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**It's In Our Nature: Management Plan for the York
Regional Forest
2019 – 2038**

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1 Introduction

1.1 Purpose and Scope

York Region has owned the York Regional Forest since 1924. This legacy began as part of the Agreement Forest program, under which the provincial government worked with counties and conservation areas to manage and reforest landscapes across southern Ontario. In 1998, York Region assumed full responsibility of these natural assets.

A well-designed management plan is a critical element of forest stewardship, and one of the Region's first initiatives in taking responsibility was to develop its 20-year forest management plan that extended from 1998 to 2018.

Because the trees that dominate life within a forest can live for decades or even centuries, the pace of change is gradual and can be hard to perceive. As the one hundredth anniversary of the York Regional Forest approaches, however, the positive impacts of work done first by the province and more recently by the Region are clear.

Building on that success, the management plan set out in this document provides direction for the next 20 years, out to 2038. It will be supported by five-year operating plans both to implement the plan and enable the Region to respond quickly to changing conditions and new knowledge. While focusing on the next 20 years, actions will be informed by a much longer-term vision for the forest, one that acknowledges a time frame measured in the centuries over which forests evolve, and respects the needs of future generations.

Together, the aim of the management and operating plans is to continue the evolution of the Forest towards greater health and improved biodiversity, strengthen its resiliency in the face of threats, and ensure that residents cherish, understand and respect it as a living natural asset. In acting on the plan, the Region will continue to demonstrate leadership in conservation, stewardship, and natural area management.

1.2 Vision, Mission and Goals

1.2.1 Vision

As the heart of the Region's natural landscape, a healthy and ecologically diverse York Regional Forest sustains its communities and inspires its people.

1.2.2 Mission

York Region is a leader in working with nature, communities and people for the benefit of the Forest.

1.2.3 Goals

Strengthen Ecological Integrity

Continue to strengthen the health, diversity, resiliency, and sustainability of the York Regional Forest

This goal emphasizes that the health and sustainability of the Forest is an overarching priority of the Region.

Foster an Understanding of the Forest's Benefits

Demonstrate that the Forest provides a wealth of environmental and social benefits, making it key to the Region's vision of healthy, thriving communities.

This goal recognizes that the Forest has value, provides a wealth of benefits and is integral to the Region's vision of healthy, thriving communities.

Inspire People

Encourage public use that inspires respect for the Forest and a connection with nature.

This goal supports public use that is compatible with the Forest, promotes learning about nature, and encourages community and individual stewardship of the Forest.

1.3 Alignment with Key Regional Directions

This Plan aligns with and supports key Regional goals and plans.

The York Regional Forest is recognized in the **Regional Official Plan (2010)**, which states:

York Regional Forests shall be sustainably managed in a manner that enhances their ecological, educational and recreational functions to ensure their health in perpetuity. (Sec. 2.2.51. Office Consolidation April 2016).

The Official Plan also sets out land use policies around a goal of 25 per cent woodland cover by 2031. (Woodland cover refers to the land area covered by extensive forest, as opposed to total canopy cover, which includes all trees in the Region). This goal was confirmed in both the **York Region Greening Strategy** and the **York Region Forest Management Plan (2016)**. Because it is made up largely of woodlands, the Regional Forest will contribute to achieving the 25 per cent woodland cover target.

Vision 2051, the blueprint for York Region's future, describes the future Region as a place where everyone can thrive, made up of livable cities and complete communities and with a resilient natural environment and agricultural system. The Forest supports that vision, as well as several more specific goal areas that support a resilient natural environment. These include:

- A protected, connected and enhanced regional greenlands system (including increased biodiversity, system resiliency, climate change actions, and partnerships with public and private entities)
- A healthy environment for a healthy population (including clean air, land and water); encouraging recreational opportunities in the natural environment
- Protecting vital water systems (including protecting Lake Simcoe and its watershed, ground water quality and quantity, and maintaining natural hydrological function)

1.4 Developing This Plan

In developing this plan, the Region drew on the expertise, advice and views of a wide range of people, including the Regional Forest Advisory Team, a technical advisory team and a key stakeholder group, as well as researching best practices in forest management and use of public lands.

Many organizations and groups contributed and actively participated in discussions to help shape this plan; particularly its vision, goals, and objectives (see Appendix A for a list of contributors). Several public open houses allowed for broad community engagement. Appendix B summarizes the entire engagement process.

The information on public use and trends is based on user surveys conducted in 1972-1976, 1993, 2006-2007 and 2016-2017 and a 2017 online survey. Additionally, public use and trends were informed through participation statistics in organized events and observations of Regional Forest Advisory Team members

and York Region Forestry staff. The 2016-2017 Forest user survey captured responses to questionnaires that were left on vehicles in Forest parking lots and main access points, and delivered to nearby homes.

A detailed forest inventory of all tracts, updated in 2016, provided baseline information on the current state of the Forest, helped to project its expected state by 2038 and beyond, and was key in identifying priorities for the Plan.

1.5 Structure Of This Plan

Chapter 1 describes the scope and purpose of the plan, the vision, mission and goals that it reflects, how the plan aligns with strategic Regional directions, and how it was developed. In the balance of this document:

Chapter 2: Evolution of the York Regional Forest provides a historical perspective on the Forest from its origins, early restoration and reforestation starting in 1924, to its turnover to the Region in 1998. It then outlines the results of the Region's management, including accomplishments of the 1998-2018 Forest Management Plan.

Chapter 3: The Forest Today discusses the current state of the Forest. It describes two key landforms and the trees and other vegetation supported by each. It discusses the age structure of the Forest and its diversification over time, and looks at how this is improving habitat for wildlife as well as plants.

Chapter 4: People in Nature discusses trends in public use and summarizes the results of the 2016-2017 forest user survey and other information. It also positions the Forest geographically within York Region and in relation to other greenspaces.

Chapter 5: The Future Forest considers the ecological future of the Forest to 2038 and beyond, including opportunities to support forest communities, directions in management and sustainability, and response to threats and challenges.

Chapter 6: Directions in Public Use explains how the Region will respond to ongoing and potential changes in public use to ensure that users continue to enjoy their visits and to balance the benefits of public access with ecological integrity.

Chapter 7: Achieving the Vision sets out the key elements of the Plan including goals, actions, and objectives and discusses implementation and monitoring.

Several **Appendices** and a **Forest Atlas** describing each tract in more detail follow.

2 Evolution of the York Regional Forest

Today's visitors to the York Regional Forest enjoy the beauty and tranquillity of towering, majestic pines and robust stands of maple, oak and hemlock. It is hard to comprehend that less than a century ago, the land occupied today by this thriving forest was virtually a desert. Much of it was empty abandoned farmland, the light sandy soil blowing into drifts that sometimes blocked local roads.

The story of the Forest over the past century is one of restoration of a degraded landscape. The history of the Forest itself, however, extends much further back in time.

2.1 Indigenous People

Some 12,500 years ago, as the climate began to warm, the glaciers of the last Ice Age retreated from what is now York Region. About 1,500 to 2,000 years later, indigenous people were moving across the landscape, which at the time was a relatively barren tundra dotted with areas of open boreal forest. (Planning for the Conservation of Archaeological Resources in York Region, 2014)

These earliest indigenous people were nomads who hunted caribou, as well as mastodon, moose and elk, and possibly fished the waters of the post-glacier lakes. Over the centuries, with further warming, more permanent villages emerged as people began to grow crops. The largest community to develop this less nomadic way of life was the Ontario Iroquoians. They and other indigenous nations grew crops on land cleared by fire and harvested forest plants for food, medicine and fibre.

As many as 2,000 members of one Iroquoian nation, the Wendat, lived in a village located on what is now the community of Stouffville in the Town of Whitchurch-Stouffville. Approximately 60,000 trees went into the building of their longhouses and protective palisades, and they cleared hundreds, possibly thousands, of acres for crops, especially corn.

From the earliest days of habitation, indigenous people created and used a trail network that connected Lake Ontario and Lake Simcoe, ultimately allowing access to the upper Great Lakes. It consisted of two main branches, one along the Humber to the Holland River, and a lesser one 40 kilometres to the east that followed the Rouge to the Holland. Together, these became known as the Toronto Carrying-Place Trail.

Although technically portages, the overland links that took travellers over the Oak Ridges Moraine were so long that canoes were often abandoned and new ones built or obtained at the next river. The portage between the Humber and Holland is believed to have been located just east of the current Happy Valley Tract of the York Regional Forest (NCC n.d., TRCA 2009). After crossing the moraine, the eastern branch is thought to have linked to the Holland River near present-day Aurora.

Despite the growth in indigenous agriculture, at least 80 per cent of what is now York Region was likely covered with mature and diverse forests at the time of European contact. In the northern reaches, coniferous forests, dominated by Eastern hemlock, white cedar, tamarack, spruce, and white pine were the prevalent vegetation. Various associations of sugar maple, American beech, white elm, and white pine occupied the upland sites on the Oak Ridges Moraine, while oaks were particularly common on the south slopes of the moraine (Puric-Mladenovic 2003).

2.2 1600 – 1900 European Arrival and Settlement

The first Europeans to see what is now central Ontario were explorers, traders and missionaries who began to arrive early in the seventeenth century.

European arrival, which brought devastating diseases, worsened the impacts of warfare between the Ontario Iroquians and the distantly related Five Nations, originally from south of Lake Ontario. By late in the century both groups had left the area and were replaced by the Anishnaubeg. These highly mobile peoples, who included the Mississauga, Ojibwa (or Chippewa) and Odawa, subsisted on hunting, fishing, gathering wild plants, and farming. (Planning for the Conservation of Archaeological Resources in York Region, 2014)

After the American Revolution in the 1770s, many United Empire Loyalists moved north into what is now southern Ontario. Concerns about the continuing American military threat led to the building of Yonge Street in the early 1800s. This route supplanted the Carrying-Place Trail and made it easier for settlers to move further north into what was then the County of York. Lumbering, especially to provide spars for the Royal Navy, also intensified. (The Forests of Southern Ontario, The Forestry Chronicle, 1998)

The pace of European settlement and land-clearing for agriculture increased through the 1800s, with impacts on both the indigenous population and the land. For example, the British re-established use of the Toronto Carrying-Place Trail, securing land from, and relocating, the Mississauga Nation. Negotiations over this land continued until the Williams Treaty in 1923 (TRCA 2009).

The southern Ojibwa continued to live in the area that now comprises York Region. They had allied with the British during the Revolution and continued the alliance through the War of 1812 (Georgina Island First Nation n.d.). The sole reserve within York Region today is the Chippewas of Georgina First Nation, where more than 200 members of the community live on three islands (Georgina, Snake and Fox) in Lake Simcoe. As with other First Nations, many community members live elsewhere. In the 2016 census, more

Figure 1. Eroding agricultural lands circa 1920 (Ministry of Natural Resources).



than 5,000 York Region residents identified themselves as indigenous, which includes First Nations, Métis and Inuit.

By the early twentieth century, the land in York County, much of which would later form York Region, was largely barren of forest. In many places, especially on the Oak Ridges Moraine, farming had depleted the soil and left large areas in a state of severe environmental decline

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2.3 1920 – 1997 Restoring Degraded Land

By the start of the twentieth century, there was growing concern about the impacts of deforestation and soil depletion. The provincial government, recognizing that land no longer fit for agriculture could support some types of trees, began efforts at reforestation. (Ministry of Natural Resources 1982).

Through the 1921 Reforestation Act, the provincial Department of Lands and Forests – forerunner to today's Ministry of Natural Resources and Forestry – embarked on a program to work with the counties to reforest 22,000 square kilometres of degraded agricultural land across southern Ontario (Figure 2). After its launch in Simcoe County in 1922, the act's Agreement Forest program was introduced in York County in 1924. Known at the time as "Vivian Forest," the first area of reforestation in the Hollidge Tract marked the beginning of the York Regional Forest.

Figure 2. Young conifer plantation established under Agreement Forest program. (Ministry of Natural Resources and Forestry)



The York County Agreement Forest was one of 59 such forests across southern Ontario managed by the province. In York County an early management goal was to stabilize soils and establish woodland cover by widespread planting of conifers including pines, spruce and larch.

By the early 1960s, the earliest reforested areas would benefit from thinning; removal of specific rows of trees and individual trees within the rows created canopy gaps, promoted natural regeneration, and maintained the health and vigour of the Forest (Figure 3). Many of those reforested areas have been thinned two or three times (Figure 4), and their biodiversity has improved. By the 1990s reforested areas contained well-established native deciduous and coniferous tree species in addition to the conifers that were originally planted.

Figure 3. Unloading logs at the landing, circa 1956. (Ministry of Natural Resources).



Figure 4. Loading logs for transport to landing, Hall Tract, October 2014. (Silv-Econ Ltd.)



At the same time that trees within the forest were growing, the forest boundaries were expanding. By 1997, through adding and reforesting new properties, it had grown to 18 properties comprising 2,051 hectares. The province ended the Agreement Forest program in 1997 and the Region assumed full management responsibility in 1998.

2.4 1998 – 2018 Growth of the Forest

After taking on the management responsibility for the York Regional Forest, the Region prepared a 20-year Forest Management Plan running from 1998 to 2018 (York Regional Forest Management Plan 1998-2018).

The goal of the 1998-2018 Forest Management Plan was:

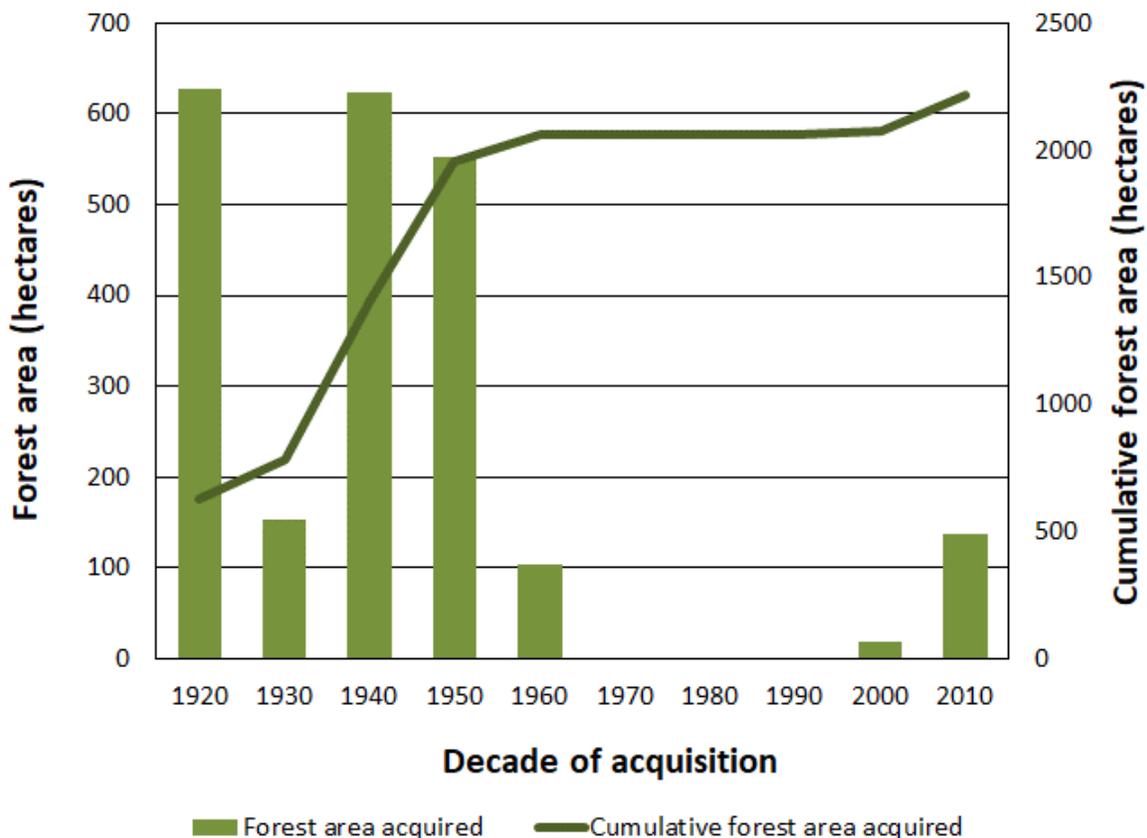
To ensure the ecological sustainability of the Regional Forest and its associated natural heritage features and values through the utilization of an ecosystem-based approach to management, which also recognizes social and economic values.

The plan identified nine objectives for meeting this goal, including protecting the ecological integrity of the forest and promoting habitat diversity, encouraging responsible recreational and educational use, and engaging public stakeholders through the Regional Forest Advisory Team.

In acting on the 1998-2018 plan, the Region developed five-year operating plans (which also included infrastructure projects such as trails and parking areas) that set goals over a succession of shorter time horizons to allow for flexibility. These were supported by work plans scheduling annual activities. Standard operating procedures and specifications for silvicultural and other forest management activities were also developed.

The Region added 13 new properties totaling 344 hectares to the Forest between 2001 and 2018 through its progressive Greening Strategy. As a result of these and earlier provincial additions, the York Regional Forest now consists of 23 properties totaling 2,395 hectares – including parking lots and trails (Figure 5).

Figure 5. Additions to the York Regional Forest by decade.



Individual property management plans consistent with the forest management plan were prepared for newly added properties.

While much of this land is being reforested, the Region has established 6.7 hectares of oak savanna and 16.2 hectares of tall grass prairie in sections of the new properties to improve habitat diversity. This has benefited wildlife, including species at risk such as the Bobolink and Eastern Meadowlark.

The York Regional Forest is recognized as a demonstration forest, which is a working forest that showcases leading-edge science and technology, and best practices. Showcasing practical management techniques benefits forest managers and educates the public about the benefits of the Forest as an ecosystem and how silvicultural management, including harvesting of trees, enhances those benefits.

2.4.1 Ecological Integrity

Almost a century of care has transformed the Forest. Initially, creation of the reforestation areas was achieved through the establishment of a monoculture of pines and other conifers. While this stopped the erosion that was the main concern at the time, it provided little habitat diversity.

As understanding of ecosystems grew and urbanization areas in southern Ontario reduced habitat diversity, first the province's and then the Region's management began to recognize the need to create a more biologically diverse Forest. Today, it is a rich mix of conifers, hardwoods, shrubs, prairie grasses, woodland plants, and wildflowers, dotted with ponds and wetlands which provide habitat for a variety of wildlife including native mammals, birds, reptiles, amphibians and insects.

This transformation reflects the Forest's high potential for biodiversity. The Region falls within the southern region of Great Lakes-St. Lawrence Forest, which lies between the deciduous Carolinian Forest to the south and the coniferous Boreal Forest to the north. The Forest is home to diverse flora and fauna including about 50 native tree species and plays an important role as a natural seed bank.

