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NATURE

Management Plan for the York Regional Forest



2019-2038




York Region

APRIL 2019

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Executive Summary

This document describes a new, 20-year management plan for the York Regional Forest, herein referred to as the "Plan". The Plan will apply from 2019 to 2038 and is founded on the following 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 Plan will usher in the second century of modern stewardship of the Forest, which was created in 1924 as part of the provincial Agreement Forest program to restore degraded lands in southern Ontario.

In the 1920s, widespread clearing and the abandonment of farms on the Oak Ridges Moraine had created a virtual desert, and the province's work after 1924 focused on planting thousands of red pines and other conifers in an effort to stabilize the light sandy soil.

In 1998, York Region developed a 20 year forest management plan to guide the York Regional Forest. Two years later, the agreement with the province was terminated and the Region officially assumed full management responsibility.

Over the course of that plan, the Region added 344 hectares to the Forest by acquiring 13 new properties. The additions brought the Forest to its current size of 2,379 hectares or close to 6,000 acres held in 23 tracts of land, most of them concentrated along Highway 48 in the northern half of the Region.

Through its first plan, the Region worked to move the Forest closer to its ecological state before European settlement, a shift that had already started under provincial management. In pre-settlement times, mature and diverse forests of maple, oak, white pine, cedar and other species dominated the landscape. For further biodiversity, the Region also started to add new habitat types such as prairie and oak savanna.

The Plan brings this direction to the forefront by emphasizing the goal of ecological integrity. Ecological integrity means that the Forest reflects the make-up and abundance of native species and biological communities, which include biotic components, and its non-living or abiotic factors like rock, soil and climate.

Ecological integrity is important as a goal in itself, because it brings the Forest into a long-term balance that gives it greater resiliency. This, in turn, is likely to increase the broader environmental and social benefits it provides beyond its borders, like absorbing greenhouse gases and reducing pollution.

Recreation and well-being are other important social benefits of the Forest. Its trail network of almost 150 kilometres, portions of which are accessible to people of all abilities, welcomes a wide range of activities, particularly walking (often with a dog), running, nature appreciation, cycling and horseback riding. The connections between Forest tracts and to other natural areas enrich the recreational possibilities.

With the steady growth in the Region's population, public use has gone up substantially, with visits estimated to have reached 600,000 in 2017. Access to this green space will become ever more essential as the Region continues to grow and urbanize.

While the social benefits are important, growth – especially in the northern reaches of the Region – will increase the pressures of recreational use. Over the same period, climate change and invasive plants, insects and pathogens will make the goal of ecological integrity more challenging. Balancing the needs of the Forest against the impacts of heavier public use will be critical.

The vision therefore reflects the overarching importance of the Forest's health and biodiversity, which are key to its ability to sustain communities and inspire people. The Plan's three major goals build on that commitment and show how it will be reflected in practice.

The first goal sets out ecological integrity as the Plan's cornerstone:

Goal 1: Strengthen Ecological Integrity

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

The objectives under this goal are to:

- Protect ecological features and improve ecosystem integrity and biodiversity
- Use innovative practices to restore and protect the Forest
- Implement best practices to prevent and mitigate impacts of invasive species
- Manage the Forest to increase ecological resilience and minimize the impacts of climate change

This goal reflects the ongoing evolution of the Forest over the past 100 years: from barren land to conifer plantations initially and then, more recently, to a more diverse system of plant communities and wildlife habitats.

This has been aided by the judicious use of silviculture to mimic natural processes, for example by selectively thinning trees to allow more sunlight to reach the vegetation underneath, and planting native species where they are slow to regenerate on their own.

For third-party evaluation of its management, the Region sought and received certification by the Forest Stewardship Council, which was a first at the time for a public forest in Canada.

The Region will continue to use silvicultural management to move the Forest towards greater ecological integrity. Experience has shown that with ongoing management, reforested areas will eventually convert to more mixed, native woodlands. By 2038, areas first planted between 1924 and 1950 will be at or very close to that point, and the numerous areas reforested in the 1950s will be approaching it. As a result, by 2038, native woodlands will account for 57 per cent of the Forest, up from 50 per cent at present.

This goal will also see the Region monitor for, assess and address such threats as climate change and invasive non-native species and update Legacy Conservation Forests which warrant special attention. Legacy Conservation Forests contain ecological features and functions sometimes found in no other part of the Forest and represent a significant portion of the Forest.

The second goal recognizes the value of showing the Forest's benefits to the communities around it:

Goal 2: Foster an Understanding of the Broader 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.

The objectives under this goal are to:

- Review and assess the environmental and social benefits of the Forest
- Ensure the Forest continues to demonstrate leadership through science, innovation and sharing best practices

The Region will continue to use standardized tools that monitor, measure and quantify the benefits of trees and the ecosystem services they provide, such as removing pollution and sequestering carbon. Under the Plan, the Region will bring together existing monitoring tools into a comprehensive framework that includes measurement of ecological and social values.

The Region works now to educate Forest users, neighbours and others about how it manages the Forest to increase the environmental and social benefits, including the use of silviculture to restore native ecosystems. Going forward, staff will review and refine existing forest stewardship and education programs to better convey the broad benefits of the Forest.

The Region also includes the Forest as a key element in the Green Infrastructure Asset Management Plan, which in turn forms part of the entire Asset Management Plan for the Region. This important measure of its environmental value, as well as the investments needed to support it, will be regularly updated.

The third goal supports compatible public use, promotes learning about nature, and encourages community and individual stewardship of the Forest:

Goal 3: Inspire People

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

The objectives under this goal are to:

- Provide an exceptional visitor experience
- Ensure that public use and facilities are managed to protect the Forest and keep visitors safe

Using such means as Forest Festivals, Nature's Classroom, other events, social media and signage, as well as the Regional Forest Advisory Team, the Region gets feedback and educates Forest users about etiquette and rules. It also advises visitors how to avoid risks to themselves (such as ticks, poison ivy and rabies) and to the Forest (such as inadvertently spreading invasive plants).

The Region is working to improve access to the Forest by public transit, bicycle and foot, and with its partners

is promoting and building greater connectivity among Forest properties and other natural areas through a larger network of trails.

As well as continuing these current initiatives, the Plan sets out criteria for acceptable activities in the Forest and explains when a Forest Use Permit is needed.

As part of its new actions, the Region will develop a visitor experience plan to facilitate connection with nature, including education and stewardship, and a trails strategy to guide management of trail infrastructure and improve wayfinding. It will also review dog-walking rules and options to consider the balance between ecological integrity and visitor experience.

York Region will continue to be recognized as a leader in working with nature, communities, and people for the benefit of the Forest.

The Region will implement the Plan through successive five-year operating plans, annual work plans, and other Regional programs, backed by comprehensive monitoring. Each five-year forest operating plan will respond to the results of monitoring and measurement and will provide for adaptive management by incorporating advances in science and technology and lessons learned.

The Region will also prepare property management plans for any newly acquired properties to ensure that they are managed in a manner consistent with the rest of the Forest.

Advancing ecological integrity, nurturing biodiversity, offering green space to Forest users and benefiting surrounding communities – these are challenging and potentially conflicting roles for the Forest over the next two decades.

The Plan seeks to achieve the best possible balance among those roles for both the Forest and the Region. While focusing on the 20 years to 2038, it aims above all to build and nurture the York Regional Forest as an enduring legacy to future generations.

1 Introduction

1.1 Purpose and Scope

The York County Agreement Forest, now the York Regional Forest, originated in 1924 when the province entered into an agreement to plant trees on land owned by the County of York, the predecessor to the Region. The agreement was part of a widespread program under which the province restored deforested lands across southern Ontario.

The Region assumed full management responsibility when the agreement with the province was terminated in 2000. Prior to terminating the agreement, one of the Region's first management initiatives was to develop a 20-year forest management plan. The plan extended from 1998-2018 and is a crucial element of forest stewardship. As the 100th anniversary of the York Regional Forest approaches in 2024, the positive impacts of work done first by the province and more recently by the Region are clear.

Building on that success, this Plan provides direction for the next 20 years. It will be supported by five-year operating plans to implement the Plan and enable the Region to respond quickly and adapt to changing conditions and new knowledge. While focusing on the 20 years to 2038, 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 value of the Forest as a legacy to future generations.

The next section outlines the vision, mission and goals of the Plan. Together, the aim of this Plan 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 understand, cherish and respect it as a living natural asset. In acting on the Plan, the Region will continue to show leadership in conservation, stewardship, and natural area management.

1.2 Vision 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 Goals

Goal 1: 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.

Goal 2: Foster an Understanding of the Broader 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 provides benefits beyond its borders that help sustain the health and well-being of the Region's communities and residents, and promotes learning about nature.

Goal 3: 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, and encourages community and individual stewardship of the Forest.

1.3 Developing this Plan

In developing this Plan, the Region drew on the expertise, advice and views of a wide range of people, including Indigenous peoples, a technical advisory team, a key stakeholder group and the Regional Forest Advisory Team, 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 and a user survey allowed for broad community engagement. Appendix B summarizes the entire engagement process.

1.4 Structure of this Plan

This chapter describes the scope and purpose of the Plan, its vision and goals, 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 2000. It then outlines the results of the Region's management, including accomplishments of the 1998-2018 Forest Management Plan.

Chapter 3: The Forest Today section discusses the current state of the Forest, including its age structure and improving biodiversity over time, and the improved habitat it provides for wildlife. It also discusses trends in public use and positions the Forest in relation to other green spaces in and around the Region.

Chapter 4: Achieving the Vision sets out the key elements of the Plan, including goals, objectives and actions. It explains how the Plan will be implemented and how monitoring will ensure goals are being achieved and allow fine-tuning as conditions change. Finally, it sets out the expected outcomes at a high level.

Chapters are followed by several **Appendices** and a **Forest Atlas** describing each tract in more detail.



There is no wifi
in the forest but
I promise you
will find a better
connection.

Today's visitors to the York Regional Forest enjoy the beauty and tranquility 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 Major Landforms

As the last glacier retreated from what it now southern Ontario roughly 12,500 years ago, it resulted in the creation of two prominent landforms that have persisted to the present time:

- **The Oak Ridges Moraine.** This massive ridge of glacial deposits extends 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.
- **The Lake Simcoe basin.** Lake Algonquin covered east-central North America during and after the last ice age, gradually shrinking to form parts of the Great Lakes. Its relicts include treed swamps throughout the lowlands south of Lake Simcoe, where a low, sandy plain covers most of what is now 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.

All of the present-day Forest properties are located within these two landforms.

2.2 Indigenous Peoples

By about 1,500 to 2,000 years after the retreat of the glaciers, Indigenous peoples were moving across the landscape, which at the time was a relatively barren tundra dotted with areas of open boreal forest (York Region 2014).

These earliest Indigenous people were nomadic and hunted caribou, as well as mastodon, moose and elk, and likely fished the waters of the post-glacier lakes. Over the centuries, with warming climate, more permanent villages emerged as people began to grow crops. In Ontario, the Iroquois were the largest community to develop this less nomadic lifestyle. They cultivated land cleared by fire and harvested forest plants for food, medicine and fibre.

As one example as many as 2,000 members of one Iroquoian nation, the Huron-Wendat, lived in a village located on land in what is now the community of Stouffville in the Town of Whitchurch-Stouffville. An estimated 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 peoples 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 River to the Holland River, and a lesser one 40 kilometres to the east that followed the Rouge River to the Holland River. Together, these became known as the Toronto Carrying-Place Trail.

Although technically portages, the overland links that took travelers 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 rivers is believed to have been located just east of the current Happy Valley Tract of the York Regional Forest (Nature Conservancy of Canada n.d., Toronto and Region Conservation Authority 2009). After crossing the moraine, the eastern branch of the trail 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 southern slopes of the moraine (Puric-Mladenovic 2003).

2.3 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 (York Region 2014).

Following 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 (Elliot 1998).

The pace of European settlement and land-clearing for agriculture increased through the 1800s. 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 and logging had depleted the soil and left large areas in a state of severe environmental decline.

Settlement also had impacts on the Indigenous population. For example, the British re-established use of the Toronto Carrying-Place Trail, securing land from, and relocating, the Mississauga Nation. The 1923 Williams Treaties, under which this and other lands were transferred to the Crown, were challenged by the affected First Nations. An agreement concluded in 2018 provided financial compensation, recognition of territorial rights, and apologies to the affected First Nations.

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 Chippewas of Georgina Island First Nation have the only reserve located within the geographical boundaries of York Region and it is one of the First Nations that signed an agreement with the federal and provincial governments to resolve the Williams Treaties.

More than 200 Georgina Island members live on three islands (Georgina, Snake and Fox) on Lake Simcoe. As with other First Nations, many community members live elsewhere. In the 2016 census, more than 5,000 York Region residents identified themselves as Indigenous, which includes First Nations, Métis and Inuit.

2.4 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. The program was launched in Simcoe County in 1922.

The provincial Agreement Forest program was introduced in York County in 1924. The county had purchased its first area for reforestation in 1922, a parcel of 197 acres (about 80 hectares) in what is now the Hollidge Tract. The purchase of another 400 acres (162 hectares) by the county in 1924 and the planting of the first trees by the province under the agreement that year marked the beginning of the York Regional Forest, at the time known as "Vivian Forest." By 1938, with additional land acquisitions, close to 1,900 acres or 770 hectares had been reforested.

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 were benefiting from thinning. Removal of specific rows of trees and individual trees within the rows created canopy gaps that promoted natural regeneration and maintained the health and vigour of the Forest. Many of those reforested areas have been thinned two or three times (Figure 1).

By the 1990s, many reforested areas contained well-established native deciduous and coniferous tree species in addition to the conifers that were originally planted. This change aligned with better understanding of ecosystems and the benefits of creating a more biologically diverse Forest.

The province terminated the agreement forest program in 1996 and the Region assumed official management responsibility in 2000. By then, through adding and reforesting new properties, the Forest had grown to 18 properties comprising 2,031 hectares.

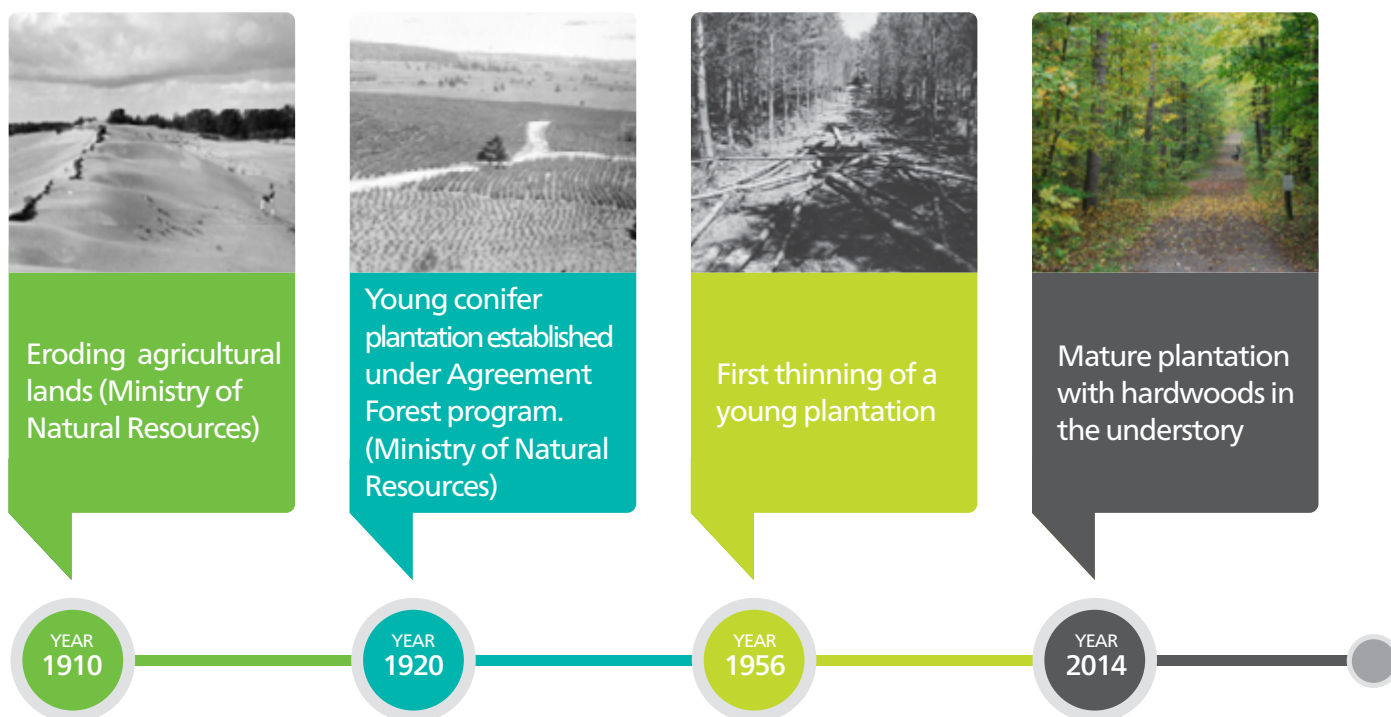


Figure 1. Restoration of the York Regional Forest.

2.5 1998 – 2018 Growth of the Forest

Prior to taking on the management responsibility for the York Regional Forest, the Region prepared the York Regional Forest Management Plan 1998-2018. This was a requirement of the transfer from the province, and forest management planning has since been enshrined in the Regional Official Plan.

The goal of the 1998 management plan was:

To ensure the ecological sustainability of the 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.

The Region implemented the plan through five-year operating plans (which also included infrastructure projects such as trail and parking area improvements), supported by work plans identifying annual activities.

Standard operating procedures and specifications for silvicultural and other forest management activities were also developed.

The Region added 13 new properties to the Forest between 2001 and 2018 through its progressive Greening Strategy, increasing the Forest area by 344 hectares (Figure 2). Individual property management plans consistent with the Forest Management Plan 1998-2018 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. As a result of these and earlier provincial additions, the York Regional Forest now consists of 23 properties totaling 2,379 hectares, including parking lots and trails.

Figure 3 shows where the York Regional Forest lands are located. The unstable sands of the Oak Ridges Moraine, especially where farms had been abandoned, were the focus of early reforestation efforts. This helps to explain why 16 of the Regional Forest tracts are situated on the Moraine, with many along or near Highway 48, which follows the route of an early settler road. In parts of some tracts, most notably Zephyr, there continue to be remnants of blow-outs and sand dunes. The remaining seven tracts are in the Lake Simcoe basin.

