures may potentially lead to an extended growing season.[11,12,13] While precipitation predictions are often associated with lower confidence levels, predictions generally suggest an overall increase in annual precipitation, a decrease in summer precipitation, and an increase in winter precipitation.[14,15] Other climate models predict a more frequent and severe extreme weather events, including droughts, heatwaves, windstorms, thunderstorms, and ice storms.

These changes will trigger shifts in the distribution and abundance of tree biodiversity not only in Vaughan but globally.[16] In transitional forests in eastern Canada, such as those found in the Mixedwood Plains Ecozone and the Acadian Forest Region, advanced modelling has suggested that deciduous species adapted to warmer conditions may pose a threat to conifers adapted to colder climates as warm-adapted species migrate northward with the climate gradient.[16]

The increased severity and variability of weather patterns and storm events are anticipated to have an impact on the woodlands of the Mixedwood Plains Ecozone. One consequence of greater variability in spring temperatures is the occurrence of "winter browning" injury. This phenomenon occurs when abnormally warm spring temperatures deceive trees into coming out of dormancy while the ground is still frozen or otherwise returns to a frozen state. When this happens, conifers lose moisture from their needles more rapidly than it can be replenished, leading to browning and drying of the needles. Notable winter browning events were observed near Hearst, Kapuskasing, and Cochrane in 2007[17] and in the Thunder Bay area in 2012.[18] Other extreme weather events, including windthrow,[19] ice storm damage,[20] and drought[21] are known to affect tree species in the Mixedwood Plains Ecozone and may become more frequent and/or severe due to the direct influence of climate change.

Climate change not only affects abiotic disturbance regimes but also influences biotic sources of disturbance. Research indicates that the range and life cycles of both fauna and flora are likely to be impacted by climate change. This creates new opportunities for known invasive pests to establish themselves beyond historically observed ranges.[22] Further, climate-induced changes may affect the life cycles of invasive species within their existing range, influencing their efficacy, the historical risk associated with outbreaks, and the probability of continued spread. As temperatures rise across much of the country, many invasive species may find new invasive ranges, often extending northward from the regions where they have historically been active.[23]

Climate change has also been linked with potentially destructive shifts in the population dynamics of endemic forest pests. A well-known example is the mountain pine beetle (*Dendroctonus ponderosae*) in British Columbia.[24] The severe impacts of this beetle are believed to be, in part, a consequence of its range expanding due to climate-induced changes.[25] There is evidence suggesting that the

spruce budworm (*Choristoneura fumiferana*) may also shift towards the poles and higher elevations within its native range, with temperate regions like those found in the Mixedwood Plains Ecozone potentially facing significant consequences from these shifts. Other studies propose that the life cycles and ranges of other impending threats, such as oak wilt,[26] Asian long-horned beetle,[27] and spongy moth[28] may be influenced by climate change in the years to come. This has the potential to alter the level of threat they pose to the local environment.

In most cases climate change will, at the very least, serve as an underlying source of stress. Stress erodes a tree's resilience to additional sources of stress. This diminished resilience is commonly referred to as heightened forest vulnerability. While the extent of vulnerability may vary among different woodlands, it is reasonable to anticipate that a considerable portion of Vaughan's woodlot areas are susceptible to some level of vulnerability.

How the City Can Respond

Currently, the City has limited resources to facilitate a comprehensive woodland management effort, leaving minimal capacity to enhance forest resilience against the challenges presented by climate change. While the specific measures the City could implement to enhance the resilience of its woodlands vary depending on the specific concern, the most crucial action is to actively address pre-existing woodland health issues and ensure there are resources in place to support an adaptive management approach.

Section 2. Strategic Framework

Vaughan's Urban Forest Vision

Our vision is for a healthy, growing, and sustainable urban forest canopy that supports biodiversity, human health, recreation, and community climate resilience to provide a greener future for generations to come.

2.1. The Woodland Management Strategy

Vaughan's Woodland Management Strategy is to serve as the central document informing all woodland management decisions within the municipality. A review of progress in implementation is scheduled every five years, with an overarching strategy update planned every 10 years, in step with processes of review and update for the City's Urban Forest Management Plan (UFMP).

Section 2 offers the strategic framework for this WMS. Here program-level directions, actions, and management decisions are identified. **Section 3** and **Section 4** outline a framework and set of guidelines for the management of individual woodlots the City owns and manages.

Management Goals

Program recommendations have been categorized into five goal areas, each consisting of several strategies. Each strategy is supported by specific program actions, along with an associated indicator and target where applicable. The identification of indicators and targets aims to support monitoring WMS implementation. Vaughan's five woodland management goals are:

Goal 1: Prioritize good program governance
Goal 2: Maintain healthy and safe urban woodlands
Goal 3: Expand the urban forest canopy and associated benefits
Goal 4: Protect trees and woodlands for future generations
Goal 5: Partner in woodland stewardship.

Strategic Framework

Goal 1: Prioritize good program governance

Strategy 1: Strengthen governance through compliance with third-party forest certification standards.

Strategy 2: Resource woodland management sufficiently to achieve formalized levels of service.

Strategy 3: Integrate woodlots and other woodlands on City property into the City's asset management program (AMP).

Goal 2: Maintain healthy and safe urban woodlands

Strategy 4: Reflect the growing threat posed by invasive plants, forest pests, and pathogens in woodland management activities.

Strategy 5: Monitor woodlands and maintain inventories to support the ongoing implementation of this Strategy.

Strategy 6: Assess and manage tree-related risks in woodland areas proactively.

Goal 3: Expand the urban forest canopy and associated benefits

Strategy 7: Utilize woodland acquisition and afforestation as tools toward achieving the City's canopy and woodland target.

Goal 4: Protect trees and woodlands for future generations

Strategy 8: Prioritize the protection of Vaughan's woodland areas.

Goal 5: Partner in woodland stewardship

Strategy 9: Encourage community investment into and stewardship of Vaughan's woodlots.

Strategy 10: Continue to support outreach, education, and equity in woodland management programming.

Goal 1: Prioritize good program governance

Encourage and support procedures, relationships, systems and capacities that support Sustainable Urban Forest Management in Vaughan.

Strategy 1: Strengthen governance through compliance with a third-party forest certification standard.

Indicator: SFI Urban and Community Forest Sustainability Standard compliance.

Target: SFI certification for Vaughan's woodland management activities is achieved by 2034 and maintained on an ongoing basis.

Action 1. Pursue SFI certification for Vaughan's woodland management activities as part of its overall urban forest management program.

Action 2. Develop strategic partnerships that will support the implementation of this Strategy.

Action 3. Support staff training, industry outreach, and professional development within the discipline of woodland management.

Strategy 2: Resource woodland management sufficiently to achieve formalized levels of service.

Indicator: Funding $ per ha of woodland.

Target: $1,300 per ha, per year (2023 dollars)

Action 4. Examine staffing levels and consider hiring new role(s) within the Forestry group to support implementation of the WMS and WMPs.

Strategy 3: Integrate woodlots and other woodlands on City property into the City's asset management program (AMP).

Indicator: Integration of woodland assets into the City's AMP.

Target: Full integration, including condition ratings and woodland management levels of service.

Action 5. Formalize and document woodland management levels of service and performance measures.

Action 6. Integrate woodlots into the City's asset management program as a formal asset class.

Action 7. Prepare woodlot management plans (WMPs) for the 26 woodlots which do not yet have a plan.

Action 8. Develop research partnerships to explore nuanced woodland appraisal methods that fully reflect the range of human and ecological values supported by woodlot assets.

Goal 2: Maintain healthy and safe urban woodlands

Leverage woodland monitoring and sustainable management procedures supported by industry best practices and third-party certification standards.

Strategy 4: Reflect the growing threat posed by invasive plants, forest pests, and pathogens in woodland management activities.

Indicator: Invasive species Woodlot Management Plan indicator scores.

Target: All woodlots score "good" (i.e., 4) or better.

Action 9. Formalize the City's pest management program in a corporate integrated pest management (IPM) policy.

Action 10. Formalize the City's invasive species management program in a corporate invasive species management policy.

Strategy 5: Monitor woodlands and maintain inventories to support the ongoing implementation of this Strategy.

Indicator: Woodland inventory re-measurement cycles.

Target: Plot and interface edge inventoried on a standard five-year cycle.

Action 11. Develop the City's library of data available to provide new insights and enhance woodland management objectives and activities.

Action 12. Adopt monitoring and reporting measures which support sustainable woodland management.

Strategy 6: Assess and manage tree-related risks in woodland areas proactively.

Indicator: Risk management Woodlot Management Plan indicator scores.

Target: All woodlots score "good" (i.e., 4) or better.

Action 13. In consultation with the City's legal and risk management teams, develop and implement an approved tree risk management policy encompassing risk management in woodland areas.

Goal 3: Expand the urban forest canopy and associated benefits

Grow Vaughan's woodland areas toward achievement of 25% tree canopy cover by 2051 and an aspirational target of 14% woodland cover over that same period.

Strategy 7: Utilize woodland acquisition and afforestation as tools toward achieving the City's canopy and woodland target.

Indicator: Woodland canopy area.

Target: 14% by 2051.

Action 14. Prepare a city-wide Biodiversity Plan to guide restoration and inform land acquisitions supporting woodland health and expansion or broader ecosystem connectivity.

Action 15. Broaden the utility of the City's Tree Planting Reserve (i.e., the Tree Protection By-law cash-in-lieu fund) to enable funds to also be applied to a greater range of planting and maintenance expenses than is permitted at present.

Action 16. Identify pilot sites to trial Miyawaki afforestation methods.

Action 17. Seek funding, such as that provided by the federal Two Billion Trees program, to support woodland reforestation and restoration programs.

Action 18. Formalize mapping of priority areas to inform woodland acquisition and afforestation.

Goal 4: Protect trees and woodlands for future generations

Ensure tree protection requirements and processes within the City are lending to the right balance between regulation and supporting continued community growth.

Strategy 8: Prioritize the protection of Vaughan's woodland areas.

Indicator: Unauthorized encroachment Woodlot Management Plan indicator scores.

Target: All woodlot score "good" (i.e., 4) or better.

Action 19. Develop operational standards for woodland trail development, decommissioning and maintenance.

Action 20. Undertake ecosystem restoration consistent with the findings and prescriptions of the City's Woodland Management Strategy and accompanying Woodlot Management Plans.

Action 21. Work with research partners to develop climate-based seed transfer trials for woodland species.

Action 22. Ensure all woodland restoration and planting activities within Vaughan comply with Section 4 of this Strategy.

Action 23. Require tree protection hold-backs for contractors working around or within woodlots as part of design and construction projects.

Action 24. Establish an approach for managing encroachment issues within woodland areas.

Action 25. Pursue stronger interdepartmental relationships in the interest of multi-use trail management.

Goal 5: Partner in woodland stewardship

Spread awareness, support urban forestry education, and leverage community capacities and partnerships in implementing this Urban Forest Management Plan and the City's Woodland Management Strategy.

Strategy 9: Encourage community investment into and stewardship of Vaughan's woodlots.

Indicator: Volunteer hours committed through woodland management programming.

Target: 4,500 volunteer hours annually.

Action 26. Establish and administer a forest steward program, designed to appoint community members with a lead role in the stewardship of each of the City's 27 woodlots.

Action 27. Support a range of community stewardship opportunities for interested members of the public.

Action 28. Ensure woodland interests are well represented through the composition of any new Community Tree Board.

Action 29. Utilize on-site signage to advertise when and why site works will be occurring/has occurred. Use the opportunity to educate the public on woodland management processes.

Strategy 10: Continue to support outreach, education, and equity in woodland management programming.

Indicator: Community members engaged through outreach per year.

Target: 2,500 community members engaged annually.

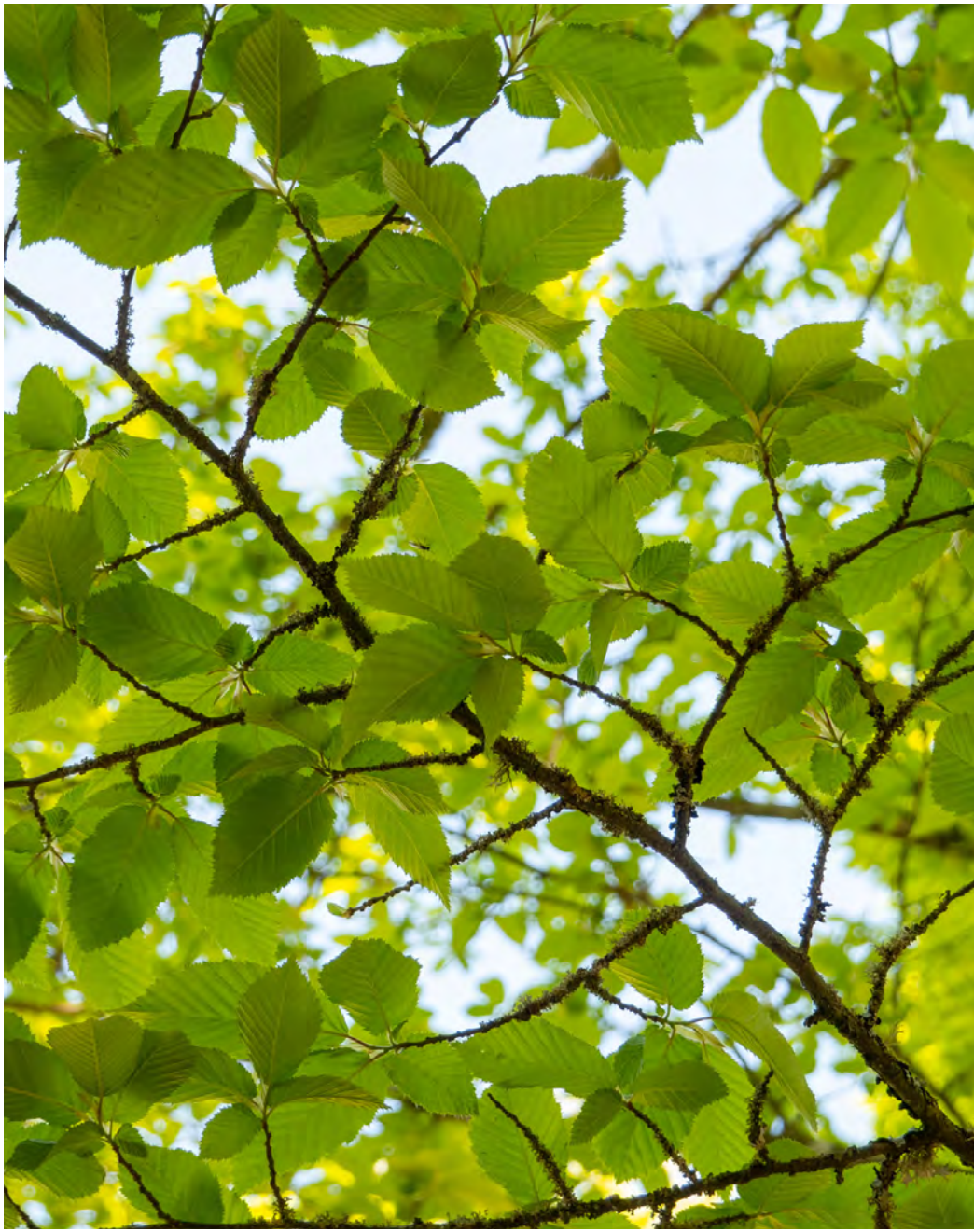
Action 30. Work together with Indigenous peoples to identify and support culturally sensitive urban forest and woodland management practices.

Action 31. Pilot the concept of food forests in partnership with the TRCA and community partners, supporting both equity outcomes and broader community engagement, education, and outreach.

Action 32. Ensure the design of urban forestry programming and engagement is considered through an equity lens.

Action 33. Utilize pop-up events to spread messaging on urban forestry topics and programming.

Action 34. Initiate a quarterly woodland walk to spread awareness of the challenges facing woodland management in the City, and to showcase activities such as restoration and invasive species removal.



2.2. The Action Plan

The following pages contain the full action plan for the City of Vaughan's Woodland Management Strategy. Specific actions are itemized and the departments with a vested interest in each action are identified. In addition, a timeframe to implementation has been identified, as well as an estimated financial commitment, a type, and a priority level. The following is a full summary of values contained to each of those fields:

Vested Interest

PFHO	Parks, Forestry, and Horticulture Operations
PIPD	Parks Infrastructure Planning and Development
DENG	Development Engineering
REST	Real Estate Services
PPLN	Policy Planning and Special Programs
LEGL	Legal Services
IPAM	Infrastructure Planning and Corporate Asset Management
FINS	Financial Services
CMSR	Community Services
OCIO	Office of the Chief Information Officer
CME	Communications, Marketing and Engagement
ECDV	Economic Development
BYLW	By-law and Compliance, Licensing, and Permit Services
TRCA	Toronto and Region Conservation Authority (External)
YORK	York Region (External)

Timeframe

SHORT	1 - 5 years
MID	6 - 10 years
LONG	10 - 15 years

Financial Commitment

$	Staff time or otherwise < $10,000
$$	$10,000 - $50,000
$$$	$50,000 - $150,000
$$$$	Needs an estimate or otherwise > $150,000

Type

BLPL	Actions which involve the adoption of new or revised by-laws or policy.
MNTR	Actions which support ongoing monitoring or reporting on the City's urban forest or the implementation of this Plan.
PCDR	Actions which involve both formal and informal procedural outcomes.
PRGM	Actions which broadly relate to the City's urban forest management program.
RSRC	Actions which relate to the development of new or use of existing program resources.

SPEC	Actions which invoke technical requirements for different program elements.
STWD	Actions which propose the development of different stewardship or community outreach outlets.
STDY	Actions which invoke the development of supplemental studies, plans or strategies in support of the City's urban forest.
PTNR	External partnerships supporting urban forest management and the implementation of the UFMP.

Priority

	No priority ranking indicates that the action is not a priority over the first ten years of implementation and may be prioritized at a future date or otherwise implemented as capacities permit.
YES	Indicates that an action is a priority over the first ten years of the UFMP's implementation.
HIGH	Indicates an action is critical to UFMP implementation over the first ten years, and should be a forefront priority in financial and resource planning.

