

# Strategic Forest Management Plan

## **SECTION ONE: Context, Goal and Performance Measures**

Conservation Halton | 2020





## Executive Summary

Conservation Halton has been a manager of forests within its watersheds since its inception in 1963, and before that as the Sixteen Mile and Twelve Mile Creek Conservation Authorities. For more than 50 years the Authority has protected, restored, managed and planted forests in the Halton watershed; more than 4 million trees planted, over 10,840 acres (4,387 ha) of largely forested lands protected through ownership and contributing toward the delivery of more than 24.71% forest canopy cover across the watershed<sup>1</sup>.

The Strategic Forest Management Plan reflects the ongoing evolution of Conservation Halton and establishes a context for the next 20 years of our role as a leader in sustainable forest management; the Plan:

- Identifies a desire to take a landscape approach to forest management, focusing less on individual properties, and more on the landscape scale and management of our forest resource
- Re-establishes a commitment to sustainable management practices that place forest health as the principle outcome
- Highlights the key pressures and challenges that our forests face from both global and local activities, changes and how these can be addressed through sustainable forest management
- Supports Conservation Halton re-engaging in active, sustainable forest management, to ensure that the current challenged condition of our forests is addressed
- Takes an accountable approach to forest management, with Key Performance Indicators built into the Plan
- Re-defines a commitment to excellence and leadership in forest management

The Plan, is in three sections:

1. Section 1: Context, Goals and Approaches
2. Section 2: Forest Inventory
3. Section 3: Implementation – a rolling annual operational program supported by Forest Prescriptions

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<sup>1</sup> Data sourced from SOLRIS v3 data tallying SOLRIS Landcover types: Conifer Forest, Deciduous Forest, Forest, Hedged Rows, Mixed Forest, Plantation, and Treed Swamp.

The Plan is driven by the following Vision and Mission:

**Our 20 Year Vision:**

Our working forest system will continue to support a range of habitat types and species richness that is vital in providing environmental, ecological, and sociological goods and services. Our forests will improve in health and resiliency while we prioritize conservation of forest communities over timber production.

***Our mission to achieve this is:***

To sustainably manage Conservation Halton's forests in a changing climate while ensuring healthy, resilient, and productive forests for the benefit of our environment and watershed communities. Softwood plantations will continue to be managed with the intent of conversion to natural mixed hardwood stands and, where possible, selected mixed hardwood stands will be managed to include old growth forest characteristics.

In summary, the Plan identifies a 20-year vision, delivered through a rolling five-year outlook of activities that address three goals to be achieved through the Plan implementation:

1. Goal 1: To improve forest health conditions using current and future accepted methodologies and science.
2. Goal 2: To maximise the value of our forests in delivering environmental goods and services, social and health benefits, and enhanced forest diversity.
3. Goal 3: To maintain, and where possible, increase forest cover across our watershed through afforestation of Conservation Halton land acquisitions and on private, municipal and corporate lands, and through public education and landowner outreach programs.

# The Strategic Forest Management Plan

This Strategic Forest Management Plan (hereinafter, the Plan) is laid out in three sections:

**Section One** establishes a context for forest management at Conservation Halton. It reflects on the strengths, weaknesses, opportunities, and threats that our forests face, and represents the challenges and possibilities that this poses on us as an agency. Section One establishes a guideline for Conservation Halton for its forests and lays out a series of Strategic Themes. Forests, by their nature, have extended lives and so these Themes are developed with a timescale appropriate to the subject – Section One is written to provide a broad context to guide forest management for a 20-year period (2020 – 2040).

**Section Two** establishes the current resource by way of a comprehensive inventory. Each forest stand will be recorded, each parcel of land managed by Conservation Halton will be reflected within this inventory. Maps that capture the current condition and pressures on our forests will be developed. Much of this stems from extensive records already developed, however, there are areas that we do not yet have full details on, and areas with outdated information on them. The Plan will lay out a tool for undertaking this inventory, populated with information that is current. It is envisioned that Section 2 will eventually be an electronic resource (Forest Information Management System or FIMS) through Geographical Information Systems (GIS) technology. The goal will be to keep all inventory current within 5 years so this will be an ongoing inventory and will be updated continuously.

**Section Three** will establish activities that meet a range of social, outreach and forest cover targets as well as themes that stem from, and are suited to, the needs of each forest management stand based on the information in Section Two. Section Three needs to be agile and flexible to allow us to adapt to both to external pressures and organisational change. As such, Section Two and Three include a detailed 1-year Operational Plan accompanied by a list of priority properties needing forest management. As forest inventory data is collected, staff will create a rolling five-year outlook that will be updated as properties are prepared for operations. Activities will be listed with annual targets for operations across forests, and each year, activities completed will be reviewed and the list revised to ensure it always maintains a five-year outlook.