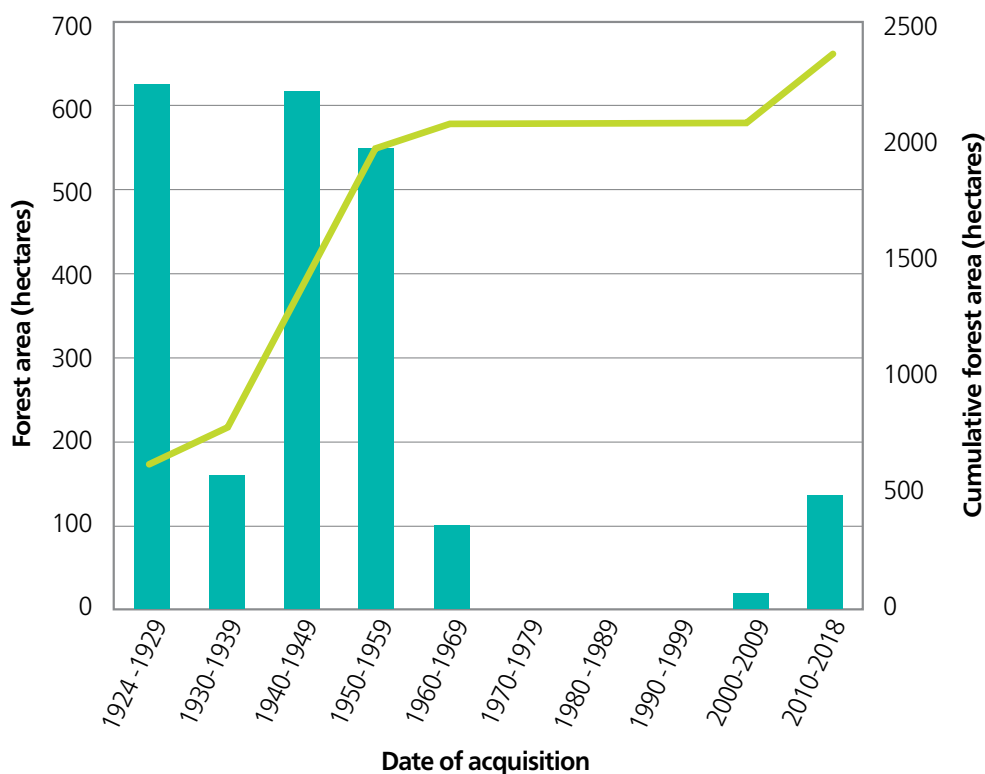
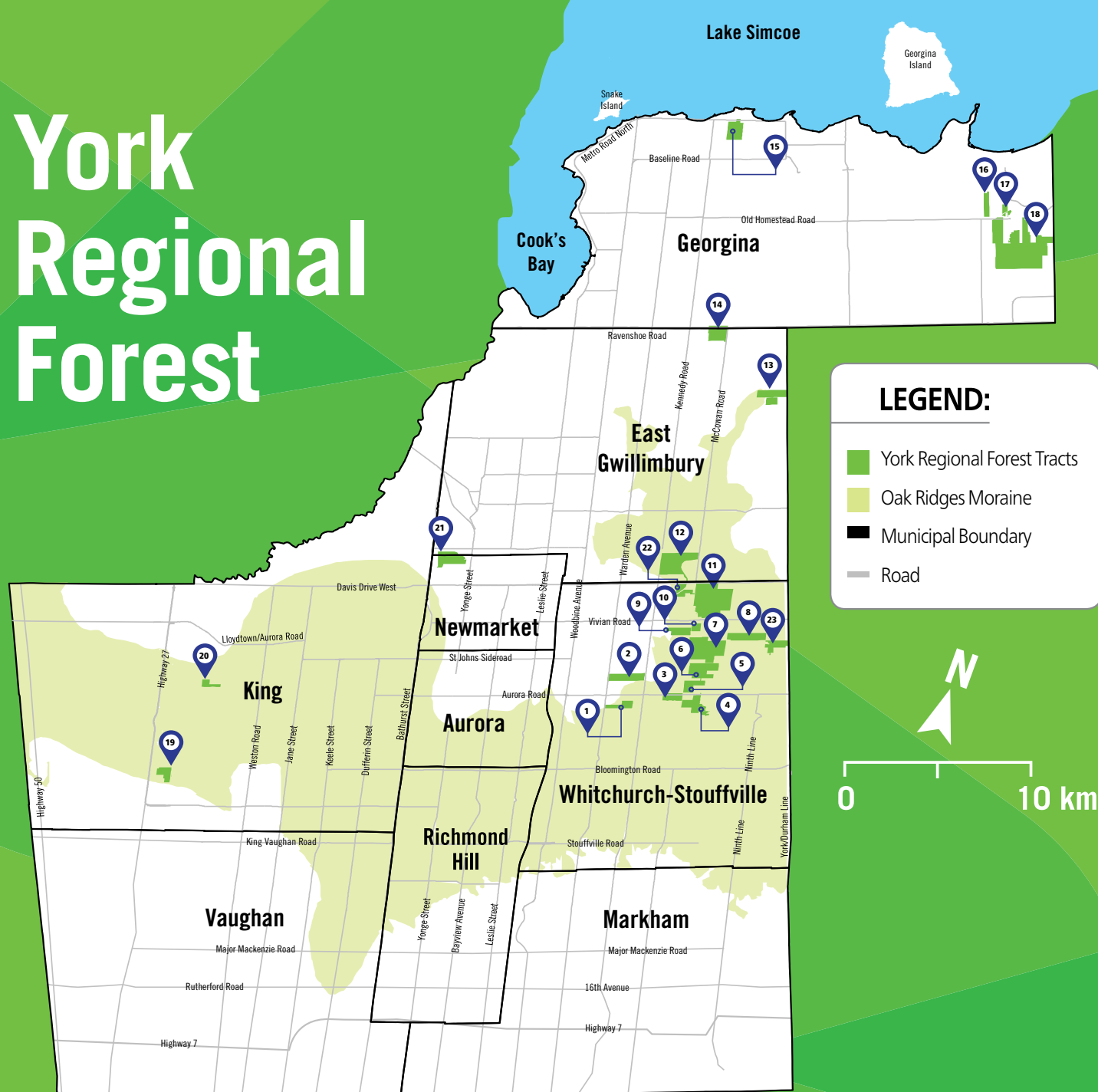


Figure 2. Additions to the York Regional Forest.

York Regional Forest



York Regional Forest Tracts - 23 tracts, totaling 2,379 hectares

1 Robinson Tract (43 ha)	9 Scout Tract (48 ha)	17 Godfrey Tract (20 ha)
2 Porritt Tract (80 ha)	10 Mitchell Tract (21 ha)	18 Pefferlaw Tract (579 ha)
3 Dainty Tract (41 ha)	11 North Tract (332 ha)	19 Nobleton Tract (44 ha)
4 Clarke Tract (85 ha)	12 Bendor and Graves Tract (181 ha)	20 Happy Valley Tract (26 ha)
5 Patterson Tract (50 ha)	13 Zephyr Tract (87 ha)	21 Peggy's Wood (19 ha)
6 Hall Tract (109 ha)	14 Brown Hill Tract (83 ha)	22 Davis Drive Tract (49 ha)
7 Eldred King Woodlands (221 ha)	15 Metro Road Tract (84 ha)	23 Drysdale Woods (55 ha)
8 Hollidge Tract (83 ha)	16 Cronsberry Tract (39 ha)	

Figure 3. York Regional Forest Tracts.

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 as exemplified by its accessible trails and silvicultural activities. 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 (Figure 4).

Milestones achieved over the last two decades:

2000

Became the first public forest in Canada to be Forest Stewardship Council certified.

2010

Acquired 25 hectare Happy Valley tract property.

2013

Acquired 55 hectare Drysdale Woods property

Developed and implemented Accessibility Design Guidelines for York Regional Forest trails.

Established prairie oak savanna at the Bendor and Graves tract.

2017

Received the Forest Stewardship Council Leadership award for the Bill Fisch Forest Stewardship and Education Centre in the Hollidge tract.

2004

Acquired 24 hectare addition to the Hall tract.

2012

Created a Legacy Conservation Forests Strategy to designate areas of the Forest with unique ecological features and functions.

2014

Constructed Dog Off Leash Area at the Bendor and Graves tract.

2018

The Bill Fisch Forest Stewardship and Education Centre became the first building in Canada to be Living Building Challenge certified.

2.5.1 Forest Certification

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

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.

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 to 2020. The Region's management activities are consistent with principles and criteria for well-managed forests as embodied in certification systems.

2.5.2 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 their life cycle.

For the asset management plan, the Region developed detailed information on the extent and condition of the York Regional Forest, 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.

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 increasingly biodiverse and resilient. Its rich mix of conifers and hardwoods includes about 50 native tree species, and it is also home to shrubs, prairie grasses, woodland plants and wildflowers. This abundance and mix of vegetation gives it an important role as a natural seed bank. It also provides habitat for a wide variety of native wildlife, including mammals, birds, reptiles, amphibians and insects across a landscape dotted with ponds and wetlands.

Increasing numbers of people have come to enjoy the York Regional Forest and its extensive trail network for recreation and to connect with nature. The connections between tracts and to other natural areas enrich the possibilities for many of these activities.

3.1 Silvicultural Management

The Region uses silvicultural management to strengthen the Forest's health and ecological integrity. Silvicultural practices replicate natural succession in woodlands. This involves, 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. The Region also adapts and refines its practices as it gains knowledge of which native species do best in which environment and considers how to manage threats from climate change and invasive species.

Silvicultural activities in the past 20 years have included:

- selectively thinning a total of 1,580 hectares to improve forest health
- underplanting some 61,600 native tree seedlings where natural regeneration was lacking
- planting 195,000 trees, mainly conifers, to reforest newly added properties (344 hectares)
- controlling invasive plants on a total of six hectares

In managing native woodlands as opposed to reforested areas, the Region draws on the guidance of The Silvicultural Guide for Managing Southern Ontario Forests (Ministry of Natural Resources 2000).

The Guide sets out recommendations on stand structure and the silvicultural 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 wildlife species. 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 to reach the remaining trees encouraging their growth and to create conditions to grow new trees in the future. This supports a more diverse stand by age, vertical structure and species while maintaining permanent forest cover. (Ministry of Natural Resources 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.

The Region applied the provincial guidelines to managing areas of native woodlands through the 1998-2018 plan. They are consistent with best practices identified in the research carried out for this plan and 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 (Ministry of Natural Resources 1986, 1999, 1997, Woods & Penner 2000, Smith Woods & 1997, Chapeski 1989) and on the collective experience of forest managers across southern Ontario.

Definitions

- For the York Regional Forest, ecological integrity means a condition that is determined to be characteristic of its natural region, including the composition and abundance of native species and biological communities, and abiotic factors like soil, rock and climate. Once established, it is a state that is likely to persist.
- 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 a forest. It includes such practices and treatments as planting and thinning trees. It can help achieve various goals, including restoring and maintaining the ecological functions of the forest, advancing forest health, and promoting species and habitat diversity.
- A native woodland is a forested area or stand of trees made up of native tree and other species representative of regional and local conditions. It may result from natural growth and succession or from conversion of a reforested area.

3.2 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.

A detailed forest inventory of all tracts, updated in 2016 and summarized in Figure 5, 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.

The updated inventory shows that while woodlands continue to account for the largest portion of the total area, non-forest habitat has increased.

The forested areas are also evolving. The 2016 forest inventory identified eight distinct types of forest community, based on species composition (Figure 6).

Each type of community is associated with either a reforested area or a native woodland:

- Reforested areas are made up of the red pine, white pine, spruce-larch and other conifer plantation communities. Many of these species would not naturally occur in the Region, or would not naturally grow in the location where they were planted.
- Native woodlands are made up of the bottomland hardwood, upland hardwood, bottomland conifer and mixedwood communities. ("Mixedwood" communities are a mix of coniferous and deciduous trees, neither of which dominates).

At the time of the provincial inventory, reforested areas represented 54 per cent of the total woodland area, while native woodlands accounted for 46 per cent.

Today the forested areas are split evenly between reforested areas and native woodlands. This reflects the succession of reforested areas, as well as acquisition of naturally forested lands.

Over time and with proper management, reforested areas come to resemble forests of natural origin and are counted as native woodlands. Technically, the

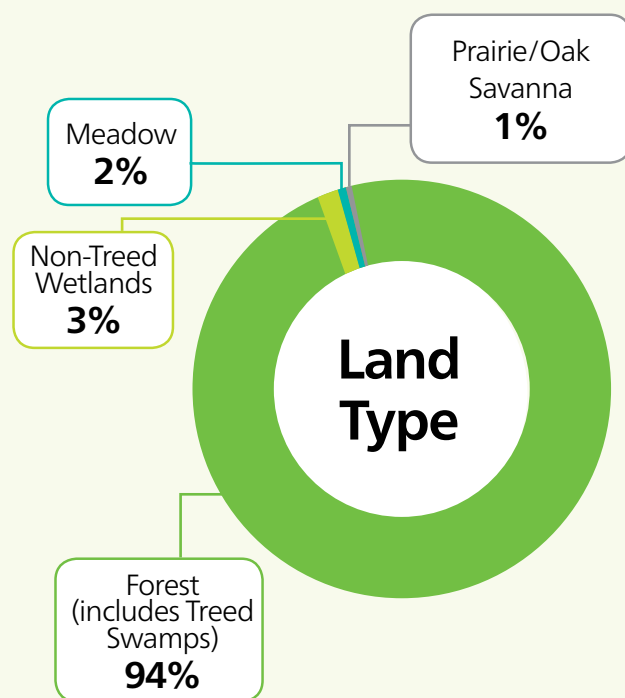


Figure 5. York Regional Forest Vegetation Communities.

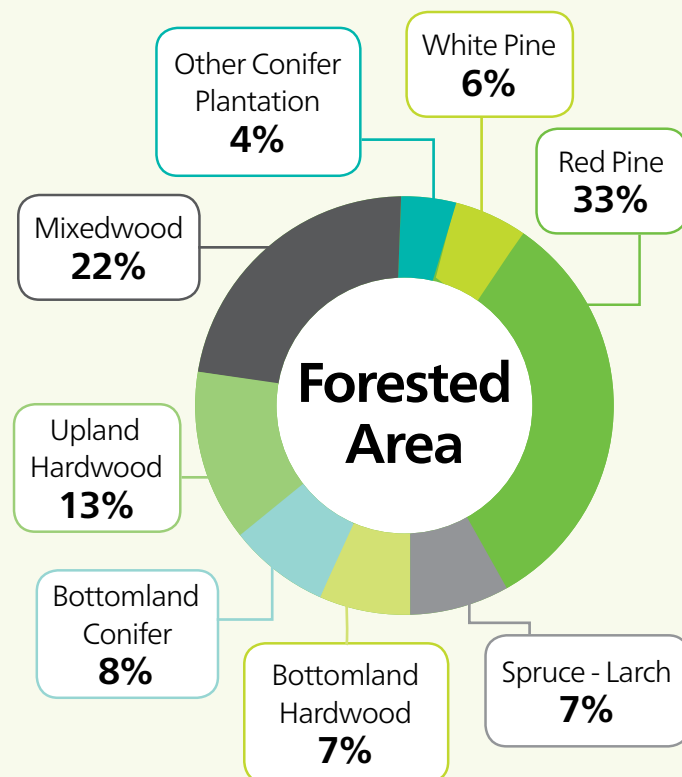


Figure 6. Forest Communities of the York Regional Forest.

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, conversion is generally taking place when plantation trees are about 90 to 120 years old.

There is considerable diversity in the reforested areas that have not yet converted to native woodlands:

- In total, reforested areas from the 1920s through the 1940s that have not yet converted to native woodlands cover about 33 per cent of the reforested area and 16 per cent of the total Forest area. The earliest trees, planted in 1924, are now 95 years old.
- The largest reforested areas are those planted in the 1950s, which today account for just over

one-third of the reforested area and about 18 per cent of the total forested area. These trees are now 61 to 70 years old. In the next 20 years, these areas will move more clearly into the conversion phase to native woodlands, although they will still be dominated by trees planted for reforestation (Figure 7).

- Reforested areas from 1960 to the time the Region assumed responsibility and began adding and reforesting land, represent 20 per cent of the reforested areas and 10 per cent of the total forested area.
- The youngest reforested stands, less than 20 years of age, have been planted on lands acquired by the Region since assuming management responsibility for the Forest in 2000. These stands represent 8 per cent of reforested areas and 4 per cent of the total forested area.

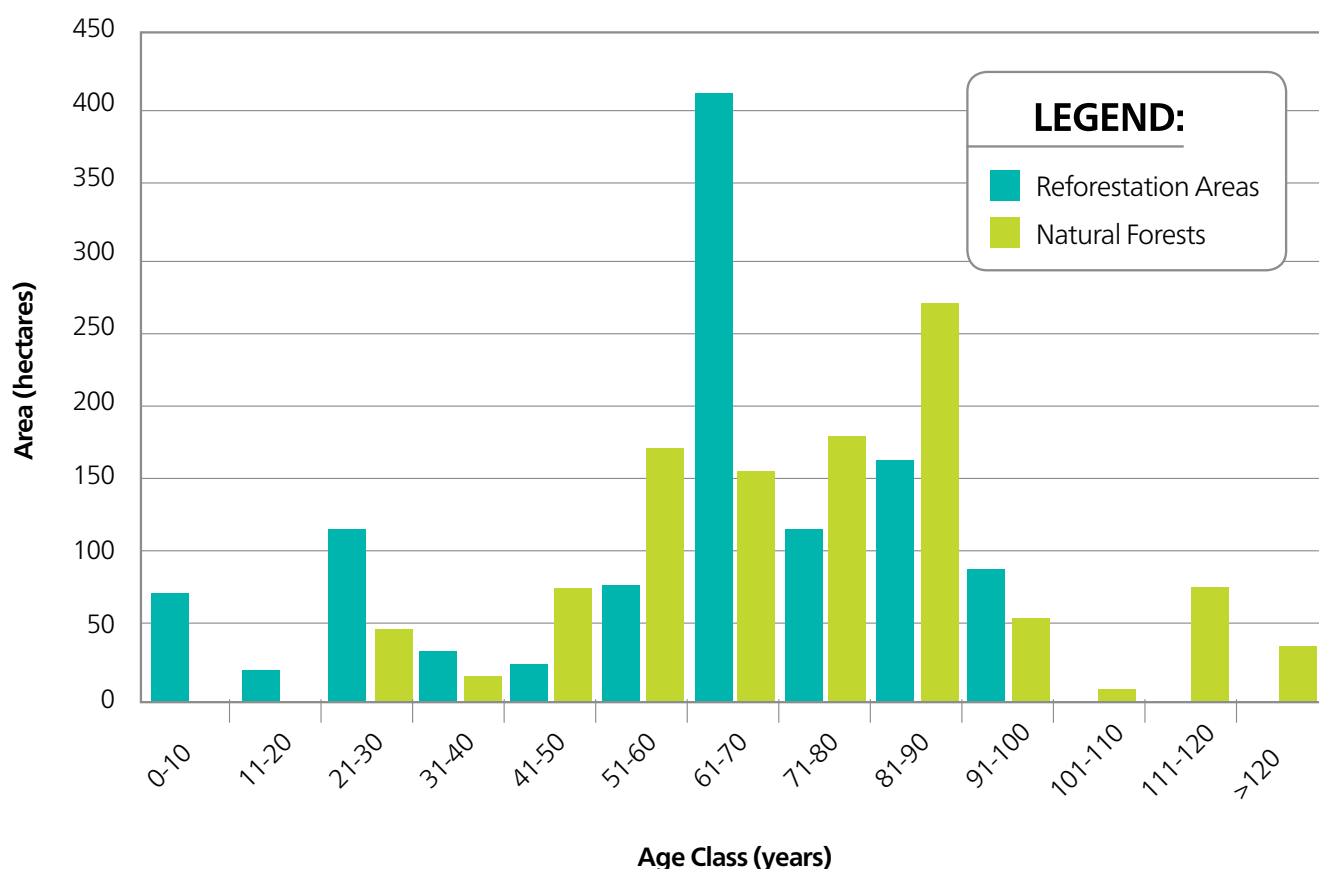


Figure 7. Age class distribution of the York Regional Forest in 2017.