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Goal 1: Prioritize good program governance						
Action 1.	Pursue SFI certification for Vaughan's woodland management activities as part of its overall urban forest management program.	PGRM	PFHO	LONG		$$
		Why: SFI certification would commit the City to best practices for urban woodland management, with benefits for the local community, ecosystems, and the City's reputation.				
Action 2.	Develop strategic partnerships that will support the implementation of this Strategy.					
Action 2.1.	Work with the TRCA, York Region, the Ontario Woodlot Association, and the Eastern Ontario Model Forest to support and encourage private landowners in accessing resources to support afforestation and SFM efforts on private land.	PGRM	PFHO, TRCA, YORK	MID		$
		Why: Collaboration with other organizations could support efficiencies in resource use related to monitoring and advance knowledge sharing to enable adaptive management.				
Action 2.2.	Continue to work with the TRCA, York Region, and LEAF, toward restoration, afforestation, and clean-up events in woodland areas.	PGRM	PFHO, TRCA, YORK	MID		$$
		Why: Collaboration with other organizations could support efficiencies in resource use related to monitoring and advance knowledge sharing to enable adaptive management.				
Action 2.3.	Continue to work with research partners such as Vineland, universities, the Ministry of Natural Resources and Forestry, and Natural Resources Canada to trial innovative planting methods, climate-facing genotypes, and novel management practices and concepts.	PGRM	PFHO	MID		$$
		Why: Increasing cost of planting, and climate change, will challenge the adaptive capacity of the program. Innovation may provide creative solutions.				
Action 2.4.	Continue to coordinate woodland management programming and efforts with the TRCA.	PGRM	PFHO	SHORT		$
		Why: As the TRCA is Vaughan's largest landowner of woodlands, with specialized expertise in woodland management, continuing coordination helps provide a similar level of service for woodland management across the City.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Action 3.	Support staff training, industry outreach, and professional development within the discipline of woodland management.	PGRM	PFHO	SHORT		$
		Why: Ensuring City staff have access and exposure to the network of woodland management professionals in south-central Ontario supports a knowledge exchange that will significantly benefit to Vaughan's woodland management program.				
Action 4.	Examine staffing levels and consider hiring new role(s) within the Forestry group to support implementation of the WMS and WMPs.	RSRC	PFHO, FINS	SHORT	HIGH	$$$$
		Why: Vaughan's woodland management program has no dedicated resources. Dedicated departmental capacity will be required to implement this Management Strategy over any time horizon.				
Action 5.	Formalize and document woodland management levels of service and performance measures.	PGRM	PFHO, IPAM	SHORT	YES	$
		Why: Levels of service should reflect the full range of services Vaughan's Forestry Operations can provide, and reflect the recommended service levels in the Woodland Management Strategy, as well as best practices.				
Action 6.	Integrate woodlots into the City's asset management program as a formal asset class.	PGRM	IPAM, PFHO	SHORT	YES	$$
		Why: Vaughan's urban forest assets encompass more than the managed street tree population. Expanding the scope of asset management planning to include all urban forest asset classes supports planning asset maintenance and renewal.				
Action 7.	Prepare woodlot management plans (WMPs) for the 26 woodlots which do not yet have a plan.	STDY	PFHO	SHORT	HIGH	$$$$
		Why: Vaughan's woodlots are the focus of its woodland management and provide a high proportion of the urban forest canopy and related ecosystem services in some neighbourhoods. Their role as conserved forest ecosystems becomes more important as the City urbanizes; while challenges like climate change and increasing use demand more active management.				
Action 8.	Develop research partnerships to explore nuanced woodland appraisal methods that fully reflect the range of human and ecological values supported by woodlot assets.	STDY	PFHO	LONG		$$
		Why: Vaughan's woodland areas support a range of human and ecological values, many of which are difficult to assign a fiscal value to. Utilizing nuanced methods for valuating the City's woodland communities would better inform cost-benefit analyses and the merits treatments designed to improve asset condition.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Goal 2: Maintain healthy and safe urban woodlands						
Action 9.	Formalize the City's pest management program in a corporate integrated pest management (IPM) policy.	BLPL	PFHO	MID	**YES**	$
		Why: Pest management will continue to be a challenge in Vaughan's urban forest. Formalizing the City's pest management approach clarifies detection and response processes.				
Action 10.	Formalize the City's invasive species management program in a corporate invasive species management policy.	BLPL	PFHO	MID	**YES**	$$
		Why: Invasive species have and will continue to be a challenge in Vaughan's urban forest. Formalizing the City's invasive species management approach would help to strategize and clarify processes with respect to the decision-making surrounding treatments.				
Action 11.	Develop the City's library of data available to provide new insights and enhance woodland management objectives and activities.					
Action 11.1.	Undertake a soils survey (once) within woodland areas to better inform management and future restoration prescriptions.	MNTR	PFHO	LONG		$$$
		Why: Soils are a governing factor in woodland composition and structure. Certain prescriptions, such as those involving planting new trees, greatly benefit from an understanding of resident soil typologies.				
Action 11.2.	Record incidental observations of tree age to the City's tree inventory as well as date of observation.	MNTR	PFHO	MID		$
		Why: Tree ages provide insight into the age and development of the forest through time. Coring is not always necessary. Tree ages can be recorded opportunistically through ring counts as trees are felled within a woodland as part of other management initiatives (e.g., hazard abatement work).				
Action 11.3.	Record incidental observations of woodland encroachment, as well as date of observation.	MNTR	PFHO	MID		$
		Why: All instances of encroachment, whether in a plot or not, should be recorded to support future woodland management planning and reduce loss of woodland area.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Action 11.4.	Establish and maintain a woodland inventory in compliance with **Section 4** of this Strategy.	MNTR	PFHO, OCIO, IPCAM	MID	HIGH	$$
		Why: Current and complete woodland inventory information is foundational for integrating woodlands into the City's asset management program, and for supporting sustainable woodland management.				
Action 11.5.	Maintain access to an inventory of Species at Risk observations within woodlot assets. Ensure broad organizational access to support decision-making.	MNTR	PFHO, OCIO, IPCAM	MID		$
		Why: Supporting broad organizational awareness of species at risk presence in woodland areas ensures all staff have the best information available to ensure legislative obligations are complied with and can support enhanced management activities.				
Action 12.	Adopt monitoring and reporting measures which support sustainable woodland management.					
Action 12.1.	Update the City's Woodlot Management Plans on a five-year cycle, in-step with woodland inventory re-measurement.	MNTR	PFHO	MID	**Yes**	$$
		Why: Woodlot health assessments are an important mechanism both from a monitoring perspective and from an asset management perspective. The forest health assessments and short-term management prescriptions put forward in the WMPs should be kept current, to ensure prescribed management activities remain aligned with long-term management objectives..				
Action 12.2.	Review this document after ten years, and prepare a new Woodland Management Strategy at the end of this Strategy's 20-year life.	MNTR	PFHO	MID		$$
		Why: Urban forest management is an adaptive process requiring sensitivity to changing community contexts and conditions. Timely review of this strategy ensures recommendations are contributing to positive urban forest outcomes, as observed through monitoring initiatives, and ensures management practices are positively contributing toward Vaughan's vision for its woodlots.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Action 13.	In consultation with the City's Legal and Risk Management team, develop and implement an approved tree risk management policy, encompassing risk management in woodland areas.	PGRM	PFHO, LEGL	SHORT	HIGH	$$$
		Why: The City should formalize its approach to risk management, supporting the identification of processes (i.e., frequency, mitigation priority, mitigation timeframe, thresholds, qualifications and documentation) and resources required to manage tree-related risk at an acceptable level. Thresholds should be based on current industry risk assessment standards.				
Goal 3: Expand the urban forest canopy and associated benefits						
Action 14.	Prepare a city-wide Biodiversity or Green Space Plan to guide restoration and inform land acquisitions supporting woodland health and expansion or broader ecosystem connectivity.	STDY	PPLN, PIPD, PFHO	LONG	YES	$$$$
		Why: A municipal biodiversity or green space plan could identify good candidate areas for consideration as habitat connectivity and wildlife corridors (woodland linkages and buffers), candidate sites for afforestation, and could provide a high-level strategy for the management of local flora and fauna given the threats imposed by climate change.				
Action 15.	Broaden the utility of the City's Tree Planting Reserve (i.e., the Tree Protection By-law cash-in-lieu fund) to enable funds to also be applied to a greater range of planting expenses than is permitted at present.	RSRC	PFHO, FINS, LEGL	SHORT	YES	$
		Why: The intent of Tree Planting Reserve at present is to facilitate the transfer of trees removed from private property to public property. As a result, the current use of the Tree Planting Reserve is limited to the purchase of trees for planting in public spaces. Enabling the Tree Planting Reserve to be applied to costs incurred through restoration, afforestation, and reforestation projects would maintain the intent of the fund's use.				
Action 16.	Identify pilot sites to trial Miyawaki afforestation methods.	RSRC	PIPD, PFHO	MID		$$$
		Why: An increasing number of Canadian municipalities have found success in leveraging Miyawaki plantings.[29,30,31] The City of Vaughan could establish pilot sites to test the method and its efficacy themselves.				
Action 17.	Seek funding, such as that provided by the federal Two Billion Trees program, to support woodland reforestation and restoration programs.	RSRC	ECDV, PFHO	MID		$
		Why: Capitalizing on opportunities for subsidized tree planting will be key to reaching the City's aspirational target of 14% woodland cover.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Action 18.	Formalize mapping of priority areas for woodland afforestation and acquisition.	PCDR	PPLN, REST, LEGL, FINS, PFHO, IPCAM, PIPD	SHORT		$
		Why: Formalizing those locations in the City where new woodlot area should be prioritized better informs discussions which relate to woodland afforestation or acquisition. Ideally, formalized locations would consider the value of a prospective location/parcel relative to both human uses and the value it adds to the City's existing woodlands network.				
Goal 4: Protect trees and woodlands for future generations						
Action 19.	Develop operational standards for woodland trail development, decommissioning and maintenance.	PCDR	PIPD, PFHO	MID		$$
		Why: Existing trails and surface materials sometimes negatively impact tree health, and unsanctioned trails are extensive.				
Action 20.	Undertake ecosystem restoration consistent with the findings and prescriptions of the City's Woodland Management Strategy and accompanying Woodlot Management Plans.	PCDR	PFHO	MID	HIGH	$$$$
		Why: As is the case in many urban communities, decades of urban growth have impacted the health and extent of Vaughan's woodland ecosystems. The City's woodland management strategy and woodlot management planning framework provide a structure through which sustainable woodland management can be achieved within the City of Vaughan. The City needs to support the resourcing levels required to support implementation of both of those documents, as well as the restorative activities prescribed.				
Action 21.	Work with research partners to develop climate-based seed transfer trials for woodland species.	RSRC	PFHO	MID		$$
		Why: Some native species genotypes may become maladapted to the local area, and climate-based seed transfer can introduce more climate suitable individuals of native species.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Action 22.	Ensure all woodland restoration and planting activities within Vaughan comply with **Section 4** of this Strategy.	RSRC	PFHO	MID		$$
		Why: Consistently applying the principles of woodlot management from this WMS to all woodlots across the City will ensure a consistent quality of service for woodland management and improve transparency.				
Action 23.	Require tree protection hold-backs for contractors working around or within woodlots as part of design and construction projects.	PCDR	DENG, FINS	SHORT		$$
		Why: Hold-backs and securities are an effective compliance measure.				
Action 24.	Establish an approach for managing encroachment issues within woodland areas.					
Action 24.1.	Establish an approach for managing legacy issues of private yard encroachments into woodlot areas.	PCDR	PFHO, LEGL	MID		$$
		Why: Legacy issues of encroachment exist. Recognizing that some issues of encroachment are not necessarily the fault of the current owner of a property, the City could adopt a standard approach to fair and equitable resolutions.				
Action 24.2.	Formalize an approach and enforcement action for managing developing issues of encroachment.	PCDR	PFHO, LEGL	MID		$$$$
		Why: As the City of Vaughan continues to experience growth and development, encroachment into public lands, including woodlands, will be a persistent issue. The City should formalize the processes and enforcement measures at its disposal to consistently manage this issue.				
Action 25.	Pursue stronger interdepartmental and TRCA relationships in the interest of multi-use trail management.	Procedure	PRC, PFHO, PIPD, TRCA	MID		$$$
		Why: The issue of unauthorized trails will persist and grow with the City. Establishing procedures to gradually decommission trails will mitigate the probability of the issue becoming overwhelming in the future.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Goal 5: Partner in woodland stewardship						
Action 26.	Establish and administer a forest steward program, designed to appoint community members with a lead role in the stewardship of each of the City's 27 woodlots.	Stewardship	PFHO, BYLW	SHORT	**YES**	$$
		Why: A forest steward program offers an invaluable network and resource to the City of Vaughan. Forest stewards would be interested members of the public assigned a leading role in monitoring efforts and in the coordination of stewardship events in a specific woodlot. Forest stewards would also be an important resource in helping City staff understand the challenges facing specific woodlots.				
Action 27.	Support a range of community stewardship opportunities for interested members of the public.					
Action 27.1.	Support public planting initiatives to expand woodland areas where sites are suited.	Stewardship	PFHO	MID		$$
		Why: Bare root planting initiatives are an excellent way to build stewardship, expand the City's woodland system and canopy, and require minimal training in advance.				
Action 27.2.	Host community clean-up events to remove garbage from woodland and riparian sites.	STWD	PFHO, PPLN	SHORT		$$
		Why: Waste and litter removal from woodlots are excellent stewardship opportunities.				
Action 27.3.	Offer outlets for citizen-led monitoring initiatives within woodland areas.	STWD	PPLN, PFHO	SHORT		$$
		Why: Tools which support citizen monitoring capitalize on the public's value as a great asset in providing numerous eyes on the ground to support woodland management.				
Action 28.	Ensure woodland interests are well represented through the composition of any new Community Tree Board.	STWD	PFHO, PPLN	SHORT		$
		Why: A Community Tree Board (CTB) would provide a platform for community members to raise specific urban forestry concerns for the sharing of program specific information, and for coordination and administrative support for stewardship and engagement programming.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Action 29.	Utilize on-site signage to advertise when and why site works will be occurring/has occurred. Use the opportunity to educate the public on woodland management processes.	PCDR	CME, PFHO, PIPD	MID	**YES**	$$
		Why: Ensuring signage is present near or at the location of site works helps ensure the public is aware of why and when the work will be occurring, capitalizes on an important educational opportunity, and can enhance the success of plantings.				
Action 30.	Work together with Indigenous peoples to identify and support culturally sensitive urban forest and woodland management practices.	PTNR	CME, PFHO	SHORT	**YES**	$$$$
		Why: For thousands of years, Indigenous Peoples have served as stewards to the natural ecosystems that have existed within the lands now known as the City of Vaughan. Although the landscape has changed dramatically over the past few centuries, there may be significant opportunities for meaningful knowledge exchange between the City and Indigenous Peoples on urban forest management, including the identification of culturally-sensitive management practices or supporting reconciliation through urban forestry programs and initiatives.				
Action 30.1.	Consult with local Indigenous Peoples and Communities toward integrating traditional ecological knowledge into woodland management activities.	STWD	CME, PFHO	SHORT	**YES**	$$
		Why: Traditional Ecological Knowledge is often defined as the cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment, encompassing language, naming and classification systems, resource use practices, rituals, spirituality and world-view. Indigenous Peoples have lived in and cared for the trees and woodlands in what is now known as Southern Ontario for thousands of years before the arrival of settlers. Having long occupied the lands sustainably, there may be opportunities to share how these lands and forests can be sustainably managed.				
Action 30.2.	Utilize place-making and other cultural tools toward integrating Indigenous Peoples, perspectives, and values into woodland areas.	STWD	PPLN, CME, PFHO, PIPD	SHORT	**YES**	$$
		Why: There are several examples of new parks and public amenities taking on Indigenous names in recognition of the histories of the lands they now exist within. In July 2021, Vaughan City Council unanimously supported the renaming of Ryerson Park to Sweetgrass Park in consultation with local Indigenous leaders.				

Action		Type	Responsibility	Timeframe	Priority	Ant. Cost
Action 31.	Pilot the concept of food forests in partnership with the TRCA and community partners, supporting both equity outcomes and broader community engagement, education, and outreach	PTNR	PFHO, PPLN, TRCA	MID		$$
		Why: Food forests are a diverse arrangement of primarily edible plants that attempt to mimic the ecosystems and patterns found in the natural world. Food forests tend to be low-maintenance once established, and can produce a reasonable crop toward food security outcomes.				
Action 32.	Ensure the design of urban forestry programming and engagement is considered through an equity lens.	PGRM	PPLN, CME, PFHO	MID		$
		Why: Making sure that urban forestry programs and engagement efforts consider the diverse socioeconomic and cultural profiles in the city helps create outcomes that benefit everyone.				
Action 33.	Utilize pop-up events to spread messaging on urban forestry topics and programming.	STWD	CME, PPLN, PFHO	SHORT		$
		Why: Pop-up events can be an effective means of engaging with community members.				
Action 34.	Initiate a quarterly woodland walk to spread awareness of the challenges facing woodland management in the City, and to showcase activities such as restoration and invasive species removal.	Education	PFHO, CME, PPLN	SHORT		$
		Why: Woodland walks are a great way to get residents out and talking about the challenges facing the City's woodlands. Showcasing issues, successes or ongoing restoration efforts is an effective way for the City to demonstrate what it's doing to supporting woodland areas.				

Section 3.Woodlot Management Planning

3.1. Basis

Woodlot management planning plays a crucial role in ensuring sustainable forest management. Although the Strategic Framework in **Section 2** outlines broad program actions, it lacks the specificity necessary to provide guidance for the management of specific woodlot assets. **Section 3** outlines the woodlot management planning framework presented in this document, and has had its inaugural application to the Sugar Baker Bush Woodlot Management Plan (WMP). One of the cornerstone actions put forward through **Section 2** of this plan is to prepare WMPs for Vaughan's 26 remaining woodlots.

The framework for Vaughan's WMPs supports the monitoring and sustainable management of the City's woodlots over a ten year period. The WMP framework incorporates a blend of stand-level analyses, the application of a common criteria and indicators framework, clearly defined long-term management objectives, and short-term management prescriptions. This section elucidates the purpose, intent, and structure of the WMPs, and a diagram illustrating the framework of the WMPs is presented in the following page.

3.2. Woodlots

Vaughan is home to 27 community "woodlots". Although the term is sometimes associated with timber harvest, Vaughan's woodlots are managed primarily for recreational and ecological values. Harvest is not a program priority given the woodlots the City currently manages.

3.3. Woodlot Management Values

The first component of Vaughan's Woodlot Management Planning Framework consists of two overarching values that is to guide the management of all woodlots within the city:

1. Biodiversity Conservation
   Management values that give priority to ecological function, biodiversity, species habitat, and environmental quality.

2. Safe and Enjoyable Human Use
   Management values that prioritize recreational opportunities, ensure the safe use of woodlot settings, and leverage environmental services that support human land use.

Every woodlot in the city is managed to achieve balance between these two overarching values. Each Woodlot Management Plan (WMP) includes an aggregate score for both values. These scores are derived from a distinct set of criteria and indicators for each value. The aggregate scores help to inform asset management and life cycle planning within each woodlot, and support the assessment of progress towards of long-term management objectives.

Vaughan's Woodlot Management Planning Framework

27 Woodlots in Vaughan managed to achieve a balance of

2 Core Forest Management Values
1) Biodiversity Conservation
2) Safe and Enjoyable Human Use

The weighting of the criteria and indicators varies among woodlot types, reflecting the differing significance of indicators to the long-term management goals of each type of woodlot.

4 Woodlot Types

1 Recreational Woodlot

2 Lowland/ Riparian Woodlot

3 Upland Woodlot

4 Remnant Woodlot

Long-term Management Objectives

Issues raised through criteria & indicator assessment inform short-term management prescriptions.

Criteria and indicators are employed to generate scores for the City's two core management values. These scores serve as a condition assessment for each woodlot.

16 Criteria and Indicators

Used to assess long-term woodlot management objectives.

13 for Biodiversity Conservation

- Invasive Species
- Unauthorized Encroachment
- Regeneration
- Supercanopy Trees
- Coarse Woody Debris
- Snags
- Uncommon Trees & Rare Woodlands Communities
- Mast Trees
- Woodland Connectivity
- Woodland Size
- Species at Risk
- Relative Biodiversity
- Interior Forest Habitat

3 for Safe and Enjoyable Human Use

- Recreation Quality
- Risk Management
- Surface Water Drainage

Short-term Management Prescriptions

Shortcomings raised through the criteria & indicator assessment are used to craft short-term management prescriptions. These prescriptions are aligned with long-term management objectives.

3.4. Woodlot Types and Long-Term Management Objectives

To establish a long-term management direction, each of Vaughan's 27 woodlots will be assigned one of four broad types, determined by patterns of prevailing human use and ecological qualities. This typology does not imply exclusive management for a single use. Instead, all woodlots are managed to strike a balance between the two core values described in **Subsection 3.3**. The types identify the predominant use of the woodlot, thereby informing suitable long-term management. Each woodlot type supports up to three long-term management priorities, intended to align with the city's aspirations for woodlot assets of the same type.

Recreational Woodlots

Recreational woodlots are managed primarily to provide access for residents and varied recreational uses. These assets often include organized trail systems, signage, and parking facilities. There may be potential for designating off-leash dog areas where this does not detract from the experience of other users or create concerns for biodiversity conservation. The management of these forests generally aims to strike a balance between preserving ecological integrity and ensuring public enjoyment.

The long-term management goals are:

1. Managing risk at an acceptable level.
2. Supporting a range of recreational opportunities suitable for all ages and abilities.
3. To support healthy, biodiverse, and native ecosystems.

Lowland/Riparian Forests

Lowland and riparian forests contain creeks, rivers, or other watercourses. Forefront objectives in this asset class include risk management, supporting broader stormwater management function, and habitat connectivity within the Natural Heritage System (NHS). Human activities are usually considered as secondary priorities.

The long-term management goals are:

1. Managing risk at an acceptable level.
2. To support healthy, biodiverse, and native ecosystems.
3. To serve as a critical support in managing stormwater and runoff within the City of Vaughan.

Upland Forests

The main purpose of managing upland forests is to create habitats for wildlife, promote ecosystem health, and contribute to the preservation of native biodiversity. While these forests may have some walking trails, recreation is not generally a primary focus.

The long-term management goals are:

1. Managing risk at an acceptable level.
2. To support healthy, biodiverse, and native ecosystems.
3. To support a range of habitats for wildlife, including by connecting between other forest types.

Remnant Forests

Remnant forests are typically small, often less than 1 hectare in size, or have elongated shapes that make effective management for public use or biodiversity preservation challenging. In such cases, these parcels may be managed primarily for risk, with secondary objectives pursued only opportunistically.

The long-term management goals are:

1. Managing risk at an acceptable level.
2. To support a range of habitats for wildlife, including by connecting between other forest types.
3. To support urban reforestation.

3.5. Criteria and Indicators

A standardized set of 16 indicators serves as the backbone of Vaughan's woodlot management planning framework. Some indicators have the support of two or more sub-indicators. Each indicator is given a score of 1 to 5, where 1 is "very poor" performance and 5 is "very good" performance. To calculate the Biodiversity Conservation and Safe and Enjoyable Human Use scores, the scores across the relevant indicators are averaged to arrive at overall ratings for each core value. The score for Safe and Enjoyable Human Use is influenced by three indicators, while 13 indicators inform the Biodiversity Conservation score.

The goal of woodlot management is not to achieve a "very good" score (i.e., 5) for both woodlot management values. Rather, woodlot management activities should be guided by cost-benefit analyses, aiming to fulfill predetermined service levels for Vaughan's woodlot assets through strategic interventions. Sustainable forest management seeks to strike a balance among public investment, public safety, and public benefits.

Monitoring criteria and indicators allows the City to track variations in woodland health and woodland services, over time. Additionally, monitoring enables an evaluation of the effectiveness of management actions. A reassessment of the criteria and indicators should occur every five years, accompanied by updates to short-term management prescriptions.

Indicators

Vaughan's Woodlot Management Plans (WMPs) incorporate 16 indicators, with three dedicated to assessing the Safe and Enjoyable Human Use value and 13 assessing the Biodiversity Conservation value. An overview of the criteria scoring is available in **Table 3-1**. A brief summary of the indicators and their method of assessment is outlined below:

Safe and Enjoyable Human Use Indicators

Recreation Management: The recreation management indicator offers a qualitative evaluation of the extent to which trail infrastructure improvements and/or renewal are expected to impact a public woodlot over the next 10 years (e.g., necessitating tree removal).

Risk Management: The risk management indicator serves as a quantitative screening measure assessing the potential risk posed by trees in the woodlot, taking into account the presence of interface environments (i.e., length of edge) and/or the existence of dead or dying trees (dead/dying trees per hectare). It's important to recognize that this indicator does not rely on any formal tree risk assessment. Low scores do not conclusively indicate that a hazard is present in the woodlot. Instead, the risk management indicator has been prepared to support prioritizing future risk management monitoring and abatement efforts.

Stormwater Management: The stormwater management indicator is a qualitative measure of the extent to which capital stormwater management and drainage projects taking place in resident creeks are anticipated to require tree removal.

Biodiversity Conservation Indicators

Unauthorized Encroachment: The unauthorized encroachment indicator gauges the severity of encroachment issues within a woodlot. Encroachment into woodland areas can result in the introduction of invasive species, displacement of native flora, and disruption of wildlife shelters, food sources, and overwintering habitats. In certain instances, encroachment may also conflict with human uses of a forest. The indicator is established through a count of incidental observations, with lesser weight assigned to more easily addressed encroachment issues (e.g., dumping) and greater weight assigned to more challenging-to-resolve matters (e.g., yard encroachments, encampment, or unauthorized trails).

