Newmarket

TOWN OF **NEWMARKET**

URBAN FORESTRY MANAGEMENT PLAN


LIVING WELL AND BECOMING EVEN GREENER
EDUCATION
COMMUNICATION
BY-LAWS
INNOVATION
ASSETS
PARTNERSHIP
DESIGN
DIVERSITY
STANDARDS
MAINTENANCE
AWARENESS
CONSERVATION
POLICIES
VALUE
DATA
COMMUNITY
INTEGRATION
TECHNOLOGY
PLANTING
REPUTATION
RESOURCES
LIVING WELL
WELL-BALANCED
WELL-EQUIPPED & MANAGED
WELL-PLANNED & CONNECTED
WELL-RESPECTED

Table of Contents

Forward

Trees have long been a topic of discussion, their beauty, their magnificence, their abundance, their diversity. Many a poem has been written about trees:

I think that I shall never see
A poem lovely as a tree.
—From "Trees" by Joyce Kilmer

Trees are long lived organisms that provide many benefits to society. Trees planted today, are planted for the future and with proper care they will last a life time. Supposing The Trading Tree in Newmarket was of significant size when trading began in the area, we can estimate that this tree would have been around 300 years old when it finally was removed due to Dutch elm disease in the 1950's. The longest living tree on earth is a spruce tree growing in Sweden at the ripe old age of 9550 years.

"Until you dig a hole, you plant a tree, you water it and make it survive, you haven't done a thing. You are just talking."
— Wangari Maathai

"Someone's sitting in the shade today because someone planted a tree a long time ago."
— Warren Buffett

These quotes represent some of the fundamental concepts about trees: planting, caring and longevity. The Newmarket community will become even Greener through the adoption of an Urban Forestry Management Plan and taking principled action toward the implementation of the recommended actions to achieve it's goals.

Ruurd van de Ven,
March 2019

1 Executive Summary

For years Newmarket has been looking after trees on municipal lands in Town. Plantings have been taking place regularly, but general tree care has been lagging. Newmarket's Urban Forestry Management Plan (UFMP) outlines a long term management strategy for the care and maintenance of all trees within the Town over the next 20 years, setting a clear path for the future management and growth of the Town's Urban Forest and making Newmarket's Urban Forestry program Well beyond the ordinary. It is the Town's road map to "being even Greener" through innovation and conservation for the many components of urban forestry.

The plan presents information on current and best urban forestry practices, and opportunities where Newmarket can be *even better*, covering the following areas:

- Urban Forest Tree Inventory
- Tree Maintenance Plan
- Tree Establishment and Planting Plan
- Tree Protection
- Invasive Species & Noxious Weeds Management Plan
- Outreach and Public Engagement Plan

Newmarket's Urban Forestry Management Plan is guided by the following four (4) principles:

1. **Recognizing the urban forest as green infrastructure and a critical municipal asset**
2. **Managing tree biodiversity to increase ecological resilience and minimize the impacts of climate change**
3. **Sustainably managing the urban forest through continuous improvement, adaptation and innovation**
4. **Increasing tree canopy cover by working toward the existing target of woodland canopy of 13 per cent by 2031 and setting targets for total canopy cover of 35 per cent by 2051**

These guiding principles are broken down further into six (6) achievable goals:

1. **Develop municipal guidelines and regulations for sustainable streetscape and subdivision design, that ensure adequate soil quality and quantity for tree establishment and reduce conflict between natural and grey infrastructure**
2. **Create a Forestry Operational Manual**

3. **Conduct proactive tree risk assessments on municipal lands and reduce the need for emergency responses**

4. **Create a Master Planting Design Plan**

5. **Create a Pollinator Strategy (required by our Bee City designation)**

6. **Increase public awareness and appreciation of the value of trees and woodlands**

The 14 recommendations below will ensure that the UFMP will succeed over the next 20 years, making Newmarket *even Greener* for present and future residents with a healthy urban canopy, by sharing the Social, Economic, and Environmental value of trees through Education, Innovation, Partnerships, and Policies:

1. Obtain software to manage workflow and maintain history on work performed on trees in Town;
2. Recognise trees in a Town asset management program (Green Infrastructure).
3. Expand Natural Heritage Coordinator position to include:
    - Invasive species management; and
    - Manage encroachments onto Town owned Natural Heritage lands.
4. Dedicate staff to forestry related work 12 months of the year.
5. Consider future growth and a future business unit structure, including:
    - Natural Heritage Coordinator;
    - Operator (Arborist);
    - Park Attendant (Arborist apprentice).
6. Consider a new position in conjunction with Planning and Engineering Services to replace the Town's Consulting Arborist who reviews and comments on development applications, including:
    - Tree inspections before and after development;
    - Determining tree values for securities;
    - Required site work; and
    - Review of the Public Tree By-law and Private Tree Cutting By-law (if created).
7. Create a Forestry Operational Manual, this will provide guidelines for pruning, fertilizing, mulching, tree risk assessment, tree removal and tree planting.
8. Develop an Encroachment Policy/By-law onto Town owned Natural Heritage lands.
9. Develop a Master Planting Plan utilizing the Urban Soil Index approach, including:
    - Plant pollinator friendly trees as part of the Bee City Strategy; and
    - Look for new planting sites as part of increasing our total canopy cover.
10. Foster alliances with internal departments: Engineering, Planning, Public Works (Water and Roads), Legal, Finance, Customer Service, etc. in regards to tree

related topics, such as: tree planting, tree preservation, public education, tree protection during all construction projects, including any Town generated projects such as road, water/waste water and park rehabilitations.

11. Foster alliances with outside organizations such as LSRCA, York Region, other local municipalities, LEAF, Trees Canada, Invasive Species Centre, etc. in regards to tree and invasive species related topics, such as tree planting, invasive species management, etc.
12. Coordination of tree planting with stormwater management and LID measures implemented by the Town (i.e. using tree pits/planting pits in a row to manage and clean storm water). This will require Forestry staff working with the Senior Climate Change Specialist to change/implement 'innovative' stormwater management solutions – such as Deep Root and Silva cells that allow for root growth around and under infrastructure in highly urbanized and paved over environments.
13. Develop an overarching strategy with all levels of government to deal with all invasive species that are present now and that may arrive in the future, this strategy will include:
    - Working with Engineering staff and the Climate Change Specialist for Newmarket to develop joint strategies;
    - Identify their locations and enter them into GIS (EDDMapS);
    - Identify best management practices for each plant/bug/species;
    - Implementing the strategies.
14. Develop a public outreach and engagement program to increase public awareness and visibility of the UFMP and the natural environment.

2 Background

Newmarket's roots originated as a trading centre, where First Nation People and fur traders would gather under a large elm tree in the Botsford and Timothy Streets area to trade goods. This tree became known as "The Trading Tree". Large trees such as this elm were used as meeting places to trade goods. They could be seen for miles in the landscape and served as trail markers to guide travelers.

The tree has also been used to symbolize Newmarket's Vision of a community "*Well* Beyond the Ordinary". In terms of urban forestry, the tree's roots represent the six (6) areas of urban forestry which feed the urban canopy.

- Urban Forest Tree Inventory
- Tree Maintenance
- Tree Establishment and Planting
- Tree Protection
- Invasive Species & Noxious Weeds Management
- Outreach and Public Engagement

The trunk represents the urban forestry employees mission of "*making Newmarket even Greener*". The branches represent the work that is done to preserve, conserve, manage and maintain the urban forest to support the business unit's vision of "*being even Greener*" forming the crown of the tree, completing the picture.

3 Introduction

Newmarket's urban forest have a collective value of approximately $364 million. These trees provide many benefits to the community, such as air quality, storm water management, recreation and human social interaction. In Newmarket alone these benefits provide a total of $1.3 million in perceived value annually. Managing this large resource requires planning and foresight.

The Town of Newmarket's Urban Forestry Management Plan will guide the growth and maintenance of Newmarket's urban canopy over the next 20 years. This Plan sets out a vision, mission, and goals for all trees in Newmarket. Through the vision statement, this document sets out where we want to be in 20 years. The Plan's mission statement is how we are going to meet our goals and achieve the vision.

The urban forest can be defined as a collection of all woody and associated vegetation found within an urban area. This includes trees on the road right of ways (boulevard trees), parks, woodlots, woodlands, and trees on private lands.

Urban forestry is a blend of traditional forestry and arboriculture. Traditional forestry is the management of woodlands and forested areas, managing many trees at once. Arboriculture is the management of individual trees, a single tree at a time. As a municipality, we manage the entire urban forest; individual trees on town-owned lands and private property and large forested areas within the urban environment. The urban forest is an important resource to a healthy community that provides both measurable and immeasurable economic, environmental and social benefits balanced between forestry and arboriculture, and public and private property owners' needs.

This Plan is a step by step guide to achieve Newmarket's vision for it's urban forest and tree canopy. It sets out 5 year goals that will lead to the 20 year vision. The Plan outlines the context for tree management in Newmarket. It is broken down into six sections of topics critical to the management of an urban forest. Within each topic, current and best practices are described and the gaps and opportunities that exist to improve the situation and become even greener. The gaps and opportunities inform the 5 year and ultimately the 20 year goals.

The Town's Urban Forestry Management Plan is viewed as a living document that will be reviewed every 5 years. It will change as Newmarket and its urban forest grows. Appendices will be updated regularly to reflect these changes.