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

3.3 Legacy Conservation Forests

In 2012, the Region developed a Legacy Conservation Forests 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 meets 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 – Pepperlaw, Hollidge, Clarke, Patterson, Bendor and Graves, Dainty, Nobleton, Hall, Happy Valley, Zephyr, Eldred King, North, Porritt and Godfrey (York Region 2012). Together, they comprise 31 per cent, or 739 hectares, of the 2,379 hectares of the York Regional Forest, exceeding the minimum targets set for these areas (Table 1).

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 is limited to such activities as maintaining trails, removing hazard trees and protecting the Forest from threats like uncontrolled fire and invasive species.

Table 1. Minimum targets and actual amounts for both types of Legacy Conservation Forests.

	Target % of total Forest area	Actual 2012 area (hectares)	Actual % of total Forest area
Special Management Areas	10%	321	13%
Nature Reserve Areas	15%	418	17%

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:

Natural Reserve Areas (NRA)

- Within the Bendor and Graves tract 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 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.

Special Management Areas (SMA)

- Areas within the Bendor and Graves tract 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.

As these examples show, Legacy Conservation Forests can support the goal of greater biodiversity.

3.4 Habitat Diversity

York Region's woodlands can support a diverse range of plant and animal life as a result of them existing between two major geographic forest regions, the deciduous Carolinian Forest to the south and the coniferous Boreal Forest to the north.

As a result, the Forest includes some Carolinian species, such as butternut, shagbark hickory, and bitternut hickory that are growing at the northern limit of their range, while Boreal species, including balsam fir and white spruce, are at their southern limit (Farrar 1995). 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.

How the Forest is being managed is also key to realizing its potential to shelter a wide range of wildlife:

- 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. In line with the guidance on best practices discussed in Section 3.1, the Region manages the Forest to maintain and enhance these features.
- 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 more mixed woodlands.
- Many wildlife species depend on habitat deep inside a woodland, far from an edge or open field. The Forest offers large expanses of woodland in a part of the province where urbanization and agriculture have resulted in many small and isolated patches of forest. 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 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 includes a schedule listing species for which Ontario must develop recovery strategies. The Forest contains existing and potential habitat, some within Legacy Conservation Forests, for several species at risk. 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
- Creating grassland habitats like tall-grass prairie and oak savanna
- 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 plant surveys

Appendix D lists many of the wildlife and plant species that have been observed or likely to occur in the Forest.

3.5 Benefits to Surrounding Communities

3.5.1 The Environmental and Social Value of the Forest

The Forest is valuable to the communities and people around it through its environmental services, like pollution reduction, as well as by providing green space to relax and recharge.

A major environmental benefit is reducing atmospheric carbon dioxide. Burning fossil fuels releases this gas into the atmosphere, where it becomes a major contributor to climate change. Forests and the wood they produce absorb and store carbon dioxide in their tissues in a process known as carbon sequestration, reducing its contribution to climate change (Colombo 1998). Larger trees absorb exponentially more carbon dioxide than smaller ones. Examples of increased carbon sequestration in the Forest include newly planted trees that are replacing fields and pasture in the Davis Drive and Bendor and 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 are used for wood products (for example, lumber in buildings) continue to store carbon for decades.

Wholesale loss of forests around the globe 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 even more important in mitigating climate change.

In addition, the Forest reduces air pollution caused by particles and gases like ozone, sulphur dioxide, carbon monoxide and nitrogen dioxide, all of which are linked to respiratory problems, and naturally manages the flow of water by absorbing rainwater and snow melt, which helps to manage the risk of flooding, filters out many contaminants and reduces the need for costly built infrastructure.

The Forest can also provide a wealth of social benefits like reducing stress and encouraging a more active lifestyle. While these benefits are more difficult to quantify, studies have shown that the availability of green space is associated with reduced mortality, obesity, depression, anxiety and cardiovascular disease, and with healthier children and even newborns. Natural spaces give people a place to restore their mental health, reduce their level of stress, and spend quality time with others.

Research into the Japanese practice of "forest bathing," in which people spend time walking or meditating in the woods, away from technology and other distractions, has shown that calming impacts are greater in a forest than from walking in urban areas.

3.5.2 Monitoring and Measuring

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. Among other features, it quantifies the value of ecosystem services provided by trees, such as removing pollution and sequestering carbon.

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 significant environmental value.

The 2017 asset management plan estimated that each year, the Forest:

- sequesters 5,717 tonnes of carbon
- captures 166,800 kilograms of polluting substances and;
- absorbs 642,600 cubic metres of rainwater and snow melt.

It provides these benefits at a minimal cost. The Green Infrastructure Asset Management Plan (2017) estimated that the environmental benefits of the Forest could amount to as much as \$5.8 million a year, with associated annual capital costs of less than \$900,000.

3.5.3 Education and Stewardship

York Region recognizes the value of teaching residents about the Forest to help them understand its benefits as well as the value of all natural spaces. Residents from many different backgrounds, including families with young children and residents new to Canada and the Region, show an interest in learning more about the Forest and its role in 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.** These seasonal festivals provide a variety of activities and engaging forums to connect people with nature. Visitors can learn about the Forest and its history, and how York Region manages it for future generations, including the use of 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 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 Forest Stewardship and Education Centre, including the Regional Envirothon, Forestry Connects, various training sessions and workshops, school tours and post-secondary field courses.

The Region works to explain how it manages the Forest to increase the environmental and social benefits, including the use of silviculture to restore native ecosystems. It also 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.

3.6 People in the Forest

3.6.1 Patterns of Public Use

In 2017, the Forest received an estimated 600,000 visits. In comparison, it is estimated that in the 1970s, visits totaled about 20,000 a year.

User surveys, including one in 2016 - 2017, have been carried out periodically since the 1970s.

Comparing recent surveys to earlier results shows 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 8 illustrates the top uses in the 2016 - 2017 user survey. Many users listed more than one activity in their response, so the totals add to more than 100 per cent.
- **What people like and dislike about the Forest has been consistent over time.** Suggestions for improvements are surprisingly similar across surveys.
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 about the Forest and information**. 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.

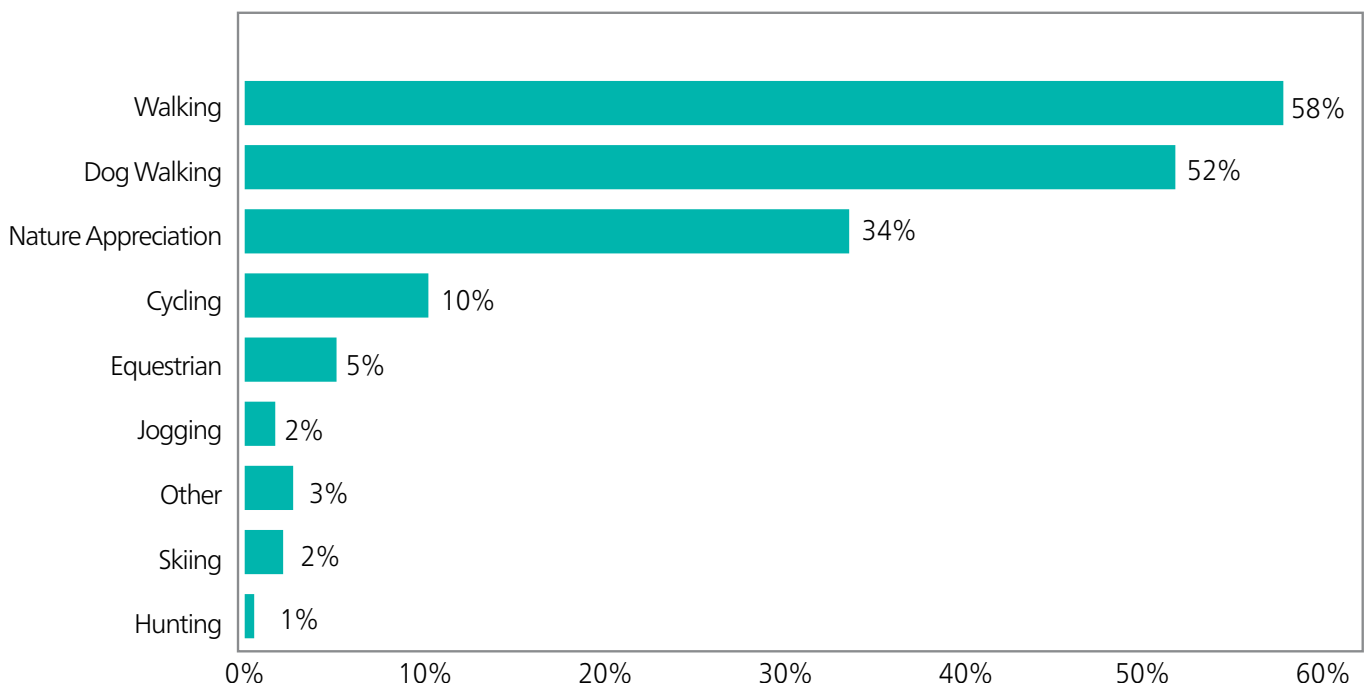


Figure 8. Top Public Uses in 2016-17 Forest User Survey (each respondent could identify multiple activities).

- **Off-leash dogs appear to be an emerging concern.** The forest is not a dog off leash area. However, at present, dogs are only allowed off leash as long as they are “under control” and put on leash near other users. A fenced, leash-free dog area has been provided in the Bendor and Graves tract. No complaints about dogs were recorded in the 1976 or 1993 surveys, but the 2017 online survey included more than 100 comments in favour of leashing dogs at all times.
- **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.
- **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.

Recent survey results also show that Forest usage by York Region residents appears to be closely tied to the proximity of tracts nearby (Figure 9). Table 2 shows the number of Forest tracts by local municipality in the Region, as well as the area of Forest within each municipality. The 2016 - 2017 user survey found that Forest users living in York Region are mostly from Whitchurch-Stouffville, Newmarket, Markham and Georgina.

Table 2. York Regional Forest tract distribution by municipality.

Municipality	Number of Tracts	Area (ha)
East Gwillimbury	3	362
Georgina	4	721
King	2	70
Newmarket	1	8
Whitchurch-Stouffville	13	1,218
Total	23	2,379

The Forest is in many ways relatively easy for visitors to reach. About 65 per cent of visitors live beside or near a Forest tract and generally visit on foot. With 13 parking lots and proximity to major roads, Forest tracts are also convenient to reach by car.

Among those arriving by car, the most frequently used tracts are Eldred King, Hollidge, Bendor and 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. The fourth tract – Brown Hill – offers specialized trails oriented toward mountain biking, which may contribute to its popularity.

The Forest is clearly a specific destination for many users, including many who live outside the Region: the average distance travelled by car to reach a tract was 17 kilometres, with 22 per cent of users travelling 30 kilometres or more. Forest visitors from outside the Region are mainly from Toronto. The 35 per cent of visitors who travelled 10 kilometres or less are likely to have been Regional residents.

LEGEND:

- Urban Area
- York Regional Forest Tract

Where Forest Users Came From:

- 1-11
- 12-38
- 39-78
- 79-202

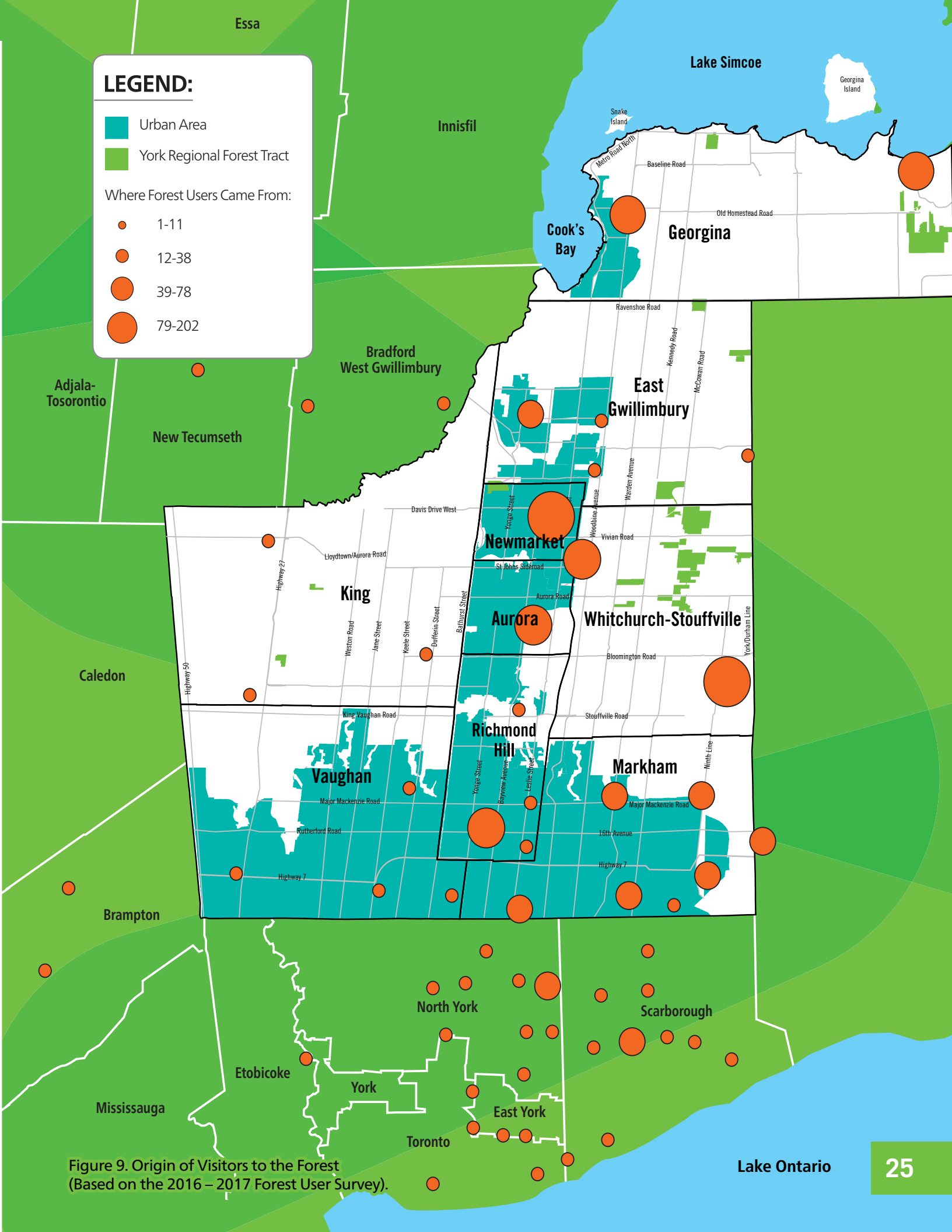


Figure 9. Origin of Visitors to the Forest
(Based on the 2016 – 2017 Forest User Survey).

3.6.2 The Trail System

Close to 150 kilometres of trails allow recreational users to enjoy and explore the Forest. Table 3 shows the distribution of trails by Forest tract. Much of this network was originally established to provide vehicle access to support 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, increasing the risk of damage to the Forest's ecology.

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

The network also includes three accessible trails, in the Hollidge, Hall and North tracts that in total provide 4.3 kilometres of wide trails that have been cleared and graded to allow ease of movement for all visitors (Figure 10). They were designed and constructed to meet requirements of the Accessibility for Ontarians with Disabilities Act 2005, as identified through the Region's own Accessibility Design Guidelines for York Regional Forest Trails. These trails are popular with all users and their design and construction have been recognized as a best practice for accessible trails across Ontario.



Figure 10. Accessible trails are popular with all users.

Table 3: Distribution of trails by Forest Tract.

Tract	Multi-use Trails (km)
Bendor and Graves	9.6
Brown Hill	17.0
Clarke	7.6
Cronsberry	1.5
Dainty	4.1
Davis Drive	5.3
Drysdale Woods	3.4
Eldred King Woodlands	16.5
Godfrey	0.3
Hall	11.6
Happy Valley	2.1
Hollidge	8.5
Metro Road	1.7
Mitchell	1.5
Nobleton	1.1
North	22.2
Patterson	4.2
Pefferlaw	11.9
Peggy's Wood	1.4
Porritt	4.7
Robinson	4.3
Scout	3.1
Zephyr	5.9
Total (km)	149.5


3.6.3 Public Health and Safety

Part of the Region's outreach and education effort – for example, its "Fight the Bite" campaign – is to explain to visitors how to avoid such concerns as poison ivy along trails and the spread of black-legged ticks, which can carry Lyme disease. Another aim is explaining 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.

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. As noted earlier, dead trees are generally left standing in other parts of the Forest because they support biodiversity.

The Region works closely with York Regional Police and Paramedic Services, 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, Regional forestry staff have received formal training in firefighting and the Region has provided local fire departments with forest fire-fighting equipment and developed protocols with them to ensure timely and appropriate response in the event of fire.



I never see
a forest
that does
not bear
a mark or
a sign
of history.

Anselm Kiefer



Figure 11. Regional Forest Advisory Team.

3.6.4 Collaboration and Partnerships

The Regional Forest Advisory Team, the Region's main opportunity for gathering input from the public, is made up of representatives from various Forest user groups and local associations, as well as Regional staff (Figure 11). 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 additional 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

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

3.6.5 A Larger Network of Green Space

The Forest complements the existing fabric of public green spaces around the Region that includes provincial parks, Rouge National Urban Park, local municipal parks, and lands owned by conservation authorities and other conservation organizations. As Table 4 shows, the York Regional Forest and other green spaces together account for almost one-tenth of the Region's land base, providing close to 1,500 hectares of public natural area for every 100,000 residents.