Supercanopy Trees (SCT): The SCT indicator offers a quantitative assessment of the abundance of large trees (> 50 cm dbh) within a woodlot (i.e., SCT per hectare). Supercanopy Trees emerge above the primary canopy of a stand, introducing vertical structural diversity that serves as lookouts, refuges, perches, and landmarks for wildlife.

Coarse Woody Debris (CWD): The CWD indicator assesses the abundance of Coarse Woody Debris within a woodlot. CWD includes dead logs and large

dead branches on the forest floor, providing a feeding environment for woodpeckers, nesting opportunities for snakes, and serving as shelter for salamanders. Additionally, CWD offers a growth medium for fungi, mosses, and lichens. Deadwood pieces exceeding the minimum size criteria for a **log** can be counted as multiple **logs**. Presently, the City lacks the necessary data to score this indicator within woodlots. However, future inventory work will be undertaken to develop this dataset.

Regeneration: The regeneration indicator offers a quantitative assessment of the proportion of understory species that are native and have the potential to become overstory trees if released from the understory. Stem counts in the understory, specifically the proportions of "quality" species, form the basis of this indicator.

Invasive Plants: The invasive species indicator provides quantitative measures of the relative abundance of both woody and non-woody invasive species within a woodlot. Invasive plants possess traits that confer a competitive advantage over native species when new growing space becomes available in woodlands. The indicator comprises two sub-indicators: woody invasives, determined by the abundance of mature invasive trees in the overstory (i.e., stems per hectare), and non-woody invasives, based on the area affected by non-woody invasive species (i.e., a percentage of total woodlot area). Sub-indicators carry equal weight in determining the overall score for the indicator.

Snags: The snags indicator offers a quantitative assessment of the relative abundance of snags in a woodlot (i.e., snags per hectare). Snags are standing dead trees that offer opportunities for feeding, nesting, and

perching for birds such as woodpeckers and hawks, as well as mammals such as squirrels and raccoons.

Interior Habitat: The interior forest habitat indicator provides a quantitative measure of the relative abundance of interior habitat within a woodlot (i.e., gross area of interior habitat). Interior habitat was defined as woodland habitat setback 100 metres or more from any edge environment. Interior habitat often provides different functions than edge environments, such as protection from nest predators like raccoons and blue jays, which tend to be more prevalent in edge habitats.

Mast Trees: The mast trees indicator offers a quantitative assessment of the relative abundance of mature mast trees in a woodlot (i.e., stems per hectare). Mast trees produce edible fruits that serve as crucial sources of food for wildlife.

Uncommon Trees: The uncommon trees indicator presents a quantitative measure of the relative abundance of uncommon tree species (as defined) in a woodlot (i.e., uncommon trees per hectare). It's important to distinguish this indicator from the SAR indicator, which encompasses species identified under Ontario Regulation 230/08. Uncommon trees are not necessarily endangered or threatened, although they often are. Instead, they are species that have become less prevalent in Vaughan's native ecosystems due to urban and agricultural growth over the past two centuries.

Forest Connectivity: The forest connectivity indicator offers a quantitative measure of the relative connectedness (external connections) and fragmentation (internal connections) of a woodlot. Forest connectivity is crucial for the long-term persistence of species dependent on forested environments. The indicator comprises two sub-indicators: forest connectivity, which assesses the number of connections between the woodlot and other nearby woodlots, and fragmentation, which evaluates the number of discrete woodlot areas within the woodlot. Both measures use linkages as the basis for criteria scoring, with linkages representing the shortest path between a woodland patch and each of its neighbours. It's important to note that barriers and the cost of movement were not considered in this analysis. The methods used to evaluate fragmentation and connectivity are simplified and can be refined in future Forest Management Plan updates as new analyses and datasets become available. Sub-indicators carry equal weight in determining the overall indicator score.

Forest Size: The forest size indicator offers a quantitative measure of the gross size of the forest area, calculated by considering all constituent woodlots. Forest size serves as an important indicator because the total size of a forest can significantly impact its suitability for supporting habitat and various types of use or management practices.

Species at Risk (SAR): The SAR indicator offers a quantitative measure of the relative abundance of Species at Risk (as defined under Ontario Regulation 230/08) or candidate habitat for these species. The indicator comprises two sub-indicators: the first involves actual observations of SAR, determined by their frequency in the woodlot (i.e., SAR observations per hectare), and the second entails observations of candidate SAR habitat (i.e., different types of candidate SAR habitat per hectare). Sub-indicators carry equal weight in determining the overall indicator score.

Relative Biodiversity: The species richness indicator provides a quantitative measure of the relative abundance of unique flora and fauna species within a woodlot. This indicator consists of two sub-indicators: richness of woody native species, determined by a simple count of unique species of native flora (i.e., species per hectare), and unique species of fauna (i.e., species per hectare). Both sub-indicators are constrained by the currently available data; the flora sub-indicator does not encompass the full spectrum of native flora within the forest, and the fauna sub-indicator is limited to avian species. Thresholds for criteria should be adjusted for this indicator as inventory data is enriched over time. Sub-indicators carry equal weight in determining the overall indicator score.

Table 3-1. *Woodlot criteria and indicators scheme.*

Objective	Very poor *Unfit for Purpose* 1	Poor *At Risk* 2	Fair *Requires Attention* 3	Good *Adequate for Now* 4	Very Good *Fit for Future* 5	Indicator Weighting by Forest Type
VALUE: Safe and Enjoyable Human Use						
Recreation Management	*Gaps exist in the provision of quality trail infrastructure within the forest. Planned network upgrades and/ or maintenance activities will likely necessitate significant tree removal.*	*Some gaps exist in the provision of quality trail infrastructure within the forest. Planned network upgrades and/ or maintenance activities will likely necessitate some tree removal.*	*Isolated gaps exist in the provision of quality trail infrastructure within the forest. Planned network upgrades and/ or maintenance activities could necessitate some tree removal.*	*Trails infrastructure in the forest is sufficient in meeting forecasted demand. Trail renewal activities could impact isolated trees.*	*Trails infrastructure in forest sufficient in meeting forecasted demand. Trail renewal activities unlikely, but could impact isolated trees.*	**Recreation: 2** **Upland: 1** **Lowland: 1** **Remnant: 0**
Risk Management	> 1,000 m edge/ha AND > 5 dead or dying trees/ha. *Concentration of dead and/or declining trees and extensive edge environments are present in the forest.*	> 0 m edge/ha AND > 5 dead or dying trees/ha. *Concentration of dead and/or declining trees and some edge environments are present in the forest.*	> 0 m edge/ha AND < 5 dead or dying trees/ha. *Some dead and/ or declining trees and some edge environments are present in the forest.*	> 0 m edge/ ha AND 0 dead or dying trees/ ha BUT one or more forest health factor(s) present. *No dead or declining trees were observed within the forest, but some interface settings exist. Forest health concerns are present, or may be expected in the future.*	0 m edge/ha AND 0 dead or high-risk trees/ha AND no significant forest health factors present. *No dead or declining trees within the forest, and no or very limited interface settings exist. No current forest health issues present or anticipated in the future.*	**Recreation: 2** **Upland: 2** **Lowland: 2** **Remnant: 2**

Objective	Very poor *Unfit for Purpose* 1	Poor *At Risk* 2	Fair *Requires Attention* 3	Good *Adequate for Now* 4	Very Good *Fit for Future* 5	Indicator Weighting by Forest Type
Stormwater Drainage 	*0.2 ha or more woodland canopy per year are removed to support stormwater management or drainage works. Some or all areas of affected woodland cover will be permanently converted to non-woodland cover.*	*Less than 0.2 ha of woodland canopy per year are removed to support stormwater management projects. Some areas of affected woodland cover will be permanently converted to non-woodland cover.*	*Less than 0.2 ha of woodland canopy per year are removed to support stormwater management projects. Restorative planting will take place in all areas affected following the end of construction.*	*Less than 10 tree removals per year occur to support stormwater management projects. Restorative planting will take place in all areas affected following the end of site alteration.*	*No tree removal is anticipated within the woodlot in support of stormwater management projects.*	**Recreation: 2** **Upland: 0** **Lowland: 2** **Remnant: 0**
VALUE: Biodiversity Conservation						
Invasive Plants 	4+ woody invasive trees/ha. *Woody invasive trees pervasive in the forest and a significant ecological concern.*	1-4 woody invasive trees/ha. *Presence of woody invasive trees common and an ecological concern in the forest.*	1-1.5 woody invasive trees/ha. *Some woody invasive trees in the forest.*	<1 woody invasive trees per ha. *Few woody invasive trees in the forest.*	No presence of woody invasive trees in the forest.	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**
	Non-woody invasive cover present in more than 2% of the forest. *Non-woody invasive plants pervasive in the forest and a significant ecological concern.*	Non-woody invasive cover present in between 1 and 2% of the forest. *Presence of non-woody invasive plants common and an ecological concern in the forest.*	Non-woody invasive cover present in between 1 and 0.5% of the forest. *Some non-woody invasive plants in the forest.*	Non-woody invasive cover present in between 0.5 and 0.1% of the forest. *Few non-woody invasive plants in the forest.*	No notable areas of Non-woody invasive cover present.	

Objective	Very poor *Unfit for Purpose* 1	Poor *At Risk* 2	Fair *Requires Attention* 3	Good *Adequate for Now* 4	Very Good *Fit for Future* 5	Indicator Weighting by Forest Type
Unauthorized Encroachment	*Very frequent instances of encroachment of multiple types in the forest. Issues often involve varieties of encroachment that are more challenging or costly to resolve (e.g., rear yard encroachment, unauthorized trails).*	*Frequent instances of encroachment of multiple types in the forest. Issues occasionally involve varieties of encroachment that are more challenging or costly to resolve (e.g., rear yard encroachment, unauthorized trails).*	*Some instances of human encroachment in the forest. Issues are typically less difficult to resolve (e.g., dumping).*	*Very isolated instances of encroachment in the forest. Issues only involve varieties of encroachment that are more readily resolved (e.g., dumping)..*	*No known issues of unauthorized encroachment in the forest.*	**Recreation: 2** **Upland: 2** **Lowland: 2** **Remnant: 0**
Regeneration	No high-quality tree regeneration present. *Regeneration exclusively invasive or otherwise consisting of species which may not achieve maturity.*	0-60% quality regeneration present. *Few suitable native recruits present in regeneration.*	60-80% quality regeneration present. *Some suitable native recruits present in regeneration.*	80-95% quality regeneration present. *Regeneration consisting primarily of suitable native recruits.*	>95% quality regeneration present. *Regeneration consisting only of suitable native recruits.*	**Recreation: 2** **Upland: 2** **Lowland: 2** **Remnant: 0**
Supercanopy Trees (SCT)	No SCT present.	1 SCT per 16-32 ha *SCT limited in the forest.*	1 SCT per 8-16 ha *Some SCT present in the forest.*	1 SCT per 4-8 ha *SCT are a common occurrence in forest.*	1 or more SCT per 4 ha or less[1] *SCT abundant in the forest.*	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**

Objective	Very poor *Unfit for Purpose* 1	Poor *At Risk* 2	Fair *Requires Attention* 3	Good *Adequate for Now* 4	Very Good *Fit for Future* 5	Indicator Weighting by Forest Type
Coarse Woody Debris (CWD) 	Very limited or no CWD present in forest.	<5 logs/ha *CWD limited in the forest.*	5-10 logs/ha *Some CWD present in the forest.*	10-20 logs/ha *CWD a common occurrence in forest.*	>20 logs/ha[1] *CWD abundant in the forest.*	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**
Snags 	Very few or no snags present in forest.	1-2 snags/ha *Few snag trees present in the forest.*	2-3 snags/ha *Some snag trees present in the forest.*	3-5 snags/ha *Snag trees a common occurrence in the forest.*	>5 snags/ha[1] *Snag trees abundant in the forest.*	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**
Interior Forest Habitat 	No interior habitat in forest.	<1 ha interior habitat. *Few interior habitat present in forest.*	1-2 ha interior habitat *Some interior habitat present in forest.*	2-4 ha interior habitat *Interior habitat a common occurrence in forest.*	>4 ha interior habitat[1] *Interior habitat abundant in the forest.*	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**
Mast Trees 	Very few or no mast trees present in forest.	1-2 mast trees/ha *Few mast trees present in the forest*	3-5 mast trees/ha *Some mast trees present in the forest*	5-8 mast trees/ha *Mast trees a common occurrence in the forest*	>8 mast trees/ha[1] *Mast trees abundant in the forest.*	**Recreation: 1** **Upland: 1** **Lowland: 1** **Remnant: 0**

Objective	Very poor *Unfit for Purpose* 1	Poor *At Risk* 2	Fair *Requires Attention* 3	Good *Adequate for Now* 4	Very Good *Fit for Future* 5	Indicator Weighting by Forest Type
Uncommon Trees	Very few or no uncommon trees observed in forest.	1 uncommon tree/2 ha or more *Few occurrences of uncommon trees in forest.*	1 uncommon tree/1-2 ha *Some uncommon trees present in forest.*	1-2 uncommon trees/ha *Uncommon trees a common occurrence in forest.*	>2 uncommon trees/ha *Uncommon trees abundant in forest.*	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**
Forest connectivity	>6 links within the forest. *Highly fragmented forest unit. Forest functionality as a single ecosystem is very limited.*	4 - 6 links within the forest *Fragmented forest unit.*	2 - 3 links within the forest *Some fragmentation exists within the forest.*	One link within the forest *Forest is largely intact.*	No links within the forest *Forest is one consolidated unit. Fragmentation and interconnectivity not a concern.*	**Recreation: 0** **Upland: 1** **Lowland: 1** **Remnant: 0**
	No external links to nearby forests. *Very isolated forest. Very limited to non-existent connections to the City's broader forest network.*	1 to <3 links at a 1 km max distance *Forest connectivity to the City's broader forest network is limited.*	3 links at a 1 km max distance *Some connections exist between the forest and the City's broader forest network.*	4 links at a 1 km max distance *Forest is reasonably well connected to the City's broader forest network.*	>= 5 links at a 1.5 km max distance *Forest is very well connected to the City's broader forest network. Numerous connections to other forest features exist.*	

Objective	Very poor *Unfit for Purpose* 1	Poor *At Risk* 2	Fair *Requires Attention* 3	Good *Adequate for Now* 4	Very Good *Fit for Future* 5	Indicator Weighting by Forest Type
Forest size 	< 0.5 ha of the forest under City ownership or management AND the larger contiguous forest is < 0.5 ha in total size *Very small remnant forest left over from development activity with little opportunity to support meaningful ecological or environmental management outcomes in light of constraints imposed by its size.*	< 0.5 ha of the forest under City ownership or management AND the larger contiguous forest is > 0.5 ha in total size *Small remnant forest parcel left over from a past subdivision process. However, opportunities may be present to manage the broader contiguous forest in collaboration with neighbouring landowners.*	0.5 - 1 ha of the forest under City ownership or management *Moderately sized forest capable of supporting ecological or biodiversity outcomes.*	1 - 8 ha of the forest under City ownership or management *Large forest are capable of supporting important ecological and biodiversity outcomes.*	>8 ha of the forest is under City ownership or management *Very large forest capable of supporting a broad range of important ecological and biodiversity outcomes.*	**Recreation: 0** **Upland: 1** **Lowland: 1** **Remnant: 0**

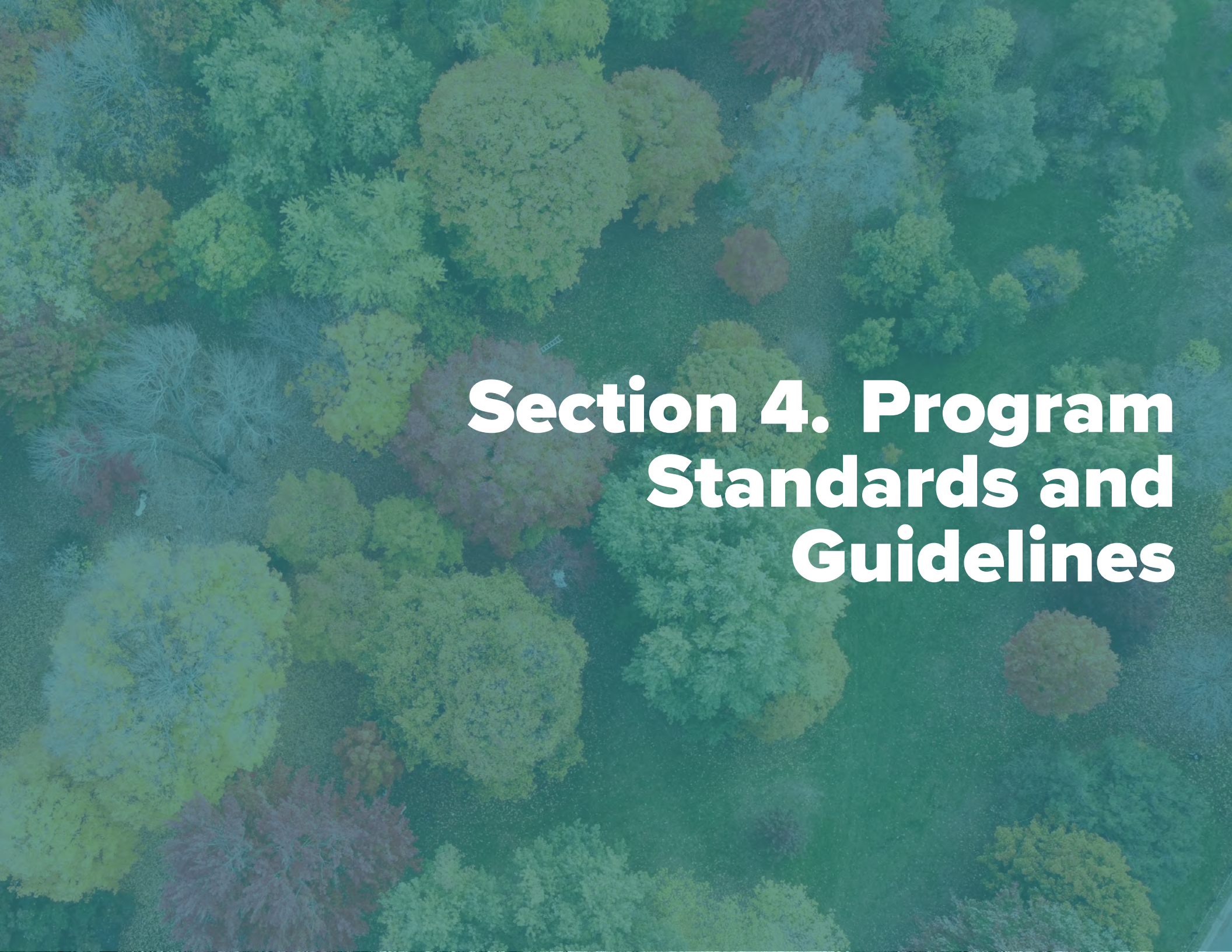
Objective	Very poor *Unfit for Purpose* 1	Poor *At Risk* 2	Fair *Requires Attention* 3	Good *Adequate for Now* 4	Very Good *Fit for Future* 5	Indicator Weighting by Forest Type
Species at Risk (SAR)	No observations of species at risk in forest	Observations of SAR at a rate of 1 species/10 ha *Very limited SAR observations in forest.*	Observations of SAR at a rate of 1 species/2 ha *Few SAR observations in forest.*	Observations of SAR at a rate of 1 species/ha *SAR observations in forest.*	Observations of SAR exceeding a rate of 1 species/ha *Abundant SAR observations in forest.*	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**
	No candidate SAR habitat observed in forest	Observations of candidate SAR habitat at a rate of no more than 1 species/2 ha *Very limited candidate SAR habitat in forest.*	Observations of candidate SAR habitat at a rate of up to 2 species/ha *Few candidate SAR habitat observations in forest.*	Observations of candidate SAR habitat at a rate of up to 5 species/ha *Candidate SAR habitat observations in forest.*	Observations of candidate SAR habitat exceeding a rate of 5 species/ha *Abundant candidate SAR habitat observations in forest.*	
Relative Biodiversity	Unique woody overstory species occur at a rate of less than 1 species/ha *Very limited native woody biodiversity.*	Unique woody overstory species occur at a rate of up to 2 species/ha *Limited native woody biodiversity.*	Unique woody overstory species occur at a rate of up to 3 species/ha *Fair native woody biodiversity.*	Unique woody overstory species occur at a rate of up to 4 species/ha *Considerable native woody biodiversity.*	Unique woody overstory species occur at a rate exceeding 4 species/ha *Rich native woody biodiversity.*	**Recreation: 1** **Upland: 2** **Lowland: 2** **Remnant: 0**
	No bird observations recorded within the forest *Very limited avian biodiversity.*	Bird observations at a rate of <2 records/ha in the forest *Limited avian biodiversity.*	Bird observations at a rate of up to 4 records/ha in the forest *Fair avian biodiversity.*	Bird observations at a rate of up to 8 records/ha in the forest *Considerable native avian biodiversity.*	Bird observations exceeding a rate of 8 records/ha in the forest *Rich avian biodiversity.*	

3.6. Short-Term Management Prescriptions

Short-term management prescriptions identify critical woodlot management activities and their planned timing. Informed by the woodlot criteria and indicators and steered by long-term management objectives, short-term prescriptions reflect the activities that should occur within the woodland toward better alignment with the objectives for its management.

The purpose of short-term management prescriptions is therefore to improve the position of key low-scoring criteria and indicators, which in turn will move the woodlot toward the relevant long-term management vision while also enhancing asset value and the range of services provided by the woodland asset.

In the context of Vaughan's WMPs, short-term prescriptions have been prepared up to 2034 (i.e., a 10-year timeframe). While a formal process for prioritizing limited resources to support prescriptions was not applied, the short-term prescriptions generally gave precedence to higher-priority actions and sought to optimize resource utilization by sequencing prescriptions to achieve efficiencies.