3.1 Vision Statement

Newmarket is **Living *Well* and becoming even *Greener*** through innovation and conservation. Newmarket's urban canopy is diverse, equitable and sustainable.

3.2 Mission Statement

We are **Making Newmarket *even Greener*** for present and future residents with a healthy urban canopy, by sharing the Social, Economic, and Environmental value of trees through Education, Innovation, Partnerships, and Policies.

3.3 Strategic Goals and Objectives

The Town of Newmarket Urban Forestry Management Plan is a goal-oriented document with a focus on actions and achievable outcomes. This Plan is organized into long term guiding principles (20 years) and more immediate goals (5 years). Yearly operational plans will be created to implement the 5 year goals. From York Region's Strategic Urban Forest Management Planning Toolkit, this proposed planning framework is outlined graphically below:

Figure 1: The strategic planning temporal and structural framework.

Newmarket's Urban Forestry Management Plan goals and objectives have incorporated suggested directions from the Urban Forest Study and York Region's Forest Management Plan, November 2016. The Urban Forest Study was a joint effort by the Town of Newmarket, The Regional Municipality of York and the Lake Simcoe Region Conservation Authority (LSRCA) and was completed in 2016

3.3.1 20 Year guiding principles

This is a strategic and long range plan. It sets out guiding principles to follow over the next 20 years to ensure that Newmarket's urban canopy is diverse, equitable, and sustainable. These broad reaching principles are the foundation of this Plan and will guide the Town's forestry section over the next 20 years.

1. **Recognize the urban forest as a critical municipal asset and green infrastructure**

Trees are living breathing organisms that provide essential and quantifiable services to the residents of Newmarket. Providing oxygen, air conditioning, air quality control, stormwater management, recreation, human social interaction, and removing carbon dioxide are but a few of the services and benefits that trees offer. Infrastructure such as sewers, water pipes, signage, and park amenities all provide similar services and we recognise them as critical municipal assets. This infrastructure makes our community livable. Trees are no different and will need to be considered and managed as such. Therefore, the goal is to fully integrate trees into the Town's asset management programs, budgets, and planning.

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

Impacts related to climate change are difficult to predict, although an increasingly volatile climate is leading to outcomes that can affect trees, including drought, higher temperatures, more frequent and severe wind and ice storms and more invasive pests. Incorporating climate change mitigation and adaptation strategies into the management of trees will help to minimize the impacts of climate change.

Strengthening the resilience of trees in the urban canopy by managing biodiversity in the face of increasing threats requires managing the existing species as well as seeking out other trees species from other areas in North America that may thrive in this changing climate. Managing biodiversity and the effects of climate change will also benefit pollinator insects which play a critical role in maintaining the health of the urban ecosystem. This will be achieved by:

- Using best practices to prevent and mitigate the impacts of invasive species on canopy cover;
- Ensuring that climate change strategies and tactics support the resiliency of the trees and urban canopy, and;
- Establishing a diverse tree population in which no species represents more than 5% of the tree population, no genus represents more than 10% of the tree population, and no family represents more than 20% of the tree population both municipal-wide and at the neighbourhood level.

3. **Sustainably manage the urban forest through continuous improvement, adaptation and innovation.**

The urban forest is a collection of trees comprised of wood lots, trees in parks, individual trees in the Town's boulevard and trees on private property. The urban forest, and its individual trees, are an element of 'green' infrastructure, and that like other infrastructure, will need to be invested in and maintained.

Urban forestry is a fast-growing field of study, with strong ties to climate change, with many forward-thinking innovations coming to the forefront. Managing the urban forest in an innovative and adaptable manner will be achieved by:

- Supporting and collaborating with the Region on re-assessing canopy and woodland cover and repeating the Urban Forest Study
- Developing a framework to manage green infrastructure as a capital asset, and better integrating total canopy cover and woodland cover initiatives across all departments;
- Acquiring additional staff to implement the Urban Forest Management Plan and manage operations,
- Continuing to use industry best practices;
- Identifying and reviewing emerging urban forestry practices, programs and trends and even investigating and developing our own best practices, going beyond industry standards to achieve our goals;
- Developing an Invasive Species Management Plan;
- Using the Town's existing tree inventory to monitor the distribution, structure and function of the urban forest and to monitor individual tree health;
- Building and maintaining ties to academic researchers, private industry and other stakeholders to stay at the leading edge of urban forestry and arboriculture science and technology and to test and incorporate new ideas;
- Monitoring proposed federal and provincial policies and legislation to identify opportunities and other impacts on the Town's plans, and monitoring outcomes of initiatives to report on progress and, where needed, to update strategies and actions;
- Developing a community urban forest monitoring system that allows public input on the Town's open data portal; and
- Developing a network of volunteers to be citizen arborists, who will promote and assist with good arboricultural practices for trees on private property.

4. **Increasing tree canopy cover by working toward the existing target of woodland canopy[1] of 13% by 2031 and setting targets for total canopy cover of 35% by 2051**

In 2051 Newmarket plans to have a woodland canopy cover of 13% and an overall canopy cover of 35%. In 2018, the woodland canopy cover is 9% and the overall canopy cover is 24%. The canopy cover increase will be achieved by:

- Looking for opportunities to increase canopy cover on private and public land, including tree planting programs and partnerships;
- Fulfilling, updating and revising the Urban Forest Management Plan on an ongoing and regular basis;
- Managing and regulating invasive species and noxious weeds;
- Using and sharing best practices for protecting, establishing and restoring canopy cover;
- Ensuring that the Town's policies and by-laws support the protection and enhancement of canopy cover, and;
- Encouraging the protection of privately-owned natural cover areas.
- Ensuring that our newly planted trees grow to maturity through a small tree program of fertilizing, watering and pruning.

[1] See definition in Glossary.

3.3.2 5 Year Goals

It is recognised that the 5-year goals will be the framework for the next five annual operating plans. These goals will be reviewed every five years starting in year three of the Plan. Each of the six goals mentioned below are tied back to the 20-year guiding principles and will be modified as needed over the life of the Plan.

1. **Develop municipal guidelines and regulations for sustainable streetscape and subdivision design that ensures adequate soil quality and quantity for tree establishment and reduces conflicts between natural and grey infrastructure.**

The development of municipal guidelines has already been initiated. Landscaping guidelines for new subdivision are in place and as a living document will be updated and reviewed on a regular basis. The landscaping guidelines require that:

- adequate soil volume for proper tree/shrub growth is provided; and
- adequate separation distances between trees and infrastructure is provided.

2. **Create a Forestry Operational Manual**

The Forestry Operation Manual is a very detailed guideline on how to maintain our urban forest, covering all tasks required to maintain our urban forest. Best management practices will be outlined in the Manual.

The Forestry Operational Manual will be the road map for Town staff to perform day to day duties to maintain (and enhance) the urban forest. The Manual will indicate how to undertake tree maintenance (pruning, mulching, etc.) and tree plantings (soil volumes, separation distances from other trees and structures, species selection, etc.).

3. **Conduct proactive tree risk assessments on municipal lands to reduce the need for emergency responses.**

Weather and climate change are very unpredictable, violent and extreme weather events are on the rise. Bringing together mature trees and people in the urban environment with increasingly extreme weather events, the Town will need to recognize and mitigate potential risks to public safety and property. This will be achieved by ensuring the urban forest is healthy, that dead and hazardous trees are removed promptly and risk assessments of trees are done regularly. Developing criteria for tree risk inspections is needed for different areas including:

- Active use trails, both paved and un-paved
- Roads
- Walkways
  - School areas
  - Residential areas
- Parks
  - Maintained and Unmaintained open space
  - Sports fields

4. Create a Master Planting Design Plan

A Master Planting Design Plan is a guide for how, where and what kind of tree to plant. This Plan will provide guidance to Staff (?) and developers (?) on locating and choosing tree species. It will be based on the Urban Soil Index (USI) approach, by looking at soil type and volume, and street configurations and assigning species of trees suitable for these locations. It will take into consideration potential future pests and all other urban constraints to determine the optimal tree species and size for each location. Placing the right tree in the right place takes many factors into consideration, for instance, there are many trees that will thrive on road boulevards but might not be suitable in other locations.

"*The Master Planting Design process has other advantages. Planned planting based on site conditions and community-wide management shifts tree selection from a beautification effort to urban infrastructure management on par with streets, utilities, and other hardscapes. It adds credibility, confidence, and efficiency to tree commission and public staff efforts. A MPD allows coordination with nurseries to grow non-traditional street trees. Finally, species segments allow for both management and aesthetic continuity, adding service value and increasing management efficiency within local urban forestry programs."* (Introduction to Urban Site Index, by: Alan Sewert, 2014)

The Master Planting Design Plan (MPDP) will assist the Town in increasing leaf area in canopied areas by planting suitable tree and shrub species under existing tree cover. Planting efforts should continue to be focused in areas of town that currently support a high proportion of ash species. The MPDP will prioritize protection of mature, healthy trees and preservation of older large-canopied species to the greatest extent possible.

The MPDP can also consider social economic factors in prioritizing planting locations.