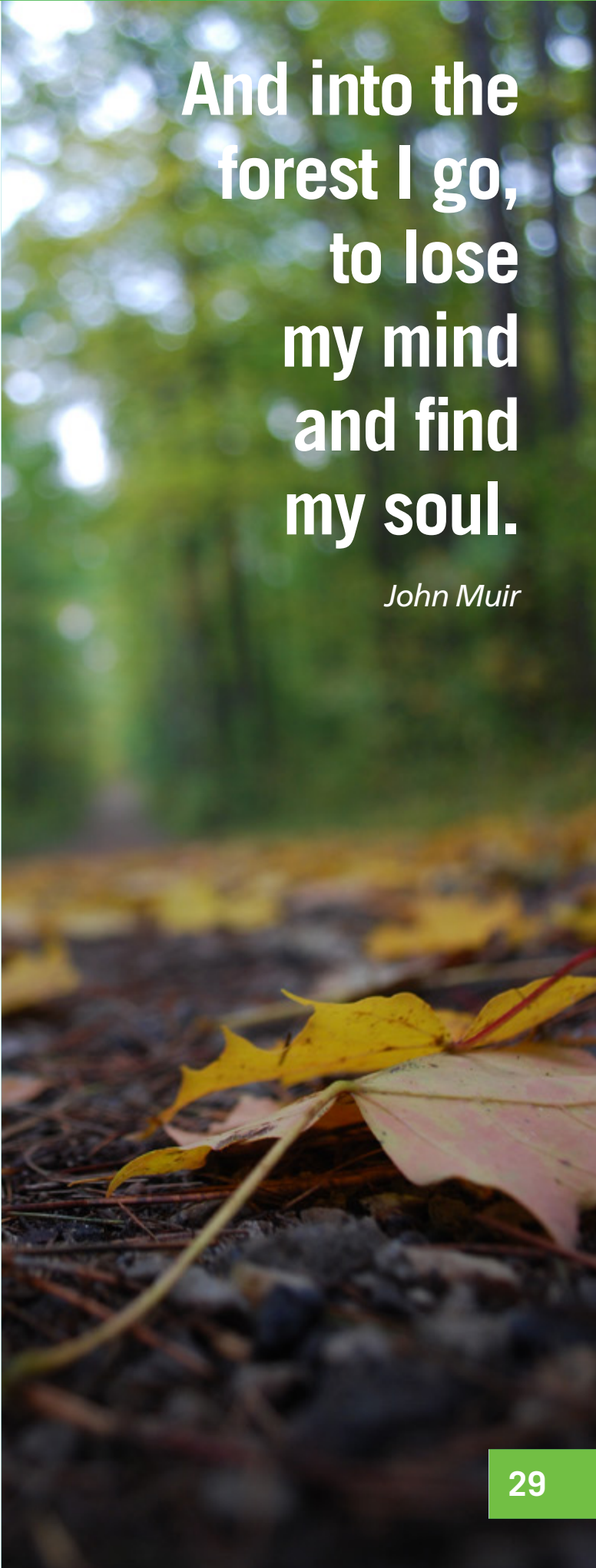
Table 4. Public Green Space in York Region.

Metric	Result
Total Green Space in York Region	16,492 hectares
% of Green Space in York Region*	9.35%
Hectares per 100,000 Population**	1,486 hectares

*Total York Region Land Base: 176,200 hectares

**Total York Region Population: 1,109,909 (Statistics Canada 2017)

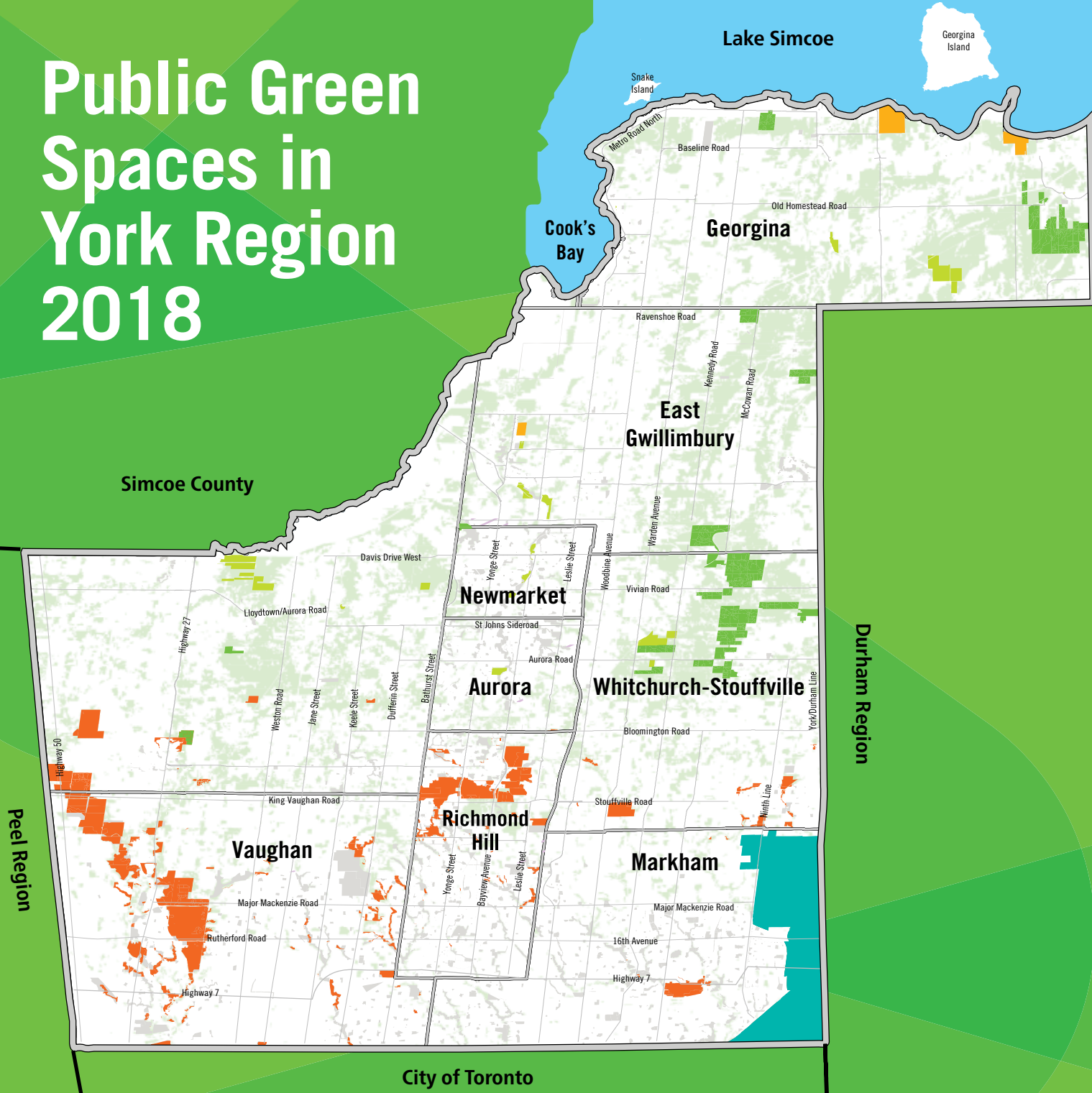
While there are no York Regional Forest tracts in Aurora, Richmond Hill, Markham or Vaughan, the Region has contributed to the acquisition of public green spaces in all municipalities to extend and improve the green space system and broaden the benefits to all residents and their communities (Figure 12).



And into the
forest I go,
to lose
my mind
and find
my soul.

John Muir

Public Green Spaces in York Region 2018



LEGEND:

Government

- Provincial Parks
- York Regional Forest
- Local Municipal Parks and Open Spaces
- Rouge National Urban Park

Conservation Authorities

- LSRCA Conservation Areas
- TRCA Conservation Areas

- Municipal Boundary
- Roads
- Regional Boundary
- Woodland Cover

Figure 12. Public green spaces and natural areas in York Region.

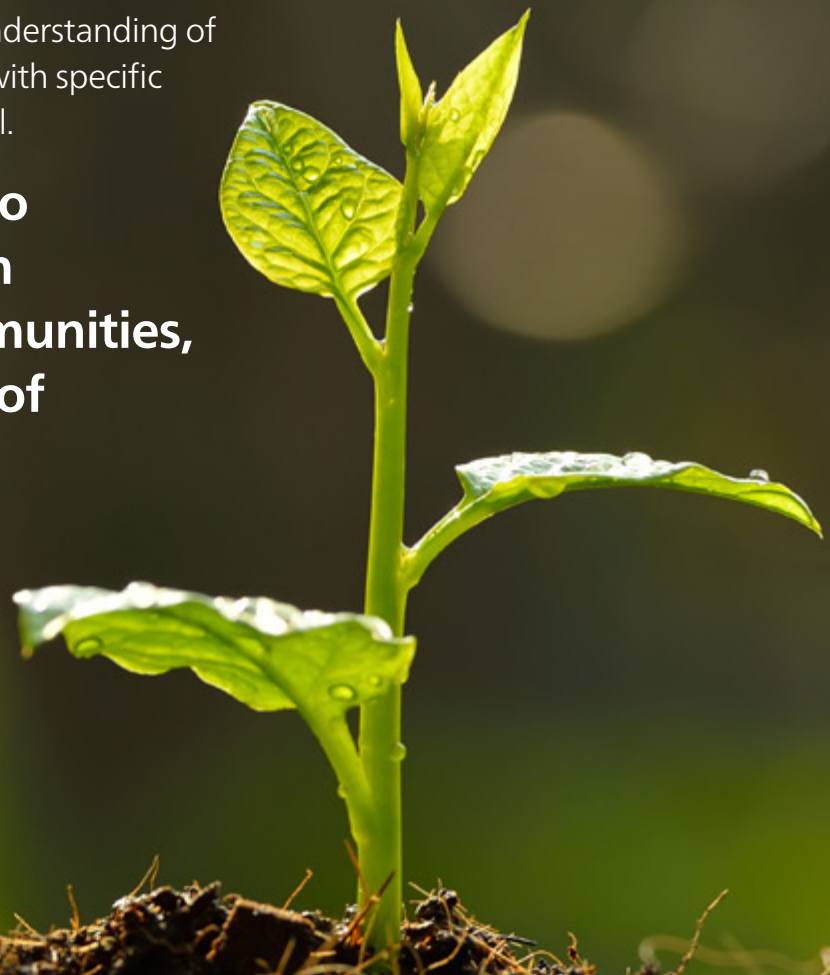
4 Achieving the Vision: The 20-year Plan for the Forest

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 broader benefits, and inspire people – with specific objectives and actions supporting each goal.

York Region will continue to be recognized as a leader in working with nature, communities, and people for the benefit of the Forest.



4.1 Goal 1: Strengthen Ecological Integrity

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

Objectives:

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

4.1.1 Approach to Forest Management

Forest management will be adaptive. The Region will 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, especially in the face of climate change, invasive species and other emerging threats, while continuing to work toward the established vision.

To help ensure continuous improvement in forest management, the Region will carry out pilot projects to compare and evaluate options for such activities as invasive species control and assisted migration of new tree species. Staff will also continue to support scientific research, which might include specific projects targeted at strengthening the ecological integrity of York Regional Forest and other southern Ontario forests.

Management will draw on accumulated knowledge and best practices, and be consistent with Regional policies and plans.

4.1.2 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 already under way. Threats are emerging and some lie entirely in the future. Over the life of this Plan, the Region will need to assess all threats, mitigate them to the extent possible and, where full mitigation is not possible, develop an adaptation strategy.

The impacts of a rapidly changing climate and more extreme weather events are already being felt.

Climate change is expected to continue, bringing generally warmer temperatures but more volatile conditions. This will profoundly change the variety of tree species in the Forest, where they grow, their health and the Forest's structure.

Most species will need to shift northward and to higher elevations to survive, leaving behind areas in which only more southerly species can thrive. Some scientists propose assisting this migration, and another option is focused breeding of tree species to speed adaptation.

The length, frequency, and severity of droughts will likely increase, which could encourage the proliferation of damaging insects by concentrating the sugar in trees' foliage. Wind, rain and ice storms are likely to be more frequent and more intense, resulting in an increase in downed trees and flood risk.

Non-native invasive species of plants, insects and pathogens will place further stress on the forest. Among invasive plants, dog-strangling vine, garlic mustard, and two species of buckthorn are of particular concern. Among insect threats, the emerald ash borer has already done significant damage, while the Asian long-horned beetle and the hemlock woolly adelgid are emerging risks with potentially devastating consequences. As well, fungal diseases threaten a number of species.

Appendix E provides more details on these concerns.

4.1.3 Building on Current Initiatives

The Region will continue to maintain and improve biodiversity based on the native species the Forest can support to create a mosaic of forest and non-forest habitats. This includes encouraging stands of native trees, shrubs and other plants that vary in age and species composition, density and size, and working to address threats. The Plan and standard operating procedures will continue to take into account the recovery of species at risk.

Silvicultural management, including selective thinning, will remain critical as the Region moves towards its vision for the Forest. Thinning not only provides more light and nutrients to native species in the understory, it also gradually removes non-native species that were planted as part of the reforestation effort. This supports the desired conversion to native woodlands.

A key aspect of silviculture management is estimating

a sustainable level of harvesting over the long term. The level is sustainable if it is not greater than the volume of wood the Forest creates over the same period. Appendix C sets out maximum sustainable harvesting levels for this Plan and explains how these were developed.

The Region will continue the use of ecological restoration tools like controlled burns for non-forested habitats. A controlled burn, such as the one carried out successfully in the Bendor and Graves tract in 2018, is essential to these habitats, mimicking the impacts of a natural fire to help preservation and regeneration. 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).

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. Nonetheless, the Region will look at opportunities to secure new land that can add to the Forest's biodiversity and, when such opportunities arise, consider how the new property could best be managed to advance the vision for the Forest.

Staff will also continue to form and leverage partnerships to increase woodland cover, reduce forest fragmentation, and strengthen the links between Forest tracts and other natural heritage areas.

4.1.4 Key Actions

As well as continuing current initiatives, the Region will undertake the following actions in the short and medium term.

Short-term (2019-2023):

1. Assess the vulnerability to climate change and develop an adaptation and mitigation plan
2. Update invasive species inventories, review mitigation practices, and develop an invasive species action plan

Medium-term (2024-2028):

1. Review Legacy Conservation Forests strategy
2. Review science-based silvicultural practices to inform management and operating procedures
3. Develop an information system to capture ecological features, species at risk, invasive species and infrastructure assets

Remember you belong to nature, not it to you.

Grey Owl



4.2 Goal 2: Foster an Understanding of the Broader 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 Forest
2. Ensure the Forest continues to demonstrate leadership through science, innovation and sharing best practices

4.2.1 Maintaining Leadership

At a global level, understanding and measurement of ecosystem services, such as carbon sequestration and storage, conservation of biological diversity, watershed management, soil conservation and recreation, is still at a relatively early stage. For example, when the Forest Stewardship Council started to provide tools in 2018 for forest owners and communities to verify and value these benefits, it was the first certification organization to do so.

Science and practices will continue to evolve considerably over the life of this Plan, and the Region will strive to remain at the forefront of developments. The next two decades will bring conditions that will make it ever more critical to understand and leverage the role of forests in mitigating climate impacts on communities and reducing the stresses of urbanization and habitat loss.

4.2.2 Building on Current Initiatives

Rigorous and evidence-based methods of measuring the Forest's condition and benefits will continue to be essential. This information will feed into updates to the Green Infrastructure Asset Management Plan and the Region's corporate asset management planning, to support the investments needed to keep the Forest healthy and biodiverse so that its environmental and other benefits are maximized.

Staff will also continue to track the return on these investments, which the first Green Infrastructure Asset Management Plan showed to be extremely high. Return on investment can be expected to

increase as the Forest continues to mature and convert to native woodlands and other habitats that increase biodiversity.

The Region will continue working to advance the science and processes used to measure benefits, and will adopt new measurement tools and approaches appropriate to the Forest as these become available. It will remain committed to third-party validation and certification of its forest management practices, and will look to certifying organizations, as well as other authorities, for guidance on global best practices for measuring benefits.

It will also continue to communicate the environmental and social benefits with Regional residents and others. The upcoming 100th anniversary of the Forest will provide an excellent opportunity for the Region to take stock and share knowledge about how the Forest has benefited the people and communities around it and, even more critically, how it will continue to do so into future centuries.

4.2.3 Key Actions

As well as continuing current initiatives, the Region will undertake the following actions in the short and medium term.

Short-term (2019-2023):

1. Develop a comprehensive monitoring framework that includes ecological and social values

Medium-term (2024-2028):

1. Review and refine forest stewardship and education programs to capture the broad benefits of the Regional Forest

Studies have shown that forests improve:

- Air quality
- Water quality and quantity
- Migratory bird habitat
- Carbon sequestration
- Mental health and well-being
- Community cohesion
- Outdoor recreation and physical activity
- Stormwater interception
- Local biological diversity
- Natural shade and UV Ray protection

Studies have shown that forests reduce:

- Risk of developing chronic diseases
- Flood risk
- Urban heat island effect
- Energy consumption
- Climate change
- Airborne pollutants



4.3 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 visitors safe

With a steadily growing population and increasing urbanization, the Region has seen major growth in visits to the 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 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.

4.3.1 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, which is in line with the outlook associated with the Province's Places to Grow Plan, 2017, would 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 growing population with changing 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. 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 the 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 and other green space 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 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 2017), 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 technologies, while pursuits like geocaching reflect a mix of digital technology with more traditional outdoor activity.

4.3.2 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:

- Providing signage for 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 Forest, as well as web-based information
- Publishing trail information on the Region's online mapping tool

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.

I took a walk in the woods and came out taller than the trees.

Henry David Thoreau



(1) Guiding Principles for Decision Making

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.

The Region recognizes that public use of the Forest can contribute to the economy, for example through tourism, and the contribution might increase with certain types of use, such as festivals. 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. Table 5 sets out criteria to help the Region decide whether future public uses are acceptable, and offers ways of mitigating or eliminating the potential impacts. The Region will monitor the usefulness and impacts of these principles and may revise them from time to time.

Table 5. Guiding Principles for Future Public Uses.

Principle	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 there is an increased risk of environmental damage (for example, when the ground is excessively wet, there is insufficient snow cover, and/or soil is likely to be degraded) • Considered by user group size and mitigated through 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, areas, or time periods • Restricted to specific trails
3. The activity must not put Forest users or the Region at an unacceptable level of risk	<p>To mitigate liability risk, the Region might require specific actions or place conditions on the activity/ user group</p>
4. The activity must not result in unreasonable costs to the Region	<p>To mitigate financial impacts, the Region may require that:</p> <ul style="list-style-type: none"> • Fees, either event-specific or annual, be charged for some activities/events to fully or partially offset related costs to the Region • A user group/association enter into a long-term agreement to share costs if their activity would involve a higher-than-normal capital investment and/or ongoing costs to the Region (for example, to create and operate a specialized trail or other facility)

(2) Acceptable and Prohibited Activities

The Region reviewed current Forest uses during the development of the Plan using feedback from public engagement. The acceptable uses and prohibited activities listed in Tables 6 and 7 reflect this review and are correct at time of adoption of this Plan. Should acceptable and/or prohibited activities change, the Region will issue an addendum to the Plan.

Table 6. Current Acceptable Activities in the York Regional Forest.