Section 4. Program Standards and Guidelines

4.1. Specifications Supporting Site Works

Vaughan's WMPs generally advocate for the creation of a 'specification' at the time when restoration and/or planting works are scheduled to take place. While the data utilized in preparing the WMPs is sufficient for guiding broad short-term prescriptions within individual woodland communities, it lacks the specificity required to prescribe the exact locations and methods for implementing these prescriptions on the ground. This level of direction is instead postponed to the development of a specification.

Specifications should encompass the information essential to facilitate the organized execution of site works and must be formulated shortly before the commencement of site work. Generally, specifications should include:

- specific spatial location(s) of site activities as part of prescribed works,
- stocking specifications across different areas and planting typologies contained to a site,
- treatment and specific location(s) of woody invasives and/or downed woody material as part of any restorative works,
- treatment and specific location(s) of non-woody invasives as part of any restorative works,
- treatment of downed woody material and large stems slated for removal (e.g., leave downed logs, girdle large invasives),
- requirements and location(s) for fencing, scarification of compacted soils, mowing, or other site preparatory site works.

Specifications should be crafted by a suitably qualified individual. While this section includes standards that can offer guidance for specifications, it is the intent of the specification to establish the nuanced direction required to inform coordinated planting and/or restoration activities on the ground.

Not all management activities within woodlot areas will be governed by specifications. Smaller-scale processes, such as the removal of hazardous trees or fallen trees over trails, will not be guided by specifications. Instead, the City will broadly adhere to the guidance provided in this Section when undertaking such activities.

4.2. Invasive Species Management Standards

The *Ontario Pesticides Act* and Ontario Regulation 63/09 include a natural resources exception that permits the application of chemical controls for managing pests and invasive species. This exception allows the use of prohibited pesticides to manage, protect, establish, or restore a natural resource. Municipalities have the authority to apply or engage a licensed contractor to apply prohibited herbicides without requiring a written letter from the Ministry of Natural Resources and Forestry (MNRF). Herbicides may only be applied in strict accordance with all label directions. Individuals or entities working on behalf of the City are obligated to comply with all federal and provincial legislation when applying herbicides.

Data gathered from field inventories has identified the presence of invasive plants in at least some of Vaughan's woodlots. While the goal of completely removing all invasive species from Vaughan's woodlots may be idealistic, striving for the eradication of most established invasive species on a city-wide scale is not practical. The City's primary focus in managing invasive species, in most cases, should be to impede their spread and conserve native ecology, rather than pursuing complete eradication.

Future efforts toward an Invasive Species Management Plan should establish a formal decision-making process for management interventions (i.e., implementing Action 10 of this WMS).

Treatment

The seed bank for some of the invasives can persist in the soil and remain viable for as long as a decade. All site works involving the removal of invasive plants should be accompanied by a monitoring budget to facilitate spot treatments within the treatment area for a period ranging between three and five years. In many cases, residual invasive pressures from surrounding land uses will endure, necessitating ongoing control efforts as part of routine woodland management to prevent re-infestation.

Whenever feasible, treatments for invasive species should be carried out simultaneously. However, the use of different herbicides and control methods for different species may hinder simultaneous treatment. Removal efforts should consistently adhere to best management practices for dealing with invasive species in the natural landscape. Generally, removal will entail a combination of chemical and mechanical controls, and the approach may be guided by the thresholds and directives outlined in an invasive species management plan, when one becomes available.

In general, specifications facilitating the removal of any existing invasive species should be implemented before

initiating any new planting on a site. On sites where native biodiversity is restricted, planting should take place shortly after the removal of invasive species. Reintroducing appropriate native species into the site following invasive removal enhances restoration outcomes. Similarly, planting native species after creating large or frequent openings in the woodland canopy (e.g., through the removal of hazard trees) can help counteract the introduction and spread of invasive species into the understory layer, especially where invasives are already present within a woodland.

Invasive Fauna and Disease Controls

A variety of invasive pests and diseases pose a threat to Vaughan's urban woodlands. Monitoring is the primary method by which the City can stay vigilant against forest health threats. Action 9 of this WMS recommends the City formalize an approach to pest management, such as through the creation of an Integrated Pest Management Policy. This document defers all pest management processes, standards, and thresholds to that document.

Notwithstanding the above, the City typically does not typically undertake treatment for health concerns deemed to be cosmetic in nature. The City does, however, monitor egg masses for spongy moth in collaboration with its organizational partners and may, at its discretion, opt to prescribe treatment where mast thresholds are deemed to warrant the prescribed activity.

Spongy moth (*Lymantria dispar dispar*).

Tree guards and rodent/rabbit fencing adjacent a recent planting site.

4.3. Planting Standards

Where prescribed through a WMP, the following minimum standards should be adhered to when developing a specification involving tree planting within a woodland area.

Site Preparation

Prescriptions for invasive plant removal will be completed prior to the commencement of planting activities at a given location.

In anticipation of fall planting, the designated planting sites undergo mowing in spring to minimize ground cover and mitigate competition.

The decision to implement exclusion fencing should be made before initiating the mowing process. Installation of exclusion fencing and/or tree guards will be required where there is a potential risk of browse damage by deer, rodents, or rabbits. In locations with high levels of pedestrian activity and trails, particular attention should be given to deer exclusion measures to reduce the risk of damage or trampling by pets. The overall specifications for fencing and guards are outlined as follows:

Deer fencing:

- Minimum 3 m tall.
- Composed of knotted-joint style woven wire with 15 cm vertical wire spacing. The bottom 1 m must have openings small enough to prevent the passage of fawns.
- Setback at least 20 cm from any enclosed tree.
- Wood battens or other materials attached to the woven wire to increase fence visibility in areas of concern.

- Pressure treated line post spacing at 4.5-6 m.
- Deer fencing need not enclose coniferous groupings.

Rabbit fencing:

- Barriers be installed around each seedling, or exclusion fencing be employed around the entire site.
- Barriers should be no shorter than 30 cm.
- The barrier should extend no less than 15 cm below grade, and should be set at 90° at maximum depth to prevent lift.
- No single opening greater than 2.5 cm x 2.5 cm.
- More than 20 cm setback from any enclosed tree.
- Use a metal mesh, rather than fibreglass or plastic which can be gnawed through.

Tree guards:

- Individual tree guards are often most effective where rabbit or rodent damage is concerned.
- Tree guards can be made from 10-20 mm square wire screen, biodegradable plastic mesh tubing, or solid plastic sleeves.
- Guards should be set 7.5-10 cm into the ground and braced away from the base of the tree.
- Guards to be installed to a height of 50 cm above the anticipated snow line.

Fencing/guards may meet other standards towards the same end, as prescribed through the relevant specification(s) for work.

Planting

- Selection of planting stock will generally align with **Table 4-1** based on the forest cover type present in the woodland. Stock may vary across the site and should be identified in the planting specification accordingly (**Section 4.1**).
- Seedlings should generally originate from Ontario seed zone 34 or seed zones directly south.
- Seedlings will generally be planted at a density of 1500 to 2400 units per ha, spaced at no less than 2 m on centre.
- Seedlings will be planted without pattern. Clustering may be employed dependent on the objectives of the site work. Use of clustering should be identified through the planting specification (**Section 4.1**).
- Approximately 10% of total plantings for a site will generally consist of an appropriate selection of shrubs, as specified by the qualified person authoring the specification.
- Dominant species will generally constitute more than half of all plantings for a site (**Table 4-1**).
- No one associate species will generally constitute more than 10% of all plantings for a site (**Table 4-1**).
- Seedlings will generally be bare root or container grown stock.
- Seedlings will not be planted within 1.5 meters of a tree greater than 5 centimetres dbh.
- Inclusion of any "trial" stock or stock not otherwise identified through **Table 4-1** (e.g., endangered trees, DED-resistant elm) will generally make up no more than 10% of all plantings for a site.
- Coniferous trees would ideally be planted in clusters where included in a planting specification.

Monitoring and Tending

Annual monitoring of the restoration process continues until the regeneration canopy is established, and the stand is deemed to have attained FTG status. Typically, FTG status is achieved between three and five years at the densities identified. Monitoring activities may encompass:

- Removal of any tree tags, tree guards, exclusion fencing, or other barriers.
- Treatment of invasive and undesired regenerative growth, as necessary.
- Subsequent ('infill') planting to maintain planting density where survivorship is below 75% across the entire planting site or in specific areas of the site which have seen increased mortality
- Watering; generally five times throughout the growing season the year after planting, four times the second year after planting, and twice the third year after planting.
- Installation of coco fibre mats following planting to suppress grasses and to retain moisture around plantings.
- Wrapping trunks of trees with burlap or sisal kraft paper (can prevent deer damage as well as protect plantings from sunscald). This will prevent deer from girdling the main trunk of the tree but will not prevent branch browsing.
- Where deer, rodent, or rabbit damage is particularly persistent, commercial repellents can be utilized to protect plantings. These can be applied to foliage or the base of the stem. Always follow the manufacturers application guidance.

4.4. Management of Deadwood

Coarse woody debris (see **Definitions**) and standing dead material play a crucial role in supporting various ecological functions. Although not always practical, it is advisable to take advantage of opportunities to incorporate woody material into the ecosystem. This may involve:

- Leaving standing dead and senescing trees standing.
- Leaving downed logs, whether sectioned or otherwise, at the felling/fall site.
- Leaving fine woody material at the felling/fall site.
- Leaving mitigated snags or "tall stumps" as part of hazard abatement activities.

Specifications for site works (**Section 4.1**) should prescribe the handling of stem removal and woody material.

4.5. Species at Risk

The City will make an effort to sustain an inventory of any locations within a woodlot area where species protected under Ontario Regulation 230/08 are identified. This database serves as the foundational information required to ensure that both on or off-site works, conducted by either the City or a third party, adhere to the regulations stipulated in the *Endangered Species Act*, 2007, S.O. 2007, c. 6.

The City will engage in management activities that contribute to the well-being of any SAR identified through the database. Additionally, the City may explore opportunities for financial support, potentially through initiatives like Ontario's Species at Risk Stewardship Program.

Table 4-1. *Planting pallet specifications.*

Species	ELC Forest Cover Type						Size	Mast	Site	Notes
	Hard	Oak	Low	Pine	Cedar	Hem				
Trees										
Aspen, largetooth		A	A						Moist to dry sites. Ideally full sun.	
Aspen, trembling		A	A						Moist to dry sites. Ideally full sun.	
Basswood	A		A	O				Y	Moist sites. Rich, well drained soils.	
Beech, American	D	O						Y	Moist sites. Preference to well-drained rich soils. Can grow in shade.	
Birch, yellow	A		D		A				Moist sites. Rich soils. Moderately shade tolerant.	
Birch, white	A	A	A	A	A				Adaptable plant. Needs full sun.	
Birch, gray									Adaptable plant. Needs full sun.	
Butternut	A		A					Y	Moist to moderately dry sites. Preference to well-drained rich soils. Good for slopes. Ideally full sun.	
Cedar, eastern white			A		D	A			Moist sites. Does not tolerate road salt. Tolerates some shade.	

Species	ELC Forest Cover Type						Size	Mast	Site	Notes
	Hard	Oak	Low	Pine	Cedar	Hem				
Cedar, eastern redcedar		A			D				Dry to average moisture. Preference to well-drained sites. Sandy or rocky soils with high pH.	
Cherry, black	D	O		O				Y	Adaptable plant. Full sun.	
Cottonwood, eastern									Moist sites. Rich and sandy soils. Full sun.	
Gum, black			I						Wet, slightly acidic sites. Ideally full sun.	Taproot- containerized stock only. Known adaptability to drier sites north and east of native range.
Hackberry	A		O						Adaptable plant. Full sun to partial shade.	Reasonable replacement for lost elm.
Hemlock, eastern	D			O		D			Moist sites. Very shade tolerant.	
Hickory, bitternut	A	O			A			Y	Very moist, rich sites. Full sun to partial shade.	
Hickory, pignut									Adaptable plant. Full sun to partial shade.	
Hickory, shagbark	A	O	A		A			Y	Moist sites with rich soils. Sun or partial shade.	
Hop tree									Moist to dry sites. Well drained, sand or loam soils. Full sun.	

Species	ELC Forest Cover Type						Size	Mast	Site	Notes
	Hard	Oak	Low	Pine	Cedar	Hem				
Ironwood	A			O	A			Y	Moist to dry, well-drained sites. Slightly acidic soils. Very shade tolerant, can tolerate full sun.	
Maple, black	A		A						Moist sites with rich soils. Shade tolerant.	
Maple, red	D	A		O		A			Adaptable plant. Tolerates some shade.	
Maple, silver			D						Moist sites with rich soils. Full sun.	
Maple, sugar	D	A	A	O		A			Moist sites with deep, rich, well-drained soils. Full sun.	
Oak, black		D		A	A				Moist to dry, adaptable to soils. Full sun.	Reduce use until the impacts of oak wilt are better understood.
Oak, bur	A	D	A	A					Adaptable plant. Full sun, tolerates moderate shade.	Reduce use until the impacts of oak wilt are better understood.
Oak, chinquapin		O		A					Adaptable plant. Full sun, intolerant of shade.	Reduce use until the impacts of oak wilt are better understood.
Oak, red	D	D	A	A	A			Y	Adaptable plant. Full sun, tolerates some shade.	No use until the impacts of oak wilt are better understood.
Oak, swamp white				A					Moist sites, rich slightly acidic soils. Full sun or partial shade.	Reduce use until the impacts of oak wilt are better understood.

Species	ELC Forest Cover Type						Size	Mast	Site	Notes
	Hard	Oak	Low	Pine	Cedar	Hem				
Oak, white	A	D	A	A	A			Y	Adaptable plant. Full sun.	Reduce use until the impacts of oak wilt are better understood.
Poplar, balsam			A		A				Moist sites, rich well-drained soils. Full sun.	
Pawpaw			I						Moist to wet sites, rich soils. Part to full shade.	Taproot- containerized stock only.
Pine, jack				D					Adaptable plant. Prefers dry sandy soils. Full sun.	
Pine, red				D	A				Adaptable plant. Tolerates poor, rocky and sandy soil. Full sun.	
Pine, white	A	A	A	D	A	A			Adaptable plant. Prefers sand or sandy loam. Tolerates partial shade when younger.	
Sassafras	O	O							Adaptable plant. Moist to dry sites preferred. Full shade or full sun.	
Spruce, white					A				Adaptable plant. Tolerates shade.	
Sycamore									Moist sites. Rich soils, tolerates heavy clay. Part shade or full sun.	
Tamarack									Adaptable plant. Full sun.	

Species	ELC Forest Cover Type						Size	Mast	Site	Notes
	Hard	Oak	Low	Pine	Cedar	Hem				
Tulip tree	O								Moist sites, sand and sandy loam. Full sun.	
Walnut, black								Y	Moist sites. Well-drained rich soils. Full sun.	

Acronym Key:

ELC Cover Type; Hard (upland tolerant hardwoods), Oak (upland oaks), Low (lowland hardwoods), Pine, Cedar (cedars and cedar swamps), Hem (hemlock). "D" indicates a dominant species in the cover type, "A" an associate species, "O" an occasional associate, and "I" and infrequent or rare associate.

Notes:

Certain species are present in the forest cover types identified but have been excluded from this table as they are not presently considered suitable planting stock.

Although "early successional hardwoods" is a discrete cover type identified through Ontario's Silvicultural Guide to Managing Southern Ontario Forests,[34] stock selection in stands currently meeting the definition of an early successional hardwood forest should instead utilize upland tolerant hardwood, upland oak, or lowland hardwood species (as is appropriate).

4.6. Woodland Acquisition

Formalizing priorities in woodland management can help to ensure new woodland acquisitions align with the City's long-term objectives for woodland management and its woodland network, as recommended by WMS Action 18. The decision to acquire new woodland areas through purchase agreements should be influenced, in part, by the proximity of the woodland parcel(s) to the City's current network. Priority should be given to purchasing woodland areas that meaningfully contribute to the City's existing woodland network, as determined by their connections to the established network. Woodland acquisitions could potentially be funded by an urban forest reserve fund (proposed by UFMP Action 2-4) or development contributions where appropriate. Potential acquisitions for woodland value should be reviewed against the Land Acquisition Study in each case.

Before the City proceeds with the purchase or dedication of a new woodland area, due diligence mechanisms will be requested and conducted prior to the transfer of land. This process involves:

- Surveys identifying the location(s) and severity of any resident populations of invasive species.
- Surveys identifying the location(s) and severity of any issues of encroachment.
- Surveys identifying the location(s) and severity of any hazardous trees.

Any issues identified during the due diligence process will ideally be addressed and resolved before transfer of ownership. Alternatively, if resolution is not possible before transfer, the fair market value of the woodland may be appropriately discounted to account for the costs associated with addressing those issues following the transfer of land.

4.7. Inventory and Monitoring Standards

Continuous inventory and monitoring processes are essential for the informed management of Vaughan's woodlots. The ongoing collection of forest inventory measurements is crucial for conducting analyses that form the basis of the WMPs outlines in **Section 3** of this Strategy. Moreover, up-to-date inventory records play a vital role in assessing the progress of WMS and WMPs implementation, facilitating the integration of the City's woodlands as a municipal asset. The following provide guidance for sampling methods and measures that support the collection of key woodland information.

Plot Sampling

Sampling programs can be employed to obtain critical insights into forest composition, structure, and health. Measurements easily collected through plot information is often challenging or impossible to acquire through remote sensing methods. The use of a variable-radius permanent sample plot inventory scheme allows for a quick collection of standard and repeated measurements of forest composition and structure over time.

In Vaughan's woodland communities, a cruising prism with a BAF of 2 is generally appropriate. For each tree identified as 'in-plot,' it is important to record species, diameter, condition, and height. Sample tree selection should be based on species and resident stratum, aiming to capture one sample measurement from each well-defined stratum in the plot, along with any noteworthy species diversity observed between strata.

Plot-level observations should include number of strata, slope, and groundcover. To assess understory composition and recruitment, surveys for regeneration and groundcover should be conducted. Regeneration data can be organized either as a stem count or as a proportion of new growth. Regardless of the format, the data should identify the species composition of recruits and understory plants. Soil samples (i.e., test pits) would ideally be taken once, at plot establishment (i.e., immediately outside plot), and paired with the plot record.

Observations of all snags, cavity trees, and coarse woody debris within the plot, including details about their size and level of decomposition should be recorded.

Sampling Density

Plots should be established with a target density of 2 plots per hectare and revisited at the same location in an iterative cycle, ideally aligning with WMP updates and SOUF reporting cycles. Revisiting the same plot is critical as it provides insights into the stands development over time. Sampling locations should be randomly selected, with a minimum buffer distance of 100 meters between them, and should be stratified by the communities and conditions present within the plot. This stratification aims to reflect the proportions of conditions such as interior forest, edge forest, and any ecosites.

Relevant Incidental Observations

Incidental observations, such as the presence of invasive species, encroachment, and erosion, whether within the plot or outside of it, should be spatially recorded, with the nature of the issue clearly identified. Ideally, the recording of incidental observations should be supported by preset standardized response fields, as outlined in Data Hygiene and Standardization.

Opportunistic observations of age (e.g., ring counts following tree felling) should be recorded to a standard dataset and the location of the observation geo-referenced.

Species at Risk

The City will make an effort to maintain an inventory of locations within woodlot areas where species protected under Ontario Regulation 230/08 are observed. This database will include information such as the location, date, and species observed, along with images where feasible. Accessibility to this database will be extended to all City

departments, recognizing that responsibilities for the protection of Species at Risk (SAR) may extend beyond the immediate site and can therefore influence various municipal operations and processes.

Forestry-related datasets

While not the primary responsibility of Vaughan's Forestry division, datasets related to stormwater asset condition and trail asset condition provide valuable information for asset maintenance activities. These datasets often contribute to woodland management prescriptions and should be utilized by Forestry as part of the criteria for the associated indicators.

Habitat/Breeding Bird Surveys

Breeding bird surveys, candidate SAR habitat, and SWH surveys were used as an input to the criteria and indicators outlined in **Section 3**. The City's inventory work should involve periodic updates to this inventory to monitor changes in populations, conducted on a 10-year basis. All observations, whether within the designated plot or not, should be spatially recorded, with the relevant species/habitat clearly identified in a designated field

Data Standardization

Defining precise specifications for data quality and cleanliness, both for internal use and as a requirement in tender documents, is crucial to ensure that new data seamlessly integrates with existing datasets and facilitates effective analysis. Inconsistent data formatting can lead to challenges in archiving and significantly hinder the analysis process.

Ensuring consistency in datasets is most effectively achieved during the data entry phase rather than through post-processing. Mitigating data entry issues can be accomplished through the use of field forms, which can be structured in different ways, including restricting data types at the time of entry (e.g., a numeric field) or providing a range of standardized options (e.g., a drop-down field). Certain GIS and software options also allow for remote monitoring of data entry in real-time, providing an additional means to detect and remedy issues before the entire dataset is collected.

Spatial Datasets

Increasingly sophisticated and accessible remote sensing and spatial datasets offer a significant resource to woodland managers. Current spatial layers played a crucial role in identifying various metrics such as forest edge, trail length, canopy height, crown density, watercourse length, and area during the development of Vaughan's pilot WMP. While technologies like hyper-spectral imagery can accurately detect multiple tree species within Vaughan's woodlands,[32] their application remains relatively uncommon in operational settings to this point. Multi-spectral imagery, including the use of red-edge and near-infrared bands, can also be employed to identify tree stress, decline, and mortality in woodlands. Although methods exist to detect individual tree stems within woodland areas,[33] they have not been widely deployed in practice so far. Access to vital remotely-sensed datasets supporting these insights and analyses has expanded in recent years, with increasingly cost-effective, accurate, and timely UAV and satellite surveys becoming more available.

Hyper-spectral imagery contrasting live and dead or declining canopy in Vancouver's Stanley Park.

Several successive years of drought in combination with western hemlock looper led to an elevated rate of conifer mortality in one of the region's most treasured parks. In response, the Vancouver Board of Parks and Recreation acquired four-band orthoimagery which allowed managers to understand the extent and severity of the decline issue toward developing an appropriate course of management action.