5. Create a Pollinator Strategy (required by our Bee City designation)

As the 14th Bee City in Canada, Newmarket will be developing a Pollinator Strategy. Trees are connected to pollinators in that many trees produce flowers and nectar and provide shelter and nesting places. In addition, there are many wind pollinated trees that contribute to the well being of overwintering pollinators. Pollinators that over-winter feed first thing in the spring from wind pollinated trees (such as maples and oaks), which sustains the pollinators until such time that they can produce a nest and new offspring.

The Pollinator Strategy will indicate which species and locations to favour to support bees and other pollinators.

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

There is a critical need to build awareness and appreciation of the benefits of trees across a wide range of stakeholders, including residents, Town Staff, and businesses. This will be achieved by:

- Developing a plan to increase public awareness of the benefits of trees and appreciation of the value of trees and woodlands in partnership with the Region and LSRCA;
- Developing a multi year plan for implementation of all the various programs listed;
- Leveraging information from the Urban Forestry Study;
- Exploring the development and implementation of a staff training program to enhance awareness of tree health and general maintenance requirements, and of proper tree protection practices to be used during construction activities more specifically:
    - Foster a “tree friendly” culture among Town staff through interdepartmental coordination on tree issues and sharing of ideas and best practices for tree protection, maintenance and planting;
    - Foster a “tree friendly” culture in the community through exemplary programs and activities on municipal lands, sharing best practices and techniques, and providing support and incentives for tree protection, maintenance and planting on private lands;
- Developing a Citizen Arborist program which includes:
    - Developing a public education and outreach program which communicates the benefits of trees and the program;
    - Using educational outreach, planting events and marketing initiatives;
    - Developing engagement strategies aligned with demographic and cultural perspectives on trees and woodlands;
- Encouraging the protection of privately owned trees and woodlots through by-laws, outreach, and incentives; and
- Working in partnership with local private businesses and agencies, i.e. LEAF, to pursue the development of an urban forest communication plan that guides the dissemination of key messages around private tree maintenance and care to residents.

3.4 Plan Structure

This Plan outlines the strategies to maintain, enhance and expand Newmarket's urban forest and urban canopy. The main areas of urban forest management are presented by outlining Newmarket's current approaches, the ideal situation of where Newmarket should be once the Plan is fully implemented, and the gaps and opportunities for improvement required to be overcome to achieve the ideal situation. This Plan also sets out recommendations, measurement targets and key performance indicators.

There are two key factors to consider when increasing the number of trees (i.e. achieving woodland targets) and ensuring the health and well being of the trees (to achieve canopy cover targets): these are plant more trees and maintain and enhance the existing trees. This Plan sets out strategies for achieving these two factors by recommending creating the following plans. These plans and their associated impacts are discussed in detail in the following sections.

3.5 Purpose

The purpose of the Urban Forestry Management Plan is to provide guidance and strategic direction on maintaining and enhancing Newmarket's urban forest. This Plan has been undertaken as the Urban Forest Study identified the need for a structured approach to caring for the urban forest. With 32,000 trees identified in the 2014 tree inventory and some 300,000 in forested areas, the value of the trees in the Town is measured at approximately $364 million (2015). That dollar figure does not consider the ecological or social value of the trees. There is a need to manage this high value asset. Unmaintained urban forests can have trees that fail and damage structures and private property.

Trees are living organisms, they grow old, get sick, and fail. Like any town-owned asset, they require maintenance, and occasionally replacement. An important factor to consider when allocating resources to tree planting is that when we plant a tree we plant for the future, a well planted and maintained tree will increase in value dramatically over its life time. The return on the investment of these maintenance dollars can be realized for, depending on the species, anywhere from 75 to 300 years. However, in our urban environment, with all the various pressures put on trees, the average life of a street tree is reported to be between 40 and 60 years, if they survive the first few years after planting. Therefore to realize the full benefit of these assets, we must put plans and resources in place to ensure their survival and continued growth.

When considering the over all health and wellbeing of the urban forest, planting trees is only part of the equation, properly planned and executed maintenance is crucial to reaching our woodland and canopy cover targets. It has been shown that the average life span of a newly planted urban tree, without maintenance, is 6-10 years. This can be increased by proper planting practices and good aftercare for at least the first 15 years.

Once trees are established, after the first 15 years of care, these trees tend to have a better survival rate in the urban environment.

Considering the maximum benefits from trees start to occur around 40-45 years, it becomes imperative that we use all the tools we have to create the right growing environment so that the Town's trees can reach the age where they provide maximum benefits. This Plan sets out a framework and guidance about how to ensure our resources expended to increase and care for these assets achieves the maximum return on investment.

3.6 Local Context

Newmarket has a population of approximately 89,000 people (84,224 in 2016 as per Statistics Canada website). It covers an area of approximately 38 square kilometres in the heart of York Region, midway between downtown Toronto and Barrie.

The Town of Newmarket is one of nine local area municipalities found within the York Region. Newmarket is a growing municipality with a 7.6% increase in population from 2006 to 2011 (Statistics Canada, 2015). The total population of the Town in 2011 was 79,978 with a high per square kilometer density (2,086.3) when compared to the neighbouring York Region municipalities (York Region Vision, 2021).

The Town of Newmarket was originally founded in 1801 as a Quaker settlement. During the first quarter of the nineteenth century, Newmarket became a centre for the fur trade and in time evolved as a market. It is believed that while York was the "old market", this new centre of commerce became the "New Market", hence giving the Town its namesake.

One of Newmarket's historical landmarks dating back to this early settlement centred around the Holland River and the millpond now known as Fairy Lake, is the Trading Tree. The Holland River was an important artery for First Nations people and fur traders, and trails crisscrossed the area.

The Trading Tree was a giant elm that served as the site of the first trading post in the area. The well-known landmark was located on Timothy Street just a few yards west of Main Street. That's where, at its base, fur traders would gather to barter with the First Nations people. Though the Trading Tree had died and removed in 1980, its significance hasn't been forgotten, and the sidewalk and road allowance still bows out around where it once stood. [2]

Newmarket also has a designated Heritage Tree, which is the oldest known tree in Town located on Botsford Street. It is a White Oak tree, estimated as at least 200 years

[2] From Newmarket Chamber of Commerce website, accessed January 30, 2019

old. It is located in the backyard of Liberty Hall, which played a role in the 1837 Rebellion.

The Town has proceeded to plan, service and develop the majority of the lands within the urban boundary. The Town is no longer growing outward, growth and change is focused in specific areas of the Town. As the town continues to urbanize and intensify, protecting, managing, and enhancing the urban forest and its tree canopy becomes even more important. In dense urban areas protecting and managing trees has to become an intentional act. This Plan will assist Newmarket in keeping a focus on trees and provide guidance on how to manage them in an ever increasingly complex urban environment.

The average after-tax income of families in Newmarket is $105,300. A mortgage payment on a home in Newmarket sold for the average selling price, with a 10% down payment at the prevailing mortgage rate, would cost approximately $3,921 per month or $47,052 per year, or 44% of the income of the average Newmarket family. For those who do not already own a home, the average Newmarket home is out of reach of the average Newmarket family. The prevailing residential form in Newmarket is single detached dwellings. Of the 29,000 homes in Newmarket 80% of them are single detached dwellings. There is often a link between average household income and lack of access to trees (the lower the income the less likely to have access to mature trees). The vision of this Plan is to provide Newmarket citizens with an equitable urban forest, therefore the planting plans discussed in this Plan will need to consider balancing out the distribution of trees throughout all neighbourhoods: old and new, large lots and small lots, and wealthy and lower income areas.

3.6.1 York Region and Town of Newmarket Official Plans

The Town's Official Plan (OP) was adopted by Council in 2006. Section 9 relates to Natural Heritage Systems and preserving the Town's woodlots and natural heritage features. From the Official Plan:

> 9.3.2 Woodlots
> Woodlots are an important natural heritage feature in Newmarket. As the existing forest cover is relatively low, and with the Town approaching full build-out, it is important to protect the existing Woodlots to the greatest degree possible. They provide habitat for forest-dependent plants and animals, help regulate temperature, reduce air pollutants, reduce soil erosion, contribute to the aesthetic value of the Town and offer passive recreational opportunities.

The OP also acknowledges the current low forest cover in the Town and the need to maintain and enhance all elements of the natural heritage system. In addition it has policies that prohibit development and alterations to areas adjacent to woodlots.

The York Region Official Plan recommends increasing Newmarket's canopy cover of 25% to 35% by 2051. Recent studies by the Region have shown that despite large number of trees being removed due to ice storms or EAB our collective canopy cover has grown over the past few years. While the Town currently has a total canopy cover of 24%, current practices may not be sufficient to reach this target. If we do not properly maintain our existing tree assets, and with the impact of invasive species and annual tree mortality rates, approximately 47,000 trees must be planted or established through natural regeneration annually across the municipality to reach 35% canopy cover over the next 40 years. Growing our canopy cover is about increasing the number of trees and, more importantly, increasing the size of trees. It is worth noting that the Town lacks a system to track the removal of private trees, data without which it is difficult to track progress toward planting goals.