Section Three will be supported by the development of forest management prescriptions for each stand. These will be developed as the comprehensive plan to deliver the activities in Section Three. These prescriptions do not form part of the plan but are an important element of delivery. For complex forest management stands, prescriptions could take up to five years to develop, for simple forest management activities they could be created in a few weeks.

# Contents

SECTION ONE: Context, Goal and Performance Measures .....1

Executive Summary .....2

The Strategic Forest Management Plan .....4

Contents .....5

Background.....9

    Who We Are .....9

    What We Do .....10

    The Forestry Department .....11

Purpose and Scope of The Plan .....12

Forest Context .....14

    Landscape Context .....14

    Recreation and Community Engagement.....16

    Silvicultural Context.....17

    Relevant Legislation and Policies.....21

Partners, Stakeholders and Linkages.....23

Land Securement, Land Management & Stewardship.....25

    Land Securement.....25

    Land Restoration/Rehabilitation .....25

    Stewardship .....25

Forest Values .....26

    Canada Target 1.....26

    Ecosystem Services.....26

        Municipal Natural Assets Initiative for Grindstone Creek ..... 28

    Timber Values.....29

Forest Health and Management .....30

    Forest Health and Resilience .....30

    Forest Health Metrics .....31

    Forest Cover .....32

    Tree Planting Programs .....33

    Seed Stock .....33

Forest Establishment and Growth .....	34
Foundations of Forest Management .....	35
Sustainable Forest Management .....	35
Mimic Natural Disturbance .....	35
Old Growth & Interior Forest Habitat .....	36
Management Challenges and Opportunities .....	36
Structural and Biological Diversity .....	37
Climate Change .....	37
Invasive Species .....	38
Species at Risk .....	40
Hazard Tree Management .....	42
Recreational Use .....	43
Development Pressure .....	43
Forest Health Monitoring .....	44
Summary .....	46
Objectives of Forest Management .....	47
Definitions .....	50
References .....	54
Appendices .....	57
Appendix 1.1 Forest Management and Sustainability Policy .....	58
Appendix 1.2 Conservation Halton Properties by Land Class .....	59
Appendix 1.3 Invasive Species Evaluation and Prioritization .....	60
Appendix 1.4 Management Recommendations for Species at Risk .....	61
<i>Bats: eastern small-footed myotis, little brown myotis, northern myotis (aka northern long-eared bat), tri-coloured bat</i> .....	61
<i>Butternut</i> .....	64
<i>Jefferson salamander</i> .....	65
<i>Snapping turtle</i> .....	67
<i>West Virginia white</i> .....	68
Appendix 1.5. Forest Management Approaches for Climate Change .....	69
Appendix 1.6. Managing Hazard Trees Policy .....	70
SECTION TWO: Forest Inventory .....	71
Introduction .....	72

Inventory Approach .....	73
Appendix 2.1. Example of Compartment Attributes Collected during Forest Inventory .....	74
SECTION THREE: Implementation .....	77
Introduction.....	78
Conservation Halton’s Managed Forest .....	78
Appendix 3.1. Management Plan .....	84