Woodlands in the drier uplands are dominated by sugar maple, basswood, beech, white ash, red and white pine and eastern hemlock. In the wetter lowlands, dominant species include balsam poplar, green and black ash, silver maple, red maple, eastern white cedar, and balsam fir.

The Region has used knowledge of which native species do best in which environment to better manage the Forest and strengthen its ecological integrity. This has involved, for example, thinning to provide more light, water and other resources to native species under another species' canopy and, where natural regeneration is not taking place, underplanting with native species. These practices replicate natural succession in woodlands. The Region also adapts and refines its practices as it gains knowledge and considers how to manage threats from climate change and invasive species.

DEFINITIONS

- Forest management is used as a broad term that includes administrative and legal responsibilities, management of public use, forest protection and economics, and planning and overseeing silvicultural management.
- Silvicultural management is a way of actively influencing the speed and pattern of growth in the forest. It includes such practices and treatments as planting and thinning trees. It can help

achieve such goals as restoring and maintaining the ecological functions of the forest, advancing forest health, and promoting species and habitat diversity.

2.4.2 Silvicultural Management

Silvicultural management is an important tool used by the Region to enhance the Forest's ecological integrity and advance its health. For areas of natural origin, the Region draws on the guidance of The Silvicultural Guide for Managing Southern Ontario Forests (MNR 2000).

This Guide sets out recommendations on stand structure and the silviculture systems to support them. Stand structure refers to the combined physical characteristics of all vegetation in a group of trees, while a silvicultural system is a planned series of actions to tend, harvest and re-establish a stand.

The Guide recommends silviculture systems that create and protect stands with several layers of vegetation, typically ranging from herbaceous plants to shrubs, understory, midstory, and finally overstory trees. This provides the vertical complexity important to many species of birds and insects. Leaving in place downed logs, dead standing trees and other features that provide habitat is also recommended.

Silviculture selection systems carefully remove certain trees to allow more resources (light, water, nutrients) to reach trees and plants and encourage their growth, and also create conditions to grow new trees in the future. It supports a more diverse stand by age, vertical structure and species while maintaining permanent forest cover. (MNR 2000, 2002).

Approaches to selection can vary. For example, group selection, which removes trees in small groups, opens up more of the canopy than single-tree selection. It is often recommended for retaining or regenerating such species as red oak and black cherry that are mid-tolerant or intolerant of shade when growing with more shade-tolerant species like sugar maple and American beech.

The Region applied the provincial guidelines to managing areas of natural forest through the 1998-2018 plan. It is consistent with best practices identified in the research carried out for this plan and is expected to be relevant for the foreseeable future.

The Silvicultural Guide does not provide guidance on managing conifer plantations. Best practices for these areas are based on earlier provincial guidelines and technical notes, particularly Managing Red Pine Plantations (Ontario Ministry of Natural Resources 1986; also Ministry of Natural Resources 1999, Ministry of Natural Resources 1997, Woods & Penner 2000, Smith & Woods 1997, Chapeski 1989) and on the collective experience of forest managers across southern Ontario.

Silvicultural activities have included:

- thinning to improve stands (1,580 hectares in total)
- underplanting some 61,600 native tree seedlings where natural regeneration is lacking
- planting 195,000 trees, mainly conifers, to reforest newly added properties
- controlling invasive plants (approximately six hectares since 2014)

2.4.3 **Forest Certification**

In March 2000, the York Regional Forest became the first public forest in Canada to be Forest Stewardship Council® (FSC®) certified by the Rainforest Alliance.

Certification requires annual compliance reviews and five-year certificate renewal audits, which have been carried out in accordance with FSC standards. In 2015, the York Regional Forest was recertified out to 2020. The Region's management activities are consistent with principles and criteria for well-managed forests as embodied in certification systems.

Certification to an internationally recognized standard like FSC provides third-party evidence that the York Regional Forest is being managed appropriately and sustainably. Many other public forests in Canada have since followed the Region's lead and become FSC certified.

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3 The Forest Today

After almost a century of restoration work, including the guidance of the most recent 20-year management plan, today's Forest is an increasingly biodiverse and resilient ecosystem of woodlands, wetlands and prairie grasslands. The Forest has become valued as a recreational amenity for the residents of York Region and beyond. This chapter describes the Forest's natural attributes and features, as well as threats and challenges.

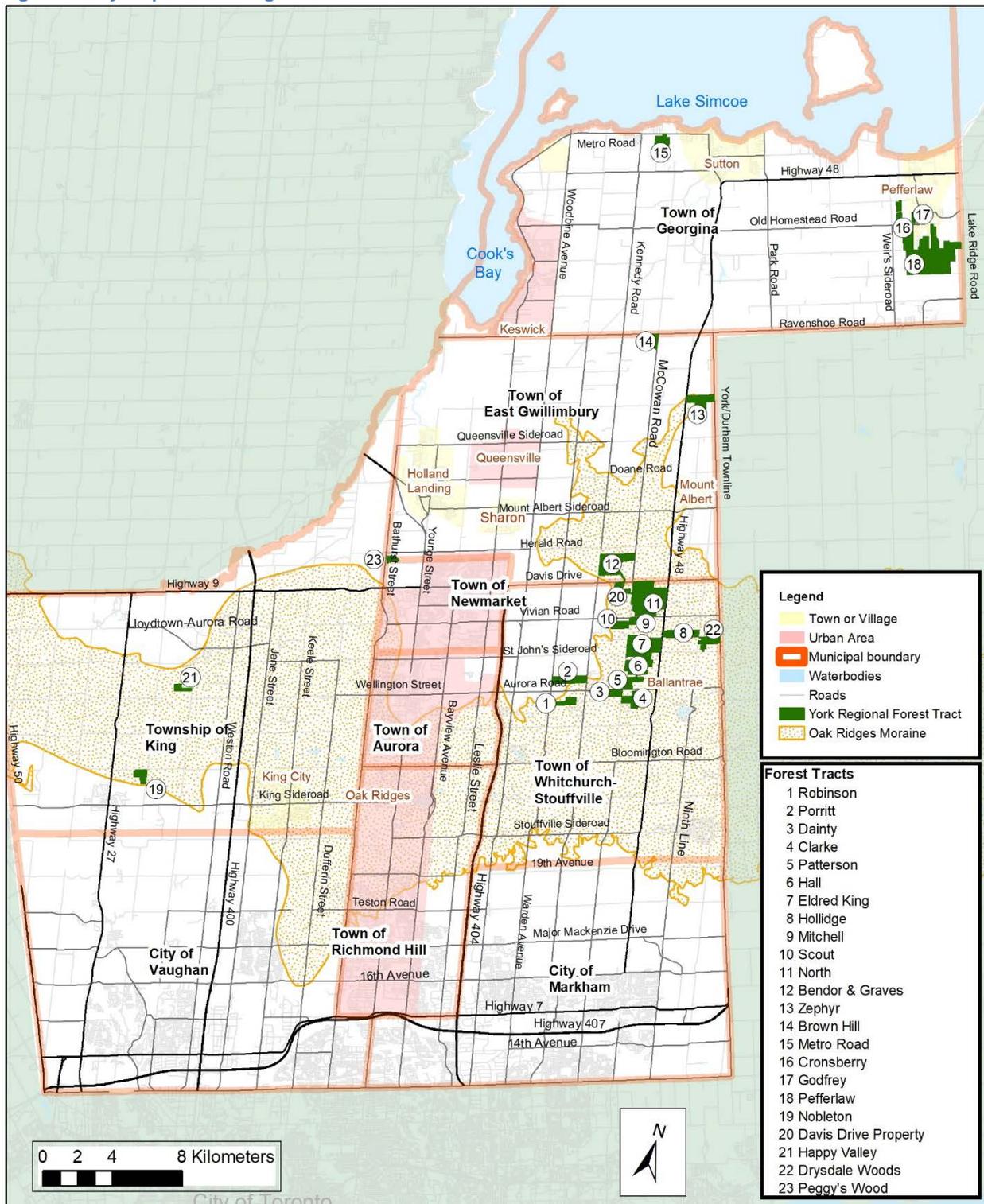
3.1 Major Landforms

As it retreated thousands of years ago, the last glacier to cover southern Ontario deposited aggregates and spoils shaping the landforms that exist today. The two most prominent landforms are:

- **The Oak Ridges Moraine.** This is a massive ridge of glacial deposits extending east-west from the Niagara Escarpment to the Trent River. The surface consists of sand or gravel hills with fairly level tracts of sand between them. A layer of windblown sand that can be a metre or more in thickness is invariably found on the surface. These fine and unstable sands were the focus of early reforestation efforts, which helps to explain why 16 of the Regional Forest tracts are situated on the moraine. In parts of some tracts, most notably Zephyr, there continues to be active remnants of blow-outs and sand dunes.
- **The Lake Simcoe basin.** This consists of the lowlands surrounding Lake Simcoe. Directly south of Lake Simcoe, a low, swampy, sandy plain covers most of Georgina and parts of East Gwillimbury, Uxbridge Township and Brock Township. The watershed here drains north into Lake Simcoe, with the Black River and Pefferlaw Brook being the major streams. Long, swampy valleys extend southward for several kilometres along these streams and their tributaries, Zephyr Creek, Mount Albert Creek, Vivian Creek, and Uxbridge Creek. These treed swamps are relicts of Lake Algonquin, which covered the area during the last ice age. Seven York Regional Forest tracts are located in the Lake Simcoe basin.

Figure 6 shows where the York Regional Forest lands are located.

Figure 6. Key Map of York Regional Forest Tracts.



3.2 A Dynamic Forest

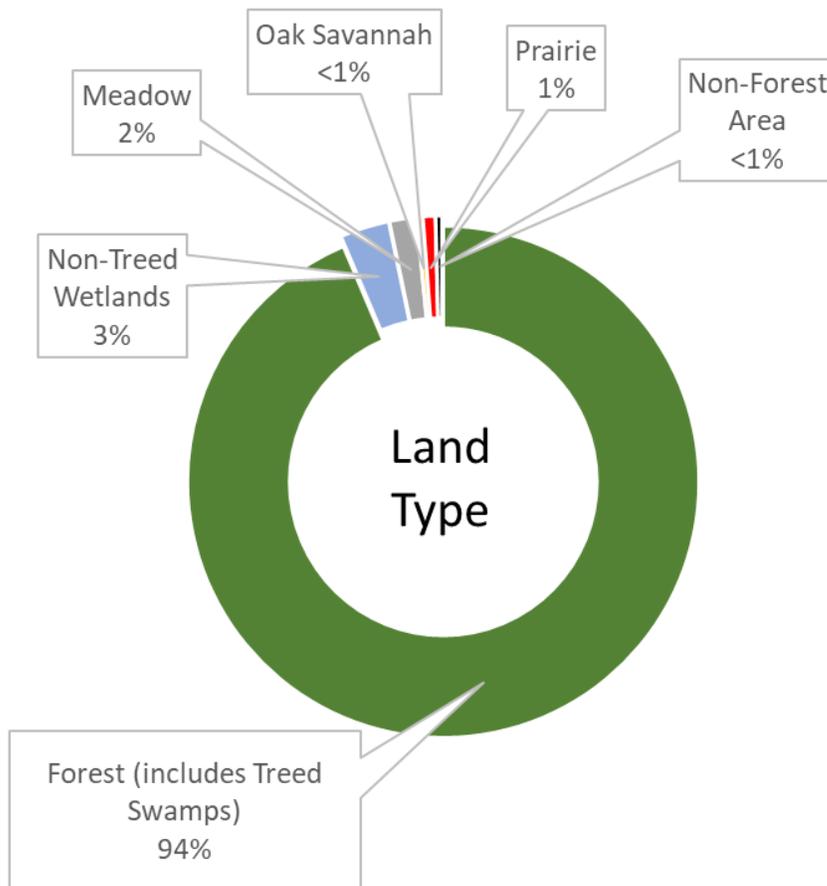
A forest is a living system. Even though most change takes place relatively gradually, over time the impacts can be profound. The Region has managed the Forest with this in mind and will continue to do so.

3.2.1 Forest Inventories

A forest inventory is a fundamental tool for assessing the current state of a forest. The Ministry of Natural Resources completed a detailed inventory of the Forest at the end of the provincial 1973-1993 forest management plan. At that time, forest communities covered 98 per cent of the York Regional Forest, with non-treed wetlands, meadows, ponds and other open areas making up the balance.

The most recent forest inventory, completed in 2016 and summarized in Figure 7, shows the increasing biodiversity resulting from the Region's management. While woodlands continue to account for the largest portion of the total area, non-forest habitat is increasing.

Figure 7. York Regional Forest Vegetation Communities (2016 Forest Inventory).



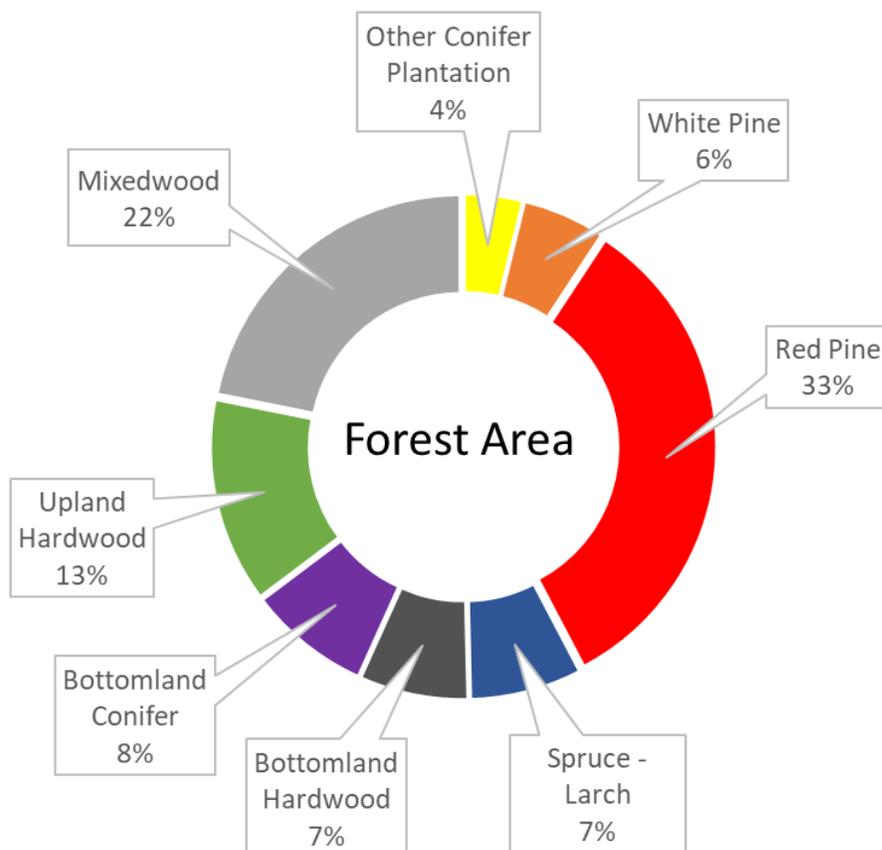
At the time of the provincial inventory, reforested areas represented 54 per cent of the total forested area while stands of natural origin accounted for 46 per cent.

Over time, aided by periodic thinning and, where needed, suitable underplanting of native species, reforested areas essentially revert to stands resembling those of natural origin. Technically, this conversion point is determined by measuring the relative proportion of trees planted for reforestation purposes to other species in a stand, using the cross-sectional areas of the trunks of the various species. In practice, the Region's experience has shown that, with management, the transition generally takes place when plantation trees are about 90 to 100 years old.

Today the forested community is split equally between reforested areas and stands forest dominated by native tree species, reflecting the evolution of reforested areas and acquisition of naturally forested lands. Reforested areas reflect early plantings of red pine, white pine, spruce and other conifers, while naturally occurring stands comprise bottomland hardwoods, upland hardwoods, bottomland conifers, and mixedwood stands. ("Mixedwood" refers to natural occurring forests made of a mix of coniferous and deciduous trees, neither of which dominates the overstory).

The 2016 forest inventory identified eight distinct types of forest community based on species composition (Figure 8.).

Figure 8. Forest Communities of the York Regional Forest (2016 Forest Inventory).



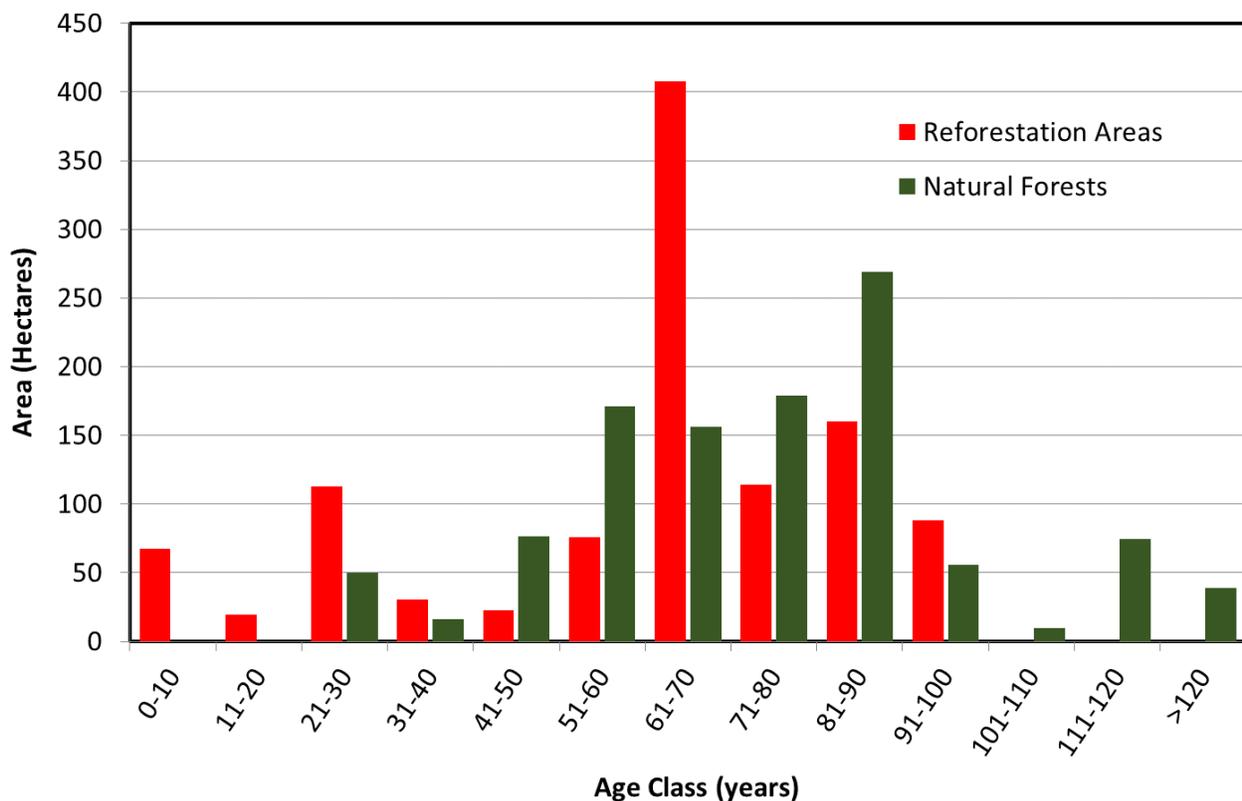
Most stands of natural origin are more than 40 years old. Many are more than 90 years old, putting them well into what is called the late seral stage of succession. (“Seral” derives from “sere,” which is a natural succession of plant communities, typically moving from uncolonized habitat to climax vegetation). Figure 9 provides the current (2017) age-class distribution of forest stands.