In this image dead and declining coniferous canopy stands out in grey against healthy canopy in red.

Tree Risk Monitoring

Tree risk refers to the likelihood of property damage or personal injury resulting from a hazardous tree. In Vaughan's woodlots, there are trails and woodland edges that interface with public and/or private land uses.

The WMS has identified (i) the locations of interface edges and woodland trails within woodlots and (ii) the woodlands containing dead trees and ash. However, it did not conduct a formal risk assessment. As Vaughan's woodland management program matures, it is expected that formalized procedures for risk management will be established and integrated into other ongoing inventory and monitoring initiatives.

Future inventory updates should therefore incorporate a level one risk assessment of all interface edges within a resident woodlot. All edge and tree assessments should be recorded in a GIS and archived. Edge inspections can be conducted on an iterative schedule, synchronized with inventory re-measurement within a woodland.

4.8. Program Levels of Service and Asset Management

The integration of Vaughan's woodlands into the City's corporate asset management approach allows for the formal management of woodlands as a municipal asset. This integration supports the establishment of levels of service related to woodland maintenance. Clearly defined levels of service assist the City in identifying the necessary resources to maintain woodlands in accordance with community values. It also facilitates the support of ecosystem health and human-centered woodland management outcomes,

including proactive attention to aspects such as risk management.

Vaughan's Woodlot Management Plan (WMP) framework employs a customized criteria and indicators approach. This approach aims to establish two scores for each of the City's 27 woodlots: one for overall Safe and Enjoyable Human Use and the other for Biodiversity Conservation (refer to **Section 3** for more detailed information).

Distinguishing itself from nearly all other asset classes within the City, Vaughan's woodlands fulfill a diverse range of functions and generate various services, many of which are not directly oriented toward human benefits. The utilization of two scores in the woodland rating system recognizes those services and functions that directly affect human populations, as well as those that do not. This approach facilitates consideration for treatment activities supporting both human-related and non-human outcomes. The combined scores can be integrated into the City's asset management portfolio, employing the same five-tiered condition scheme applicable other classes of assets, and ranging from very poor to very good.

Asset values play a crucial role as they provide a reference point for the base value of a managed asset. This underlying value informs cost-benefit analyses, aiding decisions related to appropriate treatments, if any. Determining the underlying value of an asset is particularly challenging in woodland settings for two main reasons: (i) woodlands occur naturally and maintain themselves to some degree without human intervention, unlike conventional assets which do not, and (ii) the full spectrum of ecosystem services generated by urban woodlands is exceedingly difficult to quantify in fiscal terms (see **Section 1.3**). Still, some communities have made attempts to incorporate the value of woodlands into their corporate asset management policy through various methods of appraising woodland value. In the City of London's 2019 Corporate Asset Management Plan,[34] for instance, the City's woodlands were assigned a standard *replacement value* of $67,300 per hectare. This simplified method considers the hypothetical costs for 1:1 woodland replacement, taking into account planning, preparation, modest soil restoration, plant propagation, and planting costs.

The City of London's standard value has been applied to Vaughan's woodland areas, and taken a step further by adjusting the hypothetical replacement value based on the scores identified for the woodland through the relevant WMP. This adjustment is justified through assuming that successful restoration, replanting, and management would lead to an idealized forest state. In contrast, the current condition of all of Vaughan's woodlots would not reflect an idealized state. The practical implication of adjusting the value of woodlots is that for each woodland, there is a hypothetical asset value that would apply were the woodlot to achieve a 'pristine' condition (as assessed through the criteria and indicators approach), and a value reflecting the current state of the woodlot.

As methods for evaluating the full fiscal value (beyond timber) of woodlands continue to evolve, the City should consider incorporating more nuanced methods for woodlot appraisal in future updates to the WMPs and WMS. In addition, a suitable approach to managing woodlands does not necessarily strive for an idealized woodlot condition. Similar to other types of municipal asset, woodland treatments are subject to cost-benefit considerations, with the ultimate objective being to meet a defined level of service through treatment prescriptions. Sustainable woodland management, like urban forest management more broadly, aims to strike a balance between public investment, public safety, public benefit, and, in the case of woodlands, ecological benefit as well.

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VAUGHAN

Attachment 3

City of Vaughan Ten-Year Operating & Financial Plan for Urban Forestry

March 2024

DIAMOND HEAD
3559 Commercial Street
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Executive Summary

This ten-year Operating and Financial Plan (OFP) will support the implementation of Vaughan's Urban Forest Management Plan (UFMP) and Woodland Management Strategy (WMS). Forestry will require enhanced resources to support the implementation of the actions put forward through the UFMP and WMS. This document identifies four program pathways; Status Quo, Good, Better, and Best, to explore the program impacts of four levels of UFMP and WMS implementation, as well as the resources required to achieve them. The highlights of each program pathway include:

Status Quo

Highlights

- No significant changes to the existing scope of the program.
- Program not achieving its targeted seven-year grid pruning cycle.
- Will not achieve the City's canopy target.
- Program to adopt a lifecycle cost assessment approach to resourcing.

Resourcing

- $4.2 million combined operating and capital budget (2034)

Good

Highlights

- All of Status Quo, but in addition:
- Program achieving a seven-year grid pruning cycle.
- Planting rates in boulevards support 25% canopy cover by 2054.
- Tree inventory is updated as inspections and other work is carried out.
- Woodlot management plans (WMP) for each of the City's 27 woodlots.

Resourcing

- $5.8 million combined operating and capital budget (2034).
- One additional arborist FTE.

Better

Highlights

- All of Good, but in addition:
- Enhanced care for young trees to improve establishment success.
- Iterative updates to the City's street tree inventory.
- Iterative updates to the City's 27 WMP.
- Dedicated woodland management capacity to support enhanced program delivery.

Resourcing

- $6.4 million combined operating and capital budget (2034).
- Two additional arborist FTEs.
- One additional Forestry inspector FTE.

Best

Highlights

- All of Better, but in addition:
- Program achieving a targeted five-year grid pruning cycle.
- Dedicated resourcing to support woodland management activities (e.g., replanting, restoration), as informed by the WMS and WMPs.

Resourcing

- $6.7 million combined operating and capital budget (2034).
- Two additional arborist FTEs.
- One additional Forestry inspector FTE.

The purpose of identifying different pathways to UFMP and WMS implementation is to illuminate the varying degrees to which different levels of resourcing support priority outcomes identified in the UFMP. The pathways have been loosely framed to identify the resourcing associated with that of the current program (i.e., Status Quo), the resourcing associated with a modest degree of UFMP and WMS implementation (i.e., Good), the resourcing associated with substantial UFMP and WMS implementation (i.e., Better), and the resourcing associated with full UFMP and WMS implementation with some performance measures exceeding the specifications of those documents (i.e., a "stretch" goal, or Best). Resourcing under the Best pathway is of a level that would position Vaughan's Forestry Operations program as a leader amongst its peers in the Greater Toronto Area.

Lifecycle cost analyses presented in Section 6.0 underpin annual financial forecast tables (2024-2034) presented in Section 7.0.

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Frequently Used Acronyms

FTE	Full-time equivalent
ICI	Industrial, commercial, and institutional (land uses)
LEAF	Local Enhancement & Appreciation of Forests
LoS	Level of Service
MTO	Ministry of Transportation (Ontario)
OFP	Operating and Financial Plan
RoW	Right-of-Way
TRCA	Toronto and Region Conservation Authority
UFMP	Urban Forest Management Plan
VMC	Vaughan Metropolitan Centre
WMS	Woodland Management Strategy
WMP	Woodlot Management Plan

1.0 Introduction and Plan Structure

This is Vaughan's 2024-2034 Urban Forestry Operating and Financial Plan (OFP). The OFP identifies the resources necessary to support the successful implementation of the City's Urban Forest Management Plan (UFMP) and Woodland Management Strategy (WMS) over the coming decade. The OFP is set up as six sections:

Section 2.0: four "program pathways" are identified as well as the outcomes that can be expected from the resourcing entailed. The program pathways have been developed to help illuminate what compromises in resourcing mean in terms of implementation of the UFMP and WMS and program development outcomes.

Section 3.0: restates the priority actions put forward in the UFMP and WMS and identifies the resources that will be leveraged toward achieving them. New or enhanced resources are identified accordingly.

Section 4.0: provides descriptions of new and enhanced program resources as are identified through Section 3.0, and identifies differing outcomes based on the resourcing levels submitted under the program pathways.

Section 5.0: details a lifecycle (lifecycle) cost analysis which has been used to underpin the financial forecasting tree and woodland asset classes. The rationale behind a lifecycle costing approach, as it relates to urban forest asset management, is also discussed.

Section 6.0: identifies formal program service levels that would be targeted under each of the four program pathways. This section also introduces performance measures to track program effectiveness and the implementation of the UFMP and WMS.

Section 7.0: ten-year financial forecasting for each of the four program pathways is laid out in a tabular format.

2.0 Program Pathways

Full implementation of the UFMP will require the support of new and enhanced program resources. This plan leverages a tiered approach to frame different levels of implementation and identifies the fiscal costs associated with each pathway. Four pathways were considered: Status Quo, Good, Better, and Best. Section 3.0 identifies how new program elements align with each program pathway in detail; however, a high-level description of each program pathway (as realized in 2034) is outlined below. Key performance indicators and associated levels of service are provided in Section 6.0.

Status Quo

- No current inventory information.
- Operational budgets do not scale with the number of assets under the City's care.
- No approach for management of woodland areas beyond that which is reactive in nature.
- Proactive tree care not achieving a 7-year return interval (i.e., closer to 40 years).

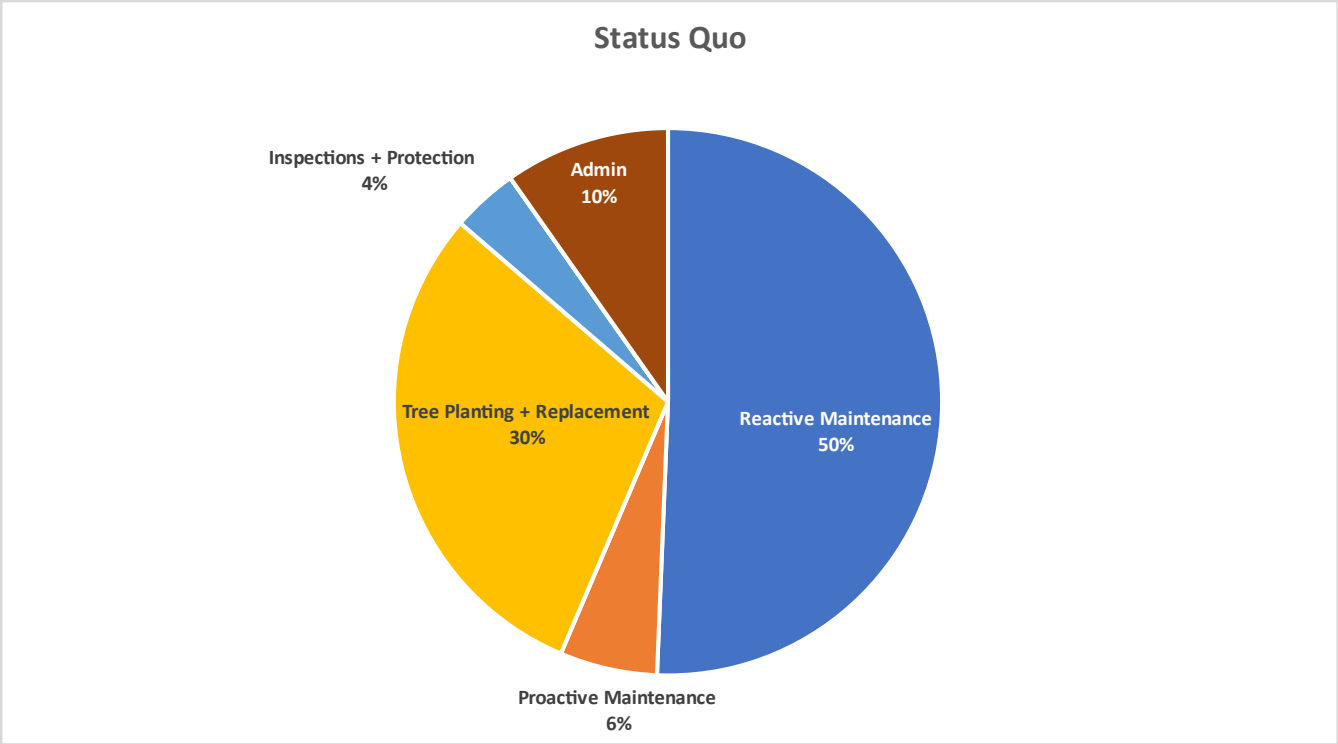

Figure 2-1. Operational spending: Status Quo program pathway forecast (2034).

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Good

- Resources are sufficient to update the tree inventory as inspections and other work are performed.
- Operational budgets scale with the number of assets under the City's care.
- Resourcing will support an increased pruning cycle, though may not achieve a 7-year return interval for intensively maintained street trees.
- A risk management program inclusive of public woodland assets is formalized and implemented.
- The City has completed an WMP for each of its 27 woodlots, but no regular funding is in place to support iterative updates.

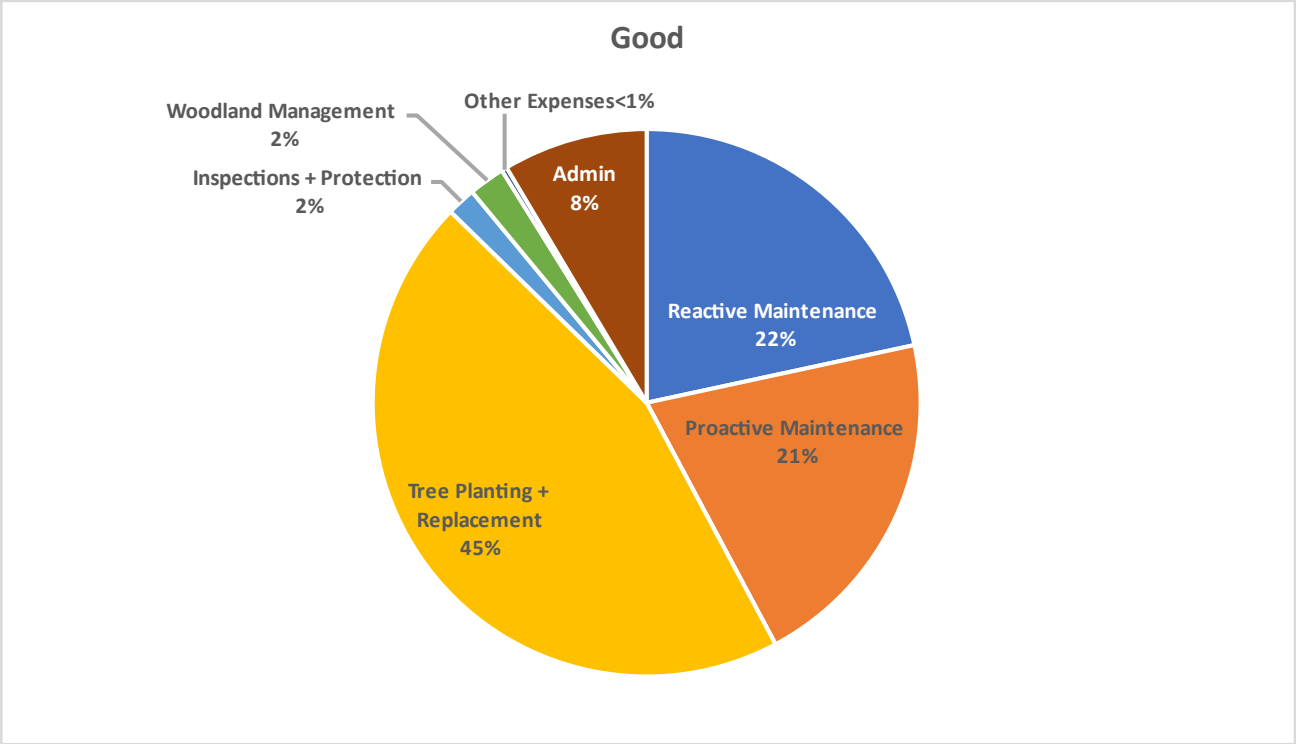

Figure 2-2. Operational spending: Good program pathway forecast (2034).

Better

- The inventory is updated on an iterative cycle, one year in advance of grid pruning work to inform tree care activities within the grid the subsequent year.
- Operational budgets scale with the number of assets under the City's care.
- Resourcing is generally adequate to achieve a 7-year return interval for intensively maintained street trees.
- Additional lifecycle activities (i.e., watering, mulching, structural training) are resourced and can be expected to further extend the service lives of ornamental tree assets.
- A risk management program inclusive of public woodland assets is formalized and implemented.
- One FTE tasked with woodland management supports the coordination and implementation of a significantly expanded woodland management program.
- The City's Woodlot Management Plans are updated on an iterative 5-year cycle and support an evidence-based approach to woodland management.

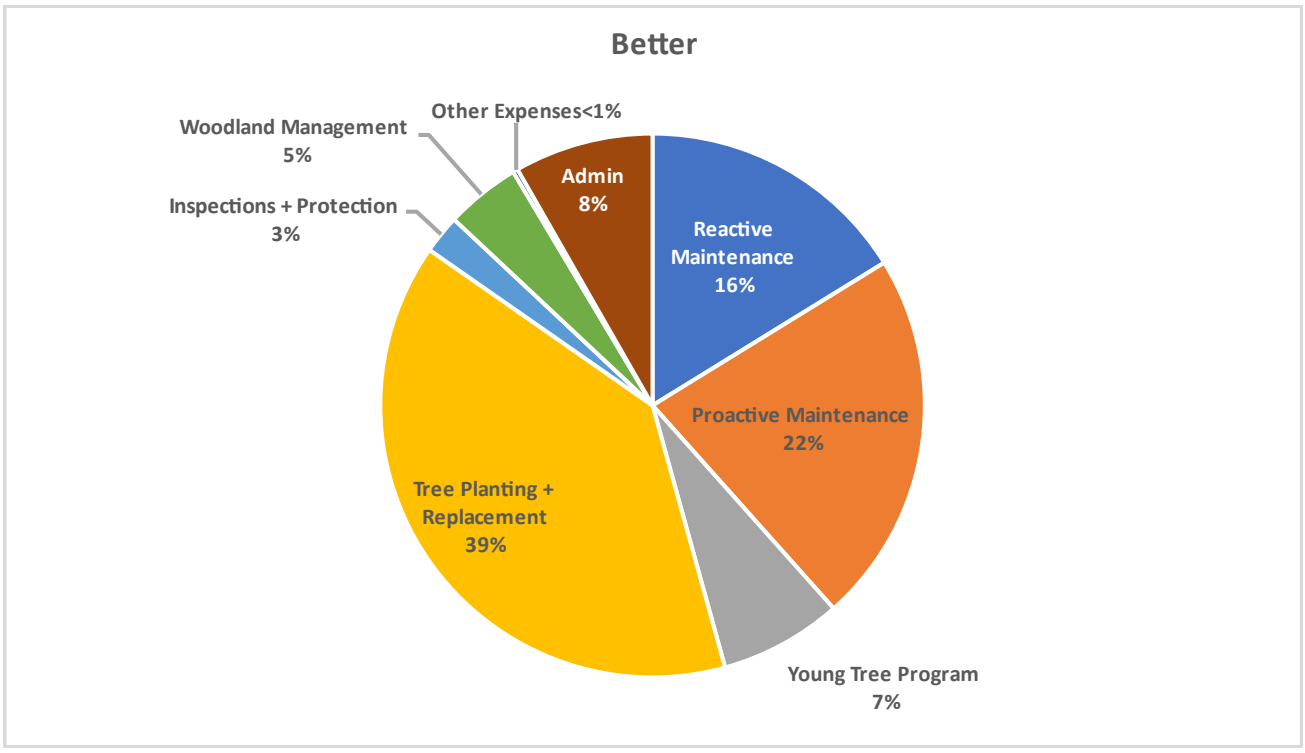

Figure 2-3. Operational spending: Better program pathway forecast (2034).

Best

- The Best program pathway generally outlines a program design that would position the City as a leader in urban forest management.
- The inventory is updated on an iterative five-year cycle, one year in advance of grid pruning work to inform tree care activities within the grid the subsequent year.
- Operational budgets scale with the number of assets under the City's care.
- Resourcing is adequate to achieve a 5-year return interval for intensively maintained street trees.
- Additional lifecycle activities (i.e., watering, mulching, structural training) are resourced and can be expected to further extend the service lives of ornamental tree assets.
- A risk management program inclusive of public woodland assets is formalized and implemented.
- One FTE tasked with woodland management supports the coordination and implementation of a significantly expanded woodland management program.
- The City's Woodlot Management Plans are updated on an iterative 5-year cycle and support an evidence-based approach to woodland management.
- Dedicated resources are put toward woodland management, restoration, and planning on an annual basis and informed by current direction in the relevant Woodlot Management Plan.