## Recommendations

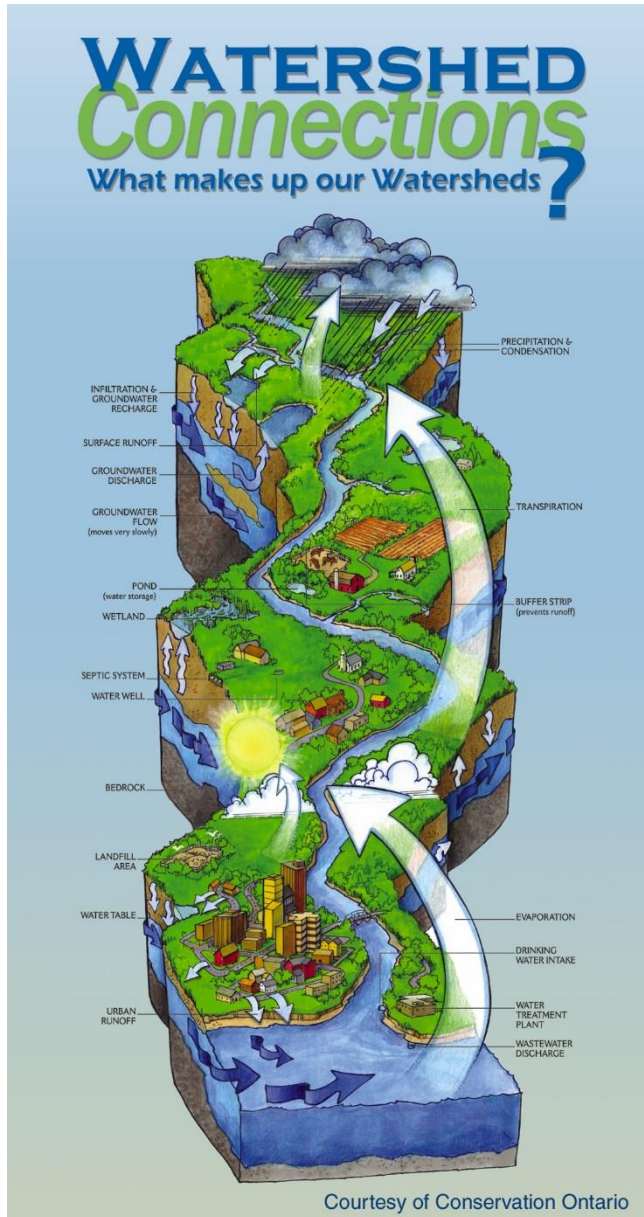
RECOMMENDATION 1: Update Forest Inventory to inform strategic forest management. ....	19
RECOMMENDATION 2: Continue to build, support and develop relationships with partners and agencies where there is a joint benefit. ....	24
RECOMMENDATION 3: Develop and sustain meaningful relationships with First Nation, Metis and Indigenous partners that seek opportunities for increased engagement and mutually beneficial partnerships. ....	24
RECOMMENDATION 4: Support active land securement by building relationships with private landowners through landowner education regarding Ecogifts program and/or designate a percentage of timber revenues to the Land Securement budget. ....	25
RECOMMENDATION 5: Ensure that the ‘value’ provided by the forest infrastructure on Conservation Halton lands is reflected in the emerging asset management framework.....	29
RECOMMENDATION 6: Establish a Forest Reserve Budget to enable timber revenues to be dedicated toward the continued growth and improvement in Conservation Halton Forests. ....	29
RECOMMENDATION 7: Monitor and improve overall forest health and wildlife habitat throughout Conservation Halton forests. ....	32
RECOMMENDATION 8: Maintain current forest cover percentage through the management of the Conservation Halton forests and by working with watershed partners.....	32
RECOMMENDATION 9: Promote private landowner tree planting programs to engage a wider community in the importance and value of forested landscapes. ....	33
RECOMMENDATION 10: Continue to support a vibrant local seed stock within southern Ontario nurseries by providing a reliable, local seed source. ....	34
RECOMMENDATION 11: Manage for long term forest health by promoting and utilizing Sustainable Forest Management principles and practices that meet or exceed current standards.....	35
RECOMMENDATION 12: Identify and manage appropriate stands toward ‘old growth’ characteristics recognising that the human environment surrounding our forests will rarely allow for true old growth forests. ....	37
RECOMMENDATION 13: Build resiliency in our forests with climate change mitigation and adaptation by maintaining and enhancing forest science knowledge for forest management practices. ....	38

RECOMMENDATION 14: Establish an Invasive Species Management Program and manage invasive and non-native plant species on Conservation Halton properties, where possible.....	40
RECOMMENDATION 15: Adopt leading practice through sustainable forest management to conserve and improve forest habitat for the benefit of Species at Risk. ....	41
RECOMMENDATION 16: Maintain a responsive hazard tree program and reduce risk of hazard trees through proactive Sustainable Forest Management. ....	43
RECOMMENDATION 17: Continue to monitor for forest pests and diseases, including invasive species, and establish greater interdepartmental collaboration on monitoring programs .....	45



## Background

### Who We Are



Conservation Halton works to sustainably protect, restore, and manage natural resources throughout the watershed, from lake to escarpment. Our vision is to sustain a healthy watershed with clean streams, vigorous forests, abundant green space, and balanced growth that results in strong livable communities. Our mandate is to create avenues for sustainable synergy between the natural world we live in and the 625,000 (growing to an estimated 1m by 2041) residents that make up the Conservation Halton watershed.

With many new neighbourhoods and growing communities within our watershed, it is Conservation Halton's priority to protect the people, homes, and businesses within our watershed from the risk of flooding and erosion through planning and regulation. We also make it our priority to support sustainable, innovative approaches to infrastructure and land use that protect and restore the natural environment, enable community growth, and contribute to a thriving economy.