The reforested areas also show age diversity:

- The earliest areas, planted in 1924, are now 95 years old. In total, reforestation areas from the 1920s through the 1940s cover about 10 per cent of the area of the Forest.
- The largest reforested areas are those planted in the 1950s, which today account for about one-third of the reforested area and about 7 per cent of the total Forest area. These trees are now 61 to 70 years old.
- The youngest stands, less than 20 years of age, have been planted on lands acquired by the Region since assuming management responsibility for the Forest (1998).

In line with the 1998-2018 Forest Management Plan, the Region has managed reforested areas to help their transition to stands of diverse native species.

Figure 9. Age class distribution of the York Regional Forest in 2017 (2016 Forest Inventory).



Note: Appendix E provides a further breakdown of the age class distribution by forest community.

3.3 Why Forest Health and Biodiversity are Important

An ecologically diverse and healthy forest provides critically needed habitat for birds, pollinators and other animals some which are threatened in Ontario and across the continent. For the people who live around it and even further afield, preserving and improving the Forest is an important amenity which also addresses the impacts of a changing climate, reduce air pollution and minimizes other stresses.

3.3.1 Mitigating Climate Change, Improving Quality of Life

Forests and the wood they produce absorb carbon dioxide, a major contributor to climate change, and store the carbon in their tissues. Larger trees exponentially absorb more carbon dioxide than smaller trees, in the process, known as carbon sequestration. Carbon Sequestration helps to reduce the impacts of carbon dioxide produced by burning fossil fuels (Colombo 1998). Examples of increased carbon sequestration in the Forest include the growth newly planted trees that are replacing fields and pasture in the Davis Drive and Bendor & Graves tracts.

Long-term conversion of plantations to communities of native species is further increasing carbon sequestration per hectare (Liao 2010). This conversion often involves thinning. Although it may seem counter-intuitive, studies suggest that thinning can promote carbon sequestration by giving the remaining trees access to more soil moisture and light, which can increase biomass and make them more resilient. The intensity of thinning can have a profound effect on the stand's net carbon balance (Magruder et al. 2013). In addition, trees that have been thinned and used for wood products (e.g. dimensional lumber in housing) continue to store carbon for decades.

Wholesale loss of forests around the globe, on the other hand, is reducing the amount of carbon stored by trees. It has been estimated that shrinkage of forested areas is contributing as much carbon dioxide to the atmosphere as the combined emissions of cars and trucks. This makes preserving and strengthening woodlands like the York Regional Forest a key part of mitigating climate change. Chapter 5 discusses the probable impacts of climate change in more detail.

The Region's Green Infrastructure Asset Management Plan estimated that every year the York Regional Forest sequesters 5,717 tonnes of carbon, captures 166,800 kilograms of pollution and absorbs 642,600 cubic metres of rainwater and snow melt that would otherwise have to be managed as run-off.

3.3.2 Restoring Natural Biodiversity

As noted earlier, York Region's woodlands have the potential to support a diverse range of plant and animal life in part because they lie between two major forest regions. For example, the Forest includes some Carolinian species, such as butternut, shagbark hickory, bitternut hickory and northern hackberry (*Celtis occidentalis*), that are growing at the northern limit of their range, while Boreal species, including balsam fir and white spruce (Farrar 1995), are at their southern limit.

The Forest is being managed to continue toward improved biodiversity by bringing back and encouraging the growth of these and other native tree species. The addition of non-forest habitats like prairie and meadow, ponds and wetlands is further improving biodiversity. The Region's efforts also recognize the importance of scale. Some areas, such as cedar stands, are naturally less biodiverse themselves, but contribute to biodiversity at the landscape level.

3.3.3 Legacy Conservation Forests

In 2015, the Region developed a Legacy Conservation Forest Strategy. The unique cultural and ecological features and functions of Legacy Conservation Forests differentiate them from other vegetation communities in the Forest. While the strategy conforms to the requirements under FSC Principle 9 – High Conservation Values, the Region has set criteria for managing these lands that exceed FSC requirements.

At present, there are Legacy Conservation Forests in 14 tracts – Pefferlaw, Hollidge, Clarke, Patterson, Bendor & Graves, Dainty, Nobleton, Hall, Happy Valley, Zephyr, Eldred King, North, Porritt and Godfrey. Together, they comprise 31 per cent, or 739 hectares, of the 2,395 hectares of the York Regional Forest.

Legacy Conservation Forests are of two types:

- Special Management Areas, where human intervention, particularly silvicultural management, may be used to protect, enhance or develop their conservation values.
- Nature Reserve Areas, which rely more on natural processes. In these areas, human intervention will be limited to such activities as maintaining trails, removing hazard trees and protecting the Forest from threats like uncontrolled fire and invasive species.

The Region has set minimum targets for both types of Legacy Conservation Forest:

	2012 area (hectare)	% of total Forest area	% of Legacy Conservation Forest areas
Special Management Areas	321	10%	40%
Nature Reserve Areas	418	15%	60%

Creation of the Legacy Conservation Forests recognizes that certain ecological features and functions, sometimes found in no other part of the Forest, warrant special attention. For example:

- Within Bendor & Graves there is an excellent example of a mature bottomland conifer forest. This naturally-occurring stand, which dates to before 1920, features steep slopes leading down to a provincially evaluated wetland. The wetland is bordered by swathes of vegetation that act as riparian buffer areas between the water and the surrounding land.
- A stand in the Hollidge Tract provides an excellent example of a natural upland mixed forest. The stand, which is close to 100 years old, contains some of the largest naturally-occurring white pine and hemlock in York Region. It also includes a riparian buffer area with groundwater discharge supporting Vivian Creek

- Areas within Bendor & Graves are being transformed into tallgrass prairie/oak savanna habitats, which are globally rare ecosystems.
- Some stands in the Hollidge Tract date back to 1924, when they were part of the earliest plantations to be established in southern Ontario. They continue to serve as a cornerstone of the establishment of the York Regional Forest.

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3.3.4 Providing Critical Habitat for Wildlife

North America's bird population is estimated to have fallen by one billion over the past 40 years, and a 2016 study pointed to loss of habitat to urbanization and large-scale agriculture as major causes (Partners in Flight, 2016).

Birds are an important part of the ecosystem because they help control pests, disperse seeds and move nutrients from one place to another. Some, like hummingbirds, also pollinate flowering plants. Because most of the continent's birds are hatched in Canada over the summer before migrating south for the winter, protecting breeding and migratory habitat is especially important. Other forms of wildlife that act as pollinators, especially bees, are also in decline. Pollination is critical to the continued diversity and existence of many agricultural crops.

With its increasing biodiversity, York Regional Forest can shelter and sustain a wider range of birds, insects and other wildlife, including many species whose habitat is becoming scarce. How the Forest is being managed is key to realizing this potential:

- Cavity trees, fallen logs, branches and trees, and snags (dead standing trees) all provide shelter and food for wildlife. Vegetation that varies in height is also important. The abundance and condition of these features are a useful marker of the quality of wildlife habitat.
- Many trees are important sources of edible seeds and nuts for wildlife. The most common species producing larger seeds and nuts that serve as food are black cherry, red oak, basswood, and American beech, all of which are found throughout the Forest. They currently account for about 6 per cent of the overstory trees and are becoming more abundant with the transition to a more mixed Forest.
- Many wildlife species depend on habitat deep in the Forest, far from an edge or open field. While urbanization and agriculture have created many small and isolated patches of forest in southern Ontario, the Regional Forest offers large expanses of woodland. Records maintained by eBird.org, which is affiliated with Cornell University, show the presence in some of the larger tracts of such interior-forest species as the black-and-white warbler, black-throated green warbler, brown creeper, ovenbird and winter wren.
- The way that the Forest's tracts connect to each other and adjoining natural areas also allows birds and other animals to move more easily and safely across the landscape for breeding purposes and to find food.
- Some wildlife depends on more open areas, like meadows, prairies and savannas. These habitats are also being lost to development and agriculture outside the Forest. Creating and managing areas of oak savanna and prairie in the Forest is providing habitat for such at-risk species as the Bobolink, Eastern meadowlark, and the endangered Monarch butterfly and Rusty-patched bumble bee.

Species at risk in Ontario and Canada are protected under Ontario's Endangered Species Act, 2007 and the federal Species at Risk Act, 2002. The Endangered Species Act requires the Province to develop recovery strategies for the species listed on Schedule 1 of the Act. The Regional Forest contains existing

and potential habitat for several species at risk, some of which are included within Legacy Conservation Forests. The Region takes part in recovery strategies by:

- Collaborating with staff from the provincial Ministry of Natural Resources and Forestry to identify locations where species at risk might be found
- Creation of rare grassland habitats (tall grass prairie and oak savanna) supporting numerous species at risk
- Posting signage to discourage recreational use in sensitive areas
- Evaluating the re-routing of trails close to the habitat of species at risk
- Partnering with the Ministry of Natural Resources and Forestry and Ontario Streams to carry out surveys of vascular plants (that is, plants with specialized tissue that conducts water and nutrients) and provide GIS mapping of roughly 75 hectares a year since 2013.

Appendix C lists many of the wildlife and plant species that have been observed in the Forest and gives their at-risk status.

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4 People In Nature

Over the last decades, increasing numbers of people have come to enjoy the York Regional Forest for recreation and to connect with nature. Its extensive trail network is inviting to a wide range of users, including hikers, people walking dogs, runners, bird watchers, families and friends taking a stroll together, cyclists, horseback riders, skiers and snowshoers. The connections between tracts and to other natural areas enrich the possibilities for many of these activities.

4.1 Public Use

4.1.1 The Trail System

Close to 148 kilometres of trails allow recreational users to enjoy and explore the York Regional Forest. Table D1 in Appendix D shows the distribution of trails by Forest tract. Much of this network was originally established to provide vehicle access for early reforestation efforts and to serve as firebreaks, and as a result many trails are relatively wide.

Many hiking trails have been extended to reach further into the Forest, to connect two or more trails and/or to connect with a boundary road/entrance. Over the years recreational users have created additional unsanctioned trails.

The Oak Ridges Trail and associated side trails coincide with Regional trails in several Regional Forest tracts (Robinson, Clarke, Dainty, Patterson, Porritt, Hall, Eldred King and Hollidge). Linking the Regional Forest trails to other trail systems improves the experience of users by broadening opportunities for recreation.

The network also includes the three accessible trails, totalling 4.3 kilometres. These accessible trails are in the Hollidge, Hall and North tracts (Figure 10). They were designed and constructed to meet requirements of the *Accessibility of Ontarians with Disabilities Act 2005*, as identified through the Region's own Accessibility Design Guidelines for York Regional Forest Trails. These trails have been very successful, and their design and construction have been recognized as a best practice for accessible trails across Ontario.



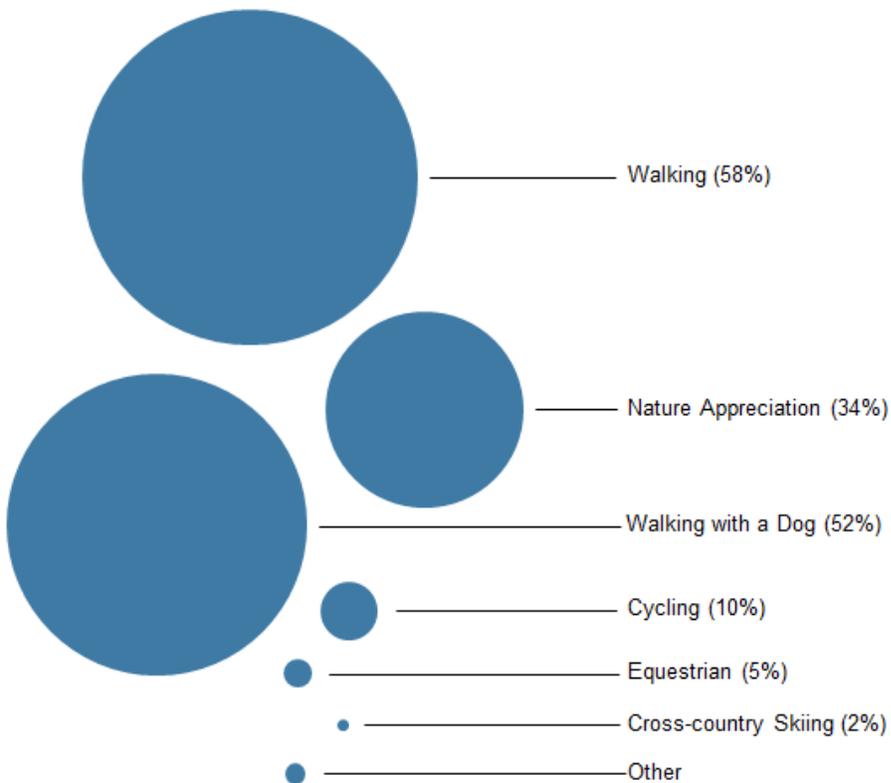
Figure 10. Accessible trail signage. (Silv-Econ Ltd.)

4.1.2 Trends in Public Use

Looking at survey data going back to the 1970s, a key finding is the greatly increased public use of the Forest. The Region's population has grown roughly six-fold from the 1970s, when about 20,000 people visited the Forest annually. In 2017 the Forest received an estimated 600,000 visits. A comparison of recent and earlier user surveys also showed that:

- **The main uses have not changed significantly.** New uses, such as geocaching, have emerged, and some existing uses, like mountain biking, have become more popular. Conversely some earlier uses, for example dog-sledding, have declined. Overall, however, the main uses remain consistent. Figure 11 illustrates the top uses in the 2016-2017 user survey. The relative size of the circle indicates the number of responses associated with that use. Many users listed more than one activity in their response, so the totals add to more than 100 per cent.

Figure 11. Top Public Uses in 2016-17 Forest User Survey – individual respondents were allowed to identify multiple activities.



- **What people like and dislike about the Forest has been consistent over time.** Suggestions for improvement are surprisingly similar across surveys, with some items having been raised in every survey since 1976.

Consistently noted interests include:

- The need for **better trail markings and maps**. This is particularly important to new users.
- A desire for more **guided nature walks and nature-oriented education**.
- Dedicated trails to support an interest in **mountain biking**.
- A need for **better communication**. This came across strongly in the online survey in particular. Examples include better access to informational pamphlets and brochures, updates of display case information, more frequent website updates, and more information about educational events and activities.
- Better **fencing** to help define boundaries and control unauthorized uses.
- More information about **user etiquette** and **rules**, including restricted activities.
- More support **facilities** including rest stops, washrooms, garbage containers at more entrances, picnic tables/areas, and improved parking.
- **User interactions are inevitable**. These sometimes lead to concerns, for example when a swift but quiet bike startles horseback riders or hikers. Members of the Regional Forest Advisory Team note, however, that most users understand and follow forest etiquette.
- **Off-leash dogs appear to be an emerging concern**. At present, dogs are allowed off leash in most areas as long as they are “under control.” A fenced, leash-free dog area has been provided in the Bendor & Graves Tract. No complaints were recorded in the 1976 or 1993 surveys, but the 2017 online survey included more than 100 comments in favour of leashing dogs.
- **Use does not vary widely across the seasons**. Although the fall season is slightly more popular and winter slightly less so, use across all seasons is fairly consistent.

4.1.3 Usage Tied Closely to Location of Tracts

Most York Regional Forest tracts are in the central eastern portion of the Region, with many located along or near Highway 48 in particular. Highway 48 follows the route of an early settler road, so this pattern likely reflects the early focus on stabilizing sand-blown soils where farms had been abandoned.

Table 1 shows the number of forest tracts by local municipality in the Region, as well as the area of Forest within each municipality.

Table 1. York Regional Forest tract distribution by municipality.

Municipality	Number of Tracts	Area (ha)	
Whitchurch-Stouffville	13	1,207	1,214
East Gwillimbury	3	362	360
Georgina	4	721	710
King	2	69	104
Newmarket	1	6	7
Total	23	2,365	2,395

The 2016-17 user survey found that Forest users living in York Region are mostly from Whitchurch-Stouffville, Newmarket, Markham and Georgina, while visitors from outside the Region are mainly from Toronto (Figure 12).

About 65 per cent of Forest visitors live beside or near a Forest tract. With 13 parking lots and proximity to major roads, the Forest is in many ways one of the easiest of the former agreement forests for visitors to reach. Most of the Forest, however, has limited access by public transit. Among those arriving by car, the most frequently used tracts are Eldred King, Hollidge, Bendor & Graves and Brown Hill. High usage of the first three of these likely relates to how close they are to larger towns, as well as their size, parking, features and amenities. As noted, the fourth – Brown Hill – offers specialized trails oriented toward mountain biking, which may contribute to its popularity. The average distance travelled by car to reach a tract was 17 kilometres, with 35 per cent of visitors travelling 10 kilometres or less and 22 per cent travelling 30 kilometres or more.

While there are no York Regional Forest tracts in Aurora, Richmond Hill, Markham or Vaughan, the Region has contributed to the acquisition of public green spaces in all municipalities. The Region also supports the public land acquisition and management activities of two local conservation authorities in the Region.

4.1.4 Public Health and Safety

In addition to various invasive species that threaten the health of the Forest, there are several natural concerns that might affect visitors' experience. These include poison ivy along trails, as well as the spread of black-legged ticks, which can carry Lyme disease. Part of the Region's outreach and education effort is to explain how to avoid these problems (e.g. Fight the Bite campaign), and also how to limit the spread of invasive plant species, the seeds of which can be carried on visitors' clothing or the fur of dogs or horses.

While following guidance on keeping important wildlife habitat trees, the Region has a comprehensive Hazard Tree Management Strategy to identify and remove dead and dying trees near forest roads, trails, parking lots, forest boundaries and other places where they might pose a risk to visitors, vehicles or other properties.