Activity	Associated Rules, Regulations and/or Conditions
Walking, running, hiking	<ul style="list-style-type: none"> Must remain on official trails and not make new trails
Dog walking	<ul style="list-style-type: none"> Dogs must be under control or on a leash at all times 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Must remain on official trails and not make new trails
Cross-country skiing	<ul style="list-style-type: none"> Must remain on official trails and not make new trails
Snowshoeing	<ul style="list-style-type: none"> Must remain on official trails and not make new trails
Snowmobiling	<ul style="list-style-type: none"> Limited to trails designated by the Ontario Federation of Snowmobile Clubs (OFSC) within the Cronsberry and Pepperlaw tracts and only when trails are open. Operators require a valid OFSC permit
Nature appreciation and wildlife viewing	<ul style="list-style-type: none"> Must remain on official trails and not make new trails
Hunting	<ul style="list-style-type: none"> Permitted in Pepperlaw, Cronsberry, and Metro Road Tracts, Town of Georgina, subject to local bylaws regarding discharge of firearms, Ontario Ministry of Natural Resources and Forestry regulations, and all other applicable provincial and federal legislation
Fishing	<ul style="list-style-type: none"> Subject to Ontario Ministry of Natural Resources and Forestry regulations and all other applicable provincial and federal legislation
Activities by clubs, associations, and for profit organizations	<ul style="list-style-type: none"> Requires a Forest Use Permit
Scientific research	<ul style="list-style-type: none"> Requires a Forest Use Permit
Geocaching	<ul style="list-style-type: none"> Cache locations must be within two metres of trails

Table 7. Current Prohibited Activities in the York Regional Forest.

Activity	Associated Rules, Regulations and/or Conditions
Lighting fires	<ul style="list-style-type: none"> Prohibited
Smoking	<ul style="list-style-type: none"> Prohibited
Cooking or heating devices	<ul style="list-style-type: none"> Prohibited, including barbecues and other portable cooking devices
Littering or Dumping	<ul style="list-style-type: none"> No person shall deposit or dispose of garbage, plant matter, yard waste or other debris
Camping	<ul style="list-style-type: none"> Prohibited
Use of unauthorized vehicles, including ATVs and dirt bikes	<ul style="list-style-type: none"> Prohibited, except snowmobiling as outlined in Table 6 (page 39)
Damaging or removing trees, plants, fungi, or other materials	<ul style="list-style-type: none"> No person shall injure or remove trees or parts of trees (including seeds or cones), plants, mushrooms or other fungi, or other materials No person shall remove firewood
Alcohol consumption	<ul style="list-style-type: none"> Prohibited
Paintballing, airgun, or pellet gun use	<ul style="list-style-type: none"> Prohibited
Fireworks	<ul style="list-style-type: none"> No person shall ignite, discharge or set off fireworks
Encroachment	<ul style="list-style-type: none"> No person shall place materials or place/construct structures, or alter vegetation, or otherwise encroach on the Forest
Property or trail altering or trail creation	<ul style="list-style-type: none"> No person shall alter trails, fences or signs, or construct trails No person shall damage property or facilities
Private Access / Entranceways	<ul style="list-style-type: none"> Unauthorized or new access from private property is prohibited
Operation of unmanned aerial vehicles (drones)	<ul style="list-style-type: none"> Prohibited

Compliance is achieved through education and enforcement including:

- Forest Festivals and Events promoting education and stewardship
- Nature's Classroom education programs
- Regional Forest Advisory Team advocacy
- Legislation (e.g. Trespass to Property Act, Dog Owners Liability Act)
- York Regional Police liaison officer

(3) Forest Use Permits

The Forest is a popular location for a variety of organized activities carried out by non-profit groups and for-profit organizations. Not-for-profit (charitable) organizations hold outdoor events like nature hikes, mountain bike rides and horseback rides, while for-profit (commercial) uses include guided trail tours and movie shoots.

The Region generally welcomes these types of uses, while managing the risks to the Forest and other users by requiring application for a Forest Use Permit. Applicants must submit a completed 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 in 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 relevant fees and charges are as listed below:

1. Not-for-Profit (charitable) organizations:

Forest Use Permit application fee: no charge

2. For-profit (commercial) organizations:

Forest Use Permit Application Fee: \$460.00

- Non-intensive coordinated events/activities:
 - » No additional fee
- Intensive coordinated events/activities (e.g. film production):
 - » Additional \$1,100.00 per day fee

All activities are subject to a review regarding permitted uses, as set out in the Plan.

If the Region deems it necessary for Regional staff to be present during the event/activity, the Forest Use Permit holder must pay the costs incurred by the Region.

Staff may waive the requirement for a permit based on an assessment of the proposed activity.

Larger events may require risk assessments and/or appropriate controls.

In some cases, the Region may choose to enter into a long-term use agreement with a particular organization.

4.3.3 Building on Current Initiatives

The Region constantly reviews public use to ensure a balance between forest protection and the visitor experience. It educates Forest users about etiquette and rules and 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), using such means as the Forest Festivals, Nature's Classroom, other events, social media, and signage. It will continue to work with the Regional Forest Advisory Team as a valuable source of feedback and education for Forest users, and will regularly review the team's Terms of Reference and composition to ensure balance as Forest use evolves.

Providing better access to more areas for visitors to enjoy is an important priority. 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.

4.3.4 New Actions

As well as continuing current initiatives, the Region will undertake the following actions in the short and medium term.

Short-term (2019-2023):

1. Review dog walking practices and options to better balance visitor experience with ecological integrity
2. Develop a visitor experience plan to enhance residents' connections with nature

Medium-term (2024-2028):

1. Develop a trails strategy to guide management of trail infrastructure, support wayfinding and contribute to an exceptional visitor experience

4.4 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)**, the latter of which also set a target for total canopy cover. Because it is made up largely of woodlands, the Forest will contribute to achieving both the woodland cover and total canopy cover targets.

The York Regional Forest is also a key component of the Regional Greenlands System, which recognizes and protects ecologically significant and sensitive areas in the Region.

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)

4.5 Implementation

The Plan will be implemented through a series of successive five-year operating plans, annual work plans, and other Regional programs. Setting out operational activities over a succession of shorter time horizons allows for flexibility as conditions change. Table 8 outlines how the short and medium term actions for each goal are expected to take place during the first ten years.

Comprehensive monitoring of the Forest will help determine if the Region is achieving the Plan's goals and objectives, and assist in fine-tuning the Region's actions. As well, the Region will review the Plan 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.

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 Forest. A plan for a new property might 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).

Table 8: 2019-2023 Actions.

GOAL 1: Strengthen Ecological Integrity	GOAL 2: Foster an Understanding of the Broader Benefits	GOAL 3: Inspire People
SHORT TERM ACTIONS (2019 – 2023)		
<ul style="list-style-type: none"> Assess the vulnerability to climate change and develop an adaption and mitigation plan Update invasive species inventories, review mitigation practices, and develop an invasive species action plan 	<ul style="list-style-type: none"> Develop a comprehensive monitoring framework that includes ecological and social values 	<ul style="list-style-type: none"> Review dog walking practices and options to better balance visitor experience with ecological integrity Develop a visitor experience plan to enhance residents' connections with nature
LONG TERM ACTIONS (2024 – 2028)		
<ul style="list-style-type: none"> Review Legacy Conservation Forests Strategy Review science-based silvicultural practices to inform management and operating procedures Develop an information system to capture ecological features, species at risk, invasive species and infrastructure assets 	<ul style="list-style-type: none"> Review and refine forest stewardship and education programs to capture the broad benefits of the Regional Forest 	<ul style="list-style-type: none"> Develop a trails strategy to guide management of trail infrastructure, support wayfinding and contribute to an exceptional visitor experience

4.6 Monitoring

Monitoring the York Regional Forest and users' experiences helps ensure continuous improvement in existing practices and informs the development of the five-year operating plans.

The Region's means of monitoring include:

- Forest inventories (updated every 10 years)
- Assessment of ecosystem services
- 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)
- Invasive species inventories

Research partners also provide valuable information through their initiatives:

- Identified tree research plots known as Permanent Growth Plots and Permanent Sample Plots (monitored at intervals determined by the researcher)
- Vascular plant surveys
- 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 in Table 8.

In addition to the existing initiatives, the framework will include evaluations carried out to update the Green Infrastructure Asset Management Plan.

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 needs 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.

4.7 The Outcomes

By 2038, it is expected that native woodlands will account for 57 per cent of the land currently occupied by the Forest, a significant increase from the current 50 per cent. By this time, most of the areas reforested between 1924 and 1950 will be well on the way to full conversion to native woodlands, with planted trees no longer dominating the mix of tree species (Figure 13).

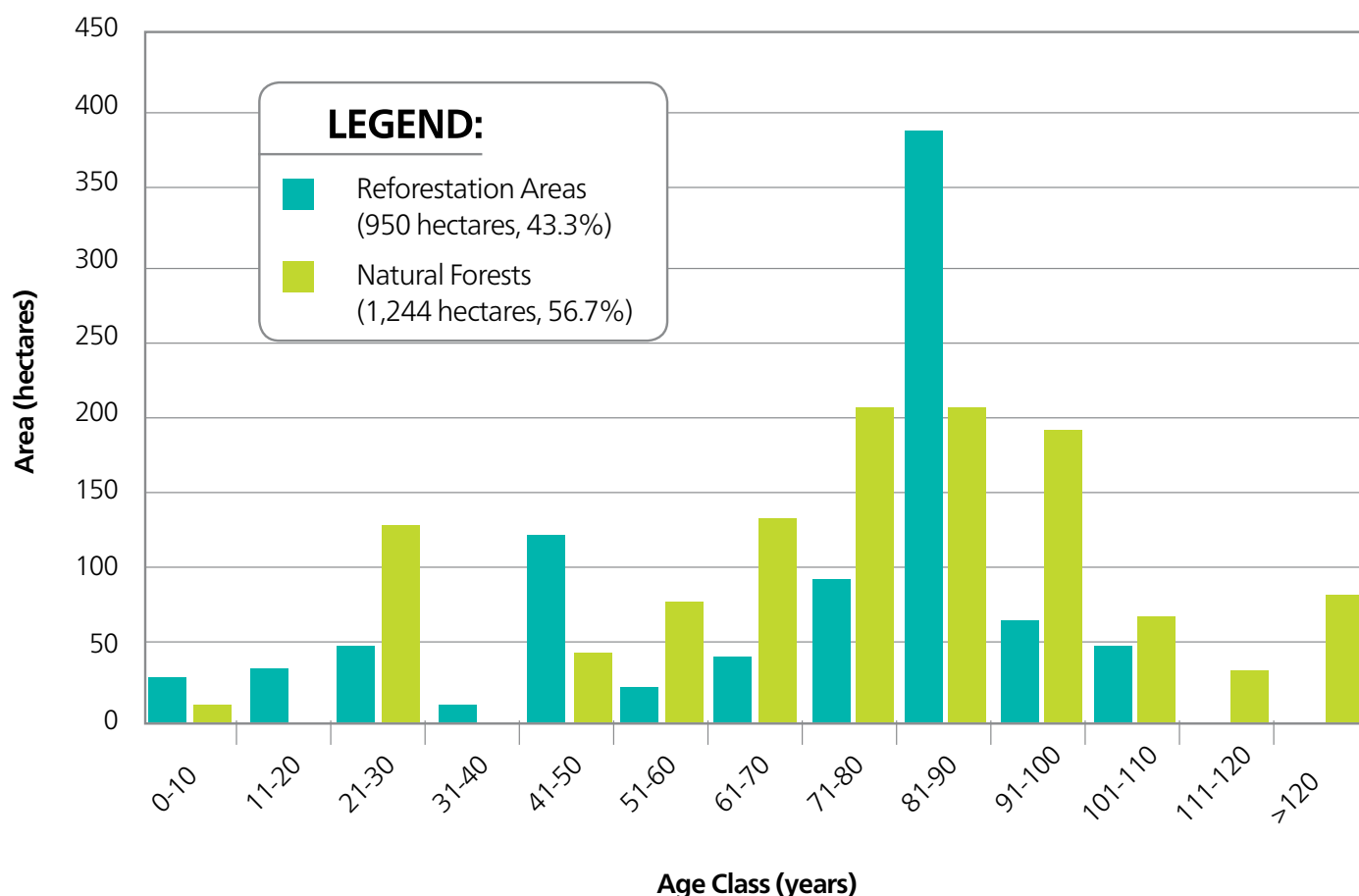


Figure 13. Age class distribution in the York Regional Forest projected to 2038.

Indeed, in some native woodlands that have converted from plantations, very few of the originally planted trees will still be in place. As a result, the age of the woodland will be defined by the relatively young mix of deciduous and other species that will have grown up beneath them. This accounts for the relatively large share of natural forests between the ages of 21 and 30 years in the graph.

The graph also shows that those areas still identifiable as reforested will be dominated by plantings made in the 1950s. While still resembling reforested areas, they will exhibit increased diversity of tree, shrub and plant species as their oldest surviving trees approach the 100-year mark and the native trees beneath them

reach greater maturity.

These changes will be assisted by thinning as part of the Region's silvicultural management, as well as some natural die-off of the trees planted for reforestation, especially in the earliest plantations.

This change in the make-up of the Forest is expected to support a greater biodiversity.

By 2058, the transition will become more obvious. With the large reforested areas planted in the 1950s reaching 100 years of age by that time, native woodlands are expected to occupy 74 per cent of the current area occupied by the Forest. Roughly half of

the native woodlands will be made up of stands over 80 years of age. Stands between 60 and 80 years old will account for about one-sixth, and those less than 60 years of age will comprise the remaining third. Most of the native woodlands less than 60 years old will be young mixed stands growing up under trees originally planted for reforestation that no longer dominate the

stand. The areas still classed as reforested will represent only about 26 per cent of the Forest. The majority – about 60 per cent – will be areas reforested by the Region between 1998 and 2018. The balance will be sites that were reforested earlier with white pine and other conifers and are now converting to mixed white pine-deciduous forest communities (Figure 14).

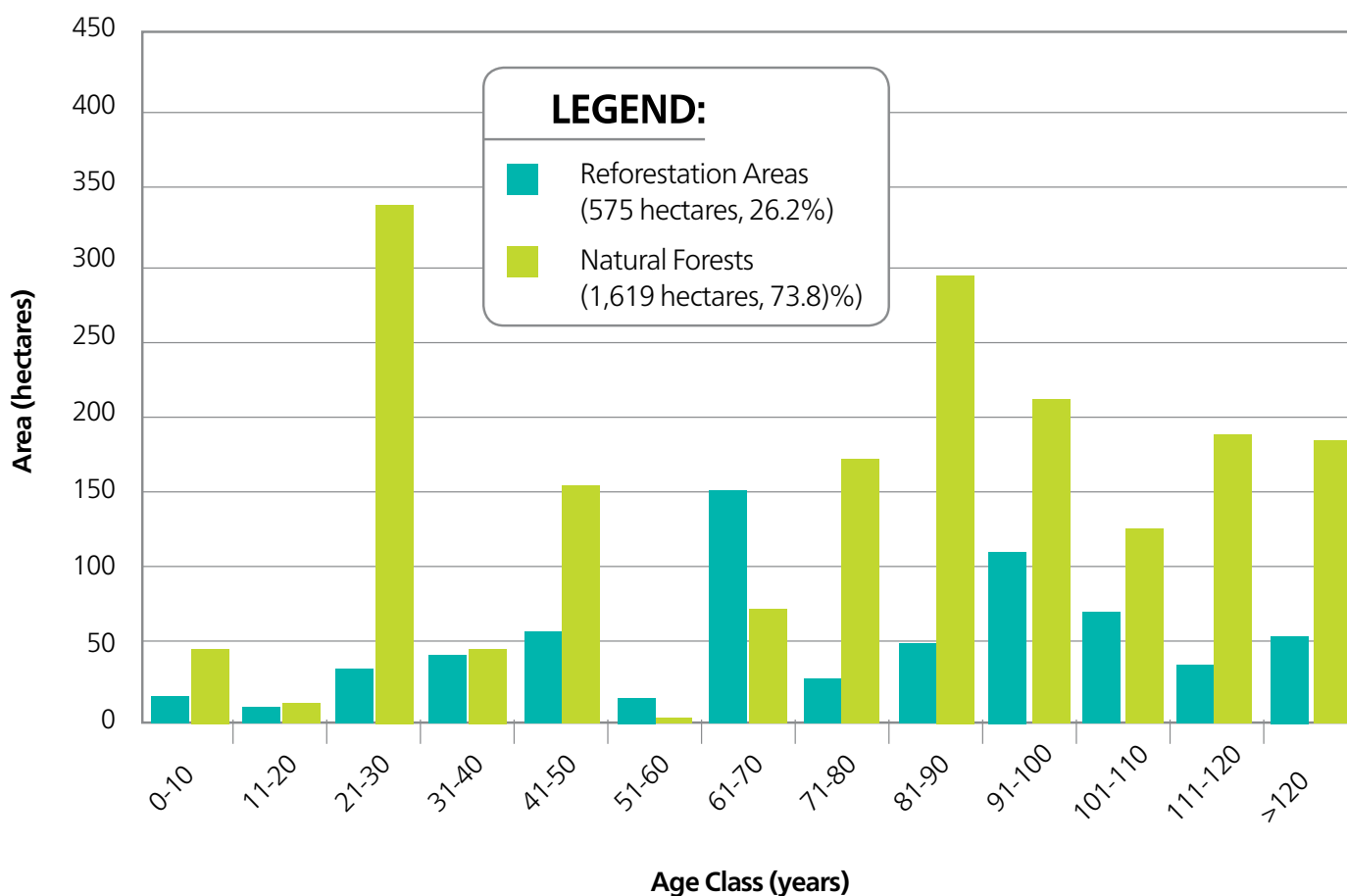


Figure 14. Age class distribution in the York Regional Forest projected to 2058.

The health of the Forest by 2038 is uncertain. Climate change models suggest significant changes in weather patterns and precipitation that may cause serious ecological disruption. It may be necessary to assist the migration of species from more southern areas as more northern species are no longer able to thrive in some areas.

The impacts of climate change may be made worse or more complicated as invasive non-native species of trees, insects and pathogens continue to

challenge the health and viability of native species.

This is why the overarching priority of this Plan is wise and adaptive management of the forest, to build and sustain its health and ecological integrity.

At the same time, public use is expected to continue to increase. This will be driven in large part by growth in the communities around the Forest. The cities in the southern portion will become increasingly densely populated, while the smaller towns and communities in the north, closer to the Forest, will

themselves become larger and more urbanized. As a result, the Forest is likely to be more and more valued as a refuge in a busier and more urban Region.

Through the efforts of the Region, the Forest should also be more recognized and valued for its social and environmental services. In particular, with the climate expected to be less predictable, as well as generally warmer, a healthy Forest will have an important role to play in reducing the impacts on the communities around it.

Advancing ecological integrity, offering green space to Forest users and benefiting surrounding communities – these are challenging and potentially conflicting roles for the Forest.

This Plan seeks to achieve the best possible balance among those roles for both the Forest and the Region. While focusing on the 20 years to 2038, it aims above all to build and nurture the York Regional Forest as an enduring legacy to future generations.