Within this overall canopy cover target of 35%, the Region has set a target of expanding the woodland cover (that previously-mentioned figure from the 2006 Official Plan of 9%, which are the larger contiguous wooded areas) in Newmarket to 13%. This requires protecting the existing woodlands, predominantly located in the southwest Oak Ridges Moraine lands and the remaining natural areas of the northwest quadrant. The next Town Official Plan update will address these issues and provide consistency between the Town's and the Region's Official Plans as they relate to canopy cover targets. Newmarket does not have many opportunities to increase the size of our woodlands. However, in areas outside of woodlands, there is a tremendous opportunity for growth, especially for semi mature trees. Allowing these trees to reach their full maturity, through good urban forestry management practices, will dramatically increase their canopy size.

3.6.2 Existing Policies and By-Laws

The Town has long considered its trees and wooded areas as a benefit to the community. There are several existing policies and by-laws which guide the current work being done for and about trees in Newmarket.

In 2005, the Town of Newmarket enacted its Tree Preservation, Protection, Replacement and Enhancement Policy. This policy was revised in 2008 and again in 2018. The purpose of the policy is to educate and increase the awareness of tree preservation and protection within the development industry. The policy applies to all significant trees situated within 4.5 meters of lands subject to a development application. The policy requires approval from the Town before removing, pruning, injuring or destroying any significant trees on lands subject to a development application. This encourages the protection of trees during development activities.

In June 2007, Woodlot By-law (2007-71) was enacted by Newmarket; this by-law prohibits or regulates the destruction or injuring of woodlot trees. The by-law prohibits the destruction of any woodland without a permit unless exempted under certain cases such as acquisition of a development permit or interference with utilities. In addition the By-law dictates that the commissioner shall not issue a permit in environmentally sensitive areas. This By-law only applies to very specific areas of the Town.

A Parks By-law (2013-14) was enacted by the Town of Newmarket to regulate activities within the parks system. A small portion was dedicated to the injury and destruction of trees in parks.

In 2017, a Public Tree Protection By-Law (2017-59) was enacted. This by-law protects all trees of any size on all public lands. A process to obtain a permit to injure or destroy a tree is part of this by-law. This allows for any future development on private lands where trees are located on public lands are in close proximity of the development and are in jeopardy of injury or will need to be destroyed.

York Region's Forest Conservation By-law 2013-68, prohibits and regulates the destruction and injuring of trees in woodlands 1 hectare or greater. York Region Forestry is responsible for the maintenance of trees on all regional roads and owns and manages a 19 hectares forested property in the north-west corner of Newmarket.

In November 2016, York Region Council adopted the York Region Forest Management Plan. This Plan was developed to maximize the benefits of all trees in the Region and to combat threats to trees. Two key pillars of this plan are: 1) Recognizing the value of all trees, not just those in woodland areas, and taking them into account as living green infrastructure assets, and 2) working to increase the total tree canopy cover in all settings. This Plan helps support the development of local municipal Urban Forest Management Plans that include canopy cover and woodland cover targets. The Newmarket Plan supports the York Region Forest Management Plan's number one goal: Increasing tree canopy cover by working towards the existing target of woodland

canopy of 25 per cent by 2031 and setting targets for total canopy cover of 35 per cent by 2031and 40 per cent by 2051.

3.6.3 Biophysical and Environment

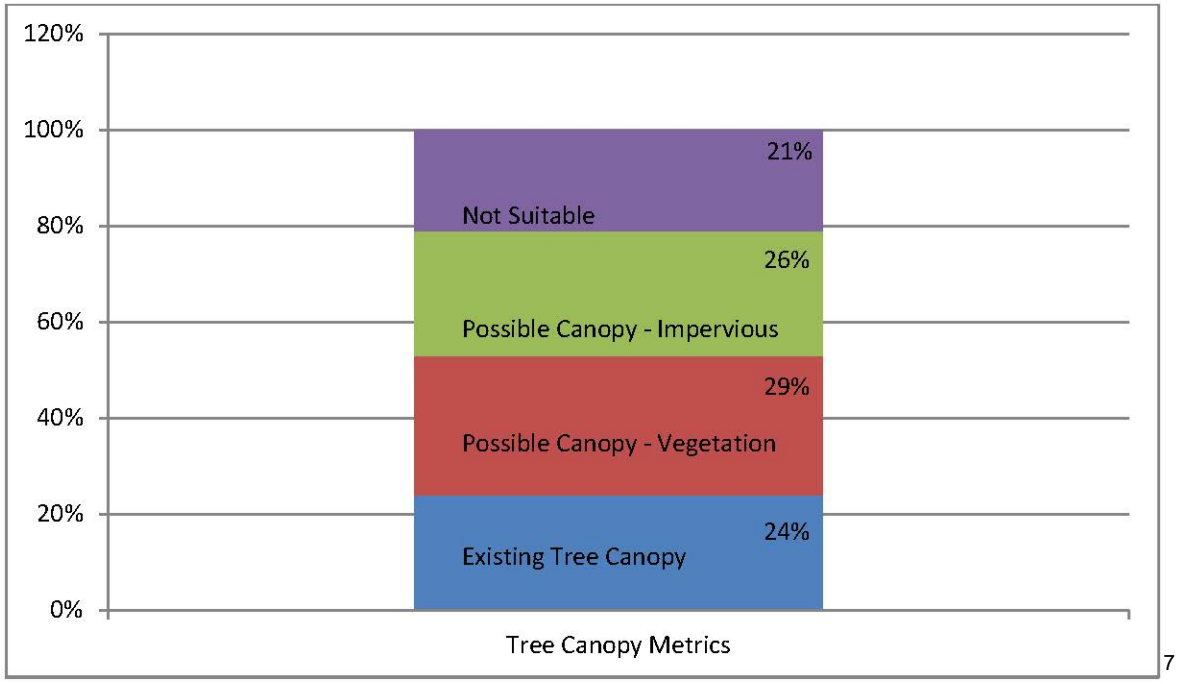
Newmarket is located in Plant Hardiness Zone 5B (Natural Resources Canada Plant Hardiness Zone Map of 2000), and ecodistrict 6E-6 (Lake Simcoe Area) in the Lake Simcoe – Rideau Ecoregion corresponding with Great Lakes – St Lawrence forest region[3]. Newmarket drains primarily into the East Holland River sub-watershed, apart from a portion in the northwest corner which drains into the West Holland River subwatershed. This region is characterized by a mixture of broad leaf and coniferous trees, such as eastern white pine (Pinus strobus), red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), red pine (*Pinus resinosa*), white ash (*Fraxinus americana*), American beech (*Fagus grandifolia*), and eastern white cedar (*Thuja occidentalis*). The south-west portion of the Town is comprised of 382 hectare of the Oak Ridges Moraine, which is protected by the Oak Ridges Moraine Conservation Plan and provincial legislation. While Newmarket is north of the Carolinian forest zone, some species representative of that zone such as American sycamore (*Platanus occidentalis*) and black walnut (*Juglans nigra*) are present.

Several centuries of urbanization, agricultural, and industrial activity has led to the loss of nearly all pre-European settlement natural cover in York Region. From 1975 to 1988 York Region's forest cover declined between 30 to 50%[4]. Concurrent with the loss of natural cover, has been a decline in the services provided by natural systems, including water management and climate regulation. Some of these services are mimicked by man-made grey infrastructure, which has a limited ability to meet the demands of a growing urban population. However, in recent years mainstream thinking has begun to recognize the importance of natural or green infrastructure in maintaining sustainable options for the future.[5]

The Urban Forest Study estimates that there are approximately 295,000 trees in the Town of Newmarket, which is approximately 77 trees per hectare. The study also found that 55% of Newmarket's total landmass could theoretically be modified to accommodate additional tree canopy.

[3] Crins and Uhlig, 2000
[4] Schmitt and Suffling, 2006.
[5] Urban Forestry Study, 2016

Tree Canopy Metrics	Description
Existing Tree Canopy	The amount of tree canopy present when viewed from above using aerial or satellite imagery
Vegetated possible tree canopy	Grass, bare soil or shrub area that is theoretically available for the establishment of tree canopy. This estimate does not consider land use preference.
Impervious possible tree canopy	Asphalt or concrete surfaces – excluding roads and buildings – that are theoretically available for the establishment of tree canopy [6]



[7]

The Town of Newmarket embarked on collecting data for a trees located on the road right of way and for some parks. Currently we have 31,195 trees in our tree inventory this represents approximately 10% of out total tree canopy (a combination of possible canopy vegetation and existing tree canopy).

3.7 Urban Forest Benefits

Trees play a fundamental role in the health of the environment. Trees support biodiversity, as they provide habitat and protect streams, aquatic life, and all other ecosystems. Trees help control erosion, sedimentation, and help reduce stormwater runoff, reducing Town costs to manage stormwater. Not only do trees and urban forests provide many environmental benefits, but they also encourage active transportation:

[6] Newmarket Urban Forest Study, 2016
[7] Newmarket Urban Forest Study, 2016

getting people out of cars and encouraging them to bike or walk by creating spaces people want to be in.

There are many benefits attributed to trees and plants in general. The most well know is the production of oxygen as a by-product of photosynthesis. Dr Kim Coder in his paper "Identified Benefits of Community Trees and Forests" provides a very good summary of their benefits:

1. Environmental benefits are:
    - Temperature and energy use
        - Shade
        - Wind control
        - Active evaporation
    - Air quality
        - Oxygen production
        - Pollution reduction
        - CO_2 reduction
    - Hydrology
        - Water run off
        - Water quality/erosion
    - Noise abatement
    - Glare reduction
    - Animal habitat

2. Economic/Social/Psychological benefits are:
    - Economic stability
    - Property values
    - Product production
    - Aesthetic Preferences
    - Visual Screening
    - Recreation
    - Health
    - Human Social Interaction

Newmarket's trees save the municipality approximately $1.32 million per year. In addition, trees in Newmarket have sequestered the equivalent of $2.74 million in carbon.