The Region works closely with York Region Police and paramedics, as well as local fire departments, on emergency planning. Access points have been assigned municipal addresses to make it easier to report the location of an emergency and ensure timely response.

In addition, the Region has provided local fire departments with forest fire-fighting equipment and Regional forestry staff have received formal training in firefighting. A fire escalation protocol is in place to identify and inform an appropriate emergency fire response.

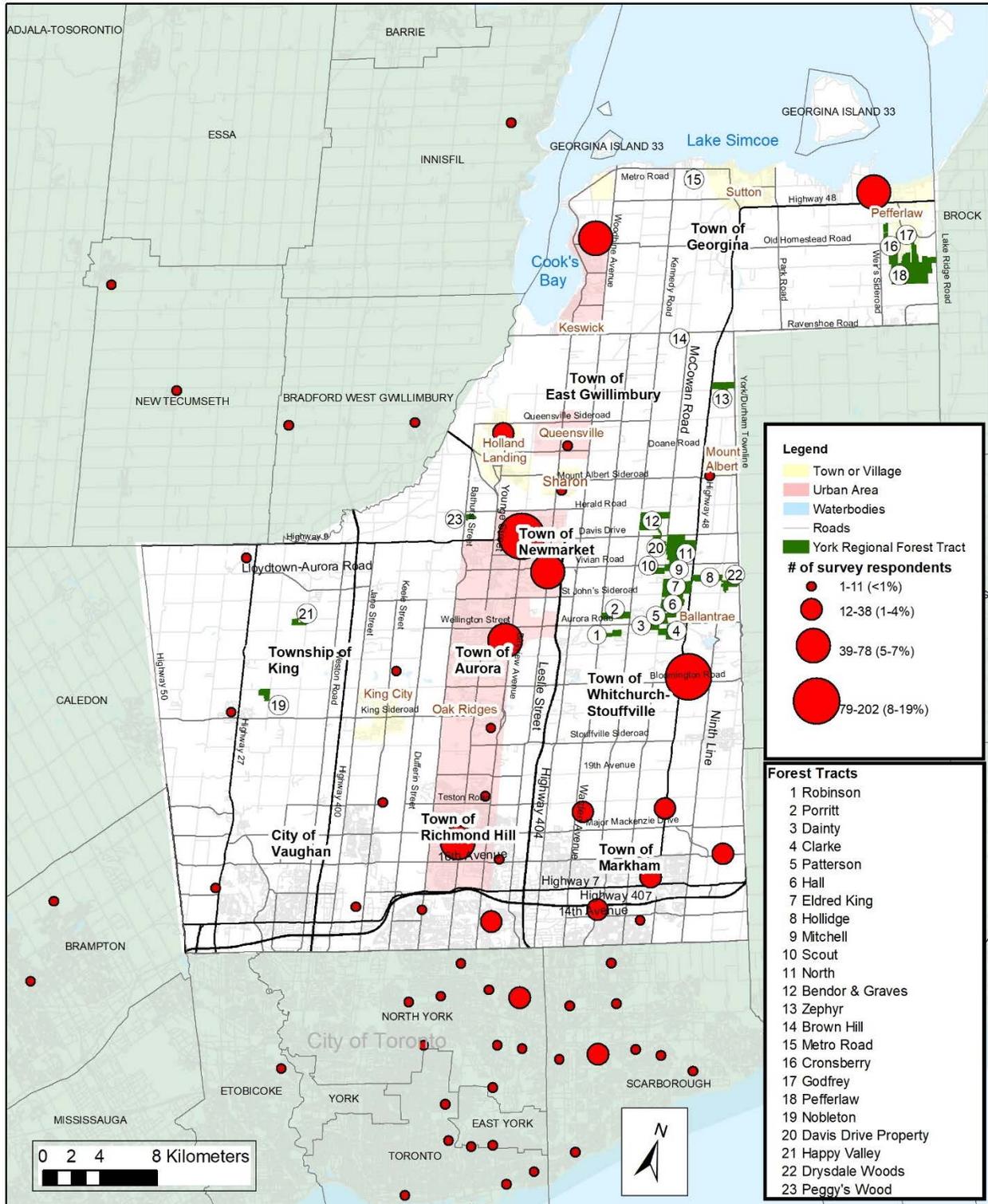


Figure 12. Origin of Visitors to the Forest (Based on the 2016-17 Forest User Survey)

4.1.5 Education and Stewardship

York Region recognizes the value of teaching residents about the Forest to help them understand its broad benefits and the functions and services of all natural spaces. Uptake of its programs suggests that new residents to Canada and the Region, and especially families with young children, are very interested in learning more about the natural environment.

The Region promotes use of the Forest and educates users through several means, including:

- **Guided Walks.** Attendance at these monthly themed walks in various tracts has increased in recent years. At each event, nearly half those attending are doing so for the first time. The walks are popular with families, with children making up about three-quarters of the participants.
- **Forest Festivals.** Seasonal Forest Festivals provide a variety of activities and engaging forums to connect people with nature. Visitors can learn about the York Regional Forest, how it was established, how York Region Forestry manages it for future generations, and sustainable forestry practices.
- **Nature's Classroom.** These educational sessions for groups of 10 to 25 people are designed to teach participants about the forest ecosystem and its importance to the community. Each roughly two-hour session includes a guided forest hike for participants who can range in age from four to over 65. There are programs focusing on diverse themes including, trees, wildlife, the Forest at night, fitness activities in the Forest, snowshoeing, and the Bill Fisch Forest Stewardship and Education Centre, an award-winning "green" building located in the Hollidge tract.
- **Other Education** – The Region offers a variety of other educational and outreach programs in the Forest and at the Bill Fisch Centre, including the Regional Envirothon, Forestry Connects, various training sessions and workshops, school tours and post-secondary field courses.

4.1.6 Collaboration and Partnerships

Continued partnerships and collaboration will be integral to realizing the vision and goals set out in this Plan.

The Regional Forest Advisory Team, the main vehicle for gathering input from the public, is made up of representatives from various forest user groups and local associations, as well as Regional staff. The team, which meets up to six times a year, brings issues to the attention of staff, contributes "on-the-ground" knowledge and experience, and helps prevent and resolve user conflicts. Members also help with Forest festivals and other events, coordinate the annual "Green Up – Clean Up" event, and are consulted by auditors during the annual forest certification audits. Appendix A lists the organizations represented on the Regional Forest Advisory Team.

The Region has partnered with many organizations, including the Toronto and Region Conservation Authority, the Lake Simcoe Region Conservation Authority, Nature Conservancy of Canada, Oak Ridges Moraine Foundation, Oak Ridges Moraine Land Trust, Environment Canada (through the Ecological Gifts program), Ontario Ministry of Natural Resources and Forestry, and local municipalities to secure lands.

Many public sector and non-profit organizations partner with the Region on education and outreach. These include the Region's Community and Health Services department, York Region District School Board, York Region Catholic District School Board, Forests Ontario, Ontario Woodlot Association, Evergreen, Mycological Society of Toronto, the two conservation authorities mentioned in the previous paragraph, Scouts Canada, and local municipalities.

The Region collaborates with other organizations on scientific research studies and activities:

- The Ministry of Natural Resources and Forestry oversees numerous growth and yield plots and is involved in the recovery of endangered species
- The Canadian Forest Service and the Region work together on release locations for emerald ash borer parasitoids and monitoring of their effectiveness
- The Canadian Food Inspection Agency is a member of the Region's invasive species technical working group and collaborates with the Region on training opportunities for identification and management of invasive species including Asian long horned beetle, emerald ash borer, and hemlock woolly adelgid
- Academic and institutional researchers take part in vascular plant monitoring.

4.2 A Larger Network of Open Spaces

The York Regional Forest is one element of an interconnected system of natural areas and open spaces across York Region that includes provincial parks, the Rouge National Urban Park, local municipal parks, open spaces, and lands owned by conservation authorities and other conservation organizations (Figure 13).

The Region has contributed funds through the Regional Greening Strategy to help other agencies acquire conservation land to extend and improve this system.

It is also important for the health of people and communities. Where people have access to green spaces, they are more physically active, which improves their mental health and wellbeing. Studies have shown that the availability of green space is associated with lower odds of a child being overweight or obese (York Region, 2017). Natural spaces give people a place to restore their mental health, reduce their level of stress, and spend quality time with others. As an example, research into the Japanese practice of "forest bathing," in which people spend time walking deep in the woods, away from technology and other distractions, has shown that the relaxation benefits are greater than from walking in urban areas.

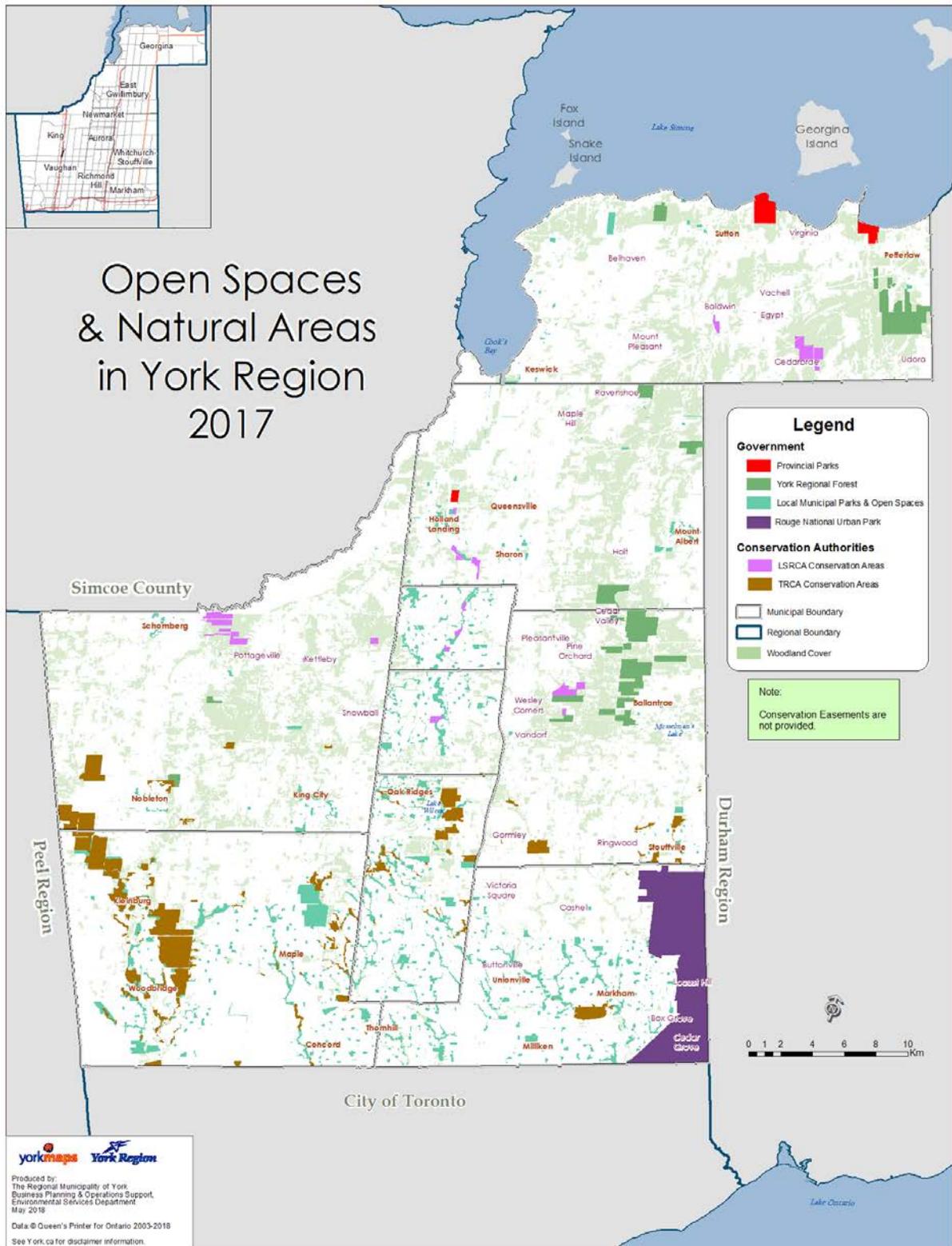


Figure 13. York Region open spaces and natural areas

5 The Future Forest

As it moves from areas of reforestation to a more natural state, the York Regional Forest will increasingly resemble the forest that existed before European settlement – mature, biodiverse natural woodlands intertwined with wetlands, prairies, and other habitats.

As this landscape advances through the stages of natural succession, the Region will need to continue forest management. The Forest is dynamic, its future subject to the uncertainties of climate and other physical and biophysical organisms. Proper management will strengthen its ecological integrity, protect its natural heritage features, increase its resilience, and help to mitigate the impacts of climate change and other threats. All of this will help maximize its benefits to people and communities.

5.1 Forest Communities

During the 20-year period of this Plan, the transition from reforestation areas to natural forest will continue. By 2038, it is expected that naturally forested areas will account for 57 per cent of the land currently occupied by the Forest. By this time:

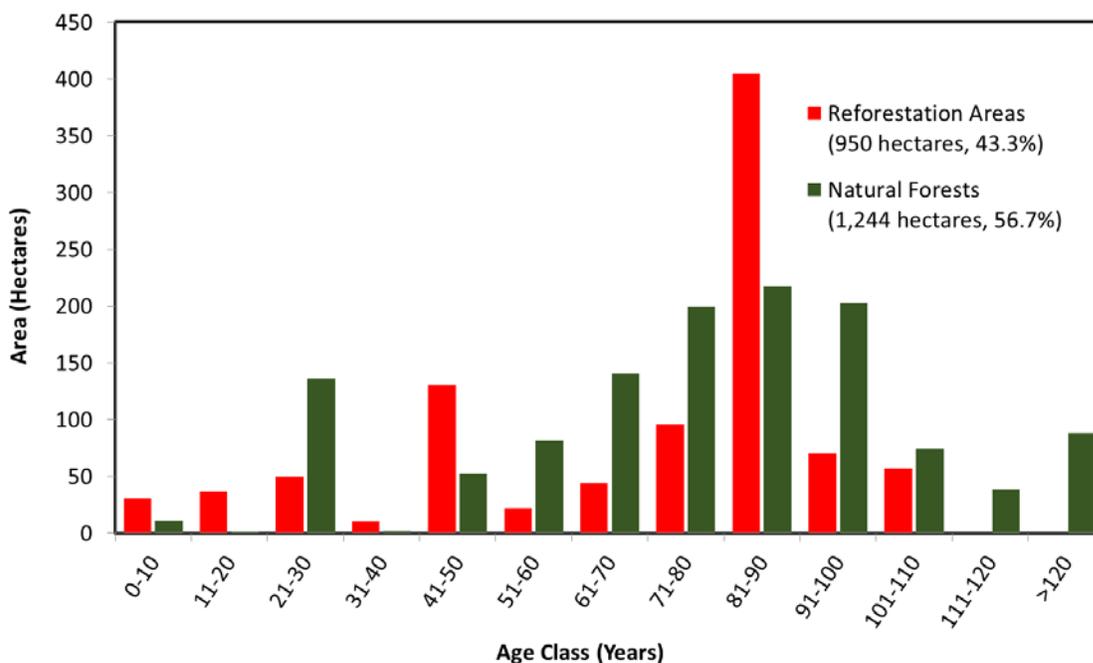
- Continued management will have helped to convert most of the reforested areas established between 1924 and 1950 to natural forest communities, and the oldest of these will be more than 100 years of age
- Areas reforested in the 1950s will be approaching the late seral stage of succession

In summary, fully half the area of natural forest will be approaching or in the late seral stage of succession, which is defined as stands over roughly 90 years of age

As well, some of the reforested areas on land acquired during the 1998-2018 management plan will be 30 years of age or older.

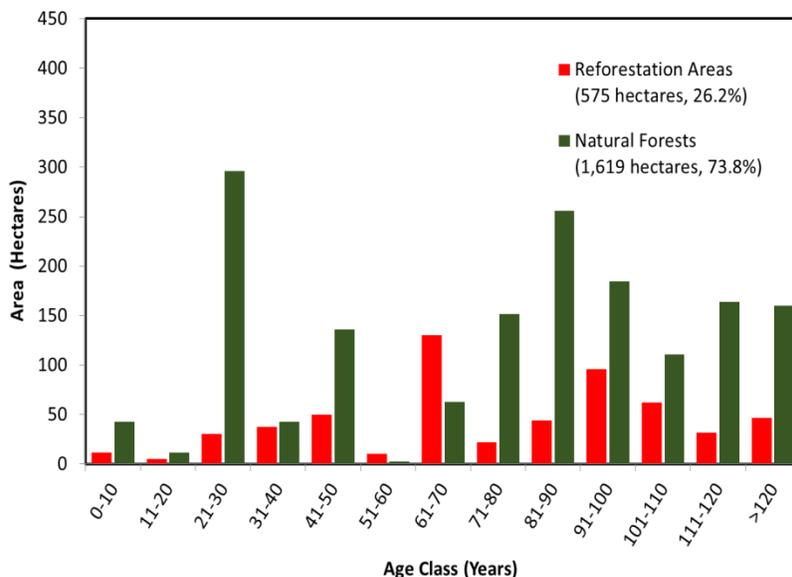
Stands of natural forest that are relatively young – less than 40 years old – will have resulted from the conversion of mature reforested areas to young deciduous and mixed forest communities (Figure 14).

Figure 14. Age class distribution in the York Regional Forest projected to 2038.



By 2058, the transition will have continued. Natural forest communities are expected to occupy 74 per cent of the forested area. Older forest stands will continue to account for roughly half of the natural forest area, with stands less than 60 years of age accounting for one-third. About 40 per cent of the reforestation areas will be in the late seral stage of succession. These are expected to be sites that were reforested with white pine and other conifers and are now converting to mixed white pine-deciduous forest communities (Figure 15).

Figure 15. Age class distribution in the York Regional Forest projected to 2058.



5.2 Managing the Forest 2019-2038

The vision for the York Regional Forest underscores the importance of its health and natural diversity. A key goal for the Forest that follows from the vision is strengthening its ecological integrity. The management practices and principles embedded in the 2019-2038 plan reflect these elements.

To succeed in the face of constant change, forest management must be adaptive. The Region must regularly monitor the state of the Forest, continually review its management practices to ensure that they are effective in achieving the intended outcomes, and be innovative in identifying, developing and adopting new best practices. The goal is to respond quickly and flexibly as needed while continuing to work toward the established vision.

5.2.1 Managing for diversity, ecological integrity and health

The overarching principle for managing the Forest comes from the vision and related goals:

- York Regional Forest will be managed to strengthen its ecological integrity.