**All good
things are
wild and
free.**

Henry David Thoreau

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 Team whose contributions were invaluable:

Graeme Davis, County of Simcoe

Phil Davies, Lake Simcoe Region Conservation Authority

Mark Stabb, Nature Conservancy of Canada

Ralph Toninger, Toronto and Region Conservation Authority

York Region Legal Services

York Region Environmental Services

Our Regional Forest Advisory Team and key stakeholders played a similarly crucial role in helping to ensure that the Plan reflects the many diverse voices across the Region:

Regional Forest Advisory Team

Canadian Recreational Horse and Rider Association
Durham Mountain Biking Association/York Mountain Biking Association
Forest Education, Nature's Classroom
Georgina Sportsmen Alliance/
Ontario Federation of Anglers and Hunters
Huronian Loggers Association
Local Resident/Forest Neighbour
Oak Ridges Trail Association
Ontario Trail Riders Association
Richmond Hill Naturalists
South Lake Simcoe Naturalists
York Regional Police

Indigenous peoples

Chippewas of Georgina Island
Metis Nation of Ontario -
Toronto and York Metis Council

Key Stakeholders Group

Regional Forest Advisory Team
Technical Advisory Team
Forest Gene Conservation Association
Forests Ontario
York Region District School Board
Mycological Society of Toronto
Oak Ridges Moraine Land Trust
Ontario Woodlot Association
Parks Canada
City of Markham
City of Vaughan
Town of Aurora
Town of Georgina
Town of East Gwillimbury
Township of King
Town of Newmarket
Town of Richmond Hill
Town of Whitchurch-Stouffville
York Region:
Community and Health Services, Accessibility
Corporate Services, Long Range Planning

Community and Health Services, Health Living
Community and Health Services, Seniors Strategy
Environmental Services, Environmental Promotion and Education
Finance, Risk
Office of the CAO, Emergency Management
Transportation Services, Active Transportation

Residents

Forest User Survey
Public Open Houses
Online Feedback

APPENDIX B: Stakeholder Engagement

The goals of the Region's comprehensive engagement process in developing the Plan were to:

- Keep the community informed
- Inform the project team of issues important to residents and other stakeholders
- Ensure community input into the project
- Liaise and build relationships with partners and other key stakeholders
- Listen and confirm residents' knowledge and experience

The approach to engagement was based on guidance from the International Association for Public Participation (IAP2).

Meetings with specific groups were invaluable to the engagement process:

- User Group Workshops involving York Region Forestry staff and the Regional Forest Advisory Team provided an opportunity to engage and discuss issues with individuals deeply involved in the operation and stewardship of the York Regional Forest.
- Key Stakeholder Group Workshops provided additional information and feedback from key users, stakeholders, and interested parties in the use and future management and planning of the York Regional Forest.

- Several meetings with the Technical Advisory Team took place over the course of the project. The purpose was to present progress updates from the project team, and collect and respond to Technical Advisory Team feedback and guidance.

In addition, public open houses provided general information regarding the process, state, and trajectory of the Plan. During these meetings, feedback was collected from attendees and this helped guide discussion as the Plan was developed. Furthermore, for one month, the draft Plan was available online for public comment.

The project team provided facilitation, note-taking, and reporting on every engagement. All feedback received within workshops was recorded and participants were given the opportunity to provide comments before / after each session.

A Forest User Survey and supplemental online survey actively solicited feedback from the public, including those who may have been unable to attend the scheduled meetings. Information collected through these surveys helped the project team assess changes in use, demand, and expectations for the Forest by comparing the results to previous surveys.

Engagement, including the Forest User Survey, took place over a more than two-year period, from October 2016 to November 2018.



Figure B1. Forest management planning and engagement process.

APPENDIX C: Sustainable Timber Harvest Management 2019-2038

This Plan's proposed harvesting levels (Table C1) were established following the approach described in "BOREAL: A tactical planning system for forest ecosystem management" (Puttock et al. 1998).

Table C1. Areas to be harvested by species and five-year operating period.

Forest type	Period 1 (2019-2023)	Period 2 (2024-2028)	Period 3 (2029-2033)	Period 4 (2034-2038)	Total (hectares)
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
Totals (hectares)	270	235	468	205	1,178

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 five-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 C2). The managed forest area of 1,620 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. The totals represent the areas that would be harvested in each five-year period. They vary with the age of different stands in the Forest and will be further assessed as the operating plans are developed.

Table C2. 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
10-20	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
	-	-	-	-	-	-	-	-	184.35	184.35
Total (ha)	731.39	120.31	161.89	84.76	278.90	157.27	483.75	176.81	184.35	2,379.43

Growth Assumptions

Standing timber volume, up to the time of the first thinning, is calculated with Plonski yield tables (1974) using forest community 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 C3 and Figure C1 respectively. After the first thinning, subsequent timber volumes were estimated using growth rates specific to managed forest communities in the York Regional Forest (Table C4).

Table C3. Plonski Yield Tables and Stocking Adjustment Applied to Estimate Timber Volumes Among Forest Types of the York Regional Forest.

Forest type	Yield Table (Plonski 1974)	Stocking Adjustment Factor
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

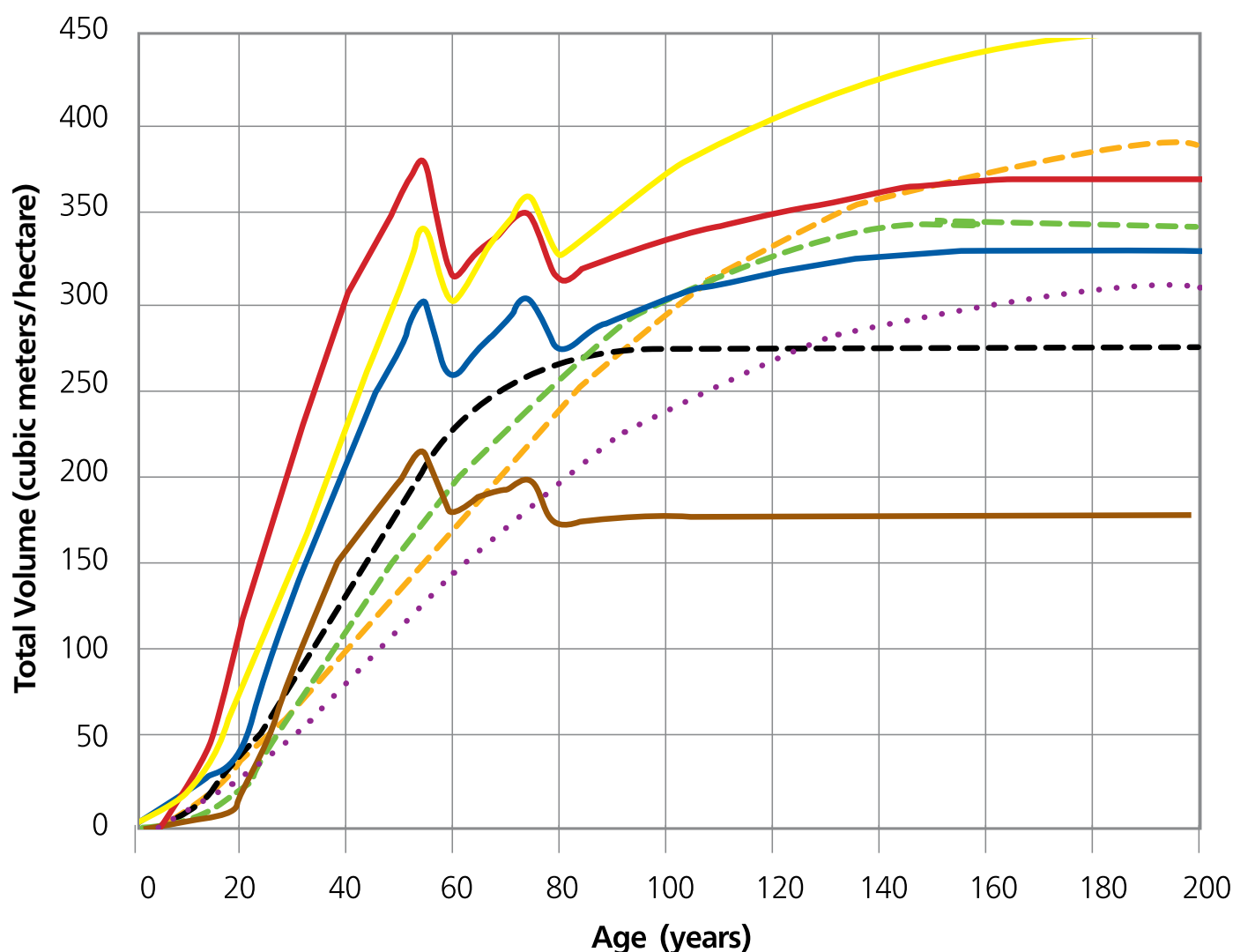


Figure C1. Plonski yield curves relating total volume (m³/ha) with age. In the York Regional Forest, most mature plantations contain 20 per cent of the total standing volume in regenerating hardwoods. Volume curves for plantations have therefore been adjusted by 20 per cent and 30 per cent for compartments 60-80 and 80+ years old respectively to avoid overestimating volumes. Regenerating hardwoods do not contribute to the volume available for harvesting, as such they were removed from the total volume by applying the adjustment factors noted above.

Table C4. Forest growth model assumptions for plantations and natural forest communities in the York Regional Forest. Thinning intensities and growth assumptions are based on silvicultural prescription and inventory data from the York Regional Forest and adhere to stand density management diagrams from the Silvicultural Guide To Managing Southern Ontario Forests (Ministry of Natural Resources 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, and 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 and 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

*Basal area is the area of a given section of land that is occupied by the cross-sectional areas of tree trunks.

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 C5). Silvicultural guidelines for the York Regional Forest are based on Provincial guidelines, 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 (Ministry of Natural Resources 1997, 2000, 2002). 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 C5. Silvicultural guidelines for sustainable forest management in the York Regional Forest.

Forest Community	Desired Future State	Current State
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
		30-100 years. Most plantations are assumed to be converted to natural forests after age 100.
Upland Hardwood, Bottomland Hardwood, Mixedwood	Multi-aged forests with a diversity of species	Basal area <26m ² /ha Model assumes >70 years and basal area > 26m ² /ha. This may vary depending on stand conditions.
Bottomland Conifer	Maintain bottomland conifer forest vegetation	<10 years
		10-70 years
		>70 years
All	Forests freely evolving without invasive species altering development	Invasive species generally absent
		Invasive species present

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

Proposed Treatment *	Indicators of Success	Monitoring Approach	Monitoring Frequency
Mowing / chemical control of competing vegetation	Survival exceeds 80%	Survival assessment and health observation Forest Inventory	Year 1, 2 and 5 10 years
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 $\geq 20\%$ basal area	Forest inventory	10 years
Monitor. However, silvicultural treatments may be required to improve regeneration or tree health. 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.	Trees of different ages, sizes and species are present	Forest inventory	10 years
Mowing / chemical control of competing vegetation	Survival exceeds 90%	Survival assessment Forest inventory	Year 1, 2 and 5 10 years
Monitor only	Coniferous trees are dominant	Forest inventory	10 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 York Regional Forest.			
Implement other silvicultural activities as necessary	Invasive species do not significantly impact the desired future forest state (e.g. regeneration is adequate even though invasive species are present)	Monitor	10-years during the forest inventory update
Integrate control treatments with other silvicultural management as necessary			

APPENDIX D: Wildlife and Plant Species Observed in the York Regional Forest

Wildlife Species

Species	Scientific Names
Alder flycatcher	<i>Empidonax alnorum</i>
American crow	<i>Corvus brachyrhynchos</i>
American goldfinch.....	<i>Spinus tristis</i>
American kestrel	<i>Falco sparverius</i>
American redstart.....	<i>Setophaga ruticilla</i>
American robin.....	<i>Turdus migratorius</i>
American toad.....	<i>Anaxyrus americanus</i>
American tree sparrow.....	<i>Spizella arborea</i>
American woodcock.....	<i>Scolopax minor</i>
Baltimore oriole.....	<i>Icterus galbula</i>
Bank swallow*	<i>Riparia riparia</i>
Barn swallow*	<i>Hirundo rustica</i>
Barred owl.....	<i>Strix varia</i>
Bay-breasted warbler	<i>Setophaga castanea</i>
Belted kingfisher.....	<i>Ceryle alcyon</i>
Black-and-white warbler.....	<i>Mniotilta varia</i>
Black-backed woodpecker.....	<i>Picoides arcticus</i>
Black-billed cuckoo	<i>Coccyzuserythrophthalmus</i>
Blackburnian warbler.....	<i>Setophaga fusca</i>
Blackpoll warbler	<i>Setophaga striata</i>
Black-throated blue warbler	<i>Setophaga caerulescens</i>
Black-throated green warbler	<i>Setophaga virens</i>
Blue jay	<i>Cyanocitta cristata</i>
Blue-gray gnatcatcher.....	<i>Polioptila caerulea</i>
Blue-headed vireo	<i>Vireo solitarius</i>
Blue-spotted salamander	<i>Ambystoma laterale</i>
Blue-winged warbler	<i>Vermivora cyanoptera</i>
Bobolink*	<i>Dolichonyx oryzivorus</i>
Bohemian waxwing.....	<i>Bombycilla garrulus</i>
Broad-winged hawk	<i>Buteo platypterus</i>
Brown creeper	<i>Certhia americana</i>
Brown thrasher.....	<i>Toxostoma rufum</i>
Brown-headed cowbird.....	<i>Molothrus ater</i>

Species	Scientific Names
Canada goose	<i>Branta canadensis</i>
Cape may warbler	<i>Setophaga tigrina</i>
Cedar waxwing	<i>Bombycilla cedrorum</i>
Chestnut-sided warbler	<i>Setophaga pensylvanica</i>
Chipping sparrow	<i>Spizella passerina</i>
Clay-colored sparrow	<i>Spizella pallida</i>
Cliff swallow.....	<i>Petrochelidon pyrrhonota</i>
Common grackle.....	<i>Quiscalus quiscula</i>
Common loon.....	<i>Gavia immer</i>
Common nighthawk*	<i>Chordeiles minor</i>
Common redpoll	<i>Acanthis flammea</i>
Common yellowthroat.....	<i>Geothlypis trichas</i>
Cooper's hawk.....	<i>Accipiter cooperii</i>
Dark-eyed junco.....	<i>Junco hyemalis</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Downy woodpecker	<i>Picoides pubescens</i>
Eastern bluebird.....	<i>Sialia sialis</i>
Eastern chipmunk.....	<i>Tamias striatus</i>
Eastern cottontail.....	<i>Sylvilagus floridanus</i>
Eastern coyote	<i>Canis latrans</i>
Eastern gray squirrel.....	<i>Sciurus carolinensis</i>
Eastern kingbird.....	<i>Tyrannus tyrannus</i>
Eastern meadowlark*	<i>Sturnella magna</i>
Eastern newt.....	<i>Notophthalmus viridescens</i>
Eastern phoebe	<i>Sayornis phoebe</i>
Eastern red-backed salamander	<i>Plethron cinereus</i>
Eastern screech-owl	<i>Megascops asio</i>
Eastern tailed-blue	<i>Cupido comyntas</i>
Eastern tailed-blue butterfly	<i>Everes comyntas</i>
Eastern towhee	<i>Pipilo erythrophthalmus</i>
Eastern whip-poor-will*	<i>Antrostomus vociferus</i>
Eastern wood-pewee*	<i>Contopus virens</i>
European starling	<i>Sturnus vulgaris</i>

* Species at Risk classified as either as Species of Special Concern, Threatened, or Endangered under Ontario's Endangered Species Act, 2007, S.O. 2007 c.6

Species	Scientific Names
Evening grosbeak	<i>Coccothraustes vespertinus</i>
Field sparrow	<i>Spizella pusilla</i>
Fox sparrow	<i>Passerella iliaca</i>
Golden-crowned kinglet.....	<i>Regulus satrapa</i>
Golden-winged warbler*	<i>Vermivora chrysoptera</i>
Grasshopper sparrow*	<i>Ammodramus savannarum</i>
Gray catbird.....	<i>Dumetella carolinensis</i>
Gray treefrog.....	<i>Hyla versicolor</i>
Great blue heron.....	<i>Ardea herodias</i>
Great crested flycatcher	<i>Myiarchus crinitus</i>
Great horned owl.....	<i>Bubo virginianus</i>
Green frog	<i>Lithobates clamitans</i>
Green heron.....	<i>Butorides virescens</i>
Green-winged teal	<i>Anas crecca</i>
Groundhog.....	<i>Marmota monax</i>
Hairy woodpecker	<i>Picoides villosus</i>
Hermit thrush	<i>Catharus guttatus</i>
Herring gull	<i>Larus argentatus</i>
Hoary redpoll.....	<i>Acanthis hornemanni</i>
Hooded merganser	<i>Lophodytes cucullatus</i>
Horned lark	<i>Eremophila alpestris</i>
House finch.....	<i>Haemorhous mexicanus</i>
House sparrow	<i>Passer domesticus</i>
House wren.....	<i>Troglodytes aedon</i>
Indigo bunting.....	<i>Passerina cyanea</i>
Jefferson Salamander*	<i>Ambystoma jeffersonianum</i>
Killdeer	<i>Charadrius vociferus</i>
Least flycatcher.....	<i>Empidonax minimus</i>
Lesser yellowlegs	<i>Tringa flavipes</i>
Lincoln's sparrow	<i>Melospiza lincolni</i>
Magnolia warbler.....	<i>Setophaga magnolia</i>
Mallard	<i>Anas platyrhynchos</i>
Marsh wren.....	<i>Cistothorus palustris</i>

Species	Scientific Names
Masked shrew	<i>Sorex cinereus</i>
Meadow vole	<i>Microtus pennsylvanicus</i>
Merlin.....	<i>Falco columbarius</i>
Mourning dove	<i>Zenaida macroura</i>
Mourning warbler	<i>Geothlypis philadelphia</i>
Muskrat	<i>Ondatra zibethicus</i>
Nashville warbler	<i>Oreothlypis ruficapilla</i>
Northern cardinal.....	<i>Cardinalis cardinalis</i>
Northern flicker	<i>Colaptes auratus</i>
Northern harrier	<i>Circus hudsonius</i>
Northern leopard frog.....	<i>Lithobates pipiens</i>
Northern parula	<i>Setophaga americana</i>
Northern raccoon.....	<i>Procyon lotor</i>
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
Northern saw-whet owl	<i>Aegolius acadicus</i>
Northern shrike	<i>Lanius borealis</i>
Northern waterthrush.....	<i>Parkesia noveboracensis</i>
Nothorn goshawk.....	<i>Accipiter gentilis</i>
Olive-sided flycatcher*	<i>Contopus cooperi</i>
Orchard oriole.....	<i>Icterus spurius</i>
Osprey.....	<i>Pandion haliaetus</i>
Ovenbird.....	<i>Seiurus aurocapilla</i>
Palm warbler	<i>Setophaga palmarum</i>
Philadelphia vireo.....	<i>Vireo philadelphicus</i>
Pileated woodpecker	<i>Dryocopus pileatus</i>
Pine grosbeak.....	<i>Pinicola enucleator</i>
Pine siskin.....	<i>Spinus pinus</i>
Pine warbler.....	<i>Setophaga pinus</i>
Purple finch	<i>Haemorhous purpureus</i>
Pygmy shrew	<i>Sorex hoyi</i>
Raven	<i>Corvus corax</i>
Red crossbill	<i>Loxia curvirostra</i>
Red fox.....	<i>Vulpes vulpes</i>