Benefit	**Associated annual value**
Air Pollution (CO, NO_2, O_3, $PM_{2.5}$, SO_2)	$321,564
Carbon sequestering	$120,408
Energy Savings	$334,533
Avoided CO emissions due Energy savings	$35,371
Hydrologic Effect (storm water management)	$499,950
Total	**$1,311,826**

There are some benefits that are less quantifiable but do have a great impact on the community and society as a whole, such as improved mental health and general well being.

Mental health benefits are often attributed to urban forests as well. Residents in an inner-city, low-income, high crime neighborhood of Chicago felt a greater sense of security, had stronger social bonds with neighbors, experienced less crime, and spent more time outside engaging with one another if there was a presence of trees and maintained greenspace, as opposed to residential spaces absent of any vegetation and seemed uninviting (Kuo, 2003). 'Volunteer performance in urban forest survey initiatives': by Nicholas Bancks, May 2017

The benefits of the urban forest are varied and diverse, and these benefits fall directly inline with role the municipality plays in providing a better quality of life for all Newmarket residents.

4 Urban Forest Tree Inventory

Managing and maintaining the urban forest requires knowing its size, condition, and details about individual trees. With an assumed value of $364 million invested in our Urban Forest it is important to be able to maintain and enhance this valuable asset. Knowing the number of trees, the species diversity, and condition of each tree in the urban forest, will allow for proper management decisions about how to care for our investment. The Tree Inventory is a critical component of the Urban Foresters tool box.

4.1 Current Situation

The Town has a complete inventory of street trees and some park trees, which is used to identify Town owned trees, to schedule pruning, to manage hazardous trees, and to manage planting locations. The inventory is also used to identify species susceptible to pests i.e. emerald ash borer. The tree inventory was completed in 2014. It lists 32,000 public trees, with 5,100 trees in parks, with the rest of the trees in boulevards. The data collected for each tree includes:

- Assigning a unique identifying number
- Municipal address
- Street name of closest street
- Park or facility name
- Site location
- GIS Coordinates
- Common name
- Family name
- Genera name
- Species name
- Variety
- DBH (cm)
- Height (m)
- Crown diameter (m)
- Age class (10 year periods)
- Overall health
- Structural defects
- Wounds/cankers
- Deadwood/decay
- Failure potential
- Recommended treatment
- Comments
- If there is a dedication sign at base of tree
- Ash trees identified for potential pesticide injection
- Photo number (includes the date and time)
- Photo name
- Arborist inspector
- Distance to property boundary

Trees removed by the Town are replaced as part of the regular forestry program. The Tree Inventory is updated with the current information obtained in the field in the course of regular duties. The street tree inventory was updated in 2018/2019, when additional information for each tree was recorded including: the species, the condition and size of the tree and confirming its location (confirming if it is a municipal tree, a private tree or a shared tree). Work performed in the field is recorded in the Tree Inventory as it happens

via remote access to the system and tablets. These records help determine where a tree needs to be planted due to a removal.

A little over half the street trees have been visited as of September 2018. The Inventory is updated by a student collecting field data and completing an initial assessment. In the field, problems are identified and once a month, the supervisor and student review list of problems, re-inspect trees and fine tune recommendations in the Inventory.

The few short years since its creation the Tree Inventory has become an invaluable tool for a variety of staff, including the admin staff, who use the tree inventory to determine ownership of trees when dealing with calls from the public. Planning and Engineering staff also have occasion to use the inventory to determine ownership and for other purposes in the course of development application review.

The current Tree Inventory is serving its purpose and assisting staff in caring for the urban forest; however, there is room for improvement.

4.2 Ideal Situation

The foundation of the inventory is satisfactory and assists many staff members in their jobs. It is anticipated that a robust and well maintained Tree Inventory will assist in managing the tree population and can help grow the canopy to the targeted 35% tree cover.

Trees are living organisms and will continue to grow and die on a regular basis, therefore the tree inventory will require updating, at least once every 5 years to keep up with the environmental changes as well as tree growth.

In the ideal situation, the Tree Inventory will be partnered with other software platforms. Utilizing new applications and programs, such as i-Tree, the Tree Inventory would be able to provide valuable information such as accurate values for:

- carbon sequestering and storage,
- pollution reduction and human health impacts,
- energy savings,
- stormwater runoff reduction,
- Species condition and distribution,
- Tree planting inputs such as where to plant based on heat islands and low density of tree population

Also the ideal Tree Inventory would have the following upgrades:

1. Inventorying individual park trees;
2. Inventorying town-owned woodlots;
3. Making the Tree Inventory available to public – specifically so they can determine if a tree is on their property or on the boulevard;

4. Inventorying all celebration trees including reason for dedication/planting and have that be available to the public;
5. Linking the tree inventory to an asset management program, this is a high priority and a specific goal of this Plan;
6. Making the Tree Inventory available to Customer Service for assisting residents determine if tree is on public or private lands;

4.3 Gaps and Opportunities

In the field, the mobile interface does not allow for historical data to be accessed, making inspections and decision making difficult. Creating reports currently requires GIS to do the work.

For management purposes Forestry Staff need to have information on:

- What work was performed including:
    - Pruning
        - Raising
        - Deadwooding
        - Thinning
        - Block pruning
    - Fertilization
        - Radial trenching
        - Deep Root Fertilization
- Other information such as location of or proximity to:
    - Over head hydro
    - Road signs
    - Utility boxes
        - Hydro
        - Cable
        - Telephone
    - Sightline issue (corner lots)
    - Complaints received
        - Attach solutions provided

There is an opportunity to create an in house management program. The Town's GIS/IT department has this capability already in house. It is anticipated that these upgrades to the tree inventory will be taking place in summer 2019/ fall 2019.

However, there are a number of readily available management programs out in the industry. These programs will keep track of a tree inventory, create work orders for work to be done on trees, keep historical data for each tree and the data can be sorted in numerous different ways to aid in managing a single tree or large numbers of trees.

There is an opportunity to incorporate additional private trees into the tree inventory by creating a process by which residents can add their own private tree information in to the tree inventory.

Historically infrastructure such as sewers, water pipes, signage, park benches, are recognised as requiring maintenance and replacement in order to maintain our standard of living in the community. Trees, or ‘green infrastructure’ are no different, maintenance and replacement is required over the years. This will be achieved through a long-term commitment to proactive management, adequate resource allocation and joint stewardship by the Town and the community.

There are several opportunities to improve and enhance the Tree Inventory, several of them are already underway. These gaps can be overcome by multiple town departments working together to create the best product for this task. Thus there is a larger opportunity for Newmarket to continue to be well connected, well managed and well beyond the ordinary.

5 Tree Maintenance Plan

As trees mature and grow larger the benefits that they provide to the community increases exponentially as can be seen in the graph in section 6. Proper tree maintenance will ensure that trees reach their mature state quicker and start providing maximum benefits sooner.

Liability is a major concern for urban forest managers. Limiting the risk and liabilities to the municipality is achieved by regular and continued maintenance such as pruning, tree removal and keeping trees in a healthy state. Regularly maintained trees suffer fewer failures and therefore there is a lower likelihood that the municipality will get a claim against them.

A Tree Maintenance Plan seeks to mitigate that risk by setting out proper and regular maintenance schedules for all town-owned trees.

5.1 Current Situation

Tree care practices currently are very reactionary. When Customer Service gets a call from a resident a Heat Ticket is created, this in turn triggers a reaction by Forestry staff to:

1. Investigate the call;
2. Provide Customer Service with a response in the form of a journal entry;
3. Create a “work order” (staff keep a paper copy of the Heat Ticket and keep track of work this way);
4. Under take the work
5. Advise Customer Service by completing and closing the ticket.

From April to November approximately 75% of staff time is spent reacting to calls with the early and later season being a little slower. During this period, Forestry deals with around 750 Heat Tickets; about 83% of the tickets received all year. During the winter months, November to April, staff is utilized for snow clearing, in January and February, 65% of staff time is spent clearing snow, leaving little time for tree work. There is still work for the Urban Forest that could be done in the winter months, such as tree removals and block pruning.

Currently the Forestry Devision consists of four staff: a supervisor, a lead hand and two operators. The two operators have taken it upon themselves to become ISA certified arborists. During the time when students are working, May to September, there are usually two students helping with forestry operations. In 2018, there was enough work to require hiring a contractor to complete the block pruning program for the year while staff reacted to heat tickets.

Regular duties for the forestry lead hand and operators include pruning, tree removals, fertilizing, mulching, and risk assessments for town-owned trees. These works are described in detail below.

Pruning: Staff perform two types of pruning for trees:

- **Block pruning** is a rotational pruning program targeted towards street trees. This program is aimed at maintaining clearances over the road, sidewalk and driveways, maintaining sightlines at corners and street signs, as well as removing very large and noticeable deadwood.
- **Maintenance pruning** is taking care of individual public trees regardless of location or impact. This type of pruning is on a purely reactionary (on call) basis

Removals: This is done as trees die or fail from extreme weather events (i.e. wind storms). We have been proactively looking at species of trees that we know are having problems such as: Ash, Manitoba Maple and Norway Maple.