In practice, this means the Region will:

- continue to restore a mosaic of natural heritage features that includes many different forest and non-forest communities and provides habitat for a diversity of plant and wildlife species, including species at risk
- strengthen the connections between different parts of the Forest and to other natural areas
- when opportunities to expand the Forest arise, consider how the new property could best be managed to advance the vision for the Forest
- continue to use silviculture, including harvesting, to encourage stands of natives trees, shrubs and other plants that vary in age and species composition, density and size
- draw on accumulated knowledge and best practices to achieve the best possible outcomes from silvicultural activities
- where possible, address climate change and other emerging threats pro-actively and adaptively
- strategically control invasive plants using methods tailored to the species and its abundance, as well as assessing potential impacts on other stand components and the site.

Legacy Conservation Forests, with their unique features and functions, will continue to represent a significant percentage of the Regional Forest area.

Management activities will be consistent with Regional policies and plans. The Region will continue to use carefully designed criteria to monitor the state of the forest and progress towards achieving goals.

5.2.2 Sustainable Harvest Levels

Sustainable forest management is based on a comprehensive forest inventory, expected growth rates, estimates of sustainable harvest levels and best management practices. It is supported by criteria and indicators of forest health and management success.

Estimating sustainable levels of harvesting in the Forest over the long term is based on the approach described in “BOREAL: A tactical planning system for forest ecosystem management” (Puttock et al. 1998).

The BOREAL model was updated in 2017 with revised growth projections using age data based on small core samples collected from living trees in the 2016 forest inventory and the Region’s experience in managing the Forest over the past 20 years. The updated model was used to estimate the sustainable harvest levels for the Green Infrastructure Asset Management Plan (York Region, 2017).

It is now being applied to estimate sustainable harvest levels for five-year periods over the Forest Management Plan’s 20-year horizon. Table 2 outlines the estimated levels over the duration of this plan. The expected area to be harvested in each five-year period varies with the age of different stands in the Forest and will be further assessed as the operating plans are developed. Appendix E provides more details.

Table 2. Sustainable forest management by 5-year operating period.

Forest type	Period 1 (2019-2023) (ha)	Period 2 (2024-2028) (ha)	Period 3 (2029-2033) (ha)	Period 4 (2034-2038) (ha)	Total (ha)
Red Pine	72	46	231	100	449
White Pine	20	9	26	18	73
Spruce - Larch	17	15	56	13	101
Upland Hardwood	94	130	102	65	391
Bottomland Hardwood	14	3	17	1	35
Mixedwood	49	32	31	2	114
Bottomland Conifer	4	0	5	6	15
Total (ha)	270	235	468	204	1177

5.2.3 Non-Forested areas

This plan does not assume any increase from the current 6 per cent of the area of York Regional Forest that consists of ponds, wetlands and open areas of land as opposed to woodland. It is possible, however, that non-forested areas could increase as a result of land acquisition or other opportunities for expansion.

Among the non-forested areas are 6.7 hectares of oak savanna and 16.2 hectares of tall grass prairie habitat that the Region has established on newly acquired properties. These habitats depend on periodic fire, so carefully controlled burns are an integral management tool. A controlled burn, such as the one carried out successfully in Bendor & Graves in 2018, mimics a natural fire to help preserve and

regenerate the habitat. It burns relatively quickly to consume dried grasses and leaves without harming larger trees.

In the case of oak savanna, controlled burns may be combined with thinning over the long term to reduce canopy and shrub cover and allow more light to reach the understory (Lettow et al. 2014).

5.2.4 **Green Infrastructure Asset Management Plan**

The Region is among the first jurisdictions in Canada to develop an asset management plan for its green infrastructure, including the York Regional Forest. This recognizes the huge benefits that forests and other living assets deliver and the need for sustainable management over its life cycle.

For the asset management plan, the Region developed detailed information on the extent and condition of the York Regional Forest, and then forecast an outlook for the next 100 years. A detailed financial analysis undertaken as part of the asset management plan identified the resources and needs for the next 100 years to ensure the Forest continues to thrive and deliver benefits to residents and communities.

5.3 **Threats**

Over the next 20 years, the Forest will face numerous threats and challenges. Some of these are well-known today and efforts at managing them are under way. Others are emerging and some lie entirely in the future. All will need to be assessed and appropriately mitigated to the extent possible over the life of this Plan.

5.3.1 **A Climate Change**

Recent years have brought the impacts of a rapidly changing climate and more extreme weather events. Examples include uprooted trees and damage to small areas of forest caused by wind bursts in the North, Eldred King, Scout, Hollidge and Pepperlaw tracts. Major ice storms and drought periods have also impacted the Forest.

In future, climate change is expected to continue, bringing generally warmer temperatures but more volatile climates. There will likely be more severe weather and more anomalies like sudden heat or frost in the spring as leaves. These impacts will profoundly change the variety of tree species in the Forest, where they grow, their age distribution, and the forest's structure.

Figure 16. Severe damage from 2006 wind burst in Eldred King Woodlands. (Silv-Econ Ltd.)



Climatically suitable habitats for most species will shift northward and to higher elevations, but the actual movement of the species they support is expected to lag (McKenney et al. 2007). Some scientists propose assisting this migration by moving plants or seeds to emerging habitats sooner than would happen naturally. In the case of the York Regional Forest, for example, this might mean exploring planting such southerly species as Sycamore (*Platanus occidentalis*), Sassafras (*Sassafras albidum*) and Tulip tree (*Liriodendron tulipifera*) in suitable locations. Another option is focused breeding of tree species to speed adaptation.

As the climate changes, the length, frequency, and severity of droughts will likely increase. This is already affecting red pine, which puts down only shallow roots in the Forest's alkaline soils and is therefore more stressed in times of drought. Older plantations in particular have become more susceptible to red pine decline, a fungal disease discussed in more detail below (Section 5.3.3).

Even without severe drought, soils will dry out more quickly and trees will lose moisture faster through transpiration because of higher temperatures. Shallow-rooted species such as white spruce, white cedar, and jack pine are likely to suffer moisture stress more often and for longer periods. Mixing them with deeper-rooted hardwood species will promote the buildup of forest litter and humus, which will improve the ability of soil to retain moisture (Papadapol 1998, Liao 2010). Managing the forest for biodiversity will also leverage the greater drought resilience of species that draw water from deeper in the soil, such as sugar maple, white ash, hickory species, several species of oak, butternut, and white pine.

Climate change is expected to have both negative and positive impacts on insect populations. For example, increased drought could concentrate more sucrose in foliage, providing insects with more sustenance. In these cases, highly focused tree breeding might be needed to increase trees' resistance. Conversely, a higher concentration of carbon dioxide in the atmosphere might enable some tree species to produce more carbon-based antifeedants (substances that repel insects), naturally increasing their resistance (Scarr 1998).

It is expected that windstorms and rain, snow and ice storms will increase in frequency and intensity, resulting in an increase in blowdown and flood risk (Gleeson et al. 2011, Williamson et al. 2009). The locations of wind damage are impossible to predict, so management will involve assessing the damage and possibly using one of the broad management options outlined below.

Management options, which could help both to prevent climate-related damage and respond more effectively when it happens, would include:

- shortening stand rotations to reduce the length of time more vulnerable trees are left in the Forest and increase vigour
- controlling competing vegetation by thinning or controlling aggressive and invasive species to reduce stress on regenerating trees
- using sanitation cutting to remove declining trees to prevent the spread of pests or diseases and encourage healthier stands, while managing invasive species

5.3.2 Non-Native Invasive Plants

Non-native invasive plants can quickly take over a forest site, crowding out native flora and in some cases overtopping small trees and shrubs. Of particular concern are dog-strangling vine (*Vincetoxicum rossicum*), Manitoba maple (*Acer negundo*), garlic mustard (*Alliaria petiolata*), and two species of buckthorn (*Rhamnus cathartica*, *Rhamnus frangula*), all of which are well-established in the York Regional Forest.

Dog-strangling vine (Figure 17) is an extremely aggressive member of the milkweed family that is now established throughout southern Ontario. It is perhaps the most significant biological threat to the Forest, since it forms a thick ground cover, smothering seedlings and strangling saplings, which stops regeneration. It is also a threat to the endangered monarch butterfly because monarchs will lay eggs on it, but monarch caterpillars cannot eat the plant. The plant continues to spread throughout the Forest and in some stands it is the most abundant ground cover. The Region is working on pilot projects to control its spread in priority areas by mechanical and chemical means. It is also supporting a collaborative research program to develop a biological control through the release of the moth *Hypena opulenta*, whose caterpillar form eats the plant. Testing has confirmed that it subsists exclusively on the vine and poses no threat to native plants.

Figure 17. Heavy infestation of dog-strangling vine – Brown Hill Tract. (Silv-Econ Ltd.)



Manitoba maple is native to Manitoba but has naturalized extensively throughout eastern Canada. It is widespread throughout the Regional Forest, often occurring in association with buckthorn, and its aggressive growth and spread reduce woodland biodiversity, especially in newly forested areas. Seed keys mature in autumn and remain on the tree over winter. Recently, the Region has been removing Manitoba maple through basal bark application of triclopyr (Garlon) or by cutting followed by treatment of the cut surfaces with an approved herbicide to prevent re-sprouting.

Garlic mustard is a biennial herb native to Europe. This species is a serious threat to deciduous forests not just because it forms dense clumps that shade out other plants, but because it secretes chemicals into the soil that prevent their return even after it is removed. It grows in a wide range of habitats and spreads quickly along roadsides and recreational trails, its seeds are often carried inadvertently by humans, pets and wildlife. When found in smaller populations, herbicide is used to remove it along with other undesirable species.

Common (European) buckthorn and **Glossy buckthorn** are exotic shrubs that readily invade natural communities, often aided by birds that disperse their seeds. They have long growing seasons and rapid growth rates, and re-sprout vigorously following removal of aboveground tissues. Like garlic mustard, buckthorn leaves chemicals in the soil that hamper the growth of other plants. Buckthorn is present in most Forest tracts. The Region has been treating it in priority areas with herbicide in the same manner as Manitoba maple.

5.3.3 Pathogens

Healthy ecosystems contain pathogens that are integral to the cycle of growth and decay. However, a number of non-native invasive pathogens are damaging the health of the Forest and, by attacking species that are important food sources for wildlife, potentially threatening the animals within.

Red pine decline, caused by root-rotting fungi combined with certain soils that limit rooting depth and brought on by periods of drought stress, is widespread in Southern Ontario. It has been present in both pockets and individual trees in the Forest for some time. In recent years, however, the intensity and rate of decline have increased to the point where many trees in the older red pine plantations in the Forest are in a severe state of decline or have already died. As discussed in the section on climate change, this is probably a result of more frequent droughts, which stress older trees.

Butternut canker is caused by the combination of a fungus (*Ophiognomonium clavignenti-juglandacearum*) that affects the butternut tree and root-limiting soils on some sites. The butternut, which is now protected under the *Species at Risk Act*, occurs naturally in the southern reaches of the Great Lakes-St. Lawrence forest zone and is present as a minor species in several deciduous stands in the Regional Forest. Once a tree is infected, halting the spread of the disease is difficult. Efforts focus on protecting the remaining healthy trees. This can include removing nearby competing species to provide more sunlight and promote health and vigour.

Oak wilt is caused by a fungus, *Bretziella fagacearum* (previously called *Ceratocystis fagacearum*), that is spread by natural root grafting of oaks or by nitidulid (sap) beetles carrying the spores. Once the fungus enters the sapwood, initially in the outer growth rings, it stimulates the formation of tyloses (hardening of cells) that impair circulation to the crown of the tree, causing the leaves to wilt. While red oak is particularly susceptible, all oak species are at risk. There is no cure for oak wilt, which is not yet present in

Ontario, but its threat can be reduced by minimizing tree wounds and refraining from harvesting oaks from April to August during the flight season of the beetles. Mechanical cutting to disrupt grafted root systems can be effective in controlling the expansion of oak wilt pockets. As well, fungicides have been developed that may prevent the disease when injected into trees without active symptoms (O'Brien et al. 2011).

Beech bark disease causes defects and death in beech trees. An insect, the beech scale (*Cryptococcus fagisuga*), feeds on the American beech, creating holes in the bark. These become entry points for a fungus (*Neonectria faginata*), which causes the disease. The stress of the insect attack also decreases the trees' resistance to the fungal infection. Beech are found on many upland sites in the Forest, but typically as a minor component of the stand and are usually left during thinning activities.

5.3.4 Non-Native Insect Infestations

Invasive non-native insects often cause extensive damage to trees and forests as they have few or no natural enemies or pathogens to limit their spread, and their host plant may have no natural resistance.

Emerald ash borer (*Agrilus planipennis*) attacks and kills all species of ash. Native to eastern Russia, northern China, Japan, and Korea, it was discovered in Michigan in June 2002. The insect is now widespread across southern Ontario and found throughout York Region, where it was first seen in 2008. Ash species (*Fraxinus*) represent a significant component in the overstory of several stands in the York Regional Forest, especially on lowland sites in East Gwillimbury and Georgina. The Region has responded to the infestation by developing innovative silvicultural treatments for ash-dominated stands and by protecting a small number of healthy, robust ash trees with the insecticide TreeAzin in an effort to preserve a future seed source. To minimize the risks to the public, ash trees are a focus in the hazard tree program.

Gypsy moth (*Lymantria dispar dispar*) is native to Europe, where it feeds on the leaves of a wide variety of tree species. It was first detected in Ontario in 1969, but widespread defoliation did not occur until 1981. Populations are now established throughout southern Ontario where the moth's range coincides with that of oak, its preferred host. The insect overwinters in the egg stage, often on the bark of trees, and in the spring, the larvae emerge to feed on new foliage. Outbreaks occur every seven to ten years. Stands in the Regional Forest containing oak, such as in North, Mitchell, Scout and Eldred King, are particularly vulnerable. Control measures include aerial application of insecticides in June when the insect is actively feeding. Egg masses can also be physically removed and destroyed. Gypsy moth populations have also collapsed from rapid proliferation of the fungus *Entomophaga maimaiga*.

Asian longhorned beetle (*Anoplophora glabripennis*), which is native to China and the Korean Peninsula, was first discovered in Canada on the boundary between Toronto and Vaughan in 2003, and then again in Mississauga in 2013. The Canadian Food Inspection Agency led a program aimed at eradicating the beetle from the affected areas. It is believed these efforts have been successful, but monitoring continues. Spread of this beetle would be devastating for the York Regional Forest and woodlots throughout southern Ontario because of the wide variety of native deciduous tree species that it would destroy.

The hemlock woolly adelgid (*Adelges tsugae*) (Figure 18), which kills its host, represents a potential threat to Ontario forests and several species of birds that need hemlock to survive. Hemlock is present as

a minor species throughout the York Regional Forest but dominates some stands in the Scout and Mitchel tracts. The Region takes part in a forest managers' working group to share information and be proactive in detecting the threat early, which will be essential to controlling its spread.

Figure 18. Hemlock Woolly Adelgid ovisacs. (Chris Evans, University of Illinois, Bugwood.org).



6 Public Use – Responding to Change

With a steadily growing population and increasing urbanization, the Region has seen growth in visits to the Regional Forest. Combined with new and changing types of use, this has the potential to place added strain on Forest health. At the same time, however, recent research has underscored how much people's mental and physical health improve with access to the outdoors and time spent in nature. The Forest presents one of the key opportunities to help keep people healthier through a connection to nature as its population grows, urbanizes and ages.

The Forest Management Plan must balance the overarching goal of ecological integrity with other important Regional goals like healthy communities. This means looking at existing and new uses in the Forest as they relate to the vision set out in this plan.

6.1 Future Public Use Context

The Region's population is expected to increase from more than 1.1 million in 2016 to 1.8 million by 2041. Development will intensify in Vaughan, Richmond Hill and Markham, the Region's southernmost communities, with over 70 per cent of the Region's population living in these municipalities 20 years from now.

At the same time, growth and urbanization will also move northward along the Yonge Street corridor. This will affect Aurora, Newmarket and especially East Gwillimbury. As well, populations will increase in Whitchurch-Stouffville and Georgina. This pattern is in line with the outlook associated with the Province's Places to Grow Act 2005, which forecast significant growth in the Region's northern municipalities. It will increase the number of people living close to the main concentration of Forest tracts along and near Highway 48 north of Aurora Road.

Higher population density typically leads to greater demand for public open spaces. The growth of specific groups within the population, and their needs and interests will also have an impact.

- The proportion of seniors (those over 65) in the population has been growing fast, from 12 per cent in 2011 to 15 per cent in 2016, and is expected to reach 21 per cent by 2031. The rapid growth reflects the aging of the large "Baby Boom" generation born between 1946 and 1965. Although more people are working past 65, this should still boost the share of retirees in the population, creating a large group potentially able to use the Forest more often. Usage patterns may change, however, especially as seniors age beyond 75, and will likely trigger a need for more accessible trails. The Region is also implementing a Seniors Strategy - *York Region Seniors Strategy: Thinking Ahead, 2016* - in which a key component is keeping seniors healthier longer. The Region will consider ways in which the Forest can help to advance this aim.
- Involving and engaging children in nature is especially important to their development and future commitment to the environment, but studies have shown that today's children spend less time outdoors, especially in unstructured activities and settings. The Regional Forest offers opportunities for children to explore an open and constantly changing environment, where it is possible to experience freedom of a kind not found in other settings.
- The Region prides itself on its ethnic diversity, with more than 230 distinct ethnic origins reflected in its make-up. People born outside Canada comprised 47 per cent of the Region's population in 2016

(Statistics Canada, 2016), a share that is expected to reach 55 per cent by 2031 (York Region, 2011). Surveys have found, however, that recent immigrants are generally less likely to take part in wilderness activities. Given the Region's commitment to inclusiveness, as well as inspiring all residents to embrace the Forest as a legacy, reaching out to these residents is crucial.

The plan will also need to be flexible in the face of potential new uses in the Forest. Some of these result from the development of new equipment like drones, while pursuits like geocaching reflect a mix of digital technology with more traditional outdoor activity.

6.2 Managing Public Use in the Forest

Like other leading jurisdictions, the Region has already created many tools to guide and manage public use. These include:

- Signage including wayfinding and other user information
- Defining acceptable and prohibited uses/activities and setting out rules around use
- Communicating the benefits of the Forest to the public
- Providing public documents, such as the printed Everyday Guide to the Regional Forest, as well as web-based information.

This Plan provides guidance to help make future decisions on public use of the Forest and identifies important use-related documents and signage improvement that need to be developed, for example around trails and visitor experience, as the Plan is implemented.