* Species at Risk classified as either as Species of Special Concern, Threatened, or Endangered under Ontario's Endangered Species Act, 2007, S.O. 2007 c.6

Wildlife Species

Species	Scientific Names
Red squirrel.....	<i>Tamiasciurus hudsonicus</i>
Red-bellied woodpecker.....	<i>Melanerpes carolinus</i>
Red-breasted nuthatch.....	<i>Sitta canadensis</i>
Red-eyed vireo.....	<i>Vireo olivaceus</i>
Red-shouldered hawk.....	<i>Buteo lineatus</i>
Red-tailed hawk.....	<i>Buteo jamaicensis</i>
Red-winged blackbird.....	<i>Agelaius phoeniceus</i>
Ring-billed gull.....	<i>Larus delawarensis</i>
Ring-necked pheasant.....	<i>Phasianus colchicus</i>
Rock pigeon.....	<i>Columba livia</i>
Rose-breasted grosbeak.....	<i>Pheucticus ludovicianus</i>
Rough-legged hawk.....	<i>Buteo lagopus</i>
Ruby-crowned kinglet.....	<i>Regulus calendula</i>
Ruby-throated hummingbird.....	<i>Archilochus colubris</i>
Ruffed grouse.....	<i>Bonasa umbellus</i>
Rusty blackbird*	<i>Euphagus carolinus</i>
Savannah sparrow.....	<i>Passerculus sandwichensis</i>
Scarlet tanager.....	<i>Piranga olivacea</i>
Sedge wren.....	<i>Cistothorus platensis</i>
Sharp-shinned hawk.....	<i>Accipiter striatus</i>
Short-tailed shrew.....	<i>Blarina brevicauda</i>
Short-tailed weasel.....	<i>Mustela erminea</i>
Snapping turtle*	<i>Chelydra serpentina</i>
Snow bunting.....	<i>Plectrophenax nivalis</i>
Solitary sandpiper.....	<i>Tringa solitaria</i>
Song sparrow.....	<i>Melospiza melodia</i>
Spotted sandpiper.....	<i>Actitis macularia</i>
Spring peeper.....	<i>Pseudacris crucifer</i>
Striped skunk.....	<i>Mephitis mephitis</i>
Swainson's thrush.....	<i>Catharus ustulatus</i>
Swamp sparrow.....	<i>Melospiza georgiana</i>
Tennessee warbler.....	<i>Oreothlypis peregrina</i>
Tree swallow.....	<i>Tachycineta bicolor</i>
Trumpeter swan.....	<i>Cygnus buccinator</i>
Tundra swan.....	<i>Cygnus columbianus</i>

Species	Scientific Names
Turkey vulture.....	<i>Cathartes aura</i>
Upland sandpiper.....	<i>Bartramia longicauda</i>
Veery.....	<i>Catharus fuscescens</i>
Vesper sparrow.....	<i>Pooecetes gramineus</i>
Virginia rail.....	<i>Rallus limicola</i>
Warbling vireo.....	<i>Vireo gilvus</i>
White tailed deer.....	<i>Odocoileus virginianus</i>
White-breasted nuthatch.....	<i>Sitta carolinensis</i>
White-crowned sparrow.....	<i>Zonotrichia leucophrys</i>
White-throated sparrow.....	<i>Zonotrichia albicollis</i>
White-winged crossbill.....	<i>Loxia leucoptera</i>
Wild turkey.....	<i>Meleagris gallopavo</i>
Wilson's warbler.....	<i>Cardellina pusilla</i>
Winter wren.....	<i>Troglodytes hiemalis</i>
Wood duck.....	<i>Aix sponsa</i>
Wood frog.....	<i>Rana sylvatica</i>
Wood thrush*	<i>Hylocichla mustelina</i>
Yellow warbler.....	<i>Setophaga petechia</i>
Yellow-bellied flycatcher.....	<i>Empidonax flaviventris</i>
Yellow-bellied sapsucker.....	<i>Sphyrapicus varius</i>
Yellow-rumped warbler.....	<i>Setophaga coronata</i>
Yellow-throated vireo.....	<i>Vireo flavifrons</i>

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Species	Scientific Names
A st. john's-wort.....	<i>Hypericum perforatum</i>
Alderleaf buckthorn.....	<i>Rhamnus alnifolia</i>
Alfalfa.....	<i>Medicago sativa</i>
Allegheny blackberry.....	<i>Rubus allegheniensis</i>
Alpine rush.....	<i>Juncus alpinoarticulatus</i>
Alsike clover.....	<i>Trifolium hybridum</i>
Alternate-leaved dogwood.....	<i>Cornus alternifolia</i>
American basswood.....	<i>Tilia americana</i>
American beech.....	<i>Fagus grandifolia</i>
American bugleweed.....	<i>Lycopus americanus</i>
American elm.....	<i>Ulmus americana</i>
American fly-honeysuckle.....	<i>Lonicera canadensis</i>
American ginseng*	<i>Panax quinquefolis</i>
American golden-saxifrage.....	<i>Chrysosplenium americanum</i>
American hog-peanut.....	<i>Amphicarpaea bracteata</i>
American hornbeam.....	<i>Carpinus caroliniana ssp.</i> <i>virginiana</i>
American larch.....	<i>Larix laricina</i>
American mountain-ash.....	<i>Sorbus americana</i>
American speedwell.....	<i>Veronica americana</i>
American water-pennywort.....	<i>Hydrocotyle americana</i>
Annual ragweed (common ragweed).....	<i>Ambrosia artemisiifolia</i>
Apple.....	<i>Malus</i>
Autumn olive.....	<i>Elaeagnus umbellata</i>
Awnless brome.....	<i>Bromus inermis</i>
Back's sedge.....	<i>Carex backii</i>
Balsam fir.....	<i>Abies balsamea</i>
Balsam poplar.....	<i>Populus balsamifera</i>
Basswood.....	<i>Tilia</i>
Beaked hazelnut.....	<i>Corylus cornuta</i>
Beaked sedge.....	<i>Carex utriculata</i>
Bearded shorthusk.....	<i>Brachyelytrum erectum</i>
Bebb's sedge.....	<i>Carex bebbii</i>
Bebb's willow.....	<i>Salix bebbiana</i>
Beech.....	<i>Fagus</i>

Species	Scientific Names
Beechdrops.....	<i>Epifagus virginiana</i>
Bell's honeysuckle.....	<i>Lonicera xbella</i>
Bird's-foot trefoil.....	<i>Lotus corniculatus</i>
Bitternut hickory.....	<i>Carya cordiformis</i>
Black ash.....	<i>Fraxinus nigra</i>
Black cherry.....	<i>Prunus serotina</i>
Black chokeberry.....	<i>Aronia melanocarpa</i>
Black holly.....	<i>Ilex verticillata</i>
Black locust.....	<i>Robinia pseudoacacia</i>
Black medic.....	<i>Medicago lupulina</i>
Black raspberry.....	<i>Rubus occidentalis</i>
Black sedge.....	<i>Carex arctata</i>
Black spruce.....	<i>Picea mariana</i>
Black walnut.....	<i>Juglans nigra</i>
Black-fruited mountain-rice.....	<i>Piptatherum racemosum</i>
Bloodroot.....	<i>Sanguinaria canadensis</i>
Blue beech.....	<i>Carpinus caroliniana</i>
Blue cohosh.....	<i>Caulophyllum thalictroides</i>
Blue spruce.....	<i>Picea pungens</i>
Blue vervain.....	<i>Verbena hastata</i>
Bluebead lily.....	<i>Clintonia borealis</i>
Blueflag.....	<i>Iris versicolor</i>
Blue-joint reedgrass.....	<i>Calamagrostis canadensis</i>
Blue-stem goldenrod.....	<i>Solidago caesia</i>
Blunt broom sedge.....	<i>Carex tribuloides</i>
Blunt spike-rush.....	<i>Eleocharis obtusa</i>
Bog birch.....	<i>Betula pumila</i>
Bog goldenrod.....	<i>Solidago uliginosa</i>
Boreal bog sedge.....	<i>Carex magellanica</i>
Boreal mannagrass.....	<i>Glyceria borealis</i>
Bracken fern.....	<i>Pteridium aquilinum</i>
Bristle-stalked sedge.....	<i>Carex leptalea</i>
Bristly black currant.....	<i>Ribes lacustre</i>
Bristly buttercup.....	<i>Ranunculus hispidus</i>
Bristly dewberry.....	<i>Rubus hispidus</i>

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Plant Species

Species	Scientific Names
Bristly sedge.....	<i>Carex comosa</i>
Broad loose-flowered sedge	<i>Carex laxiflora</i>
Broad-leaved cattail	<i>Typha latifolia</i>
Broad-leaved goldenrod	<i>Solidago flexicaulis</i>
Broad-leaved water-plantain (common water-plantain).....	<i>Alisma triviale</i>
Brownish sedge	<i>Carex brunnescens</i>
Brown-seed dandelion	<i>Taraxacum officinale</i>
Buckthorn.....	<i>Rhamnus cathartica</i>
Bulb-bearing water-hemlock.....	<i>Cicuta bulbifera</i>
Bulblet fern.....	<i>Cystopteris bulbifera</i>
Bulbous bitter-cress.....	<i>Cardamine bulbosa</i>
Bull thistle.....	<i>Cirsium vulgare</i>
Bunchberry.....	<i>Cornus canadensis</i>
Bur oak.....	<i>Quercus macrocarpa</i>
Burreed sedge.....	<i>Carex sparaganioides</i>
Bush honeysuckle.....	<i>Diervilla lonicera</i>
Butternut*	<i>Juglans cinerea</i>
Calico aster.....	<i>Symphotrichum</i> <i>lateriflorum</i> var. <i>lateriflorum</i>
Canada anemone.....	<i>Anemone canadensis</i>
Canada bluegrass.....	<i>Poa compressa</i>
Canada clearweed	<i>Pilea pumila</i>
Canada enchanter's nightshade.....	<i>Circaea lutetiana</i> <i>ssp. canadensis</i>
Canada goldenrod.....	<i>Solidago canadensis</i> <i>var. canadensis</i>
Canada lettuce	<i>Lactuca canadensis</i>
Canada moonseed.....	<i>Menispermum canadense</i>
Canada violet.....	<i>Viola canadensis</i>
Canada wild-ginger	<i>Asarum canadense</i>
Canadian yew	<i>Taxus canadensis</i>
Cardinalflower.....	<i>Lobelia cardinalis</i>
Carolina spring beauty.....	<i>Claytonia caroliniana</i>
Catherinettes berry.....	<i>Rubus pubescens</i>

Species	Scientific Names
Checkered rattlesnake-plantain.....	<i>Goodyera tessellata</i>
Chicory	<i>Cichorium intybus</i>
Choke cherry	<i>Prunus virginiana</i>
Christmas fern	<i>Polystichum acrostichoides</i>
Cinnamon fern	<i>Osmunda cinnamomea</i>
Clammy ground cherry	<i>Physalis heterophylla</i>
Cleavers	<i>Galium aparine</i>
Climbing bittersweet.....	<i>Celastrus scandens</i>
Climbing nightshade.....	<i>Solanum dulcamara</i>
Clinton's wood fern	<i>Dryopteris clintoniana</i>
Closed bottle gentian.....	<i>Gentiana andrewsii</i>
Coltsfoot.....	<i>Tussilago farfara</i>
Columbian watermeal.....	<i>Wolffia columbiana</i>
Common apple	<i>Malus pumila</i>
Common boneset.....	<i>Eupatorium perfoliatum</i>
Common crown-vetch	<i>Securigera varia</i>
Common elderberry.....	<i>Sambucus nigra</i> ssp. <i>canadensis</i>
Common evening-primrose	<i>Oenothera biennis</i>
Common goatsbeard (bride's feather).....	<i>Aruncus dioicus</i>
Common labrador tea	<i>Rhododendron</i> <i>groenlandicum</i>
Common motherwort.....	<i>Leonurus cardiaca</i>
Common pipsissewa.....	<i>Chimaphila umbellata</i>
Common red raspberry.....	<i>Rubus idaeus</i> ssp. <i>idaeus</i>
Common viper's-bugloss	<i>Echium vulgare</i>
Common wood-sorrel.....	<i>Oxalis acetosella</i>
Common yarrow	<i>Achillea millefolium</i> <i>ssp. millefolium</i>
Corn mint.....	<i>Mentha arvensis</i>
Cottongrass bulrush	<i>Scirpus cyperinus</i>
Crack willow.....	<i>Salix fragilis</i>
Cranberry viburnum	<i>Viburnum opulus</i>
Creeping snowberry.....	<i>Gaultheria hispida</i>

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Species	Scientific Names
Creeping spike-rush	<i>Eleocharis smallii</i>
Creeping thistle	<i>Cirsium arvense</i>
Crested wood fern	<i>Dryopteris cristata</i>
Curly dock.....	<i>Rumex crispus</i>
Cut-leaf toothwort	<i>Cardamine concatenata</i>
Cyperus-like sedge	<i>Carex pseudo-cyperus</i>
Dame's rocket.....	<i>Hesperis matronalis</i>
Ditch-stonecrop.....	<i>Penthorum sedoides</i>
Downy solomon's seal.....	<i>Polygonatum pubescens</i>
Downy willowherb	<i>Epilobium strictum</i>
Downy yellow violet.....	<i>Viola pubescens</i> <i>var pubescens</i>
Drooping woodreed.....	<i>Cinna latifolia</i>
Dudley's rush.....	<i>Juncus dudleyi</i>
Dutchman's breeches.....	<i>Dicentra cucullaria</i>
Dwarf scouring rush	<i>Equisetum scirpoides</i>
Early goldenrod.....	<i>Solidago juncea</i>
Early meadow-rue	<i>Thalictrum dioicum</i>
Eastern cottonwood	<i>Populus deltoides ssp.</i> <i>deltoides</i>
Eastern hemlock	<i>Tsuga canadensis</i>
Eastern leatherwood.....	<i>Dirca palustris</i>
Eastern mannagrass	<i>Glyceria septentrionalis</i>
Eastern red cedar.....	<i>Juniperus virginiana</i>
Eastern riverbank wildrye	<i>Elymus riparius</i>
Eastern white cedar.....	<i>Thuja occidentalis</i>
Eastern white pine.....	<i>Pinus strobus</i>
Elecampane flower	<i>Inula helenium</i>
English plantain	<i>Plantago lanceolata</i>
European common reed.....	<i>Phragmites australis</i> <i>ssp. australis</i>
European larch	<i>larix decidua</i>
European lily-of-the-valley	<i>Convallaria majalis</i>
European mountain-ash	<i>Sorbus aucuparia</i>
European reed.....	<i>Phragmites australis</i>

Species	Scientific Names
European swallow-wort.....	<i>Cynanchum rossicum</i>
False beech-drops.....	<i>Monotropa hypopithys</i>
False nettle.....	<i>Boehmeria cylindrica</i>
False solomon's seal	<i>Maianthemum racemosum</i> <i>ssp. racemosum</i>
Field basil	<i>Clinopodium vulgare</i>
Field bindweed	<i>Convolvulus arvensis</i>
Field horsetail	<i>Equisetum arvense</i>
Fireweed.....	<i>Epilobium angustifolium</i>
Flatstem pondweed.....	<i>Potamogeton zosteriformis</i>
Flat-top white aster	<i>Doellingeria umbellata</i>
Fleabane.....	<i>Conyza canadensis</i>
Fowl bluegrass	<i>Poa palustris</i>
Fowl manna grass	<i>Glyceria striata</i>
Fox sedge	<i>Carex vulpinoidea</i>
Foxglove beardtongue.....	<i>Penstemon digitalis</i>
Fragrant water-lily	<i>Nymphaea odorata</i>
Fraser fir.....	<i>Abies fraseri</i>
Fraser's st. john's-wort.....	<i>Triadenum fraseri</i>
Fringed black bindweed.....	<i>Fallopia cilinodis</i>
Fringed brome.....	<i>Bromus ciliatus</i>
Fringed gentian.....	<i>Gentianopsis crinita</i>
Fringed loosestrife	<i>Lysimachia ciliata</i>
Fringed polygala	<i>Polygala paucifolia</i>
Fringed sedge.....	<i>Carex crinita</i>
Garden asparagus-fern	<i>Asparagus officinalis</i>
Garlic mustard	<i>Alliaria petiolata</i>
Giant bur-reed.....	<i>Sparganium eurycarpum</i>
Golden ragwort (Senecio aureus)	<i>Packera aurea</i>
Goldie's fern.....	<i>Dryopteris goldiana</i>
Graceful sedge	<i>Carex gracillima</i>
Grass-leaved goldenrod	<i>Euthamia graminifolia</i>
Gray dogwood	<i>Cornus racemosa</i>
Great angelica	<i>Angelica atropurpurea</i>

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Plant Species

Species	Scientific Names
Great blue lobelia	<i>Lobelia siphilitica</i>
Great hedge bedstraw.....	<i>Galium mollugo</i>
Great mullein.....	<i>Verbascum thapsus</i>
Great st.johns-wort.....	<i>Hypericum ascyron</i>
Greater bladderwort.....	<i>Utricularia vulgaris</i>
Greater celandine.....	<i>Chelidonium majus</i>
Great-spurred violet.....	<i>Viola selkirkii</i>
Green ash.....	<i>Fraxinus pennsylvanica</i>
Green-flowered pyrola	<i>Pyrola chlorantha</i>
Ground ivy.....	<i>Glechoma hederacea</i>
Ground juniper.....	<i>Juniperus communis</i>
Grove bluegrass.....	<i>Poa alsodes</i>
Gypsy-weed.....	<i>Veronica officinalis</i>
Hairy honeysuckle	<i>Lonicera hirsuta</i>
Hairy sweet-cicely.....	<i>Osmorhiza claytonii</i>
Hairy willow-herb	<i>Epilobium ciliatum</i> <i>ssp. ciliatum</i>
Heart-leaf aster	<i>Symphotrichum</i> <i>cordifolium</i>
Heart-leaved foam-flower	<i>Tiarella cordifolia</i>
Heart-leaved willow.....	<i>Salix eriocephala</i>
Hedge false bindweed	<i>Calystegia sepium</i>
Hedge-nettle	<i>Stachys arenicola</i>
Helleborine	<i>Epipactis helleborine</i>
Hemlock water-parsnip.....	<i>Sium suave</i>
Herb robert.....	<i>Geranium robertianum</i>
Hickey's tree-clubmoss.....	<i>Lycopodium hickeyi</i>
Hidden sedge	<i>Carex umbellata</i>
Highbush cranberry.....	<i>Viburnum opulus var</i> <i>americanum</i>
Hispid greenbrier	<i>Smilax hispida</i>
Hitchcock's sedge	<i>Carex hitchcockiana</i>
Hoary sedge.....	<i>Carex canescens</i>
Hoary vervain.....	<i>Verbena stricta</i>
Hoary willowherb	<i>Epilobium parviflorum</i>