Fertilizing trees: In 2018 Staff were again able to fertilize some trees with liquid injectable fertilizer. Approximately 100 trees were fertilized in 2018. All the trees fertilized were mostly young trees planted in the last 5-10 years that have not been performing well. Some trees were chosen to be fertilized based on residents concerned about the lack of growth on their trees and some trees were chosen as they were significant trees such as: Celebration Trees or trees in prominent locations.

Mulching: Every tree is mulched at the time of planting. Mulch on young newly planted trees helps keeps moisture in the soil, keeps the lawn mowers and weed trimmers away from the trunk and when the mulch breaks down it provides a bit of nutrients to the soil. Traditionally mulching never occurs again, or only when staff have some extra time. Trees that get regular mulching are more likely to survive the first few years after planting and grow better over the long term. In 2018 staff were able to spend a few days mulching trees and they managed to mulch 282 trees in 3 days.

Risk assessment: There is no current program for formal risk assessment. Issues are spotted by residents or noted by Town staff in the course of their other duties. These noted hazards are then dealt with on a reactionary basis. Staff will assess the problem and prescribe an appropriate action, such as pruning or removal.

The current industry standard for tree risk assessment has three levels:

- Level 1 – Limited visual inspection: look for something major, this will identify trees needing a higher level of assessment – can be done from a car or walking past.
- Level 2 – Basic inspection: a close inspection of the tree and targets, assess potential loads and general health. This is all documented and may identify a need for a higher level of assessment.
- Level 3 – Advanced Inspection: use tools (i.e. resistograph, sonic tomography, aerial assessment) to assess the health of the tree.

5.2 Ideal Situation

The Town of Newmarket should have a Tree Maintenance Plan which outlines how and when do to all of the above noted duties. As part of creating a Tree Maintenance Plan, four sub-topics must be discussed: staffing levels, enhancement of the Tree Inventory, risk assessments and a forestry operation manual.

5.2.1 Forestry Staff

It would be ideal to have full time staff dedicated solely to the practice of tree maintenance. Currently the Town has dedicated forestry staff in three positions:

- Supervisor of Forestry
- Lead hand of Forestry
- Natural Heritage Coordinator (EAB specialist)

Two additional Parks Operators have been dedicated to forestry. These two operators have obtained their arborist certification on their own and have had some special training in tree climbing practices, as such these individuals are qualified to perform arborist duties.

For the future of the forestry department it is necessary to create two Parks Operator, Arborist. This could be accomplished by moving the two Parks Operators who are temporarily assigned to the Forestry Department during the spring/summer/fall and allow them to stay in forestry all year round. This would decrease the need to hire outside contractors. One or two temporary Parks Operators would have to be hired each winter to cover the snow clearing duties previously covered by the Parks Operators, Arborists.

5.2.2 Tree Inventory and Asset Management

It would be ideal to link the Tree Inventory to a tree management/asset management program to distill operational information. Linking the Tree Inventory to operational tasks will allow for creating and keeping track of all work order information and retaining historical data that has been collected on any tree asset. Historical data is key in managing trees, it will allow us to see management trends in the entire population but also on individual trees. This information will help us predict with more accuracy the operational needs for the department.

5.2.3 Forestry Operational Manual

A Forestry Operational Manual goes hand in hand with a Tree Maintenance Plan. The Tree Maintenance Plan sets out what has to be done to maintain all of the Town's trees. The Forestry Operational Manual sets out the precise actions and work duties to

implement the Maintenance Plan. Specifically, the Forestry Operational Manual will provide guidelines for the following five tasks regularly preformed by Forestry Staff.

Pruning: A block and maintenance pruning "how to" reference guide should be created and updated regularly.

Fertilizing: Plan to fertilize 500 trees a year. An approach and detailed implementation plan will need to be developed.

Mulching: Newly planted trees that have come off warrantee, should be mulched 2 years after the warrantee expired. The first 2 years are generally still covered by the contractor. Then all trees should be topped up every 2 years until the 8th year when they will be mulched for the last time. When the Town has the staff and resources to start this program, the trees planted 4 years prior should be mulched (in 4th year), as well as 6 and 8 years ago. For example, if this program were started in 2018, staff would mulch trees planted 4 years ago (2014) which was approximately 250 trees. They would also be mulching trees in their 6th year (planted 2012) and 8th year (planted 2010). With approximately 250 trees planted each – the first year the program is run would require mulching 750 trees.

Tree risk assessment: A risk assessment protocol needs to be developed, there is a need to have a level of risk for trees in different areas i.e. street trees, park trees and paved trails. Different areas will have different levels of acceptable risk. For example, in BC, foresters inspect all trees for damage along paved trails in their parks after an event with 80km/hr winds. Ideally Newmarket would copy this practice and do a Level 1 inspection on all trees after significant weather events.

The tree inventory is being updated to include information about tree health, decay, trunk problems which should assist in these assessments. It is becoming easier to make a list of trees that require regular monitoring, either 1, 2, or 5 year monitoring.

Tree removal: The Town should develop criteria for assessing trees for removal such as tree inspections on a regular basis for trees with known issues. Regular monitoring should be set up for all trees in the system to feed into any new risk assessment practices.

5.3 Gaps and Opportunities

Below is a list of areas for improvement in the Town's tree maintenance practices, these would all be addressed in a Tree Maintenance Plan.

Pruning: Block pruning has been initialized with each ward being done annually this provides for a 7 year cycle of pruning for the trees in Newmarket. This was started in December of 2017 with the expectation of pruning all trees in Ward 3 by the end of

2018. However, it is taking 2 years to get through one ward instead of one. The pruning of each ward may need to be extended to 1.5 or 2 years.

Trees that residents call in about to have work performed on them, need to be recorded and scheduled for maintenance pruning in 7 years (or 5 to 10 years) cycles. An asset management program or work order program will keep this organized.

A formal work order tracking system is required to replace the current haphazard arrangement of paper copies or keeping the e-mails.

Fertilizing: Identify all trees in Town that should be fertilized and create an annual fertilizing program.

Mulching: Mulching is only done as time and recourses are available. Ideally, a mulching program should be implemented as previously discussed. There shouldn't be an increase in materials purchased for mulching as woodchip mulch is always being produced as part of forestry operations and will always be a free resource to use.

Tree risk assessment: A risk assessment protocol will identify and eliminate trees that have the highest likelihood of failure. This Plan requires that the Town come up with a formal Tree Risk Management Plan. Formalizing the criteria of what is inspected for a Level 1 Assessment and when the assessments are done (i.e. after event with 80km/hr winds) is also required. A risk assessment protocol will describe how to identify risk trees and how and when to implement mitigation practices.

Tree removal: The Town should be tracking tree and stump removals

Encroachment policy: The Town does not have a formal Encroachment Policy. The encroachments we are seeing in Town are residents placing structures, fences, and trees on Town owned lands and treating it as their own. Therefore there is a need to:

- Develop an encroachment by-law
- Define encroachments
- Develop a guideline to follow when encroachments are found
- Strengthen the parks by-law to include tree injury

Staffing: Fully implementing this Plan and achieving all of the Town's targets and goals will require dedicating two staff as Parks Operator, Arborist, for 12 months of the year. This will allow them to stay in forestry all year round and work at implementing this Plan. It will also minimize the requirement to hire outside contractors. However, a contractor would still be required for special projects and jobs that requires equipment and tools the Town does not own. Also, the Natural Heritage Coordinator role should be amended to include monitoring and control of all invasive species and expanded to include duties of an Encroachment Officer (i.e. dealing with trees that over hang and encroach onto town-owned lands).

Resources: Full implementation of this Plan will require obtaining appropriate software, application and programs previously discussed to enhance and maintain the Urban Forest Tree Inventory.

The Tree Maintenance Plan delves deeper into the details of what actions, programmes, assessments, and projects are required to properly maintain the Town's trees. Along side a Tree Maintenance Plan, there will need to be Forestry Operational Manual outlining how staff will undertake their daily duties and setting the technical requirements for each maintenance action. All of this will entail additional staffing requirements and some new software programs.

6 Tree Establishment and Planting Plan

Our urban forest is made up of a variety of different species; however 65% of the total population is comprised of only four different tree species. When insect or disease problems, such as Emerald Ash Borer, go through communities without a wide variety of species, the end result can be devastating. For instance Emerald Ash Borer (EAB) has destroyed 95% of all Ash trees in Newmarket.

Trees are generally long-lived organisms, changing the character of our urban forest and introducing a wider variety of species is a long-term project. It takes a tree a number of years to mature, but once they are established, after 2-3 years, they will reach a substantial size within 3-5 years. As mentioned earlier, trees have a lifespan of 40-60 years. Changing the character of our urban forest will require a lot of foresight and planning over the next 40-60 years.

A Tree Establishment and Planting Plan will set out a strategy to diversify our urban forest over the next 40 to 60 years as well as set out the best locations for new tree plantings to ensure an equitably distributed urban forest.

6.1 Current Situation

The current practice at the Town is that whenever a tree is removed a new tree is planted in its place. Tree removals can happen for a variety of reasons:

- Disease or pests such as the emerald ash borer causing the Town to actively remove ash trees from public property;
- Removing dead and hazardous trees; and
- Due to extreme weather events.