6.3 Criteria for Making Decisions

All public use has an impact, whether direct or indirect, on the environment. Some uses also have the potential to increase user conflicts, give rise to liability concerns, and involve costs to the Region.

Table 3 sets out criteria to help the Region decide whether current and proposed public uses are acceptable, and offers ways of mitigating or eliminating the potential impacts.

Table 3. Criteria for Consideration of Acceptable Public Uses

Criterion	Mitigation/management
1. The environmental impact of the activity must be manageable.	<p>To mitigate the environmental impact, an activity might be:</p> <ul style="list-style-type: none"> • Prohibited at times when damage to soil or other parts of the environment are more likely, such as when the ground is wet or before there is sufficient snow cover • Limited by user group size or allowed only under a Forest Use permit • Limited to Forest tracts or areas where the environmental impact would be less
2. The activity must not detract from other users' enjoyment of the Forest	<p>To mitigate the impact on other users, an activity might be:</p> <ul style="list-style-type: none"> • limited to specific forest tracts or areas • restricted to designated trails • disallowed altogether or segregated from other uses (e.g. space, time)
3. The activity must not put Forest users or the Region at risk	<p>To mitigate liability risk, the Region could decline an activity or require that higher-risk and group activities or events carry appropriate insurance with adequate limits.</p>
4. The activity must consider costs to the Region.	<p>To mitigate financial impacts, the Region will specify that:</p> <ul style="list-style-type: none"> • large non-profit groups and all commercial groups/activities must apply for a forest use permit with associated fees • fees, either event-specific or annual, must be charged for some activities/events, to fully or partially offset related costs to the Region • a user group/association must enter into a long-term agreement to share costs if their activity would involve a higher-than-normal capital investment and/or ongoing costs (for example, to create and operate a specialized trail or other facility) to the Region

The Region recognizes that public use of the Forest can contribute to the economy (e.g. tourism), and the contribution might increase with certain types of use, such as festivals. Direct impacts can be estimated using such tools as Ontario’s Tourism Regional Economic Impact Model (Ministry of Tourism and Culture).

The economic benefits associated with public use must never outweigh the environmental and societal benefits of protecting and restoring the Forest as a healthy and diverse mosaic of natural areas.

6.4 Review of Uses

The Region reviewed current forest uses based on the criteria in Table 3 above and feedback from engagement as this plan was developed. The acceptable uses and prohibited activities listed in Tables 4 and 5 reflect this review and are correct at time of adoption of this plan. Should acceptable and/or prohibited activities change, an addendum to the plan will be issued.

Table 4. Acceptable Uses in the York Regional Forest

Activities	Associated Rules and Regulations
Walking, running, hiking	Must remain on official trails and not make new trails.
Dog walking (including service dogs)	Dogs must be under control or on a leash at all times (note: dog walking rules are currently under review). Dogs must be leashed around other Forest users. Owners must carry one leash per dog at all times. Pet waste must be kept off trails.
Cycling and mountain biking	Must remain on official trails and not make new trails Always wear an approved helmet. Slow down and yield to all other users Avoid using trails after heavy rainfall or wet periods, especially in the spring.
Horseback riding	Must remain on official trails and not make new trails.
Cross-country skiing	Must remain on official trails and not make new trails.
Snowshoeing	Must remain on official trails and not make new trails.
Snowmobiling	Limited to trails designated by the Ontario Federation of Snowmobile Clubs (OFSC) within the Cronsberry and Pefferlaw tracts and only when trails are open. Riders require a valid OFSC permit.
Nature appreciation and wildlife viewing	Must remain on official trails and not make new trails.
Hunting	In season in Pefferlaw and Cronsberry tracts, Town of Georgina. In season and bow hunting only in Metro Road tract, Town of Georgina. Hunters must consult local “discharge of firearms” by-laws and Ontario Ministry of Natural Resources and Forestry regulations to confirm restrictions.
Fishing	In season and subject to legislation including Provincial Fish and Wildlife Conservation Act, compliance with all Ministry of Natural Resources and Forestry Ontario Fishing Regulations Summary

Activities	Associated Rules and Regulations
Organized recreational and educational walks, activities, and events	Requires a forest use permit.
Scientific research activities	Requires a forest use permit.
Geocaching	Cache locations are not to be established more than two meters from trails

Table 5. Prohibited Activities in the York Regional Forest

Activities	Associated Rules and Regulations
Lighting fires	No lighting of fires in the Forest.
Smoking	No person shall smoke in the Forest.
Using a BBQ and other portable cooking devices	No portable cooking devices are to be used in the Forest.
Littering	No person shall deposit or dispose of garbage, plant matter, yard waste or other debris in the Forest.
Camping	No person shall camp in the Forest.
Use of unauthorized vehicles, including ATVs and dirt bikes	Snowmobiling is limited to trails designated by the Ontario Federation of Snowmobile Clubs (OFSC) within the Cronsberry and Pefferlaw tracts and only when trails are open. Riders require a valid OFSC permit. No motorized vehicles are allowed in the Forest.
Damaging or removing trees, plants (seeds and cones) and fungi (including mushrooms)	No person shall injure or remove trees or parts of trees, plants or fungi (including mushrooms). No person shall remove firewood. No person shall remove materials on site
Alcohol consumption	Alcohol shall not be consumed in the Forest.
Paintballing or pellet gun use	No target practice or paintballing in the Forest.
Fireworks	No person shall ignite, discharge or set off fireworks in the Forest.
Property and trail altering/creation	No person shall alter trails or fences and/or construct structures or trails. No person shall damage property, facilities or materials on site.

6.5 User Charges and Fees

The Regional Forest is a popular location for a variety of organized activities carried out by non-profit groups and for-profit users. Non-profit organizations hold outdoor events like nature hikes, mountain bike rides and horseback rides, while for-profit uses include professional dog walking, guided trail rides and commercial or movie shoots.

The Region generally welcomes these types of uses, while managing the risks to the Forest and other users through requiring an application for a Forest Use permit. Applicants must submit a completed Forest Use permit application form, supporting documentation and the prescribed application fee.

The application process allows the Region to confirm that the proposed activity is compatible with Forest health and does not pose unreasonable risks. If this cannot be confirmed, the Region may deny the permit application, request a change or changes to the proposed event/activity, or issue a permit with specific conditions that address its concerns. In some instances, the Region might require an applicant to post a security deposit before the event.

User fees and charges for activities in the Forest are reflected the Region's Fees and Charges Bylaw as approved and updated from time to time by Regional Council. Appropriate proof of insurance is required for some activities. At the time this plan was finalized, the relevant fees and charges are as listed below:

Not for profit or Non-profit organizations:

1. Forest Use Permit Application Fee: \$50

For-profit organizations:

1. Forest Use Permit Application Fee: \$100
2. Forest use charge for film production and other intensive event/activity: \$1,000 a day
3. Forest use charge for guided walks, professional dog walking and other non-intensive events/activity: \$250 a day up to a maximum of \$500 a year

If the Region deems it necessary for Regional staff to be present during the event/activity, the Forest Use permit holder must pay operations support on a cost-recovery basis.

In some cases, the Region may choose to enter into a long-term use agreement with a particular organization. Larger events may require risk assessments and implementation of appropriate controls.

7 Achieving the Vision

All aspects of this plan flow from its overarching vision:

As the heart of the Region’s natural landscape, a healthy and ecologically diverse York Regional Forest sustains its communities and inspires its people.

The vision gives rise to three high-level goals for the plan – strengthen ecological integrity, foster an understanding of the forest’s benefits, and inspire people – with specific objectives and actions following from each goal.

The Plan will be implemented through a series of successive five-year operating plans. It will be reviewed at the ten-year mark to ensure that it is responding to the changing needs of the Forest. The actions outlined below are expected to be completed by the time of the ten-year review, at which point actions may be refined and new ones developed as needed.

Comprehensive monitoring of the Regional Forest will help determine if the Region is achieving the Plan’s goals and objectives, and help to fine-tune the Region’s actions.

7.1 Goals, Objectives and Actions

GOAL 1: Strengthen Ecological Integrity

Continue to strengthen the health, diversity, resiliency, and sustainability of the York Regional Forest

Objectives

1. Manage the York Regional Forest to protect ecological features and improve ecosystem health and biodiversity
2. Use innovative practices to restore and protect the York Regional Forest
3. Implement best practices to prevent and mitigate impacts of invasive species in the York Regional Forest
4. Manage the York Regional Forest to increase ecological resilience and minimize the impacts of climate change

Building on Current Initiatives

The Region will continue to maintain and improve biodiversity based on the range of native species the Forest can support, and work to prevent the spread of non-native invasive species. This involves developing forest management strategies that include appropriate silvicultural and other management activities. As well, plans and standard operating procedures will continue to take into account the recovery of species at risk.

The Region will also continue working to secure new land that can add to the Forest’s biodiversity, and forming partnerships to increase woodland cover, reduce forest fragmentation and link Forest tracts with other natural heritage areas.

Pilot projects to compare and evaluate options for such activities as invasive species control and assisted migration will help ensure continuous improvement in forest management. The Region will continue to support scientific research in the Forest, which might include specific projects targeted at improving the ecological integrity of York Regional Forest and other southern Ontario forests.

New Actions

As well as continuing current initiatives, the Region will:

1. Assess the York Regional Forest's vulnerability to climate change and develop an adaptation plan
2. Review Legacy Conservation Forest criteria and update atlas
3. Update invasive species inventories, review mitigation practices, and develop an invasive species action plan
4. Review science-based silvicultural practices and Traditional Ecological Knowledge to sustainably manage the York Regional Forest and inform standard operating procedures
5. Develop an Information System to consolidate existing information on the York Regional Forest, including ecological features, species at risk, invasive species, and infrastructure assets.

GOAL 2: Foster An Understanding of the Forest's Benefits

Demonstrate that the Forest provides a wealth of environmental and social benefits, making it key to the Region's vision of healthy, thriving communities

Objectives

1. Review and assess the environmental and social benefits of the York Regional Forest.
2. Ensure the York Regional Forest continues to demonstrate leadership through science, innovation and promoting best practices

Building on Current Initiatives

The Region regularly measures the benefits of the Forest using such existing means as i-Tree, a suite of tools developed by the United States Forest Service to analyze and calculate the benefits of trees. Among other features, it quantifies the value of ecosystem services provided by trees, such as removing pollution and sequestering carbon.

This is an example of how the Region leverages scientific and other research into the benefits of natural spaces in managing the Forest. It will adopt new measurement tools and approaches appropriate to the Regional Forest as these become available.

The Region works to educate forest users, neighbours and others about how it manages the Forest to increase the environment and social benefits, including the use of silviculture to restore native ecosystems. It encourages volunteers to take part in initiatives aimed at increasing social and environmental benefits, such as Green Up – Clean Up, tree planting and citizen science.

Including the Forest as a key element of the Green Infrastructure Asset Management Plan, which then forms part of the entire Asset Management Plan for the Region, is an important step in recognizing its

environmental value. The Region will continue to monitor the condition, value and long-term investment needs of Forest assets for updates to asset management plans.

New Actions

As well as continuing current initiatives, the Region will:

1. Review and refine forest stewardship and education programs to better convey the benefits of the Regional Forest
2. Bring together existing monitoring initiatives into a comprehensive monitoring framework that includes ecological, environmental and social values.

GOAL 3: Inspire People

Encourage public use that inspires respect for the Forest and a connection with nature.

Objectives

1. Provide an exceptional visitor experience
2. Ensure that public use and facilities are managed to protect the Forest and keep visits safe and enjoyable

Building on Current Initiatives

The Region constantly reviews public use to ensure a balance between forest protection and the visitor experience. Using such means as the Forest Festivals, Nature's Classroom, other events and social media, it educates forest users about etiquette and rules, as well as how to avoid risks to themselves (such as ticks, poison ivy and rabies), as well as to the Forest (such as inadvertently spreading invasive plants).

Providing better access and larger areas for visitors to enjoy are important priorities. In cooperation with Regional and local transportation agencies and such stakeholders as the Oak Ridges Trail Association, the Region is working to improve access to the Forest by public transit, bicycle and foot, as well as private vehicle. It also promotes and builds greater connectivity among Forest properties and to other natural areas through land acquisition by the Region and others, conservation easements, property bequests, and further development of trail and on-road cycling networks.

The Green Infrastructure Asset Management Plan helps to achieve this goal with its recommendations on providing a safe and functional environment.

New Actions

As well as continuing current initiatives, the Region will:

1. Review dog walking rules and options to balance ecological integrity and visitor experience
 2. Develop a visitor experience plan to facilitate connection with nature, education, and stewardship
 3. Develop a trails strategy to guide management of trail infrastructure and to support an exceptional visitor experience
-

7.2 Implementation

The Region will implement this Plan through successive five-year operating plans, annual work plans, and other Regional programs.

Five-year operating plans set out a schedule for recommended silvicultural treatments for individual stands, tree planting, capital improvements and public use considerations in each year. Each plan also includes a summary of achievements of the previous plan and explains why any scheduled actions were not completed. It lists actions needed to address any changes that may have occurred in the state of the forest over the previous five-year period. The plan also provides an opportunity for adaptive management by including advances in science and technology and lessons learned.

The Region will prepare property management plans for any newly acquired properties to ensure that they are managed in a manner consistent with the rest of the Regional Forest. The plan may include a forest inventory and stand mapping, recommendations for silvicultural management, site securement (such as fencing and signage), and actions to ensure public safety (such as removing hazard trees and maintaining trails).

7.3 Monitoring

Monitoring the York Regional Forest and users' experiences helps ensure continuous Improvement in existing practices and informs adaptive management as conditions change.

The Region's means of monitoring include:

- Forest inventories (updated every 10 years)
- I-tree analysis (every 5 years)
- Information from Forest user surveys (every 10 years) and Forest Education program satisfaction surveys (carried out at the time of the event)
- Timber harvest inspections (annually)
- Hazard tree inspections (annually on a rotating basis)
- Tree planting assessments (one, three and five years following planting)

Research partners also provide valuable information through their initiatives:

- Identified research plots known as Permanent Growth Plots and Permanent Sample Plots (monitored at intervals determined by the researcher)
- Vascular plant surveys (annually)
- Specific species at risk surveys

As the list indicates, these initiatives take place at differing intervals. While most monitoring follows a formal schedule, the Region also relies on informal information-gathering, typically based on conditions observed during formal monitoring or during regular scheduled management activities. The duration of monitoring also varies. Some programs have been in place for decades, while checking on the use of a new trail may continue for only the first year or two.

The Region will develop a comprehensive monitoring framework as outlined under Goal 2 above. In addition to the existing initiatives, the framework will include evaluations carried out to update the Green Infrastructure Asset Management Plan every 10 years.

A comprehensive monitoring framework will:

- Provide more consistent and robust information about the Forest's ecological integrity and broader benefits in support of Goals 1 and 2.
- Improve the Region's understanding of public engagement and satisfaction in support of Goals 2 and 3.

The framework will recognize that monitoring activities are based on the scale and intensity of management needs and uses of the Forest, and may have to change over time. For example, public surveys may be refined to assess general knowledge of the Forest's broad environmental and social benefits, and survey methods may change to ensure that the views of more users are gathered. This will be helpful in building the Region's knowledge as well as fostering public stewardship.

Each five-year forest operating plan will provide an opportunity to review monitoring protocols and revise them where appropriate.

Appendices

APPENDIX A: ACKNOWLEDGEMENTS

Preparing a management plan for a public forest requires the expertise and support of many people. The Natural Heritage and Forestry section of the Region's Environmental Services department would like to acknowledge, in particular, the skills and enthusiasm of our Technical Advisory Committee whose contributions were invaluable:

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- Lake Simcoe Region Conservation Authority
- Nature Conservancy of Canada
- Toronto and Region Conservation Authority
- York Region Staff

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- Town of Richmond Hill
- City of Markham
- City of Vaughan
- Town of Aurora
- Town of Newmarket
- Township of King
- Town of East Gwillimbury
- Town of Whitchurch-Stouffville
- Town of Georgina
- Chippewas of Georgina Island
- Metis Nation of Ontario
- Ontario Ministry of Natural Resources and Forests
- Toronto and Region Conservation Authority
- County of Simcoe
- Parks Canada
- Nature Conservancy of Canada
- Forests Ontario
- Oak Ridges Moraine Land Trust
- Mycological Association of Toronto
- South Lake Simcoe Naturalists/RFAT
- Richmond Hill Naturalists/RFAT
- Seed Collection/RFAT
- Huronia Loggers Association/RFAT
- Ontario Trail Riders Association/RFAT
- Forest Education Contractor/RFAT
- York Region District School Board

- Lake Simcoe Region Conservation Authority
- Forest Gene Conservation Association
- Ontario Woodlot Association-York Durham Chapter
- North W/S Ratepayers Association/RFAT
- Local Resident- Green Up Clean Up/RFAT
- Oak Ridges Trail Association (W/S Chapter)/RFAT
- Canadian Recreation Horse and Riders Association/RFAT
- Ontario Federation of Anglers and Hunters/Georgina Sportsman's Alliance/RFAT
- Durham Mountain Biking Association and York Mountain Biking Association/RFAT
- York Region Catholic School Board
- York Regional Police

York Region

- Natural Heritage and Forestry
- Risk Management
- Legal Services
- Planning
- Community Health Services – Accessibility, Seniors' Strategy, Healthy Living
- Transportation Services, Active Transportation
- Environmental Promotion and Protection
- Emergency Management

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APPENDIX B: STAKEHOLDER ENGAGEMENT

To follow

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APPENDIX C: WILDLIFE AND PLANT SPECIES OBSERVED IN THE YORK REGIONAL FOREST

WILDLIFE SPECIES (See note at end on how status is coded)