Species	Scientific Names
Hobblebush	<i>Viburnum lantanoides</i>
Hybrid maple.....	<i>Acer X freemanii</i>
Indian cucumber-root.....	<i>Medeola virginiana</i>
Indian pipe.....	<i>Monotropa uniflora</i>
Interrupted fern.....	<i>Osmunda claytoniana</i>
Ironwood	<i>Ostrya virginiana</i>
Jack pine.....	<i>Pinus banksiana</i>
Jack-in-the-pulpit.....	<i>Arisaema triphyllum</i>
John's cabbage	<i>Hydrophyllum virginianum</i>
Jointed rush	<i>Juncus articulatus</i>
Kansas milkweed (common milkweed).....	<i>Asclepias syriaca</i>
Kentucky bluegrass	<i>Poa pratensis ssp. pratensis</i>
Kidney-leaf buttercup	<i>Ranunculus abortivus</i>
Kidney-leaved violet.....	<i>Viola renifolia</i>
Lady fern (northern lady fern).....	<i>Athyrium filix-femina</i> <i>ssp. angustum</i>
Lake-bank sedge	<i>Carex lacustris</i>
Lanceleaf wild licorice	<i>Galium lanceolatum</i>
Large tick-trefoil	<i>Desmodium glutinosum</i>
Large yellow lady's-slipper	<i>Cypripedium parviflorum</i> <i>var. pubescens</i>
Large-leaf wood-aster	<i>Eurybia macrophylla</i>
Largetooth aspen	<i>Populus grandidentata</i>
Late lowbush blueberry.....	<i>Vaccinium angustifolium</i>
Le conte's violet.....	<i>Viola affinis</i>
Leafy pondweed	<i>Potamogeton foliosus</i>
Lesser burdock.....	<i>Arctium minus</i>
Linear-leaved panicgrass	<i>Dichanthelium linearifolium</i>
Linear-leaved willowherb	<i>Epilobium leptophyllum</i>
Loesel's twayblade.....	<i>Liparis loeselii</i>
Long-fruited anemone.....	<i>Anemone cylindrica</i>
Long-spurred violet	<i>Viola rostrata</i>
Longstalk sedge.....	<i>Carex pedunculata</i>
Lopseed	<i>Phryma leptostachya</i>

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Species	Scientific Names
Low bindweed	<i>Calystegia spithamea</i>
Mackay's brittle fern.....	<i>Cystopteris tenuis</i>
Manitoba maple.....	<i>Acer negundo</i>
Maple-leaved viburnum	<i>Viburnum acerifolium</i>
Marginal wood fern	<i>Dryopteris marginalis</i>
Marsh bedstraw.....	<i>Galium palustre</i>
Marsh bellflower.....	<i>Campanula aparinoides</i>
Marsh cinquefoil	<i>Comarum palustre</i>
Marsh marigold	<i>Caltha palustris</i>
Marsh seedbox	<i>Ludwigia palustris</i>
Marsh speedwell	<i>Veronica scutellata</i>
Marsh yellowlegs.....	<i>Rorippa palustris</i>
Meadow timothy.....	<i>Phleum pratense</i>
Meadow willow	<i>Salix petiolaris</i>
Mountain holly.....	<i>Ilex mucronata</i>
Mountain honeysuckle	<i>Lonicera dioica</i>
Nannyberry	<i>Viburnum lentago</i>
Narrow-leaved cattail	<i>Typha angustifolia</i>
Narrow-leaved spring beauty	<i>Claytonia virginica</i>
Needle spike-rush.....	<i>Eleocharis acicularis</i>
New england aster.....	<i>Symphyotrichum</i> <i>novae-angliae</i>
New york fern.....	<i>Thelypteris noveboracensis</i>
Nipple-seed plantain	<i>Plantago major</i>
Nodding beggar-ticks	<i>Bidens cernua</i>
Nodding bulrush.....	<i>Scirpus pendulus</i>
Nodding fescue.....	<i>Festuca subverticillata</i>
Nodding ladies'-tresses.....	<i>Spiranthes cernua</i>
Nodding sedge	<i>Carex gynandra</i>
Nodding trillium*	<i>Trillium cernuum</i>
Northern beech fern.....	<i>Phegopteris connectilis</i>
Northern starflower.....	<i>Trientalis borealis</i> <i>ssp. borealis</i>
Northern watermeal	<i>Wolffia borealis</i>
Northern water-milfoil.....	<i>Myriophyllum sibiricum</i>

Species	Scientific Names
Northern wild raisin.....	<i>Viburnum cassinoides</i>
Northern wild rice	<i>Zizania palustris</i>
Norway spruce	<i>Picea abies</i>
Nuttall's pondweed.....	<i>Elodea nuttallii</i>
Oak fern.....	<i>Gymnocarpium dryopteris</i>
One-seed bur cucumber	<i>Sicyos angulatus</i>
One-sided pyrola	<i>Orthilia secunda</i>
Ontario aster.....	<i>Symphyotrichum ontarionis</i>
Orange daylily	<i>Hemerocallis fulva</i>
Orange-fruited horse gentian	<i>Triosteum aurantiacum</i>
Orchard grass	<i>Dactylis glomerata</i>
Ostrich fern.....	<i>Matteuccia struthiopteris</i>
Painted trillium.....	<i>Trillium undulatum</i>
Panicked aster.....	<i>Symphyotrichum</i> <i>lanceolatum ssp</i> <i>lanceolatum</i>
Paper birch	<i>Betula papyrifera</i>
Partridge-berry	<i>Mitchella repens</i>
Path rush	<i>Juncus tenuis</i>
Pennsylvania bittercress	<i>Cardamine pensylvanica</i>
Pennsylvania buttercup	<i>Ranunculus pensylvanicus</i>
Pennsylvania sedge.....	<i>Carex pensylvanica</i>
Philadelphia fleabane.....	<i>Erigeron philadelphicus</i>
Pin cherry.....	<i>Prunus pensylvanica</i>
Pink pyrola	<i>Pyrola asarifolia</i>
Plantain-leaved sedge.....	<i>Carex plantaginea</i>
Poison ivy.....	<i>Toxicodendron rydbergii</i>
Poplar.....	<i>Populus</i>
Porcupine sedge	<i>Carex hystericina</i>
Prairie sedge.....	<i>Carex prairea</i>
Pretty sedge.....	<i>Carex woodii</i>
Prickly gooseberry.....	<i>Ribes cynosbati</i>
Pubescent sedge.....	<i>Carex hirtifolia</i>
Purple flowering raspberry	<i>Rubus odoratus</i>

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Species

Purple milkweed	<i>Asclepias incarnata</i> <i>spp. incarnata</i>
Purple-stemmed aster.....	<i>Symphyotrichum puniceum</i> <i>var. puniceum</i>
Pussy willow	<i>Salix discolor</i>
Rattlesnake fern.....	<i>Botrychium virginianus</i>
Red baneberry.....	<i>Actaea rubra</i>
Red maple.....	<i>Acer rubrum</i>
Red oak.....	<i>Quercus rubra</i>
Red pine	<i>Pinus resinosa</i>
Red spruce	<i>Picea rubens</i>
Red trillium.....	<i>Trillium erectum</i>
Red-berried elder.....	<i>Sambucus racemosa</i>
Red-osier dogwood.....	<i>Cornus sericea</i>
Reed canary grass.....	<i>Phalaris arundinacea</i>
Retorse sedge	<i>Carex retrorsa</i>
Rice cutgrass	<i>Leersia oryzoides</i>
Riverbank grape.....	<i>Vitis riparia</i>
Rock polypody.....	<i>Polypodium virginianum</i>
Rosy sedge	<i>Carex rosea</i>
Rosy twisted-stalk.....	<i>Streptopus lanceolatus</i> <i>var. roseus</i>
Rough bedstraw	<i>Galium asprellum</i>
Rough sedge	<i>Carex scabrata</i>
Rough-leaf goldenrod.....	<i>Solidago rugosa</i>
Rough-leaved dogwood	<i>Cornus rugosa</i>
Round-lobed hepatica.....	<i>Anemone americana</i>
Royal fern	<i>Osmunda regalis</i> <i>var. spectabilis</i>
Rufous bulrush	<i>Scripus pendulus</i>
Running clubmoss	<i>Lycopodium clavatum</i>
Russian olive.....	<i>Elaeagnus angustifolia</i>
Sallow sedge	<i>Carex lurida</i>
Sand dropseed	<i>Sporobolus cryptandrus</i>

Species

Scotch pine.....	<i>Pinus sylvestris</i>
Seaside brookweed.....	<i>Samolus parviflorus</i>
Self-heal.....	<i>Prunella vulgaris</i> <i>spp. lanceolata</i>
Sensitive fern	<i>Onoclea sensibilis</i>
Serviceberry	<i>Amelanchier</i>
Shagbark hickory	<i>Carya ovata</i>
Sharp-lobed hepatica	<i>Anemone acutiloba</i>
Shinleaf.....	<i>Pyrola elliptica</i>
Short-awned foxtail.....	<i>Alopecurus aequalis</i>
Short-scale sedge	<i>Carex deweyana</i>
Showy lady's slipper.....	<i>Cypripedium reginae</i>
Showy tick-trefoil.....	<i>Desmodium canadense</i>
Silky dogwood.....	<i>Cornus amomum</i>
Silver maple	<i>Acer saccharinum</i>
Skunk cabbage.....	<i>Symplocarpus foetidus</i>
Skunk currant.....	<i>Ribes glandulosum</i>
Slender agalinis.....	<i>Agalinis tenuifolia</i>
Slender rosette grass.....	<i>Dichanthelium</i> <i>xanthophysum</i>
Slender stinging nettle.....	<i>Urtica dioica ssp. gracilis</i>
Slender wedge grass.....	<i>Sphenopholis intermedia</i>
Slender-spike loosestrife	<i>Lythrum salicaria</i>
Small purple-fringed orchid	<i>Platanthera psycodes</i>
Small white leek.....	<i>Allium tricoccum</i>
Small yellow lady's-slipper.....	<i>Cypripedium parviflorum</i> <i>var. makasin</i>
Small-fruit bulrush	<i>Scirpus microcarpus</i>
Smooth gooseberry.....	<i>Ribes hirtellum</i>
Smooth herbaceous greenbrier	<i>Smilax herbacea</i>
Smooth serviceberry.....	<i>Amelanchier laevis</i>
Smooth white violet.....	<i>Viola macloskeyi</i>
Smooth-sheathed sedge.....	<i>Carex laevivaginata</i>
Soft rush.....	<i>Juncus effusus ssp. solutus</i>

* Species at Risk classified as either as Species of Special Concern, Threatened, or Endangered under Ontario's Endangered Species Act, 2007, S.O. 2007 c.6

Species	Scientific Names
Soft-stemmed bulrush.....	<i>Schoenoplectus abernaemontani</i>
Southern ground-cedar	<i>Diphasiastrum digitatum</i>
Speckled alder.....	<i>Alnus incana</i>
Spiked sedge	<i>Carex spicata</i>
Spikenard	<i>Aralia racemosa</i>
Spinulose wood fern	<i>Dryopteris carthusiana</i>
Spotted joe-pye-weed.....	<i>Eupatorium maculatum</i>
Spotted touch-me-not.....	<i>Impatiens capensis</i>
Spreading dogbane	<i>Apocynum androsaemifolium</i>
Spreangel's sedge	<i>Carex sprengei</i>
Spring clearweed.....	<i>Pilea fontana</i>
Square-stemmed monkey-flower	<i>Mimulus ringens</i>
Squawroot.....	<i>Conopholis americana</i>
Squirrel-corn.....	<i>Dicentra canadensis</i>
Staghorn sumac.....	<i>Rhus typhina</i>
Stalk-grain sedge.....	<i>Carex stipata</i>
Star duckweed	<i>Lemna trisulca</i>
Starflower false solomon's seal	<i>Maianthemum stellatum</i>
Stiff clubmoss	<i>Lycopodium annotinum</i>
Stiff marsh bedstraw.....	<i>Galium tinctorium</i>
Stout woodreed	<i>Cinna arundinacea</i>
Sugar maple	<i>Acer saccharum</i>
Sulphur cinquefoil.....	<i>Potentilla recta</i>
Swamp dodder	<i>Cuscuta gronovii</i>
Swamp fly honeysuckle.....	<i>Lonicera oblongifolia</i>
Swamp red currant.....	<i>Ribes triste</i>
Swamp rose	<i>Rosa palustris</i>
Sweet flag	<i>Acorus americanus</i>
Sweet-scent bedstraw	<i>Galium triflorum</i>
Tall blue lettuce	<i>Lactuca biennis</i>
Tall buttercup.....	<i>Ranunculus acris</i>
Tall hairy groovebur (tall agrimony)	<i>Agrimonia gryposepala</i>

Species	Scientific Names
Tartarian honeysuckle.....	<i>Lonicera tatarica</i>
Tender sedge.....	<i>Carex tenera</i>
Thicket creeper	<i>Parthenocissus vitacea</i>
Three-leaved solomon's-seal	<i>Maianthemum trifolium</i> (<i>Smilacina trifolium</i>)
Three-petalled bedstraw.....	<i>Galium trifidum</i>
Three-way sedge	<i>Dulichium arundinaceum</i>
Tower cress.....	<i>Arabis glabra</i>
Tower-mustard.....	<i>Turritis glabra</i>
Treelike clubmoss	<i>Lycopodium dendroideum</i>
Trembling aspen	<i>Populus tremuloides</i>
Troublesome sedge.....	<i>Carex molesta</i>
True forget-me-not.....	<i>Myosotis scorpioides</i>
Tuckerman's sedge.....	<i>Carex tuckermanii</i>
Tufted vetch	<i>Vicia cracca</i>
Tussock sedge	<i>Carex stricta</i>
Twinflower	<i>Linnaea borealis</i>
Two-leaf bishop's cap	<i>Mitella diphylla</i>
Two-seeded sedge	<i>Carex disperma</i>
Variegated horsetail.....	<i>Equisetum variegatum</i>
Virginia anemone (thimbleweed).....	<i>Anemone virginiana</i>
Virginia creeper.....	<i>Parthenocissus quinquefolia</i>
Virginia stickseed.....	<i>Hackelia virginiana</i>
Virginia virgin's bower.....	<i>Clematis virginiana</i>
Virginia wildrye	<i>Elymus virginicus</i>
Water avens.....	<i>Geum rivale</i>
Water dock.....	<i>Rumex orbiculatus</i>
Water sedge	<i>Carex aquatilis</i>
Wheat sedge	<i>Carex atherodes</i>
White ash	<i>Fraxinus americana</i>
White baneberry.....	<i>Actaea pachypoda</i>
White bear sedge	<i>Carex albursina</i>
White heath aster.....	<i>Symphotrichum ericoides</i> <i>var. ericoides</i>

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Plant Species

Species

Scientific Names

White oak.....	<i>Quercus alba</i>
White rattlesnake-root.....	<i>Prenanthes alba</i>
White snakeroot	<i>Ageritina altissima</i>
White spruce.....	<i>Picea glauca</i>
White trillium.....	<i>Trillium grandiflorum</i>
White turtlehead.....	<i>Chelone glabra</i>
White vervain	<i>Verbena urticifolia</i>
White water-crowfoot.....	<i>Ranunculus aquatilis</i>
White wild licorice	<i>Galium circaezans</i>
White-grained mountain-ricegrass.....	<i>Oryzopsis asperifolia</i>
Wild black currant.....	<i>Ribes americanum</i>
Wild calla.....	<i>Calla palustris</i>
Wild carrot.....	<i>Daucus carota</i>
Wild columbine.....	<i>Aquilegia canadensis</i>
Wild geranium	<i>Geranium maculatum</i>
Wild lily-of-the-valley.....	<i>Maianthemum canadense</i>
Wild mock-cucumber.....	<i>Echinocystis lobata</i>
Wild sarsaparilla	<i>Aralia nudicaulis</i>

Species

Scientific Names

Wild strawberry.....	<i>Fragaria virginiana</i> ssp. <i>virginiana</i>
Willow	<i>Salix</i>
Wintergreen.....	<i>Gaultheria procumbens</i>
Witch-hazel.....	<i>Hamamelis virginiana</i>
Wood millet	<i>Milium effusum</i>
Wood nettle	<i>Laportea canadensis</i>
Woodland horsetail.....	<i>Equisetum sylvaticum</i>
Woodland sedge	<i>Carex blanda</i>
Woodland strawberry.....	<i>Fragaria vesca</i>
Woolgrass bulrush.....	<i>Scirpus atrovirens</i>
Woolly sedge.....	<i>Carex pellita</i>
Woolly-fruit sedge	<i>Carex lasiocarpa</i>
Yellow avens.....	<i>Geum aleppicum</i>
Yellow birch.....	<i>Betula alleghaniensis</i>
Yellow sedge	<i>Carex flava</i>
Yellow trout lily.....	<i>Erythronium americanum</i>

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APPENDIX E: Risks Relating to Climate Change and Non-Native Invasive Species

Climate Change

Recent examples of climate change impacts in the Forest include uprooted trees and damage to small areas of the Forest caused by wind bursts in the North, Eldred King, Scout, Hollidge and Pepperlaw tracts (Figure E1). Major ice storms and drought periods have also affected the Forest.

As climate change continues, there will likely be more severe weather and more anomalies like sudden heat or frost in the spring as leaves are expanding. 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 E1. 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 would mean considering whether to plant 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 in the Pathogens section.

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. This includes white pine as well as hardwoods like sugar maple, white ash, hickory species, butternut and several species of oak.

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.

The following are management options that could help prevent climate-related damage and respond more effectively when it happens:

- shortening stand rotations to reduce the length of time more vulnerable trees are left in the Forest and increase vigour
- reducing 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

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 E2) 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, stopping regeneration by smothering seedlings and saplings. 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 E2. 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 Forest, often occurring in association with buckthorn. Seed keys mature in autumn and remain on the tree over winter. Its aggressive growth and spread reduce woodland biodiversity, especially in newly forested areas. 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 often carried inadvertently by humans, pets and wildlife. When it is 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.

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 putting wildlife at risk by attacking species that are important food sources.

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 a fungus (*Ophiognomonia clavigignenti-juglandacearum*) that affects the butternut tree. 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 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 outgrowths called tyloses 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.

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 of the moth are now established throughout southern Ontario where its 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 Forest containing oak, such as in the North, Mitchell, Scout tracts and Eldred King Woodlands, 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 long-horned 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 E3), 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 Mitchell 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 E3. Hemlock woolly adelgid ovisacs.
(Chris Evans, University of Illinois, Bugwood.org).

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