Reasons trees are planted:

- Residents request a tree in the boulevard (in front of or at the side of their property) or in a park.
- The Town has a Celebration Tree Planting Program where people can pay for a tree to be planted in memory of someone (see the Town's website for details) in a park.
- As part of town-initiated park improvements.
- Replacement of a removed tree, if appropriate.
- The site plan process requires tree planting.
- Community events such as LSRCA and Neighbourhood Networks planting.

Plantings are done twice per year, in the spring and in the fall. Staff generally know of areas that need more trees. Currently, one staff member is responsible for creating the planting list and validating locations.

As of 2018 the target is to plant 1,000 trees a year. The 1,000 trees include all of the Ash tree replacements (approximately 400-600), replacements for trees that were removed over the course of the year (100-200) and new trees to increase canopy cover (200-500).

The following chart outlines the targeted plantings for the next five years.

Year	Estimated Quantity
2018	1000
2019	1000
2020	1000
2021	400-500
2022	400-500

As the EAB program finishes, in 2021, fewer replacement trees will be planted.

The current planting program only addresses biodiversity loosely, with staff deciding about tree type by what is growing on neighbouring properties. In Newmarket, 34% of our tree population is Maple, and 18.5% of Maples are Norway Maples, the rest are Silver, Sugar, and Manitoba Maples.

The current planting standard gives consideration for soil volume when trees are replanted, for instance if a tree is removed from a 3m boulevard, a new one will not be replanted due to insufficient soil volume.

Tree planting practices have been developed by the Town in the last two years to aid in the establishment on newly planted trees. This guideline outlines:

- How trees are planted,
- Nursery stock selection,
- Tree watering during establishment,
- Mulching during establishment.

6.2 Ideal Situation

Ideally, a Tree Establishment and Planting Plan will be developed utilizing the Urban Soil Index (USI) approach. Also there should be coordination of tree planting with stormwater management and LID measures implemented by the Town (i.e. using tree pits/planting pits in a row to manage and clean stormwater). This will require Forestry staff working with the Senior Climate Change Specialist to implement innovative stormwater management solutions, such as deeproot and silva cells that allow for root

growth around and under infrastructure in highly urbanized and paved over environments. Closer ties need to be fostered with the Engineering Department in dealing with tree plantings and/or replacement plantings in capital projects such as new trails and parks as well as road reconstructions.

Ideally, the Town should be encouraging private landowners, specifically larger commercial landowners to plant trees to increase the tree canopy within the Town. Commercial land uses the largest opportunity for increasing our urban tree canopy.[8]

6.3 Gaps and Opportunities

In terms of creating a Tree Establishment and Planting Plan tasks to be undertaken include:

- Creating a master list for planting locations. This may be started by identifying gaps through the mapping component of the tree inventory but locations would always need to be verified in the field.
- The master list of planting locations would need to consider residents' concerns with new trees including religious (i.e. Feng Shui) and nuisance reasons such as allergies, slip hazards, and pest attraction. For example little leaf lindens are not always appropriate in front lawns because they attract aphids which in turn attract wasps.
- Considering the location of replacements based on the disease which may have caused the tree to be removed, as disease can stay in the soil (i.e. Dutch elm disease and verticillium wilt).
- Selecting wind pollinated tree species as they provide food for the pollinator bugs who over-winter (this pollen is what they eat first thing in the spring).
- Update the Tree Policy with a section which allows for large commercial land owners to plant trees on unused portions of their property and the trees can be removed without penalty in the future should the landowner require it for commercial purposes (i.e. an expansion of their building).

Closing statement: A Tree Establishment and Planting Plan will provide Forestry Staff and all Town Departments with direction on where to plant new trees and what should be considered in choosing these locations.

[8] Urban Forestry Study, 2016 pg 27

7 Tree Protection

Newmarket's urban canopy is made up of both public and private trees and is a valuable infrastructure asset. As per the 2016 Urban Forestry Study, these trees help avoid more than 200,000 cubic metres of water runoff each year, a service valued at nearly $500,000. Our trees reduce erosion, improve air quality, and increase property values. The urban canopy reduces residential energy costs by more than $334,500 per year. The replacement value of Newmarket's trees exceeds $350,000,000.

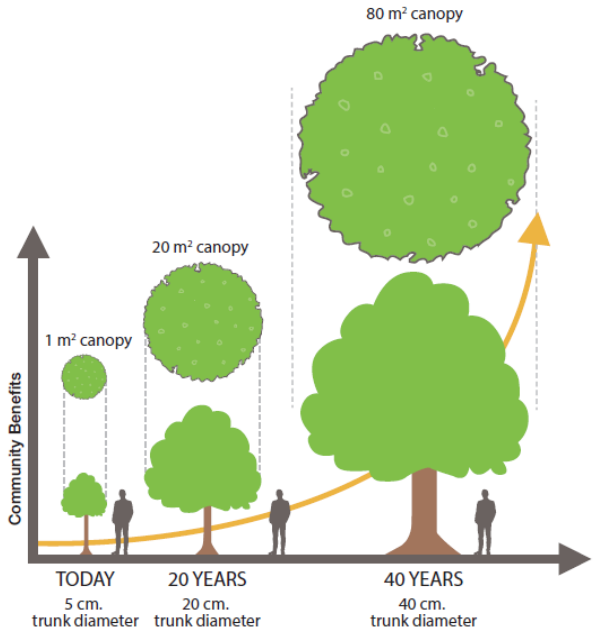
Once trees are planted they need to be maintained and managed for them to be able to grow to their potential. Proper management can greatly assist in reaching our tree canopy targets. Proper regulation of tree removal is important to ensure that trees are protected, their unnecessary removal discouraged, and when necessary to be removed that their public value is not lost.

The larger the tree, the more benefits they provide to society. Therefore tree protection is equally important as planting trees. Trees need to mature so that the Town and residents can realize the full benefit of each tree.

Trees are an intrinsic part of our communities. They play a vital role in creating and maintaining sustainable communities that attract and retain residents and businesses. A healthy urban canopy can be considered as an investment that will only appreciate over time.

Canopy cover is a measure of the size of our urban forest, being comprised of all trees in the municipality. Increasing canopy cover will increase the value and benefits to the community. Canopy cover of trees increases exponentially during their lifetime. This means the protection and maintenance of mature and maturing trees is critical to preserving and extending canopy cover. As canopy cover increases, the benefits to the community also increase exponentially.

Figure 5. Relationship Between Tree Size, Leaf Area and Benefits Provided to Residents



From York Region Forest Management Plan, November 2016

It is important to protect wind pollinated tree species (maple, oak, etc.) as they provide food for the pollinator bugs who over-winter (this pollen is what they eat first thing in the spring).

7.1 Current Situation

Newmarket currently has a three branched approach to tree protection: protection of trees on town-owned lands (by by-law), protection of trees on private property (currently under review) and a policy regulating trees related to development applications.

Trees planted as a result of development applications (i.e. secured through site plan or subdivision agreement) are protected as long as the agreement is in force and effect. The Town has a Policy which guides tree considerations through the development process.

The Tree Preservation Protection Replacement and Enhancement Policy was adopted by Council in 2005 and revised in 2008 and 2018. The Policy applies to all “significant trees” located on and within 4.5 metres of any land subject to a development application. The Policy describes significant trees as a tree that is at least 20cm (or larger) DBH.

Staff are currently investigating possible forms of by-laws that can regulate trees on private property. It is anticipated that some options will be presented to the public and Council for discussion in Q1 of 2019.

7.2 Ideal Situation

It would be ideal if all trees were protected during all construction projects that require a building permit, not just the projects going through a Planning Act development application process. Tree protection measures should be included in all construction projects undertaken by the Town, with exceptions provided for emergency situations. Also that all trees in the Town of Newmarket are provided with a measure of protection, whether on private or public property.

7.3 Gaps and Opportunities

When considering protection of trees on lands not related to a development application, it was determined that the Tree Policy was not the correct regulating tool to address this issue. Council has enacted a by-law protecting trees on town-owned lands. This by-law protects any tree on town-owned land, including those that may be damaged or injured through the building permit process. If an eventual by-law regulating the injury and damage to private trees is enacted, this will protect trees on private property not subject to a development application.

8 Invasive Species & Noxious Weeds Management Plan

Due to globalization of our economy and the increases in international trade, we are experiencing more non-native species being introduced into North America. Climate change will contribute to their survival in our environment. These new species are crowding out native species and reducing the overall biodiversity of our ecosystem. Invasive species pose a threat to our environment, health, safety, and economy. Because of their negative impacts and rapid spread, invasive species are gaining global recognition as a serious threat.

Local governments can provide a critical component to addressing invasive species issues.

8.1 Current Situation

The Town of Newmarket has created and is implementing its plan to deal with Emerald Ash Borer. There is not currently a strategy to deal with any other invasive species, they are dealt with on a reactive basis when they are encountered in the field. We are proactively looking for wild parsnip, giant hog weed and poison ivy. Staff monitor the trails when they are out doing their jobs. The Town has provided signage in areas where there is a high incidence of a certain pest. Some measure of success has been achieved in actively controlling plants which pose a health and safety risk.