COMMON NAME	SCIENTIFIC NAME	SRANK¹	GRANK²	COSSARO³	COSEWIC⁴
Eastern Newt	<i>Notophthalmus viridescens</i>	S5	G5		
Gray Treefrog	<i>Hyla versicolor</i>	S5	G5		
Spring Peeper	<i>Pseudacris crucifer</i>	S5	G5		
Wood Frog	<i>Rana sylvatica</i>	S5	G5		
Sharp-shinned Hawk	<i>Accipiter striatus</i>	S5	G5		NAR
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	S4	G5		
Wood Duck	<i>Aix sponsa</i>	S5	G5		
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5B	G5		
Cedar Waxwing	<i>Bombycilla cedrorum</i>	S5B	G5		
Ruffed Grouse	<i>Bonasa umbellus</i>	S4	G5		
Red-tailed Hawk	<i>Buteo jamaicensis</i>	S5	G5	NAR	NAR
Red-shouldered Hawk	<i>Buteo lineatus</i>	S4B	G5	NAR	NAR
Broad-winged Hawk	<i>Buteo platypterus</i>	S5B	G5		
Northern Cardinal	<i>Cardinalis cardinalis</i>	S5	G5		
American Goldfinch	<i>Carduelis tristis</i>	S5B	G5		
Purple Finch	<i>Carpodacus purpureus</i>	S4B	G5		
Veery	<i>Catharus fuscescens</i>	S4B	G5		
Hermit Thrush	<i>Catharus guttatus</i>	S5B	G5		
Brown Creeper	<i>Certhia americana</i>	S5B	G5		
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	S5B	G5		
Northern Flicker	<i>Colaptes auratus</i>	S4B	G5		
Rock Pigeon	<i>Columba livia</i>	SNA	G5		
Eastern Wood-pewee	<i>Contopus virens</i>	S4B	G5		
American Crow	<i>Corvus brachyrhynchos</i>	S5B	G5		
Blue Jay	<i>Cyanocitta cristata</i>	S5	G5		
Yellow Warbler	<i>Dendroica petechia</i>	S5B	G5		
Pine Warbler	<i>Dendroica pinus</i>	S5B	G5		
Black-throated Green Warbler	<i>Dendroica virens</i>	S5B	G5		
Bobolink	<i>Dolichonyx oryzivorus</i>	S4B	G5		THR
Pileated Woodpecker	<i>Dryocopus pileatus</i>	S5	G5		
Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	G5		
Wood Thrush	<i>Hylocichla mustelina</i>	S4B	G5		
Baltimore Oriole	<i>Icterus galbula</i>	S4B	G5		
Wild Turkey	<i>Meleagris gallopavo</i>	S5	G5		
Song Sparrow	<i>Melospiza melodia</i>	S5B	G5		
Brown-headed Cowbird	<i>Molothrus ater</i>	S4B	G5		
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	S4B	G5		
Mourning Warbler	<i>Oporornis philadelphia</i>	S4B	G5		
Indigo Bunting	<i>Passerina cyanea</i>	S4B	G5		
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	S4B	G5		
Downy Woodpecker	<i>Picoides pubescens</i>	S5	G5		
Hairy Woodpecker	<i>Picoides villosus</i>	S5	G5		
Scarlet Tanager	<i>Piranga olivacea</i>	S4B	G5		

Black-capped Chickadee	<i>Poecile atricapillus</i>	S5	G5		
Common Grackle	<i>Quiscalus quiscula</i>	S5B	G5		
Ovenbird	<i>Seiurus aurocapillus</i>	S4B	G5		
Northern Waterthrush	<i>Seiurus noveboracensis</i>	S5B	G5		
American Redstart	<i>Setophaga ruticilla</i>	S5B	G5		
Red-breasted Nuthatch	<i>Sitta canadensis</i>	S5	G5		
White-breasted Nuthatch	<i>Sitta carolinensis</i>	S5	G5		
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	S5B	G5		
Chipping Sparrow	<i>Spizella passerina</i>	S5B	G5		
Field Sparrow	<i>Spizella pusilla</i>	S4B	G5		
Barred Owl	<i>Strix varia</i>	S5	G5		
Eastern Meadowlark	<i>Sturnella magna</i>	S4B	G5		THR
European Starling	<i>Sturnus vulgaris</i>	SNA	G5		
Tree Swallow	<i>Tachycineta bicolor</i>	S4B	G5		
American Robin	<i>Turdus migratorius</i>	S5B	G5		
Nashville Warbler	<i>Vermivora ruficapilla</i>	S5B	G5		
Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	G5		
Northern Raccoon	<i>Procyon lotor</i>	S5	G5		
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>	S5	G5		
Eastern Chipmunk	<i>Tamias striatus</i>	S5	G5		
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	S5	G5		
Eastern Tailed-Blue butterfly	<i>Everes comyntas</i>				
White tailed deer	<i>Odocoileus virginianus</i>				
Raven	<i>Corvus corax</i>				
Groundhog	<i>Marmota monax</i>				
Red fox	<i>Vulpes vulpes</i>				

PLANT SPECIES (See note at end on how status is coded)

COMMON NAME	SCIENTIFIC NAME	COEFF CONS ⁵	COEFF WET. ⁶	COSEWIC	COSSARO	GRANK	SRANK
Balsam Fir	<i>Abies balsamea</i>	5	-3			G5	S5
Red Maple	<i>Acer rubrum</i>	4	0			G5	S5
Silver Maple	<i>Acer saccharinum</i>	5	-3			G5	S5
Sugar Maple	<i>Acer saccharum</i>	4	3			G5	S5
Hybrid Maple	<i>Acer X freemanii</i>					GNA	SNR
Common Yarrow	<i>Achillea millefolium ssp. millefolium</i>		3			G5T5?	SNA
White Baneberry	<i>Actaea pachypoda</i>	6	5			G5	S5
Red Baneberry	<i>Actaea rubra</i>	5	5			G5	S5
White Snakeroot	<i>Ageritina altissima</i>					G5	SNR
Tall Hairy Groovebur (Tall Agrimony)	<i>Agrimonia gryposepala</i>	2	2			G5	S5

Broad-leaved Water-plantain (Common Water-plantain)	<i>Alisma triviale</i>	3	-5			G5	S5
Garlic Mustard	<i>Alliaria petiolata</i>		0			GNR	SNA
Small White Leek	<i>Allium tricoccum</i>	7	2			G5	S5
Speckled Alder	<i>Alnus incana</i>					G5	S5
Annual Ragweed (Common Ragweed)	<i>Ambrosia artemisiifolia</i>	0	3			G5	S5
Alleghamy Service-berry	<i>Amelanchier laevis</i>	5	5			G4G5Q	S5
American Hog-peanut	<i>Amphicarpaea bracteata</i>	4	0			G5	S5
Canada Anemone	<i>Anemone canadensis</i>	3	-3			G5	S5
Virginia Anemone (Thimbleweed)	<i>Anemone virginiana</i>					G5	S5
Spreading Dogbane	<i>Apocynum androsaemifolium</i>					G5	S5
Wild Columbine	<i>Aquilegia canadensis</i>	5	1			G5	S5
Wild Sarsaparilla	<i>Aralia nudicaulis</i>	4	3			G5	S5
Lesser Burdock	<i>Arctium minus</i>					GNR	SNA
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>					G5	S5
Common Goatsbeard (Bride's Feather)	<i>Aruncus dioicus</i>		3			G5	SNA
Canada Wild-ginger	<i>Asarum canadense</i>	6	5			G5	S5
Purple Milkweed	<i>Asclepias incarnata</i> spp. <i>incarnata</i>					G5T5	S5
Kansas Milkweed (Common Milkweed)	<i>Asclepias syriaca</i>	0	5			G5	S5
Garden Asparagus-fern	<i>Asparagus officinalis</i>		3			G5?	SNA
Lady Fern (Northern Lady Fern)	<i>Athyrium filix-femina</i> ssp. <i>angustum</i>					G5T5	S5
Yellow Birch	<i>Betula alleghaniensis</i>	6	0			G5	S5
Paper Birch	<i>Betula papyrifera</i>	2	2			G5	S5
Nodding Beggar-ticks	<i>Bidens cernua</i>	2	-5			G5	S5
Awnless Brome	<i>Bromus inermis</i>		5			GNR	SNA
Bulbous Bitter-cress	<i>Cardamine bulbosa</i>	8	-5			G5	S4
Cut-leaf Toothwort	<i>Cardamine concatenata</i>	6	3			G5	S5
Black Sedge	<i>Carex arctata</i>	5	5			G5?	S5
Bebb's Sedge	<i>Carex bebbii</i>	3	-5			G5	S5
Woodland Sedge	<i>Carex blanda</i>	3	0			G5?	S5
Bristly Sedge	<i>Carex comosa</i>	5	-5			G5	S5
Graceful Sedge	<i>Carex gracillima</i>	4	3			G5	S5
Lake-bank Sedge	<i>Carex lacustris</i>	5	-5			G5	S5
Longstalk Sedge	<i>Carex pedunculata</i>	5	5			G5	S5
Pennsylvania Sedge	<i>Carex pennsylvanica</i>	5	5			G5	S5
Plantain-leaved Sedge	<i>Carex plantaginea</i>	7	5			G5	S5
Cyperus-like Sedge	<i>Carex pseudo-cyperus</i>	6	-5			G5	S5
Retorse Sedge	<i>Carex retrorsa</i>	5	-5			G5	S5
Rosy Sedge	<i>Carex rosea</i>	5	5			G5	S5

Pretty Sedge	<i>Carex woodii</i>	6	0			G4	S4
Bitternut Hickory	<i>Carya cordiformis</i>	6	0			G5	S5
Shagbark Hickory	<i>Carya ovata</i>	6	3			G5	S5
Blue Cohosh	<i>Caulophyllum thalictroides</i>	6	5			G4G5	S5
Climbing Bittersweet	<i>Celastrus scandens</i>	3	3			G5	S5
Bulb-bearing Water-hemlock	<i>Cicuta bulbifera</i>	5	-5			G5	S5
Canada Enchanter's Nightshade	<i>Circaea lutetiana</i> ssp. <i>canadensis</i>					G5T5	S5
Bull Thistle	<i>Cirsium vulgare</i>	0	4			GNR	SNA
Virginia Virgin's Bower	<i>Clematis virginiana</i>	3	0			G5	S5
Field Basil	<i>Clinopodium vulgare</i>	4	5			G5	S5
Bluebead Lily	<i>Clintonia borealis</i>	7	-1			G5	S5
Field Bindweed	<i>Convolvulus arvensis</i>	0	5			GNR	SNA
Fleabane	<i>Conyza canadensis</i>	0	1			G5	S5
Alternate-leaved Dogwood	<i>Cornus alternifolia</i>	6	5			G5	S5
Gray Dogwood	<i>Cornus racemosa</i>					G5?	S5
Rough-leaved Dogwood	<i>Cornus rugosa</i>	6	5			G5	S5
Red-osier Dogwood	<i>Cornus sericea</i>	2	-3			G5	S5
Beaked Hazelnut	<i>Corylus cornuta</i>	5	5			G5	S5
European Swallow-wort	<i>Cynanchum rossicum</i>	0	5			GNR	SNA
Bulblet Fern	<i>Cystopteris bulbifera</i>	5	-2			G5	S5
Orchard Grass	<i>Dactylis glomerata</i>	0	3			GNR	SNA
Wild Carrot	<i>Daucus carota</i>	0	5			GNR	SNA
Large Tick-trefoil	<i>Desmodium glutinosum</i>	6	5			G5	S4
Bush Honeysuckle	<i>Diervilla lonicera</i>	5	5			G5	S5
Spinulose Wood Fern	<i>Dryopteris carthusiana</i>	5	-2			G5	S5
Crested Wood Fern	<i>Dryopteris cristata</i>	7	-5			G5	S5
Marginal Wood Fern	<i>Dryopteris marginalis</i>	5	3			G5	S5
Wild Mock-cucumber	<i>Echinocystis lobata</i>	3	-2			G5	S5
Autumn Olive	<i>Elaeagnus umbellata</i>	0	3			GNR	SNA
Beechdrops	<i>Epifagus virginiana</i>	6	5			G5	S5
Helleborine	<i>Epipactis helleborine</i>	0	5			GNR	SNA
Dwarf Scouring Rush	<i>Equisetum scirpoides</i>	7	-1			G5	S5
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>					G5	S5
Yellow Trout Lily	<i>Erythronium americanum</i>	5	5			G5	S5
Spotted Joe-pye-weed	<i>Eupatorium maculatum</i>					G5	S5
Large-leaf Wood-aster	<i>Eurybia macrophylla</i>	5	5			G5	S5
Grass-leaved Goldenrod	<i>Euthamia graminifolia</i>	2	-2			G5	S5
American Beech	<i>Fagus grandifolia</i>	6	3			G5	S4
Woodland Strawberry	<i>Fragaria vesca</i>	4	4			G5	S5
White Ash	<i>Fraxinus americana</i>	4	3			G5	S5
Black Ash	<i>Fraxinus nigra</i>	7	-4			G5	S5
Green Ash	<i>Fraxinus pennsylvanica</i>	3	-3			G5	S5
Great Hedge Bedstraw	<i>Galium mollugo</i>	0	5			GNR	SNA

Sweet-scent Bedstraw	<i>Galium triflorum</i>	4	2			G5	S5
Teaberry	<i>Gaultheria procumbens</i>	6	3			G5	S5
Wild Crane's-bill	<i>Geranium maculatum</i>	6	3			G5	S5
Herb Robert	<i>Geranium robertianum</i>	0	5			G5	SNA
Yellow Avens	<i>Geum aleppicum</i>	2	-1			G5	S5
Ground Ivy	<i>Glechoma hederacea</i>	0	3			GNR	SNA
John's Cabbage	<i>Hydrophyllum virginianum</i>	6	-2			G5	S5
A St. John's-wort	<i>Hypericum perforatum</i>	0	5			GNR	SNA
Black Holly	<i>Ilex verticillata</i>	5	-4			G5	S5
Spotted Touch-me-not	<i>Impatiens capensis</i>	4	-3			G5	S5
Elecampane Flower	<i>Inula helenium</i>	0	5			GNR	SNA
Blueflag	<i>Iris versicolor</i>	5	-5			G5	S5
Butternut	<i>Juglans cinerea</i>	6	2	END	END	G4	S3?
Black Walnut	<i>Juglans nigra</i>	5	3			G5	S4
Dudley's Rush	<i>Juncus dudleyi</i>	1	0			G5	S5
Path Rush	<i>Juncus tenuis</i>	0	0			G5	S5
Tall Blue Lettuce	<i>Lactuca biennis</i>	6	0			G5	S5
Wood Nettle	<i>Laportea canadensis</i>	6	-3			G5	S5
Common Motherwort	<i>Leonurus cardiaca</i>	0	5			GNR	SNA
Mountain Honeysuckle	<i>Lonicera dioica</i>	5	3			G5	S5
Tartarian Honeysuckle	<i>Lonicera tatarica</i>	0	3			GNR	SNA
Bird's-foot Trefoil	<i>Lotus corniculatus</i>	0	1			GNR	SNA
Wild Lily-of-the-valley	<i>Maianthemum canadense</i>	5	0			G5	S5
Starflower False Solomon's Seal	<i>Maianthemum stellatum</i>	6	1			G5	S5
Common Apple	<i>Malus pumila</i>	0	5			G5	SNA
Ostrich Fern	<i>Matteuccia struthiopteris</i>	5	-3			G5	S5
Alfalfa	<i>Medicago sativa</i>					GNR	SNA
Moonseed	<i>Menispermum canadense</i>	7	0			G5	S4
Square-stemmed Monkey-flower	<i>Mimulus ringens</i>	6	-5			G5	S5
Two-leaf Bishop's Cap	<i>Mitella diphylla</i>	5	2			G5	S5
True Forget-me-not	<i>Myosotis scorpioides</i>	0	-5			G5	SNA
Common Evening-primrose	<i>Oenothera biennis</i>	0	3			G5	S5
Sensitive Fern	<i>Onoclea sensibilis</i>	4	-3			G5	S5
White-grained Mountain-ricegrass	<i>Oryzopsis asperifolia</i>	6	5			G5	S5
Hairy Sweet-cicely	<i>Osmorhiza claytonii</i>	5	4			G5	S5
Cinnamon Fern	<i>Osmunda cinnamomea</i>	7	-3			G5	S5
Eastern Hop Hornbeam	<i>Ostrya virginiana</i>	4	4			G5	S5
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	6	1			G5	S4?
Meadow Timothy	<i>Phleum pratense</i>	0	3			GNR	SNA
Lopseed	<i>Phryma leptostachya</i>	6	5			G5	S4S5
White Spruce	<i>Picea glauca</i>	6	3			G5	S5
Canada Clearweed	<i>Pilea pumila</i>	5	-3			G5	S5
Eastern White Pine	<i>Pinus strobus</i>	4	3			G5	S5

Scotch Pine	<i>Pinus sylvestris</i>	0	5			GNR	SNA
Nipple-seed Plantain	<i>Plantago major</i>	0	-1			G5	SNA
Gay-winged Polygala	<i>Polygala paucifolia</i>	6	3			G5	S5
Downy Solomon's Seal	<i>Polygonatum pubescens</i>	5	5			G5	S5
Christmas Fern	<i>Polystichum acrostichoides</i>	5	5			G5	S5
Balsam Poplar	<i>Populus balsamifera</i>	4	-3			G5	S5
Largetooth Aspen	<i>Populus grandidentata</i>	5	3			G5	S5
Trembling Aspen	<i>Populus tremuloides</i>	2	0			G5	S5
Sulphur Cinquefoil	<i>Potentilla recta</i>	0	5			GNR	SNA
White Rattlesnake-root	<i>Prenanthes alba</i>	6	3			G5	S5
Wild Black Cherry	<i>Prunus serotina</i>	3	3			G5	S5
Choke Cherry	<i>Prunus virginiana</i>	2	1			G5	S5
Bracken Fern	<i>Pteridium aquilinum</i>	2	3			G5	S5
Shinleaf	<i>Pyrola elliptica</i>	5	5			G5	S5
White Oak	<i>Quercus alba</i>	6	3			G5	S5
Mossy-cup Oak	<i>Quercus macrocarpa</i>	5	1			G5	S5
Red Oak	<i>Quercus rubra</i>	6	3			G5	S5
Kidney-leaf Buttercup	<i>Ranunculus abortivus</i>	2	-2			G5	S5
Tall Buttercup	<i>Ranunculus acris</i>	0	-2			G5	SNA
Bristly Buttercup	<i>Ranunculus hispidus</i>					G5	S5
Buckthorn	<i>Rhamnus cathartica</i>	0	3			GNR	SNA
Staghorn Sumac	<i>Rhus typhina</i>					G5	S5
Prickly Gooseberry	<i>Ribes cynosbati</i>	4	5			G5	S5
Allegheny Blackberry	<i>Rubus allegheniensis</i>	2	2			G5	S5
Common Red Raspberry	<i>Rubus idaeus ssp. idaeus</i>	0	5			G5T5	SNA
Black Raspberry	<i>Rubus occidentalis</i>	2	5			G5	S5
Purple Flowering Raspberry	<i>Rubus odoratus</i>	3	5			G5	S5
Catherinettes Berry	<i>Rubus pubescens</i>	4	-4			G5	S5
Crack Willow	<i>Salix fragilis</i>	0	-1			GNR	SNA
Common Elderberry	<i>Sambucus nigra ssp. canadensis</i>	5	-2			G5T5	S5
Bloodroot	<i>Sanguinaria canadensis</i>	5	4			G5	S5
One-seed Bur Cucumber	<i>Sicyos angulatus</i>	5	-2			G5	S5
Smooth Herbaceous Greenbrier	<i>Smilax herbacea</i>	5	0			G5	S4
Climbing Nightshade	<i>Solanum dulcamara</i>	0	0			GNR	SNA
Blue-stem Goldenrod	<i>Solidago caesia</i>	5	3			G5	S5
Canada Goldenrod	<i>Solidago canadensis var. canadensis</i>	1	3			G5T5	S5
Broad-leaved Goldenrod	<i>Solidago flexicaulis</i>	6	3			G5	S5
Rough-leaf Goldenrod	<i>Solidago rugosa</i>	4	-1			G5	S5
American Mountain-ash	<i>Sorbus americana</i>	8	-1			G5	S5
Heart-leaf Aster	<i>Symphotrichum cordifolium</i>	5	5			G5	S5
White Heath Aster	<i>Symphotrichum ericoides var. ericoides</i>					G5T5	S5
Calico Aster	<i>Symphotrichum lateriflorum var. lateriflorum</i>					G5T5	SNR