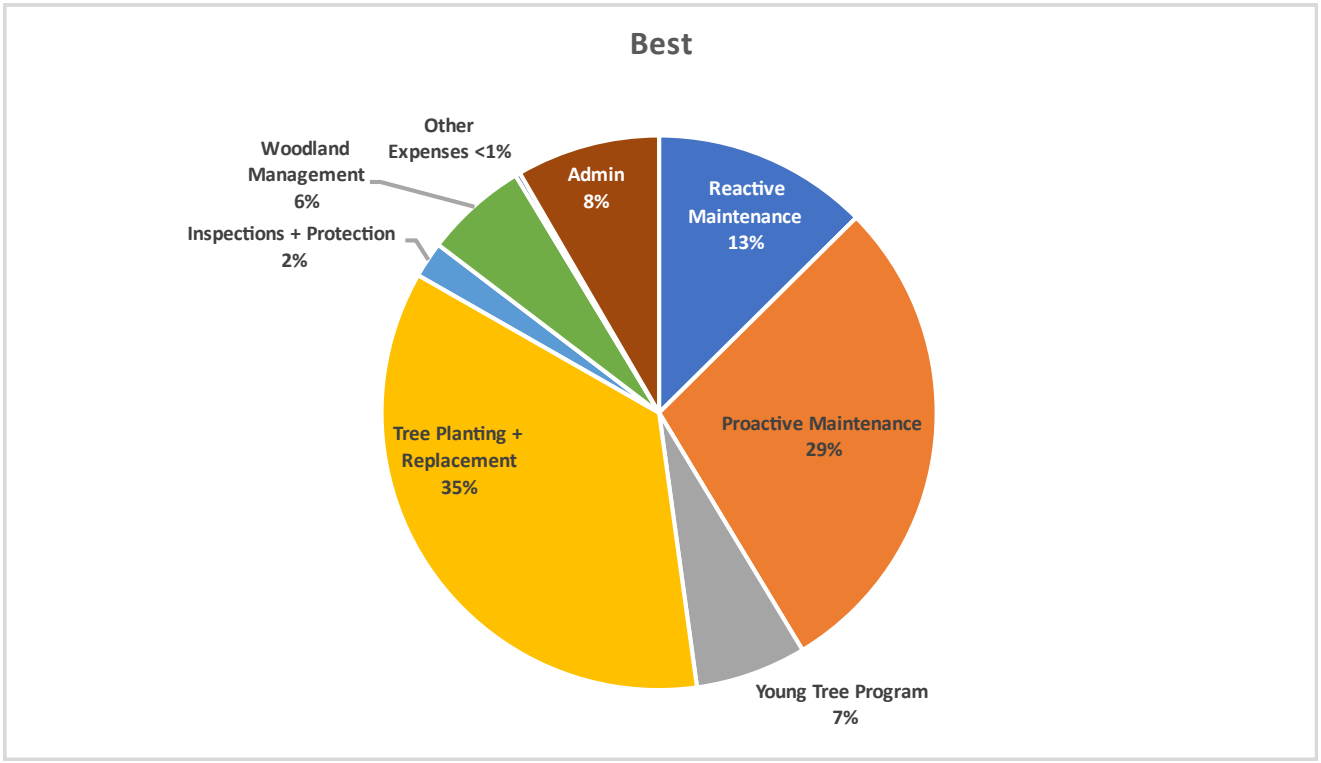

Figure 2-4. Operational spending: Best program pathway forecast (2034).

3.0 Priorities and Plan Implementation

Vaughan's UFMP and WMS propose a variety of program actions and processes that require resources to implement. In alignment with the UFMP and WMS, priority actions are those which the City will look to achieve over the life of this Operating Plan and Financial Strategy. Several priority actions will require additional resources to implement, while others can be implemented through existing city resources. The highest priority actions in the UFMP/WMS are shown in **bold**. Actions not identified as a priority will be implemented opportunistically, as capacity permits, or will otherwise be prioritized following the review of the UFMP and WMS in 2034. Priority actions are listed in this section, in addition to the new or existing resources that will be leveraged in achieving them. Priority actions are listed here relative to the five central goals of the City's UFMP and WMS:

- *Align urban forest management with best practices* (UFMP) and *Align woodland management with best practices* (WMS)
- *Maintain a healthy and safe urban forest* (UFMP) and *Maintain healthy and safe woodland environments* (WMS)
- *Expand the urban forest canopy and associated benefits* (UFMP) and *Expand the City's woodlands and the associated provision benefits* (WMS)
- *Protect trees and woodlands for future generations* (UFMP and WMS)
- *Partner in urban forest stewardship* (UFMP) and *Partner in woodland stewardship* (WMS)

Table 3-1. Priority actions and proposed resources to support implementation: Align urban forest management with best practices (UFMP) and Align woodland management with best practices (WMS)

Priority Actions	
Action	**Resources to Implement**
Pursue Forest Stewardship Council (FSC) certification for the management of city woodlots.	Existing Staff Resources.
Aim to meet the Sustainable Forestry Initiative (SFI) Urban Forest Certification standard by 2030 and consider certification if costs and staff resources permit.	Existing Staff Resources.
Develop urban tree asset condition assessment protocols consistent with the industry tree care standards such as the ANSI A300 standards.	**Existing Staff Resources.**
Establish an interdepartmental working group on urban forestry to meet twice a year at minimum to share updates of the UFMP implementation and identify and address barriers and challenges in implementation.	**Existing Staff Resources.**

Priority Actions	
Action	**Resources to Implement**
Examine current staffing levels and consider hiring new role(s) within Forestry Operations to address the capacity gaps and provide additional support for the UFMP implementation.	**Achieved by carrying out additional actions specified in this strategy.**
Examine current resources, staffing levels, and growth/lifecycle costing models to inform future budgets.	Some suggested through this Plan, others absorbed through existing staff resources.
Establish a lifecycle costing approach for street tree assets, aligned with level of service commitments, to inform budget planning for maintenance and renewal.	Framework proposed through this Plan, full implementation and ongoing work absorbed through existing staff resources.
Continue to integrate urban trees and add woodlands and other green infrastructure into the City's asset management framework.	**Existing Staff Resources** **Annual technology expense for software subscriptions and API development for enterprise integration.**

Table 3-2. Priority actions and proposed resources to support implementation: Maintain a healthy and safe urban forest (UFMP) and Maintain healthy and safe woodland environments (WMS)

Priority Actions	
Action	**Resources to Implement**
Shift to proactive a seven-year pruning cycle for urban trees including trees by rural roads and parks.	**R5. Enhanced Tree Care Regimen.**
Extend the watering of public trees from the first two years (as is warrantied) to five years after planting.	**R5. Enhanced Tree Care Regimen.**
Document operational procedures for risk inspection, frequency, resolution timeframes, qualifications, and documentation to reflect the industry best practices such as the Best Management Practices (BMPs) by the International Society of Arboriculture and Tree Care Industry Association's A300 standards.	Existing Staff Resources.
Formalize the City's approach to pest management through an integrated pest manage (IPM) policy.	Existing Staff Resources. Initial work is an output from the UFMP project.

Priority Actions	
Action	**Resources to Implement**
Update the City's street tree inventory on an iterative seven-year cycle (15% of inventory, per year), aligned with the grid pruning program.	**R2. Street Tree & Woodland Plot Inventories.**
Establish and maintain plot-based inventory program within the City's woodlots in-step and supporting iterative updates to the City's WMPs.	R2. Street Tree & Woodland Plot Inventories. Dedicated Woodland Management Capacity.
Prepare a State of the Urban Forest report every five years to provide the latest information about the conditions of Vaughan's urban forest and its management program.	The City will use the combination of city-led State of the Urban Forest Reports and the TRCA's Forest Studies Reports to provide one monitoring study on the urban forest every five years. R1. Capital Funds: Monitoring, Reporting.
Review the UFMP and WMS after ten years and update the actions informed by the recurring State of the Urban Forest reports. Renew the UFMP and WMS (update or new version) as applicable.	R1. Capital Funds: Monitoring, Reporting.
Update the City's forest management plan(s) on a five-year iterative cycle to ensure content and short-term prescriptions remain current and relevant.	R4. WMP Documents. The City will undertake its first round of WMPs through capital expenditure in 2026 and may look to update those through an iterative process dependent on the program pathway chosen.
Assess urban forest canopy cover at least every five years using LiDAR or other high-resolution methods of canopy estimation.	Canopy analyses will underpin State of the Urban Forest Reporting. Opportunities for cost-sharing on the acquisition with York Region and TRCA exist and are leveraged currently.
Formalize and implement a tree risk management policy that applies to all urban forestry asset classes.	**R3. Woodland Risk Monitoring & Abatement (Woodlands) AND Existing Staff Capacity (Street Trees)**
Formalize funding for woodland management lifecycle activities which seek to improve the condition of woodland assets (e.g., restoration).	R7. Capital Funds: Woodland Restoration and Afforestation Activities.

Table 3-3. Priority actions and proposed resources to support implementation: Expand the urban forest canopy and associated benefits (UFMP) and Expand the City's woodlands and the associated provision benefits (WMS)

Priority Actions	
Action	**Resources to Implement**
Increase tree planting in the public RoW toward the achievement of the City's canopy cover target.	**R6. Capital Funds:** Expanded Planting Program**.**
Prioritize planting in low tree equity areas and hotspots in the City.	**Existing Staff Resources.**
Establish a Tree Canopy Reserve Fund through by-law, direct cash-in-lieu fees collected through the tree by-law or through other development processes to that fund and establish guidelines for use of the fund.	Existing Staff Resources.
In collaboration with strategic partners such as LEAF and the TRCA, leverage external funding toward increased tree planting on public and private land.	**Existing Staff Resources.**
Review and update the City's Tree Protection Protocol.	Existing Staff Resources.
Explore opportunities/programs to support the greening of Industrial, Commercial, and Institutional (ICI) land uses and campuses.	Existing Staff Resources.
Work with the Ministry of Transportation (MTO) to encourage tree planting along provincial highway corridors.	Existing Staff Resources.
Require applications for development to identify the mature canopy area that will be supported within a development if approved. Track the proposed mature canopy in a city-wide dataset to provide a means of assessing whether the proposed canopy area is being met over time.	Process in place in locations such as the VMC. Continue to develop and formalize the requirement.
Update the City's zoning by-law to include provisions that are broadly tree supportive.	**Existing Staff Resources.**
Re-evaluate and update the current planting list for public and private trees to ensure that these recommended species are non-invasive and climate-adapted (e.g., have high tolerance for drought and heat)	Existing Staff Resources.
Partner with the TRCA to pilot the planting, monitoring, and maintenance of a Miyawaki forest.	**R8. Dedicated Woodland Management Capacity.**
Revisit and enhance the position of urban trees and green infrastructure through future updates to the City's Sustainability Metrics Program.	Existing Staff Resources.

Table 3-4. Priority actions and proposed resources to support implementation: Protect trees and woodlands for future generations (UFMP and WMS)

Priority Actions	
Action	**Resources to Implement**
Review and update the City's Tree Protection By-Law (052-2018).	Existing Staff Resources.
Update Tree Protection and Encroachment by-laws to include Administrative Monetary Penalties (AMP).	**Existing Staff Resources.**
Explore establishing formal enforcement capacity within the Forestry division, including the ability to issue citations under the Tree By-Law and Encroachment By-Law.	**Existing Staff Resources.**
Continue to support opportunities for the integration of Forestry Operations' perspectives in the various development processes that exist within the City.	Existing Staff Resources.
Review and update tree-related language used in the City's subdivision agreements.	Existing Staff Resources.
Review and update the City's Tree Protection Protocol.	Existing Staff Resources.

Table 3-5. Priority actions and proposed resources to support implementation: Partner in urban forest stewardship (UFMP) and Partner in woodland stewardship (WMS)

Priority Actions	
Action	**Resources to Implement**
Share the urban forest inventory online (e.g., through a web map).	Existing Staff Resources.
Establish a woodland steward program, where interested members of the public can act as the community representative of each of Vaughan's 27 woodlands.	**R8. Dedicated Woodland Management Capacity.**
Develop and implement programs that leverage community capacity to support urban forest monitoring, invasives removal, and planting. Work with the TRCA and other levels of government where possible.	**Existing Staff Resources.**
Explore strategic partnerships with LEAF toward enhancing canopy cover on private land.	Existing Staff Resources.

Priority Actions	
Action	**Resources to Implement**
Develop a webpage that clearly and simply describes the tree permit process, requirements, and conditions for private residents.	Existing Staff Resources.
Offer urban forest walks to improve people's access to and understanding of Vaughan's urban woodlands.	R8. Dedicated Woodland Management Capacity.

4.0 Resourcing Requirements

R1. Capital Funds: Monitoring, Reporting, and Plan Reviews

Division: Forestry Operations

Scope: Resources allocated to support preparation of recurring State of the Urban Forest Reports, and to support review of the UFMP and WMS at the ten-year mark.

Rationale: Monitoring is critical in tracking the ongoing implementation of the UFMP and WMS. Ensuring resources are available to support monitoring efforts furthers the broader implementation of both strategic documents.

Options:

Status Quo

- No funding earmarked to support monitoring or plan reviews.

Good

- Monitoring absorbed through the TRCA's decadal Forest Reports.
- Capital funding to support plan review at the ten-year mark.

Better/Best

- Dedicated funds to support the production of State of the Urban Forest reports on a ten-year cycle in addition to the ten-year Forest Reports led by the TRCA.
- Capital funding to support plan review at the ten-year mark.

R2. Street Tree & Woodland Plot Inventories

Division: Forestry Operations

Scope: Resources allocated to the upkeep of the City's urban inventory datasets.

Rationale: Current datasets supporting insights into the urban forestry assets are critical to monitoring efforts and are foundational to a proactive maintenance regimen. As with an enhanced tree care regimen, inventory budgets would scale with the number of assets under Forestry's care.

Options:

Status Quo

- Continue using out-of-date street tree inventory information. No formalized resources toward supporting ongoing urban forest planning or monitoring.

Good

- Tree inventory is updated as inspections and other work is carried out. No formalized resources toward supporting ongoing urban forest planning or monitoring.
- Subscription to an inventory management software.
- Woodland inventory completed in 2026 toward supporting the development of the City's remaining 26 Woodlot Management Plans. No formalized resources toward supporting ongoing urban forest planning or monitoring.

Better/Best

- Subscription to an inventory management software.
- The City's street tree inventory is updated in-step with the grid-pruning cycle. Inventory updates for a grid occur in advance and inform next year's work within that grid.
- Ongoing funding to support staff, work agreements (e.g., the TRCA), or contractors to undertake woodland inventory on a repeat interval. Inventory informs ongoing updates to the City's woodlot management plans and supports the monitoring of woodland health on an ongoing basis.

R3. Woodland Risk Monitoring & Abatement

Division: Forestry Operations

Scope: Ongoing capital program scoped around the monitoring and management of tree-related risk in woodland areas.

Rationale: Vaughan needs a program in place to monitor and respond to tree-related risk along woodland interface settings. The City currently manages tree-related risk on a reactive basis, only.

Options:

Status Quo

- No funding to support risk management in woodland areas. The City will continue to manage risk on a reactive basis, and the City may face increased liabilities as a result.

Good/Better/Best

- Dedicated funding to support risk management in woodland areas. Woodland risk will be captured within the City's broader approach to tree risk management. Woodland risk will be managed on a proactive basis.

R4. WMP Documents

Division: Forestry Operations

Scope: Resources allocated to the development and iterative update of the City's 27 woodlot management plans (WMPs).

Rationale: The City's WMPs are the documents through which the condition of individual woodlots is evaluated and through which management programming (lifecycle activities) are planned and scheduled. Iterative updates to these documents based on the most current inventory datasets available ensure they reflect current woodlot conditions, and that planned lifecycle activities are consistent with long-term management objectives for the woodlot given current condition. These documents also serve as an important public record to demonstrate the City's woodlot management efforts and the progress made toward improving woodlot conditions.

Options:

Status Quo

- The remaining 26 WMPs are not developed, and no funding is dedicated to the upkeep of the one (i.e., Baker's Sugar Bush) the City has developed.

Good

- The remaining 26 WMPs are developed (2026 capital expenditure), however, no funding is dedicated to their upkeep.

Better/Best

- The remaining 26 WMPs are developed (2026 capital expenditure), and dedicated funding is set aside for iterative updates and supporting inventory works.

R5. Enhanced Tree Care Regimen

Division: Forestry Operations

Scope: While the City has committed to a standard 7-year grid-pruning cycle, current resourcing levels do not support the achievement of this target. Enhanced resources would support the maintenance of street trees in alignment with a standard grid-pruning cycle and could enable additional lifecycle activities (i.e., mulching, watering, structural training) which support elongated asset service lives.

Rationale: Vaughan's current grid pruning cycle is well beyond the City's minimum LoS commitment for its grid pruning cycle and is out of alignment with industry best practices. An injection of resources into the maintenance budget would support:

- Achieving the City's 25% canopy cover target by minimizing premature tree mortality in the public RoW
- Optimizing the lifecycle costs of public tree maintenance in terms of the public benefits derived from mature trees
- Reduced costs associated with storm cleanup and extreme weather
- Reduced mortality of young trees before establishment
- Improvements in planting and re-establishment lag times following removal and stumping (owed to elongated tree lifecycles and reduction in mortality and removals)
- Reduced CRM volumes as compared to an elongated grid pruning cycle

Resources to support the enhanced maintenance regimen, whatever the specific design, would be phased in across five years (i.e., 2024-2029). The City's operating budget would continue to scale with changes in the number of street tree assets under Forestry's care on an ongoing basis consistent with lifecycle costing estimates.

Options:

Status Quo

- Funding remains consistent with current levels but scales with the number of assets under Forestry's care. This will maintain shorter average lifecycles for tree assets, and a greater share of public investment into costlier lifecycle activities like planting, removal, and reactive care.

Good

- Funding is adequate to achieve the targeted seven-year grid pruning cycle. This will improve the serviceable life of tree assets beyond current and reduce public investment into costlier lifecycle activities like planting, removal, and reactive care.
- One additional arborist FTE.

Better

- Funding is adequate to achieve the targeted seven-year grid pruning cycle. This will improve the serviceable life of tree assets beyond current and reduce public investment into costlier lifecycle activities like planting, removal, and reactive care.

- Additional resources are allocated to tree establishment and young tree care. This ensures more investment is earmarked for a critical stage in the asset lifecycle, improving rates of establishment, significantly reducing young tree mortality, and ensuring trees have optimal structure for long-term growth and success.
- Two additional arborist FTEs.

Best

- Funding is adequate to achieve a five-year grid pruning cycle. This will vastly improve the serviceable life of tree assets beyond current and reduce public investment into costlier lifecycle activities like planting, removal, and reactive care.
- Additional resources are allocated to tree establishment and young tree care. This ensures more investment is earmarked for a critical stage in the asset lifecycle, improving rates of establishment, significantly reducing young tree mortality, and ensuring trees have optimal structure for long-term growth and success.
- Two additional arborist FTEs.

R6. Capital Funds: Expanded Planting Program

Division: Forestry Operations

Scope: Enhanced boulevard tree planting toward the achievement of the City's 25% canopy target by 2053.

Rationale: Canopy modelling has identified that achieving 25% canopy cover by 2053 will require planting 1400 net new trees on City-owned property per year,[1] over the next 30 years. This planting rate is the City's direct contribution to increasing canopy cover, and will need to be complemented with accelerated net new planting on private property to meet the UFMP canopy cover target.

Options:

Status Quo

- No funding to support an enhanced tree planting program and the 25% canopy cover target will not be achieved.

[1] Net new refers to the total number of trees planted within the city, every year, above and beyond the complete offsetting of any trees and canopy removed within that same window. If other land uses do not hit their planting targets within that window, it may be that additional tree planting on public land and boulevards would be necessary to achieve 25% by 2053. Once 25% canopy is achieved, the city will need to maintain rates of replacement at a level that offsets any canopy removal on an ongoing basis to sustain 25% canopy cover.

Good/Better/Best

- Enhanced tree planting funding, including increased efforts to leverage grants, to support the necessary expansion of the tree planting program to support the achievement of the City's planting target as part of meeting the overall 25% canopy cover target city-wide.

R7. Capital Funds: Woodland Restoration and Afforestation Activities

Division: Forestry Operations

Scope: Ongoing woodland restoration and enhancement projects toward supporting biodiversity conservation and environmental quality within the City.

Rationale: Vaughan's woodland management strategy and woodlot management plans have established a framework for woodland assets to be integrated into the City's AMP, using a two-stepped approach to scoring asset condition: (i) condition assessment through the lens of safe and enjoyable human use, and (ii) condition assessment through the lens of biodiversity conservation. Capital resources supporting regular restoration and afforestation activities directly contribute to the improvement of woodland biodiversity conservation indicators and improve the relative condition of woodland assets as such. In addition, targeted afforestation activities on public lands can present a significant contribution toward the achievement of the 25% canopy cover target. As a result, this type of capital project can be considered as a lifecycle activity within the City's broader approach to asset management.

Options:

Status Quo/Good/Better

- No funding to support woodland management activities. Woodland conditions can be expected to continue to decline given the joint pressures of increasing urbanization and climate change. Note this resource does not encompass WMP updates or woodland risk management (R3), which are considered separately by this Financial Plan.

Best

- Dedicated funding to support restoration and planting activities as informed by the City's WMPs. Proactive maintenance ensures underlying woodland health issues are managed as resources permit and builds the urban forests' broader resilience to contemporary threats.

R8. Dedicated Woodland Management Capacity

Division: Forestry Operations

Duties: contract administration of woodland prescriptions, woodland inventory, support stewardship/educational activities in woodland areas, coordination with other levels of government on woodland management, implementation of the WMS, implementation of the WMPs, ongoing updates to both the WMPs and WMS, risk monitoring in woodland areas.

Rationale: The Forestry Section has no dedicated woodland management capacity at present. Meaningful expansion of Forestry's scope of work within woodland areas will require dedicated staff resources.

Options:

Status Quo

- No proactive management of woodland areas and no dedicated resourcing to support any formalized management outcomes.

Good

- No FTE supporting woodland management. Incorporating new considerations for woodland management into program involves trade-offs within current departmental capacity. Otherwise, implementation can be supported through contracted labour.

Better/Best

- One FTE supporting woodland management, achieved through additional staff allocation and increased budgets for contracted work as required.

R9. Forest Protection and Planning

Division: Forestry Operations

Duties: issuance of citations under tree-related by-laws, development review, policy development, long-term planning, development inspection.

Rationale: There is currently no authority to issue citations under any of the City's By-laws within the Forestry Operations team. Currently, tree-related infractions rely on the By-law department to issue citations, notwithstanding that Forestry Operations is the City's tree care subject matter expert. Growing enforcement capacity within Forestry Operations could result in improved enforcement of the by-law and greater efficiencies in terms of the overall use of staff time between the Forestry Operations and Enforcement Divisions.