The Town is part of a Region-wide forum to deal with invasive species. This gives the Town a better opportunity to act as needed to and it pulls from many resources to deal with problems. Species that are known to be in Newmarket that need to be dealt with:

- Emerald ash borer (it is anticipated that the total program will be complete by 2021)
- Beech bark disease
- Giant hog weed
- Phragmites
- Wild parsnip
- Poison Ivy
- European buckthorn
- Dog strangling vine
- Japanese knot weed

Staff has previously requested an FTE, Natural Heritage Coordinator, position that administers the Emerald Ash Borer program. Currently this role is being carried out by a secondment

8.2 Ideal Situation

Typically, by the time invasive species have been found, the species is generally well established and hard to eradicate. An over arching strategy to deal with all invasive species present now and those that arrive in the future will need to be developed, this strategy will include:

- Expanding the Natural Heritage Coordinator job description to include all of the invasive species.
- Working together with Engineering and the Senior Climate Change Specialist to come up with joint strategies;
- Identifying their locations and entering the data into GIS (EDDMapS);
- Identifying best strategies for management of each plant/bug/species;
- Implementing the strategies.

8.3 Gaps and Opportunities

The Town has a unique opportunity in that staff have a seconded FTE, Natural Heritage Coordinator (NHC), looking after an invasive species already (EAB). It is the intent that the NHC will be responsible for creating and rolling out the Invasive Species & Noxious Weeds Management Plan.

There is also a need to deal with non-native species which may effect the urban canopy and overall health of Newmarket's ecosystem.

9 Outreach and Public Engagement Plan

As people move into residential and suburban areas, the need for greenery is at the forefront of the public consciousness. There seems to be a need for residents to be involved with what happens to the trees and other 'green' initiatives in their neighbourhood.

9.1 Current Situation

Currently, there is not a formal outreach program for the Parks Departments, Forestry Division. However, these Departments participate in several initiatives put on by the Town, including:

- The public is informed by way of door hangers and letters of any work performed on trees in the neighbourhood
- A tree walk once a year, which is a guided tour through the town, talking and sharing information about Newmarket trees. It is hosted and organized by the Recreation and Culture Department.
- Touch-A-Truck is a yearly event showcasing machines and tools used by Public Works Departments including Forestry.
- Speaking to the Grade 5 students who come to Town Hall. Staff will go to schools to do presentations when asked.
- Participate in Town's Open House with a booth showing tree planting programs (currently mostly EAB), information is provided to residents.

The majority of the Forestry Division's outreach and education is done by providing information on the Town's website: www.newmarket.ca/trees.

Tree planting assistance is provided by LEAF.

9.2 Ideal Situation

The ideal situation would be to have an outreach and engagement program that outlines regularly scheduled events and activities. Ideally, the department would be highly visible in the community; this would benefit the trees and the Town. The events and activities could include (but are not limited to):

- Town staff engagement with private landowners in response to landowner inquiries;
- Community engagement through planting and event partnerships with LSRCA and other community groups;
- Talk to schools on a regular basis;
- Additional tree walks;
- Implement a citizen arborist program;
- Provide information for residents on our website (and other places) on:

    - pollinators;
    - tree planting plans;
    - insect control;
    - the value of trees;
    - Best Trees for Best Spaces;
    - how to limit tree injuries including: walkways, cabanas/sheds, cars and equipment, general compaction, neighbors, construction, chemicals, pools, play structures and patios
    - landscaping design advice
- Provide a planting guide and tree planting assistance;
- Seminars on:
    - historical trees;
    - tree assessment;
    - hazardous trees.
- Give trees a voice through augmented reality:
    - Copy City of Melbourne – email address for each tree;
    - Show price tags on individual public trees of:
        - maintenance cost;
        - replacement cost;
        - value of benefits (i.e. water treatment, erosion control, etc.)
- Create a scavenger hunt to go look for all the “trees with voices” giving people a chance to discover Newmarket;
- Take inspiration from the Live Oak Society of the Louisiana Garden Club Federation Inc.
- Improve and promote the Town Arboretum in Fairy Lake Park

9.3 Gaps and Opportunities

Opportunities for the Town to increase and supplement the current public engagement practices include developing a Citizen Arborist program. With rising costs for equipment, staff time, and materials, the public’s engagement in the care of green spaces is an untapped resource that the Town can take advantage of. Many organizations have volunteers performing all kinds of work for instance the Botanical Gardens of Phoenix rely on about 2,000 volunteers to maintain the property and run their programs. Many municipalities across North America have various volunteer programs that assist with maintaining the urban forest.

In a Citizen Arborist program the volunteers do basic tree maintenance, such as block pruning on small trees and removal of invasive trees and plants in parks and forested areas. The volunteers would be trained by Town staff; this would require additional communication and staff time.

For developing the Citizen Arborist program students could assist with the initial research and program framework. These would be additional students beyond the ones currently hired and would be specifically hired for this project.

There may be opportunities for grants and additional funding sources for educational and outreach programs, especially innovative programs/projects reaching into reducing climate change impacts or mitigating climate change or using new technology using virtual and augmented reality.

10 Recommendations

1. Obtain software to manage workflow and maintain history on work performed on trees in Town.

2. Recognise trees in a Town asset management program (Green Infrastructure).

3. Expand Natural Heritage Coordinator position to include:
    - Invasive species management;
    - Manage Encroachments onto Town owned Natural Heritage lands.

4. Dedicate filed staff to forestry related work 12 months of the year.

5. Consider future growth and a future structure, including:
    - Natural Heritage Coordinator;
    - Operator (Arborist);
    - Park Attendant (Arborist apprentice).

6. Consider a new position in Parks in conjunction with Planning and engineering to replace the Town's Consulting Arborist contractor who reviews and comments on development applications, including:
    - Tree inspections before and after development;
    - Determining tree values for securities;
    - Required site work;
    - Review Public Tree By-law and Private Tree Cutting By-law (if created).

7. Create a Forestry Operational Manual, this will provide guidelines for Pruning, Fertilizing, Mulching, Tree Risk Assessment, Tree removal and Tree Planting.

8. Develop an Encroachment policy onto Town owned Natural Heritage lands Policy/By-law.

9. Develop a Master Planting Plan utilizing the Urban Soil Index approach, including:
    - Plant pollinator friendly trees as part of the Bee City Strategy;
    - Look for new planting sites as part of increasing our Total Canopy Cover.

10. Foster alliances with internal departments: Engineering, Planning, Water, Roads, Legal, Finance, Customer Service etc. in regards to tree related topics, such as: tree planting, tree preservation, public education, protect trees during all construction projects, including any Town generated projects such as road, water/waste water and park rehabilitations.

11. Foster alliances with outside organizations such as LSRCA, York Region, other local municipalities, LEAF, Trees Canada, Invasive Species Centre etc. in

regards to tree and invasive species related topics, such as tree planting, invasive species management etc.

12. Coordination of tree planting with stormwater management and LID measures implemented by the Town (i.e. using tree pits/planting pits in a row to manage and clean storm water). This will require Forestry staff working with the Senior Climate Change Specialist to change/implement 'innovative' stormwater management solutions – such as Deep Root and Silva cells that allow for root growth around and under infrastructure in highly urbanized and paved over environments.

13. Develop an overarching strategy with all levels of government to deal with all invasive species that are present now and that may arrive in the future, this strategy will include:
    - Working together with Engineering staff and the Climate Change Specialist for Newmarket to develop joint strategies;
    - Identify their locations and enter into GIS (EDDMapS);
    - Identify best strategies for management of each plant/bug/species;
    - Implementing the strategies.

14. Develop a public outreach and engagement program to increase public awareness and visibility of the public works and the natural environment.

11 Glossary of Terms

Ecological Resilience:
The ability of an ecosystem to maintain its normal patterns of nutrient cycling and biomass production after being subjected to damage caused by an ecological disturbance.

Ecosystem services:
The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth.

Woodlots vs woodlands:
Woodland cover refers to all of the woodlots in Town and is the forested areas, this currently stands at 9%. All trees outside of this, are trees located in the many parks, road right of ways and private properties, this comprises approximately 15%. The total canopy cover to the Town of Newmarket is 24%.

Tree Canopy Cover:

Tree Canopy Cover (TCC) is the layer of leaves, branches and stems of trees that cover the ground when viewed from above.

Urban Forest:
The urban forest can be defined as a collection of all woody and associated vegetation found within an urban area. Trees on the road right of way, parks, woodlots and woodlands and trees on private lands are included in the Urban Forest. As part of the Urban Forest, there is interaction between people and trees. The Urban Forest is seen as an important resource that provides many measurable benefits to the community

12 Literature and Resources Cited

Strategic Urban Forest Management Planning Toolkit, prepared for The Regional Municipality of York, prepared by Urban Forest Innovations Inc, December 2010.
https://ufmptoolkit.net/one/work-plan/

Town Of Newmarket Urban Forest Study - Technical Report, March 2016

Town of Newmarket Emerald Ash Borer Management Plan , 2012

'Volunteer performance in urban forest survey initiatives': by Nicholas Banks, May 2017

'Identified Benefits of Community Trees and Forests': by Dr. Kim D. Coder

Urban Forestry, Planning and Managing Urban Green spaces: Robert W. Miller, Richard J. Hauer, Les P. Werner, third edition

https://www.newmarket.ca/

York Region Forest Management Plan, November 2016