New England Aster	<i>Symphotrichum novae-angliae</i>	2	-3			G5	S5
Brown-seed Dandelion	<i>Taraxacum officinale</i>	0	3			G5	SNA
Early Meadow-rue	<i>Thalictrum dioicum</i>	5	2			G5	S5
New York Fern	<i>Thelypteris noveboracensis</i>	7	-1			G5	S4S5
Eastern White Cedar	<i>Thuja occidentalis</i>	4	-3			G5	S5
Heart-leaved Foam-flower	<i>Tiarella cordifolia</i>	6	1			G5	S5
American Basswood	<i>Tilia americana</i>	4	3			G5	S5
Poison Ivy	<i>Toxicodendron rydbergii</i>	0	0			G5	S5
Alsike Clover	<i>Trifolium hybridum</i>	0	1			GNR	SNA
Red Trillium	<i>Trillium erectum</i>	6	1			G5	S5
White Trillium	<i>Trillium grandiflorum</i>	5	5			G5	S5
Coltsfoot	<i>Tussilago farfara</i>	0	3			GNR	SNA
Broad-leaved Cattail	<i>Typha latifolia</i>	3	-5			G5	S5
American Elm	<i>Ulmus americana</i>	3	-2			G5?	S5
Great Mullein	<i>Verbascum thapsus</i>	0	5			GNR	SNA
Gypsy-weed	<i>Veronica officinalis</i>	0	5			G5	SNA
Maple-leaved Viburnum	<i>Viburnum acerifolium</i>	6	5			G5	S5
Nannyberry	<i>Viburnum lentago</i>	4	-1			G5	S5
Highbush Cranberry	<i>Viburnum opulus var americanum</i>	5	-3			G5T5	S5
Tufted Vetch	<i>Vicia cracca</i>	0	5			GNR	SNA
Canada Violet	<i>Viola canadensis</i>	6	5			G5	S5
Downy Yellow Violet	<i>Viola pubescens var pubescens</i>	5	4			G5T5	S5
Long-spurred Violet	<i>Viola rostrata</i>	6	3			G5	S5
Riverbank Grape	<i>Vitis riparia</i>	0	-2			G5	S5

Key to Status Coding

¹SRANK: The provincial Natural Heritage Information Centre uses this ranking system to set protection priorities for rare species and natural communities in Ontario. A rank of 5 indicates a species is secure in Ontario, while concern about its status increases as the score declines. These ranks are not legal designations. A “?” following the ranking indicates that the rank is tentatively assigned pending further study. <http://nhic.mnr.gov.on.ca/MNR/nhic/glossary>

²GRANK: This ranking is assigned in a manner similar to the provincial one, but considers the range-wide status of a species, sub-species, or variety at the global level. A “?” following the ranking indicates that the rank is tentatively assigned pending further study. <http://nhic.mnr.gov.on.ca/MNR/nhic/glossary>.

³COSSARO: The Committee on the Status of Species-at-Risk in Ontario
<http://nhic.mnr.gov.on.ca/MNR/nhic/glossary>

⁴COSEWIC: The Committee on the Status of Endangered Wildlife in Canada.
<http://nhic.mnr.gov.on.ca/MNR/nhic/glossary>

⁵ COEFFICIENT OF CONSERVATION: Coefficients of conservatism range from 0 - 10 and represent an estimated probability that a plant is likely to occur in a landscape relatively unaltered from what is believed to be pre-European settlement condition. A C of 0, therefore, is given to plants that have demonstrated little fidelity to any remnant natural community, *i.e.* may be found almost anywhere, while a C of 10 is applied to those plants that are almost always restricted to a pre-settlement remnant, *i.e.* a high quality natural area (Wilhelm 1995).

⁶ COEFFICIENT OF WETNESS: The estimated probability for which a species occurs in wetlands. Positive signs (+) indicating a wet tendency and negative signs (-) indicating a dry tendency (Wilhelm 1989, 1992).

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APPENDIX D: TRAILS BY TYPE AND LOCATION

Table D1. Length (km) of multi-use and accessible trails in the York Regional Forest.

Tract	Multi-use Trails (km)	Accessible Trails (km)	Total (km)
Bendor & Graves	9.62		9.62
Brown Hill	17.02		17.02
Clarke	7.60		7.60
Cronsberry	1.50		1.50
Dainty	4.12		4.12
Davis Drive	5.30		5.30
Drysdale	3.40		3.40
Eldred King	16.48	1.00	17.48
Godfrey	0.30		0.30
Hall	10.03	1.60	11.63
Happy Valley	2.10		2.10
Hollidge	7.54		7.54
Metro Road	1.73		1.73
Mitchell	1.50		1.50
Nobleton	0.00		0.00
North	20.50	1.70	22.20
Patterson	4.20		4.20
Pefferlaw	11.93		11.93
Peggy's Woods	1.40		1.40
Porritt	4.70		4.70
Robinson	4.33		4.33
Scout	3.10		3.10
Zephyr	5.90		5.90
Total (km)	144.30	4.30	148.6

APPENDIX E: ASSUMPTIONS REGARDING SUSTAINABLE TIMBER MANAGEMENT 2019-2038

Sustainable Timber Management Model

The long-term sustainable timber management for the York Regional Forest is estimated following the approach described in “BOREAL: A tactical planning system for forest ecosystem management” (Puttock et al. 1998). The calculations for each forest community take into consideration the age class distribution, pre-thinning stand structure (species composition, density, basal area) regeneration species and density, presence of invasive species and primary disease factors (e.g. red pine decline), yield tables that describe expected growth rates, previous management activity, and targets for residual stand structure. The system projects outcomes of management alternatives in terms of sustainable harvest levels. System components include descriptive statistics and other information that describe the state of the forest, silvicultural systems and yield tables, and various policy scenarios.

The BOREAL model was updated in 2017 with revised growth projections using data obtained from increment cores collected in the 2016 forest inventory and the Region’s experience in managing the Forest over the past 20 years. The updated model was used to estimate the sustainable harvest levels for the Green Infrastructure Asset Management Plan (2017) and is now being applied to estimate sustainable harvest levels for 5 year periods over a 100 year planning horizon.

The updated BOREAL model was applied to the areas of the Forest that are available for silvicultural management (Table E1). The managed forest area of 1620 hectares represents approximately 74 per cent of the total Forest area and does not include Nature Reserve Areas and inoperable areas such as steep slopes and wet sites.

Table E1. Area (hectares) by age class and forest community in the managed forest in 2017 (2016 Forest Inventory).

Age class	Red Pine	White Pine	Spruce - Larch	Other Conifer Plantation	Upland Hardwood	Bottomland Hardwood	Mixedwood	Bottomland Conifer	Non-Forest Areas	Total
0-10	35.69	20.31	7.60	3.81						67.41
20- Nov	14.46	0.70	4.22							19.38
21-30	58.10	8.77	44.00	2.04	22.56	20.98	6.44			162.89
31-40	16.57	6.65	5.36	1.82	13.72		2.50			46.62
41-50	13.47	4.28	3.52	1.52	17.86	18.19	22.45	17.74		99.03
51-60	32.40	15.48	20.57	7.14	19.88	14.03	95.16	42.31		246.97
61-70	262.28	40.52	55.68	49.01	12.96	16.55	91.87	35.13		564.00
71-80	96.18	3.97	6.63	7.47	22.27	31.20	97.82	27.56		293.10
81-90	121.74	17.62	9.92	10.85	88.81	43.65	104.69	32.06		429.34
91- 100	80.50	2.01	4.39	1.10	23.51	12.67	18.07	1.48		143.73
101- 110					7.97		1.66			9.63
111- 120					32.84		41.47			74.31
>120					16.52		1.62	20.53		38.67
									200.00	200.00
Total (ha)	731.39	120.31	161.89	84.76	278.90	157.27	483.75	176.81	200.00	2,395.08

Growth Assumptions

Standing timber volume, up to the time of the first thinning, is calculated with Plonski yield tables (1974) using compartment characteristics such as area (hectares), forest community, age class, and condition (stocking). A yield table shows the relationship between timber volume per hectare and age for various site classes. Walter Plonski developed the tables for Ontario tree species in the 1950's using inventory data from unmanaged forests. The yield tables were later updated and converted to metric units and are routinely applied today to estimate yield. The yield tables and associated yield curves which best estimate existing timber volumes by forest community are listed in Table E2 and Figure E1 respectively. After the first thinning, subsequent timber volumes were estimated using growth rates specific to managed compartments in the York Regional Forest (Table E3).

Table E2. Plonski Yield Tables and Stocking Adjustment Applied to Estimate Timber Volumes Among Forest Types of the YRF.

Forest Type	Yield Table (Plonski 1974)	Average Stocking (Relative to Plonski Basal Area)
Bottomland Conifer	Spruce SC1	1.1
Bottomland Hardwood	Aspen SC3	1.2
Mixedwood	Tolerant Hardwood SC3	1.3
Other Conifer Plantation	Jack Pine SC1	0.9
Red Pine	Red Pine SC1	0.7
Spruce - Larch	Spruce SC1	0.6
Upland Hardwood	Tolerant Hardwood SC1	0.9
White Pine	White Pine SC1	0.6

Figure E1. Plonski yield curves relating total volume (m³/ha) with age. In the YRF, most mature plantations contain 20 per cent of the total standing volume in regenerating hardwoods. Volume curves for plantations have therefore been adjusted by 20 per cent and 30 per cent for compartments 60-80 and 80+ years old respectively to avoid overestimating volumes.

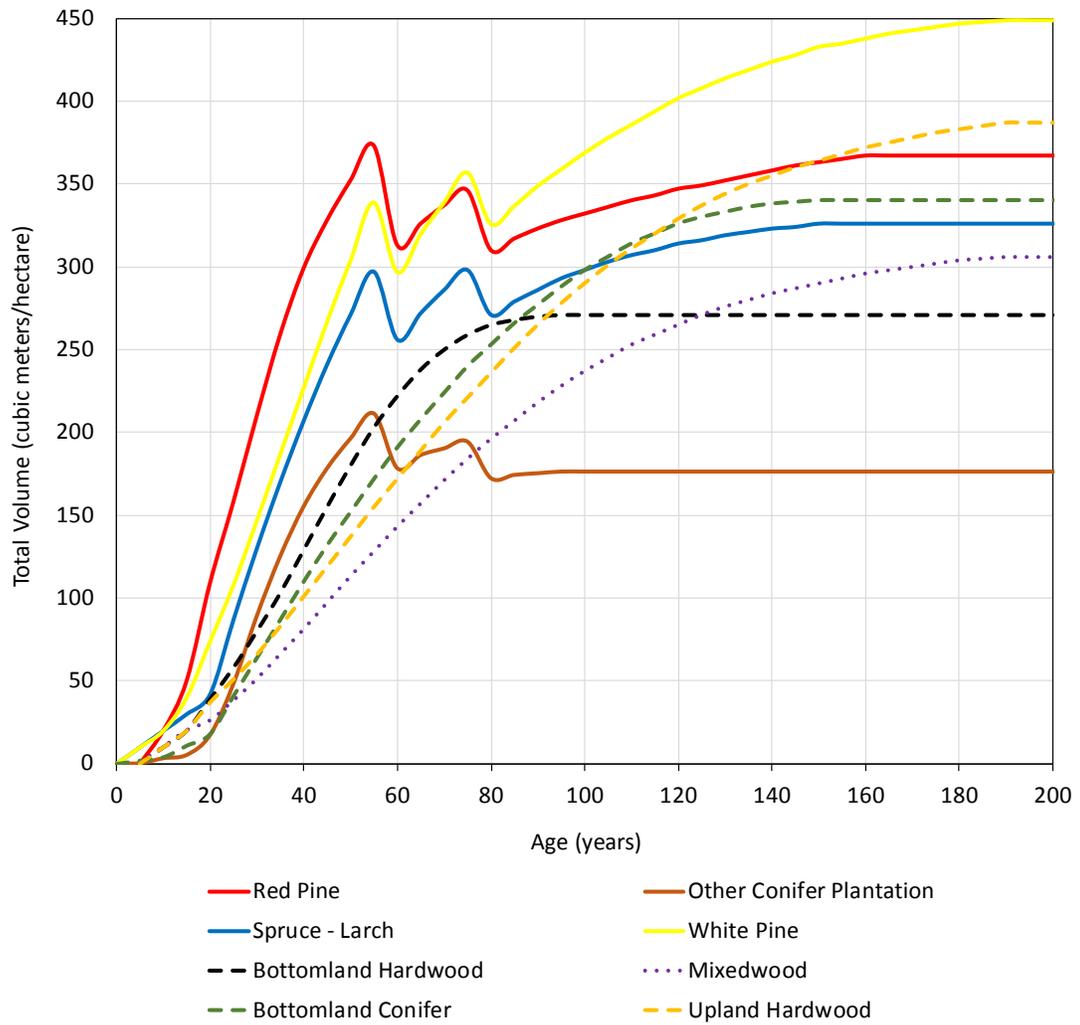


Table E3. Forest growth model assumptions for plantations and natural forest communities in the YRF. Thinning intensities and growth assumptions are based on silvicultural prescription and inventory data from the YRF and adhere to stand density management diagrams from the Silvicultural guide to managing southern Ontario forests (OMNR 2000).

Forest type	Age class range	Thinned proportion (% of basal area removed on 20 year cycles)	Basal area growth following thinning (m ² /ha/yr)	Basal area (m ²)		Average annual volume growth (m ³ /ha/yr)
				Minimum before thinning	Residual after thinning	
Red Pine, Spruce-Larch, & White Pine	40-60	30	0.54	38	26.6	3.2
	60-80	30	0.33	36.8	25.8	2.1
	80-100	30	0.05	32.0	22.4	0.7
	100+	50	0.05	23.5	11.8	0.7
Upland Hardwood, Mixedwood & Bottomland Hardwood	70-80	20	0.23	26	20.8	1.8
	90-100	20	0.25	25.4	20.3	2.0
	110-120	20	0.28	25.3	20.2	2.1
	130+	20	0.28	25.7	20.6	2.1

SILVICULTURAL GUIDELINES FOR THE YORK REGIONAL FOREST

Silvicultural guidelines for advancing the forest from the current state to the desired future condition were established for each forest community (Table E2). Silvicultural guidelines for the York Regional Forest are based on Provincial guidelines (MNR 1997, 2000, 2002), growth data obtained from increment cores collected during the 2016 forest inventory, and the Region's experience in managing the Forest for the past 20 years. The guidelines include proposed silvicultural systems and indicators of success.

Management is initiated when a compartment achieves a minimum age and basal area, at which time a portion of the volume in the stand is harvested. Residual trees continue to grow until a time when thinning is again necessary to prevent density induced mortality. The thinning cycle (period between thinnings) depends on the forest type, growth rate and age. Over the course of repeated thinnings, the forest type may change (e.g. as conifer plantations are converted to deciduous or mixedwoods stands).

Table E4. Silvicultural guidelines for sustainable forest management in the York Regional Forest.

Forest Community	Desired Future State	Current State	Proposed Treatment ¹	Indicators of Success	Monitoring Approach	Monitoring Frequency
Plantations (red pine, white pine, spruce-larch, other conifer)	Progression to mixed or deciduous. Hardwoods make up at least 10% of the overstory basal area by age 70-80, and 20% of the overstory basal area by age 85.	<30 years	Mowing / chemical control of competing vegetation	Survival exceeds 90%	Survival assessment & health observation Forest Inventory	Year 1, 2 and 5 Forestry Inventory every 10 years
		30-100 years. Most plantations are assumed to be converted to natural forests after age 100.	Shelterwood/selection Retain a component of coniferous trees in the overstory in final thinning. Supplement regeneration by underplanting if regeneration is limited.	Deciduous/other conifers represent ≥ 20% basal area	Forest inventory	10 years 5 years
Upland Hardwood, Bottomland Hardwood, Mixedwood	Multi-aged forests with a diversity of species	Basal area <26m ² /ha	Monitor. However, silvicultural treatments may be required to improve regeneration or tree health.	Trees of different ages, sizes and species are present	Forest inventory	10 years

¹ Where invasive plants are present control measures are activated according to best management practices and consistent with FSC principles and criteria..

Forest Community	Desired Future State	Current State	Proposed Treatment ¹	Indicators of Success	Monitoring Approach	Monitoring Frequency
		Model assumes >70 years and basal area > 26m ² /ha. This may vary depending on stand conditions.	Selection / group selection. An appropriate minimum residual basal area will be selected to achieve the desired forest conditions (e.g. 20m ² /ha in upland hardwoods). Supplement regeneration by underplanting if regeneration is limited.			
Bottomland conifer	Maintain bottomland conifer forest vegetation	<10 years	Mowing / chemical control of competing vegetation	Survival exceeds 90%	Survival assessment Forest inventory	Year 1, 2 and 5 5 years 10 years
		10-70 years	Monitor only	Coniferous trees are dominant		5 years
		>70 years	Even-aged management through a 3-cut shelterwood approach which utilizes small openings (0.5 hectare) dispersed throughout the compartment. Restoration of the new forest will be achieved through tree planting following thinning. This approach will offer an opportunity to introduce species to support climate change adaptation within the YRF.		Forest inventory	10 years
All	Forests freely evolving without invasive	Invasive species generally absent	Implement other silvicultural activities as necessary	Invasive species do not significantly impact the	Monitor	10-years during the

Forest Community	Desired Future State	Current State	Proposed Treatment ¹	Indicators of Success	Monitoring Approach	Monitoring Frequency
	species altering development	Invasive species present	Integrate control treatments with other silvicultural management as necessary	desired future forest state (e.g. regeneration is adequate even though invasive species are present)		forest inventory update

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APPENDIX G: References

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