Forestry's capacity to serve as a party in the various development processes ongoing within the City is presently limited between 1 and 2 FTE. Split roles mean three staff are partially responsible for different aspects of plan or permit review, with actual time spent fluctuating with the demand for review. Given the magnitude of growth expected within the City over the coming decade and given there are existing opportunities to improve development outcomes as they relate to urban trees, building Forestry's capacity to participate in those processes would support a range of development-related actions under the UFMP.

Options:

Status Quo

- Enforcement of infractions under the Tree Protection or Encroachment By-Laws remains out of scope for the Forestry Operations team.
- Capacity to comment and consult in development discussions and processes remains at a level consistent with current staff resourcing and is likely insufficient for the projected growth anticipated within Vaughan over the coming decade.

Good

- Enforcement of infractions under the Tree Protection or Encroachment By-Laws remains out of scope for the Forestry Operations team.
- One additional Forestry Inspector (one FTE) is added to Forestry's ranks to build capacity for participation in development processes.

Better/Best

- Capacity to issue citations for infractions under the Tree and Encroachment By-Law is developed within the Forestry Operations division.
- One additional Forestry Inspector (one FTE) is added to Forestry's ranks to build capacity for participation in development processes and various other plan review tasks associated with other permit types, including pool, building, demolition, and site alteration permits.

5.0 Life-cycle Cost Analyses

The purpose of a lifecycle cost assessment exercise is to identify the full costs of an asset's installation, maintenance, and renewal, to inform lifecycle planning activities. With urban trees, the cost associated with lifecycle activities are often annualized, which identifies a value that can be used to inform operating budgets that scale with the number or area of the urban forest asset under the City's care. Lifecycle analyses have been prepared for Vaughan's management program to identify program costs associated with the Status Quo, Good, Better and Best program pathways identified under Section 2.0.

5.1 Street Tree Maintenance

Applying a lifecycle cost assessment approach to the City's inventoried street tree population allows for the full cost of maintenance and renewal activities to be considered as part of operational planning or that class of asset. Further, the use of a lifecycle cost scheme better positions the City to scale operating funds both with the number of street tree assets under Forestry's care and in alignment with level of service (LoS) commitments. The first approach, referred to as the Status Quo pathway (Table 5-1), provides insight into baseline program resourcing and helps to inform the relative fiscal cost of changes in program design owed to actions coming from the UFMP:

Table 5-1. Vaughan lifecycle costing analysis for the City's street tree management program under the Status Quo program pathway.

	Activity cost ($) [Per Tree]	Status quo					
Asset Renewal		**50**					
Pruning cycle (years)		**40**					
Life cycle activities		**Frequency**	**Life-cycle cost ($)**	**Annualized Cost ($)**	**% of Net Operating Costs**	**Net Operating Costs**	**100-Year Cost**
Inspection inventory and update	$3.25	-	$0.00	$0.00	0.0%	$0.00	$0.00
Planned pruning	$50.00	1.3	$62.50	$1.25	5.0%	$168,750.00	$125.00
Reactive pruning	$500.00	0.6	$300.00	$6.00	24.0%	$810,000.00	$600.00
Watering	$30.00	-	$0.00	$0.00	0.0%	$0.00	$0.00
Young Tree "Training"	$30.00	-	$0.00	$0.00	0.0%	$0.00	$0.00
Removal	$500.00	1.0	$500.00	$10.00	39.9%	$1,350,000.00	$1,000.00
Replacement Program (incl. Stump Grind)	$650.00	0.5	$325.00	$6.50	26.0%	$877,500.00	$650.00
Sub-Totals			**$1,187.50**	**$23.75**	**94.9%**	**$3,206,250.00**	**$2,375.00**
Administrative Costs (per asset)				**$0.44**			
Equivalent Expenditure				**$3,206,250.00**			

Vaughan currently spends approximately $24 per street tree, per year, on the maintenance of street tree assets. The Forestry Operations programming operated on approximately $3.2 million in expenditures in 2023 (from combined operating and capital sources). The Status Quo program pathway is intended to reflect program resources and demands as they exist in 2023, approximated through the use of a life-cycle approach to costing.

The level of resourcing associated with the Status Quo pathway is insufficient to implement the UFMP, would result in reduced service lives for street tree assets, and would result in the City not achieving its 25% canopy target. The purpose of the Status Quo program pathway is more to provide a baseline for comparison to the Good, Better, and Best program pathways. The Status Quo program is in large part reactive in nature as a result of resourcing constraints. However, staff have tried to shift to a proactive management regimen in recent years.

Table 5-2. Vaughan lifecycle costing analysis for the City's street tree management program under the Good program pathway.

	Activity cost ($) [Per Tree]	Good					
Asset Renewal		60					
Pruning cycle (years)		7					
Life cycle activities		**Frequency**	**Life-cycle cost ($)**	**Annualized Cost ($)**	**% of Net Operating Costs**	**Net Operating Costs**	**% 100-Year Avg.**
Inspection inventory and update	$3.25	-	$0.00	$0.00	0.0%	$0.00	$0.00
Planned pruning	$50.00	8.6	$428.57	$7.14	17.9%	$964,285.71	$714.29
Reactive pruning	$500.00	0.4	$200.00	$3.33	8.3%	$450,000.00	$333.33
Watering	$30.00	-	$0.00	$0.00	0.0%	$0.00	$0.00
Young Tree "Training"	$30.00	-	$0.00	$0.00	0.0%	$0.00	$0.00
Removal	$500.00	1.0	$500.00	$8.33	20.8%	$1,125,000.00	$833.33
Replacement Program (incl. Stump Grind)	$650.00	1.0	$650.00	$10.83	27.1%	$1,462,500.00	$1,083.33
Sub-Totals			**$1,778.57**	**$29.64**	**74.1%**	**$4,001,785.71**	**$2,964.29**
Administrative Costs				**$0.54**			
Equivalent Expenditure				**$4,075,216.46**			

Under the Good program pathway, resourcing supporting Vaughan's Forestry Operations program would grow expend approximately $29.60 per street tree, per year, on the maintenance of street tree assets. The Good program pathway could potentially achieve the City's pre-existing seven-year grid pruning target for intensively maintained trees. This proactive investment would be expected to result in an extended asset renewal cycle, which reduces lifecycle costs associated with planting and removal, and reactive forms of tree maintenance.

In addition, planting funding under the Good program pathway is sufficient to achieve a rate of planting on City property supportive of the City's canopy cover target. The urban forest program for the current inventoried tree population would operate on an estimated $4.1 million budget under the Good program pathway, but the budget would continue to grow in-step with the number of tree assets under Forestry Operations' care.

Table 5-3. Vaughan lifecycle costing analysis for the City's street tree management program under the Better program pathway.

	Activity cost ($) [Per Tree]	Better					
Asset Renewal		65					
Pruning cycle (years)		7					
Life cycle activities		Frequency	Life-cycle cost ($)	Annualized Cost ($)	% of Net Operating Costs	Net Operating Costs	% 100-Year Avg.
Inspection inventory and update	$3.25	9.3	$30.18	$0.46	1.1%	$62,678.57	$46.43
Planned pruning	$50.00	9.3	$464.29	$7.14	16.5%	$964,285.71	$714.29
Reactive pruning	$500.00	0.3	$150.00	$2.31	5.3%	$311,538.46	$230.77
Watering	$30.00	3.0	$90.00	$1.38	3.2%	$186,923.08	$138.46
Young Tree "Training"	$30.00	3.0	$90.00	$1.38	3.2%	$186,923.08	$138.46
Removal	$500.00	1.0	$500.00	$7.69	17.8%	$1,038,461.54	$769.23
Replacement Program (incl. Stump Grind)	$650.00	1.0	$650.00	$10.00	23.1%	$1,350,000.00	$1,000.00
Sub-Totals			**$1,974.46**	**$30.38**	**70.3%**	**$4,100,810.44**	**$3,037.64**
Administrative Costs				**$0.56**			
Equivalent Expenditure				**$4,176,058.24**			

Under the Better program pathway resourcing supporting street tree maintenance would grow to approximately $30.40 per street tree, per year. The Better program pathway achieves the City's pre-existing seven-year grid pruning target. The Better program pathway improves on the Good pathway by supporting robust young tree care and establishment (i.e., watering and training). Further investment into young tree care can be expected to further extend the asset renewal cycle of established trees and would significantly reduce rates of young tree mortality from those observed at present.

Planting funding under the Better program pathway is again sufficient to achieve a rate of boulevard planting supportive of the City's canopy cover target. The urban forest program for the current inventoried tree population would operate on an estimated $4.2 million budget under the Better program, and the program budget would continue to grow in step with the number of tree assets under Forestry's care.

Table 5-4. Vaughan lifecycle costing analysis for the City's street tree management program under the Best program pathway.

	Activity cost ($) [Per Tree]	Best					
Asset Renewal		70					
Pruning cycle (years)		5					
Life cycle activities		Frequency	Life-cycle cost ($)	Annualized Cost ($)	% of Net Operating Costs	Net Operating Costs	% 100-Year Avg.
Inspection inventory and update	$3.25	14.0	$45.50	$0.65	1.5%	$87,750.00	$65.00
Planned pruning	$50.00	14.0	$700.00	$10.00	22.4%	$1,350,000.00	$1,000.00
Reactive pruning	$500.00	0.2	$100.00	$1.43	3.2%	$192,857.14	$142.86
Watering	$30.00	3.0	$90.00	$1.29	2.9%	$173,571.43	$128.57
Young Tree "Training"	$30.00	3.0	$90.00	$1.29	2.9%	$173,571.43	$128.57
Removal	$500.00	1.0	$250.00	$7.14	16.0%	$964,285.71	$714.29
Replacement Program (incl. Stump Grind)	$650.00	1.0	$650.00	$9.29	20.8%	$1,253,571.43	$928.57
Sub-Totals			**$1,925.50**	**$31.08**	**69.6%**	**$4,195,607.14**	**$3,107.86**
Administrative Costs				**$0.57**			
Equivalent Expenditure				**$4,272,594.41**			

Under the Best program pathway, resourcing supporting street tree maintenance would grow to approximately $31.10 per street tree, per year. The Best program pathway would meet or exceed a seven-year grid pruning target and support the establishment of robust practices supporting young tree care and establishment (i.e., watering and training). Increasing the frequency of the grid pruning cycle beyond the seven-year mark to a five-year iterative cycle would further extend the renewal cycle of street tree assets, and again reduce investment into more costly lifecycle activities and the beginning and end of the asset lifecycle.

Planting funding under the Best program pathway is again sufficient to achieve a rate of boulevard planting supportive of the City's canopy cover target. The urban forest program for the current inventoried tree population would operate on an estimated $4.3 million budget under the Best program pathway, and the program budget would again scale with the number of assets under Forestry Operations' care.

5.2 Woodland Assets

Woodland assets differ from street tree assets because woodlands do not follow a typical asset lifecycle. Unlike street trees, which will reach the end of their useful life and need replacement, woodlands are dynamic systems, containing populations of trees that individually die and regenerate without human intervention. As a result, woodlands do not experience the typical curve associated with the useful service life of a municipal asset. However, there are still lifecycle activities that can enhance the condition of these assets, such as risk assessment, hazard abatement, invasive species removal and restoration.

Vaughan's WMS prescribes a Woodlot Management Planning framework which leverages a criteria and indicators method to establish condition score for each of the City's 27 woodlots. This approach is described in greater detail through the City's Woodland Management Strategy (WMS). The Woodlot Management Plans establish two main scores (i.e., from zero to five, "very poor" to "very good") for each of the 27 woodlots in the city. One score evaluates the Safe and Enjoyable Human Use of the asset and the other Biodiversity Conservation.

This approach to asset management enables us to consider treatment activities (i.e., management prescriptions) in terms of activities that will benefit one score, the other, or both. Scores are designed to be readily integrated into the City's asset management portfolio, through the same five-tiered condition scheme that is typical to other classes of municipal asset (i.e., "very poor" to "very good").

The Status Quo pathway, reflecting current practices, offers no formal resourcing toward the City's woodland management program. The Good pathway supports completing the City's remaining Woodlot Management Plans as a one-time capital expense in 2026 (± $85,000 between inventory and production of 26 plans), and then ongoing funding from 2029 on at a rate of $80,000 annually. This operational funding would support a risk management program within woodland areas, but no other woodland management outcomes, including no funding toward iterative updates to the City's WMPs.

Table 5-5. Vaughan lifecycle costing analysis for the City's woodland management program under the Better program pathway.

	Activity cost ($) [Per Hectare]	Better					
Asset Renewal		50					
Life cycle activities		**Frequency**	**Life-cycle cost ($)**	**Annualized Cost ($)**	**% of Net Operating Costs**	**Net Operating Costs**	**100-Year Cost**
Woodland inventory	$500	10.0	$5,000	$100.00	0%	$20,000.00	$10,000.00
Risk monitoring (i.e., edge and interface monitoring)	$250	10.0	$2,500	$50.00	0%	$10,000.00	$5,000.00
Risk abatement	$700	25.0	$17,500	$350.00	1%	$70,000.00	$35,000.00
Planting and site prep	$67,300	0.1	$6,730	$134.60	0%	$26,920.00	$13,460.00
Forest health and restoration	$24,000	-	-	$0.00	0%	$0.00	$0.00
WMP Updates	$1,000	10.0	$10,000	$200.00	1%	$40,000.00	$20,000.00
Sub-Totals			**$41,730**	**$834.60**	**2%**	**$166,920**	**$63,460**
Administrative Costs				**$94.33**			
Equivalent Expenditure				**$166,920.00**			

Under the Better program pathway, resourcing supporting Vaughan's woodland management program would spend approximately $830 per hectare of managed woodland, per year. The Better program pathway would require dedicated woodland management capacity (one FTE), to support a range of woodland management outcomes, including woodland inventory, WMP updates, and varied community engagement and outreach (as well as resources to support each of those initiatives).

Under the Better pathway, the woodland management program would operate on an estimated $170,000 budget, less staff time for coordination of the new service levels. Establishment of formalized woodland management capacity within Forestry Operations would go some way toward ensuring the quality and condition of the City's woodlands are managed at an acceptable level moving forward.

Table 5-6. Vaughan lifecycle costing analysis for the City's woodland management program under the Best program pathway.

	Activity cost ($) [Per Hectare]	Best					
Asset Renewal		50					
Life cycle activities		**Frequency**	**Life-cycle cost ($)**	**Annualized Cost ($)**	**% of Net Operating Costs**	**Net Operating Costs**	**100-Year Cost**
Woodland inventory	$500	10.0	$5,000	$100.00	0%	$20,000.00	$10,000.00
Risk monitoring (i.e., edge and interface monitoring)	$250	10.0	$2,500	$50.00	0%	$10,000.00	$5,000.00
Risk abatement	$700	25.0	$17,500	$350.00	1%	$70,000.00	$35,000.00
Planting and site prep	$67,300	0.1	$6,730	$134.60	0%	$26,920.00	$13,460.00
Forest health and restoration	$24,000	1.0	$24,000	$480.00	2%	$96,000.00	$48,000.00
WMP Updates	$1,000	10.0	$10,000	$200.00	1%	$40,000.00	$20,000.00
Sub-Totals			**$65,730**	**$1,314.60**	**4%**	**$262,920**	**$111,460**
Administrative Costs				**$148.59**			
Equivalent Expenditure				**$262,920.00**			

Under the Best program pathway, resourcing supporting Vaughan's woodland management program would grow expend approximately $1,350 per hectare of managed woodland, per year. The Best program pathway again supports dedicated woodland management capacity within Forestry Operations, however differing from the Better pathway, goes further to resource that capacity to implement targeted woodlot management lifecycle activities (e.g., restoration) to support proactive management of that asset class on an ongoing basis.

Under the Best pathway, the woodland management program would operate on an estimated $260,000 budget, less the staff time for coordination of the new service levels. The Best pathway identifies the resourcing required to position Vaughan as a leader in the management of its urban woodlots.

Each of the preceding tables identifies lifecycle activities, their associated cost, the frequency at which each activity occurs over an asset's useful life (i.e., number of occurrences), the full lifecycle cost, an annualized lifecycle cost (and its proportion), and a 100-year lifecycle cost are detailed. The latter reflects the maintenance costs of the associated lifecycle activities over a standardized period. Asset renewal is hypothetically set to occur on a 50-year cycle. To conduct lifecycle costing, a hypothetical service life must be established. While urban woodlands can persist well beyond 50 years without any intervention, in many cases their condition would be significantly degraded from what would be observed in a natural woodland state. Treatment activities in woodland areas are intended to improve the safe and enjoyable human use of the City's woodlands and/or support sustainable woodland management.

Without the support of ongoing lifecycle activities, urban woodlands tend to harbour elevated levels of tree-related risk, as well as concentrated populations of negative environmental factors such as pests and invasive plants. The gradual erosion of woodland quality significantly degrades the ecosystem services provided by the City's woodlands.

For the first time, the City's woodland management strategy and woodlot management plans advocate an informed, sustainable, and coordinated approach to improving lifecycle management of the City's woodland assets. Currently, the City lacks dedicated capacity to implement woodland management activities. The continuous administration of a woodland management program, along with supporting initiatives such as third-party (e.g., SFI) certification, would benefit greatly from dedicated forestry resources and staffing.

6.0 Program Levels of Service

The UFMP and WMS recommend the establishment of new or renewed program levels of service (LoS). The UFMP and WMS both recommend updating the City's Urban Forestry Asset Management Plan to formalize LoS consistent with the actions put forward in those respective documents. LoS should reflect program design that the City is reasonably resourced and positioned to achieve, and therefore differ based on the program pathway considered. Table 6-1 identifies performance measures by asset class, a baseline condition, and a series of relevant LoS sensitive to the design of the program pathway considered:

Table 6-1. Vaughan recommended performance measures and associated level of service (LoS).

Performance Measure	Suggested Level of Service Target by Program Pathway			
	Status Quo (i.e., Baseline)	Good	Better	Best
All Asset Classes				
City-wide Canopy Cover Target **Method of Monitoring:** Canopy Analyses (i.e., LiDAR + Aerial Imagery)	20% (2019)	25% (Target, 2053)	25% (Target, 2053)	25% (Target, 2053)
Canopy Cover in the Municipal RoW and in (Non-Forested) Parks **Method of Monitoring:** Canopy Analyses (i.e., LiDAR + Aerial Imagery)	13% and 19%, respectively (2019	17% and 26%, respectively (Target, 2053)	17% and 26%, respectively (Target, 2053)	17% and 26%, respectively (Target, 2053)
Resident satisfaction with urban forestry educational and stewardship offerings and program outreach **Method of Monitoring:** Survey	12% (2022)	60%	60%	60%
Resident literacy across urban forestry program areas (i.e., % of the population with awareness of pruning cycle, pest management, protection processes, educational offerings, etc.) **Method of Monitoring:** Survey	60-90%, all program areas (2022)	75%+, all program areas	75%+, all program areas	75%+, all program areas
Street & (Ornamental) Park Tree Assets				
Grid Pruning Cycle **Method of Monitoring:** Inventory	~40 Year (2022)	Seven-Year	Seven-Year	Five-Year
Inventory Cycle **Method of Monitoring:** Inventory	NA (2023)	NA	Seven-Year	Five-Year

Performance Measure	Suggested Level of Service Target by Program Pathway			
	Status Quo (i.e., Baseline)	Good	Better	Best
Trees in "Poor" or Worse Condition **Method of Monitoring:** Inventory	Unknown (2023)	2.5%	2.5%	2.0%
Average Time to Service Completion (i.e., Call to Closure- non-emergency) **Method of Monitoring:** CRM	~6 months (2022)	3 months	2 months	1 month
Number of CRM Calls for Tree Inspection/Obstruction/Risk **Method of Monitoring:** CRM	~5,100 annually (2022)	3,100 annually	2,500 annually	1,500 annually
Resident Satisfaction: Removal, Stumping & Replacement Timelines **Method of Monitoring:** Survey	34% (2022)	60%	70%	80%
Street Tree Annual Maintenance Budget Per Unit **Method of Monitoring:** Financials	$16.00 (2023)	$29.60	$30.50	$31.10
Woodland Assets				
Inventory (Plot) Cycle **Method of Monitoring:** Survey	NA (2023)	NA	Seven-Year	Five-Year
% of Safe and Enjoyable Human Use Scores "Poor" or Worse **Method of Monitoring:** WMPs	Unknown (2023)	< 30%	< 20%	< 10%
% of Woodland Biodiversity Conservation Scores "Poor" or Worse **Method of Monitoring:** WMPs	Unknown (2023)	NA	NA	< 30%
Woodland Budget Per Hectare **Method of Monitoring:** Financials	NA (2023)	$410	$850	$1,340

7.0 Financial Forecasts

Table 7-1. 2024-2034 operating forecast toward the achievement of a Status Quo program pathway.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Labour: Admin.	$ 57,809	$ 59,941	$ 60,241	$ 60,542	$ 60,842	$ 61,142	$ 61,442	$ 61,743	$ 62,043	$ 62,343	$ 62,643	$ 62,944
Labour: Forestry supervisors	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Administration CC	**$ 57,809**	**$ 59,941**	**$ 60,241**	**$ 60,542**	**$ 60,842**	**$ 61,142**	**$ 61,442**	**$ 61,743**	**$ 62,043**	**$ 62,343**	**$ 62,643**	**$ 62,944**
Inspection, inventory, and update **[R2.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Planned pruning **[R5.]**	$ 168,750	$ 168,750	$ 170,000	$ 171,250	$ 172,500	$ 173,750	$ 175,000	$ 176,250	$ 177,500	$ 178,750	$ 180,000	$ 181,250
Reactive pruning	$ 810,000	$ 810,000	$ 816,000	$ 822,000	$ 828,000	$ 834,000	$ 840,000	$ 846,000	$ 852,000	$ 858,000	$ 864,000	$ 870,000
Watering **[R5.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
YT "Training" **[R5.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Removal	$ 1,350,000	$ 1,350,000	$ 1,360,000	$ 1,370,000	$ 1,380,000	$ 1,390,000	$ 1,400,000	$ 1,410,000	$ 1,420,000	$ 1,430,000	$ 1,440,000	$ 1,450,000
Capital Projects: (i.e., SOUFR, plan reviews) **[R1.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Labour: Additional arboricultural staff **[R5.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Maintenance & Monitoring CC	**$ 2,328,750**	**$ 2,328,750**	**$ 2,346,000**	**$ 2,363,250**	**$ 2,380,500**	**$ 2,397,750**	**$ 2,415,000**	**$ 2,432,250**	**$ 2,449,500**	**$ 2,466,750**	**$ 2,484,000**	**$ 2,501,250**
Capital Projects: replacement program (incl. stump grind)	$ 877,500	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
Capital Projects: enhanced tree planting budget **[R6.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Planting & Re-establishment CC	**$ 877,500**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**	**$ 1,000,000**
Labour: Forest protection program (i.e., inspectors) **[R9.]**	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000
Labour: Forestry ops. enforcement capacity **[R9.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tree Protection CC	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**
Labour: Woodland management FTE **[R8.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Woodland inventory **[R2.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
WMP documents **[R4.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk monitoring and abatement **[R3.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Capital Projects: (i.e., restoration and afforestation) **[R7.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Woodlot Management CC	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Sub-total	**$ 3,379,059**	**$ 3,503,691**	**$ 3,521,241**	**$ 3,538,792**	**$ 3,556,342**	**$ 3,573,892**	**$ 3,591,442**	**$ 3,608,993**	**$ 3,626,543**	**$ 3,644,093**	**$ 3,661,643**	**$ 3,679,194**
Annual Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 87,592**	**$ 88,031**	**$ 88,470**	**$ 88,909**	**$ 89,347**	**$ 89,786**	**$ 90,225**	**$ 90,664**	**$ 91,102**	**$ 91,541**	**$ 91,980**
Cumulative Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 87,592**	**$ 175,623**	**$ 264,093**	**$ 353,002**	**$ 442,349**	**$ 532,135**	**$ 622,360**	**$ 713,023**	**$ 804,126**	**$ 895,667**	**$ 987,647**
Revenues & Recoveries	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**
Total	**$ 2,979,059**	**$ 3,191,284**	**$ 3,296,865**	**$ 3,402,885**	**$ 3,509,344**	**$ 3,616,241**	**$ 3,723,578**	**$ 3,831,353**	**$ 3,939,566**	**$ 4,048,219**	**$ 4,157,310**	**$ 4,266,840**

Table 7-2. 2024-2034 operating forecast toward the achievement of a Good program pathway.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Labour: Admin.	$ 46,288	$ 52,037	$ 61,518	$ 64,693	$ 62,246	$ 62,824	$ 63,403	$ 63,981	$ 64,559	$ 65,138	$ 65,716	$ 67,410
Labour: Forestry supervisors	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Administration CC	**$ 46,288**	**$ 52,037**	**$ 61,518**	**$ 64,693**	**$ 64,693**	**$ 64,693**	**$ 64,693**	**$ 64,693**	**$ 64,693**	**$ 65,138**	**$ 65,716**	**$ 67,410**
Inspection, inventory, and update **[R2.]**	$ -	$ 150,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000
Planned pruning **[R5.]**	$ 168,750	$ 431,277	$ 709,036	$ 984,286	$ 994,286	$ 1,004,286	$ 1,014,286	$ 1,024,286	$ 1,034,286	$ 1,044,286	$ 1,054,286	$ 1,064,286
Reactive pruning	$ 810,000	$ 810,000	$ 698,368	$ 580,597	$ 464,000	$ 468,667	$ 473,333	$ 478,000	$ 482,667	$ 487,333	$ 492,000	$ 496,667
Watering **[R5.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
YT "Training" **[R5.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Removal	$ 1,350,000	$ 1,350,000	$ 1,288,980	$ 1,224,123	$ 1,160,000	$ 1,171,667	$ 1,183,333	$ 1,195,000	$ 1,206,667	$ 1,218,333	$ 1,230,000	$ 1,241,667
Capital Projects: (i.e., SOUFR, plan reviews) **[R1.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000
Labour: Additional arboricultural staff **[R5.]**	$ -	$ -	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000
Maintenance & Monitoring CC	**$ 2,328,750**	**$ 2,741,277**	**$ 2,821,384**	**$ 2,914,006**	**$ 2,743,286**	**$ 2,769,619**	**$ 2,795,952**	**$ 2,822,286**	**$ 2,848,619**	**$ 2,874,952**	**$ 2,901,286**	**$ 3,007,619**
Capital Projects: replacement program (incl. stump grind)	$ 877,500	$ 877,500	$ 1,477,667	$ 1,492,833	$ 1,508,000	$ 1,523,167	$ 1,538,333	$ 1,553,500	$ 1,568,667	$ 1,583,833	$ 1,599,000	$ 1,614,167
Capital Projects: enhanced tree planting budget **[R6.]**	$ -	$ -	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000
Planting & Re-establishment CC	**$ 877,500**	**$ 877,500**	**$ 1,477,667**	**$ 1,492,833**	**$ 1,508,000**	**$ 1,523,167**	**$ 1,538,333**	**$ 1,553,500**	**$ 1,568,667**	**$ 1,583,833**	**$ 1,599,000**	**$ 1,614,167**
Labour: Forest protection program (i.e., inspectors) **[R9.]**	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 115,000
Labour: Forestry ops. enforcement capacity **[R9.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tree Protection CC	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**
Labour: Woodland management FTE **[R8.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Woodland inventory **[R2.]**	$ -	$ -	$ -	$ 60,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
WMP documents **[R4.]**	$ -	$ -	$ -	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk monitoring and abatement **[R3.]**	$ -	$ -	$ -	$ -	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000
Capital Projects: (i.e., restoration and afforestation) **[R7.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Woodlot Management CC	**$ -**	**$ -**	**$ -**	**$ 120,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**
Sub-total	**$ 3,367,538**	**$ 3,785,814**	**$ 4,475,569**	**$ 4,706,532**	**$ 4,530,978**	**$ 4,572,478**	**$ 4,613,978**	**$ 4,655,478**	**$ 4,696,978**	**$ 4,738,924**	**$ 4,781,002**	**$ 4,904,195**
Annual Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 94,645**	**$ 111,889**	**$ 117,663**	**$ 113,274**	**$ 114,312**	**$ 115,349**	**$ 116,387**	**$ 117,424**	**$ 118,473**	**$ 119,525**	**$ 122,605**
Cumulative Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 94,645**	**$ 206,535**	**$ 324,198**	**$ 437,472**	**$ 551,784**	**$ 667,134**	**$ 783,521**	**$ 900,945**	**$ 1,019,418**	**$ 1,138,943**	**$ 1,261,548**
Revenues & Recoveries	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**
Total	**$ 2,967,538**	**$ 3,480,459**	**$ 4,282,104**	**$ 4,630,730**	**$ 4,568,451**	**$ 4,724,263**	**$ 4,881,112**	**$ 5,038,999**	**$ 5,197,923**	**$ 5,358,342**	**$ 5,519,945**	**$ 5,765,743**

Table 7-3. 2024-2034 operating forecast toward achievement of a Better program pathway.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Labour: Admin.	$ 44,564	$ 48,288	$ 58,648	$ 62,684	$ 65,927	$ 67,035	$ 68,142	$ 68,176	$ 68,747	$ 69,317	$ 69,888	$ 71,532
Labour: Forestry supervisors	$ -	$ -	$ -	$ -	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000
Administration CC	**$ 44,564**	**$ 48,288**	**$ 58,648**	**$ 62,684**	**$ 105,927**	**$ 107,035**	**$ 108,142**	**$ 108,176**	**$ 108,747**	**$ 109,317**	**$ 109,888**	**$ 111,532**
Inspection, inventory, and update **[R2.]**	$ -	$ 15,000	$ 35,898	$ 57,866	$ 79,629	$ 80,279	$ 80,929	$ 81,579	$ 82,229	$ 82,879	$ 83,529	$ 84,179
Planned pruning **[R5.]**	$ 168,750	$ 431,277	$ 709,036	$ 984,286	$ 994,286	$ 1,004,286	$ 1,014,286	$ 1,024,286	$ 1,034,286	$ 1,044,286	$ 1,054,286	$ 1,064,286
Reactive pruning	$ 810,000	$ 810,000	$ 652,202	$ 485,904	$ 321,231	$ 324,462	$ 327,692	$ 330,923	$ 334,154	$ 337,385	$ 340,615	$ 343,846
Watering **[R5.]**	$ -	$ -	$ 62,324	$ 127,836	$ 192,738	$ 194,677	$ 196,615	$ 198,554	$ 200,492	$ 202,431	$ 204,369	$ 206,308
YT "Training" **[R5.]**	$ -	$ -	$ 62,324	$ 127,836	$ 192,738	$ 194,677	$ 196,615	$ 198,554	$ 200,492	$ 202,431	$ 204,369	$ 206,308
Removal	$ 1,350,000	$ 1,350,000	$ 1,260,126	$ 1,164,940	$ 1,070,769	$ 1,081,538	$ 1,092,308	$ 1,103,077	$ 1,113,846	$ 1,124,615	$ 1,135,385	$ 1,146,154
Capital Projects: (i.e., SOUFR, plan reviews) **[R1.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -	$ -	$ -	$ -	$ 80,000
Labour: Additional arboricultural staff **[R5.]**	$ -	$ -	$ 110,000	$ 110,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000
Maintenance & Monitoring CC	**$ 2,328,750**	**$ 2,606,277**	**$ 2,891,911**	**$ 3,058,667**	**$ 3,071,391**	**$ 3,099,918**	**$ 3,168,445**	**$ 3,156,972**	**$ 3,185,499**	**$ 3,214,026**	**$ 3,242,553**	**$ 3,351,080**
Capital Projects: replacement program (incl. stump grind)	$ 877,500	$ 877,500	$ 1,364,000	$ 1,378,000	$ 1,392,000	$ 1,406,000	$ 1,420,000	$ 1,434,000	$ 1,448,000	$ 1,462,000	$ 1,476,000	$ 1,490,000
Capital Projects: enhanced tree planting budget **[R6.]**	$ -	$ -	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000
Planting & Re-establishment CC	**$ 877,500**	**$ 877,500**	**$ 1,364,000**	**$ 1,378,000**	**$ 1,392,000**	**$ 1,406,000**	**$ 1,420,000**	**$ 1,434,000**	**$ 1,448,000**	**$ 1,462,000**	**$ 1,476,000**	**$ 1,490,000**
Labour: Forest protection program (i.e., inspectors) **[R9.]**	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000
Labour: Forestry ops. enforcement capacity **[R9.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tree Protection CC	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**
Labour: Woodland management FTE **[R8.]**	$ -	$ -	$ -	$ -	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000
Woodland inventory **[R2.]**	$ -	$ -	$ -	$ 60,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
WMP documents **[R4.]**	$ -	$ -	$ -	$ 60,000	$ -	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000
Risk monitoring and abatement **[R3.]**	$ -	$ -	$ -	$ -	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000
Capital Projects: (i.e., restoration and afforestation) **[R7.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Woodlot Management CC	**$ -**	**$ -**	**$ -**	**$ 120,000**	**$ 220,000**	**$ 260,000**	**$ 260,000**	**$ 260,000**	**$ 260,000**	**$ 260,000**	**$ 260,000**	**$ 260,000**
Sub-total	**$ 3,365,814**	**$ 3,647,065**	**$ 4,429,560**	**$ 4,734,351**	**$ 5,019,319**	**$ 5,102,953**	**$ 5,186,587**	**$ 5,189,148**	**$ 5,232,245**	**$ 5,275,343**	**$ 5,318,441**	**$ 5,442,612**
Annual Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 91,177**	**$ 110,739**	**$ 118,359**	**$ 125,483**	**$ 127,574**	**$ 129,665**	**$ 129,729**	**$ 130,806**	**$ 131,884**	**$ 132,961**	**$ 136,065**
Cumulative Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 91,177**	**$ 201,916**	**$ 320,274**	**$ 445,757**	**$ 573,331**	**$ 702,996**	**$ 832,725**	**$ 963,531**	**$ 1,095,414**	**$ 1,228,375**	**$ 1,364,441**
Revenues & Recoveries	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**
Total	**$ 2,965,814**	**$ 3,338,241**	**$ 4,231,476**	**$ 4,654,626**	**$ 5,065,076**	**$ 5,276,284**	**$ 5,489,583**	**$ 5,621,872**	**$ 5,795,776**	**$ 5,970,757**	**$ 6,146,816**	**$ 6,407,052**

Table 7-4. 2024-2034 operating forecast toward the achievement of a Best program pathway.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Labour: Admin.	$ 45,044	$ 50,534	$ 60,620	$ 65,559	$ 67,962	$ 69,095	$ 71,894	$ 71,942	$ 72,532	$ 73,122	$ 73,712	$ 75,387
Labour: Forestry supervisors	$ -	$ -	$ -	$ -	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000
Administration CC	**$ 45,044**	**$ 50,534**	**$ 60,620**	**$ 65,559**	**$ 107,962**	**$ 109,095**	**$ 111,894**	**$ 111,942**	**$ 112,532**	**$ 113,122**	**$ 113,712**	**$ 115,387**
Inspection, inventory, and update **[R2.]**	$ -	$ 15,000	$ 44,258	$ 75,012	$ 105,480	$ 106,390	$ 107,300	$ 108,210	$ 109,120	$ 110,030	$ 110,940	$ 111,850
Planned pruning **[R5.]**	$ 168,750	$ 558,563	$ 970,145	$ 1,378,000	$ 1,392,000	$ 1,406,000	$ 1,420,000	$ 1,434,000	$ 1,448,000	$ 1,462,000	$ 1,476,000	$ 1,490,000
Reactive pruning	$ 810,000	$ 810,000	$ 612,631	$ 404,738	$ 198,857	$ 200,857	$ 202,857	$ 204,857	$ 206,857	$ 208,857	$ 210,857	$ 212,857
Watering **[R5.]**	$ -	$ -	$ 57,873	$ 118,705	$ 178,971	$ 180,771	$ 182,571	$ 184,371	$ 186,171	$ 187,971	$ 189,771	$ 191,571
YT "Training" **[R5.]**	$ -	$ -	$ 57,873	$ 118,705	$ 178,971	$ 180,771	$ 182,571	$ 184,371	$ 186,171	$ 187,971	$ 189,771	$ 191,571
Removal	$ 1,350,000	$ 1,350,000	$ 1,235,394	$ 1,114,211	$ 994,286	$ 1,004,286	$ 1,014,286	$ 1,024,286	$ 1,034,286	$ 1,044,286	$ 1,054,286	$ 1,064,286
Capital Projects: (i.e., SOUFR, plan reviews) **[R1.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -	$ -	$ -	$ -	$ 80,000
Labour: Additional arboricultural staff **[R5.]**	$ -	$ -	$ 110,000	$ 110,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000
Maintenance & Monitoring CC	**$ 2,328,750**	**$ 2,733,563**	**$ 3,088,173**	**$ 3,319,371**	**$ 3,268,566**	**$ 3,299,076**	**$ 3,369,586**	**$ 3,360,096**	**$ 3,390,606**	**$ 3,421,116**	**$ 3,451,626**	**$ 3,562,136**
Capital Projects: replacement program (incl. stump grind)	$ 877,500	$ 877,500	$ 1,266,571	$ 1,279,571	$ 1,292,571	$ 1,305,571	$ 1,318,571	$ 1,331,571	$ 1,344,571	$ 1,357,571	$ 1,370,571	$ 1,383,571
Capital Projects: enhanced tree planting budget **[R6.]**	$ -	$ -	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000	$ 910,000
Planting & Re-establishment CC	**$ 877,500**	**$ 877,500**	**$ 1,266,571**	**$ 1,279,571**	**$ 1,292,571**	**$ 1,305,571**	**$ 1,318,571**	**$ 1,331,571**	**$ 1,344,571**	**$ 1,357,571**	**$ 1,370,571**	**$ 1,383,571**
Labour: Forest protection program (i.e., inspectors) **[R9.]**	$ 115,000	$ 115,000	$ 115,000	$ 115,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000	$ 230,000
Labour: Forestry ops. enforcement capacity **[R9.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tree Protection CC	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 115,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**	**$ 230,000**
Labour: Woodland management FTE **[R8.]**	$ -	$ -	$ -	$ -	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000
Woodland inventory **[R2.]**	$ -	$ -	$ -	$ 60,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
WMP documents **[R4.]**	$ -	$ -	$ -	$ 60,000	$ -	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000
Risk monitoring and abatement **[R3.]**	$ -	$ -	$ -	$ -	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000
Capital Projects: (i.e., restoration and afforestation) **[R7.]**	$ -	$ -	$ -	$ -	$ -	$ -	$ 122,920	$ 122,920	$ 122,920	$ 122,920	$ 122,920	$ 122,920
Woodlot Management CC	**$ -**	**$ -**	**$ -**	**$ 120,000**	**$ 220,000**	**$ 260,000**	**$ 382,920**	**$ 382,920**	**$ 382,920**	**$ 382,920**	**$ 382,920**	**$ 382,920**
Sub-total	**$ 3,366,294**	**$ 3,776,596**	**$ 4,530,364**	**$ 4,899,502**	**$ 5,119,099**	**$ 5,203,742**	**$ 5,412,972**	**$ 5,416,529**	**$ 5,460,629**	**$ 5,504,729**	**$ 5,548,829**	**$ 5,674,014**
Annual Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 94,415**	**$ 113,259**	**$ 122,488**	**$ 127,977**	**$ 130,094**	**$ 135,324**	**$ 135,413**	**$ 136,516**	**$ 137,618**	**$ 138,721**	**$ 141,850**
Cumulative Inflation (CPI 2.5% - 10-year avg.)	**$ -**	**$ 94,415**	**$ 207,674**	**$ 330,162**	**$ 458,139**	**$ 588,233**	**$ 723,557**	**$ 858,970**	**$ 995,486**	**$ 1,133,104**	**$ 1,271,825**	**$ 1,413,675**
Revenues & Recoveries	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**	**-$ 400,000**
Total	**$ 2,966,294**	**$ 3,471,011**	**$ 4,338,038**	**$ 4,829,663**	**$ 5,177,238**	**$ 5,391,974**	**$ 5,736,528**	**$ 5,875,499**	**$ 6,056,115**	**$ 6,237,833**	**$ 6,420,654**	**$ 6,687,690**

Urban Forest Management Plan

Maintaining a healthy, growing and sustainable urban forest canopy that supports biodiversity, human health, recreation and community climate resilience to provide a greener future for generations.

Attachment 4

GOAL 1	GOAL 2	GOAL 3	GOAL 4	GOAL 5
Align urban forest planning and management with best practices	**Maintain a healthy and safe urban forest**	**Expand the urban forest canopy**	**Protect trees and woodlands**	**Increase community stewardship**
STRATEGY 1: Improve urban forest governance through collaboration	**STRATEGY 5:** Develop a tree risk management policy and operational procedures	**STRATEGY 9:** Increase tree planting rates to offset losses and achieve larger tree canopy cover	**STRATEGY 12:** Strengthen partnerships to expand urban forest management capacity	**STRATEGY 13:** Educate the community to improve awareness of urban forest benefits and care
STRATEGY 2: Establish a sustainable urban forestry program	**STRATEGY 6:** Reduce the risk of pests, disease and invasive species affecting the urban forest	**STRATEGY 10:** Restore and expand woodlands to enhance biodiversity and connectivity		**STRATEGY 14:** Improve educational programming to build public awareness and understanding of the benefits of the urban forest and its management
STRATEGY 3: Improve natural asset inventory and integration into the City's asset management frameworks	**STRATEGY 7:** Develop monitoring and reporting standards to track progress and inform adaptive management	**STRATEGY 11:** Review by-laws, policies and procedures to improve tree protection		
STRATEGY 4: Focus on proactive urban forest maintenance	**STRATEGY 8:** Ensure urban design and development processes are delivering quality urban planting sites			

Five-Year Priority Action Plan

YEAR	GOAL 1 Align urban forest planning and management with best practices	GOAL 2 Maintain a healthy and safe urban forest	GOAL 3 Expand the urban forest canopy	GOAL 4 Protect trees and woodlands	GOAL 5 Increase community stewardship
2024/2025	• Establish City-wide forestry working group • Introduce tree inventory software • Engage students to build project-driven roles • Expand the scope of study and management of trees • Update the City's street tree inventory on a seven-year cycle aligned with the grid pruning program • Increase full-time hours worked and seasonal labour	• Increase proactive tree maintenance funding	• Plant 900 new trees in addition to tree replacements • Support urban forest management through the Official Plan	• Establish by-law enforcement within the Forestry team	• Expand the Green Guardians Program
2026	• Increase full-time hours worked and seasonal labour • Establish plot inventories within City-owned woodlots	• Establish a life-cycle costing approach to maintenance budgets	• Prepare woodlot management plans for 26 locations • Work with external partners to add 70 hectares of canopied area		• Establish a woodland stewardship program
2027	• Integrate all classes of forestry assets in city-wide asset management framework • Establish a formal capacity of woodland management • Add a Woodland Co-ordinator position	• Form and implement a tree risk management policy	• Work with York Region to maximize tree planting on regional roads	• Establish woodland risk initiative • Take inventory, decommission and restore areas where the ecosystem has degraded	
2028		• Establish a young tree care program • Extend the watering of public trees to five years after planting	• Support tree planting to maximize canopy area on TRCA lands		• Establish a community board to advise on urban forest management
2029	• Prepare a planting strategy prioritizing areas with low tree equity	• Complete an integrated pest management policy • Prepare State of the Urban Forest report	• Undertake ecosystem restoration consistent with a warehouse management system		
ONGOING	• Re-examine funding to ensure sufficient resourcing • Explore external funding opportunities		Update the City's engineering design criteria and standard drawings for urban and suburban streetscapes		• Develop programs to leverage community engagement