The natural systems within our watershed are essential for clean air, safe water, healthy ecosystems, biological diversity, climate change resilience, and flood and erosion control. It is our mandate to protect and restore the lands, forests, and water features needed to support these natural systems and maintain the features and functions that promote the environmental integrity of our watershed. We work to conserve the landscapes that create opportunities for recreation and tourism and the landmarks that define our natural, cultural, and indigenous heritage.

Healthy watersheds and resilient ecosystems enable us to reduce and better respond to the effects of climate change. Understanding the impacts of climate change, such as potential flooding, drought and erosion will increase the ability of our watershed to adapt to these changes and support our communities, agricultural lands and natural environment. We will also address the impacts of climate change on biodiversity, such as species and habitat loss and invasive species.

Our watershed is abundant with forests, trails, streams, and waterbodies which offer endless opportunities for active and passive outdoor recreation. Our parks provide diverse opportunities to connect people with nature, support the health and wellness of those who live in our communities and create living classrooms for children to learn about the natural world. It is important that these opportunities be provided in an environmentally sustainable way, while minimising disruption to plant and animal habitats or any of the natural features and functions of the environment.



To achieve our goals and objectives as an organization, we will continue to use innovative technologies, best practices, and creative solutions to operate in a way that is more effective, efficient, and agile. We will listen, cooperate, and take a proactive approach to accountability and transparency. We will pursue knowledge, share our expertise, and offer leadership. Above all, we will strive for service excellence for our customers, clients, partners, staff, and landscape.

## What We Do

Conservation Halton owns and manages more than 10,840 acres (4,387 ha) of land across its watersheds. These lands represent a diverse mix of habitats and woodland types with over 63% of the lands being forested. The Forestry department is responsible for managing around 7,000 acres (2,834 ha) of forests under various programs such as the Managed Forest Tax Incentive Program, the Conservation Land Tax Incentive Program, the Ash and Hazard Tree Management Program, and trails and maintenance programs. Conservation Halton's areas of focus include education, recreation and water and forest resource management. Educational and recreational experiences in natural environments enrich the lives of people of all ages by instilling awareness and appreciation of the watershed's natural heritage. Conservation Halton manages water resources using integrated, ecologically sound environmental practices to maintain secure supplies of clean water, to protect communities from flooding and erosion, and to ensure that environmental planning is an integral part of community development.

Forests form a major part of the natural resources owned and managed by Conservation Halton and play an important role in determining the quantity and quality of water in the watershed. Our forests form an important ecological network across our watersheds, protecting and enhancing both the natural heritage and quality of life

of those who live in our watershed. These forests provide important landscape, recreation, economic and ecological-service values and represent an iconic element of the Conservation Halton mandate. Our goal is to manage this large forest resource using sustainable forest management practices while educating the public on the importance of the natural environment and why we need to be proactive in managing a resource that is facing increasing pressures. Mandatory programs under the CA Act stipulate:

21.1 (1) An authority shall provide the following programs or services within its area of jurisdiction:

1. A program or service that meets any of the following descriptions and that has been prescribed by the regulations:
  - i. Programs and services related to the risk of natural hazards.
  - ii. Programs and services related to the conservation and management of lands owned or controlled by the authority, including any interests in land registered on title.

## **The Forestry Department**

The Forestry Department consists of an Arborist team and a Technical team, currently within our Park Operations team. The Department's role is to plan, implement and monitor the management of Conservation Halton's forests and to deliver sustainable forest and hazard tree management. The Forestry Department also provides support and services to internal departments and private landowners within the Conservation Halton watershed. Forestry staff offer services to landowners at a fee such as but not limited to creating Managed Forest Plans (under the Managed Forest Tax Incentive program), tree marking, and tree planting. The Forestry Department works in a close partnership with many teams within Conservation Halton:

- **Parks:** Our parks encompass approximately half of the total land that Conservation Halton manages. These are operating recreational facilities with hazard tree and forest management services.
- **Lands:** Our property portfolio is extensive, and Forestry carries out tree planting, invasive species control, hazard tree and forest management on these lands. Through Managed Forest and Conservation Lands Tax Incentive Programs, Conservation Halton realizes significant financial cost savings on property taxes. In 2020, these savings were estimated to be \$356,000/year.
- **Stewardship:** Our Stewardship team is engaged in landowner outreach through a wide variety of programs. A close partnership between our Forestry and Stewardship teams means that landowners can benefit from the expertise offered from both teams as well as accessing available funding opportunities.
- **Restoration:** Our Restoration team provides services to a range of landowners that are looking to engage in environmental restoration programs. Tree planting advice is provided, and stock is secured by our Forestry team who provides advice on which species align best with soil and climate conditions of planting sites.
- **Ecology:** The skillset between Forestry and Ecology is shared; Ecological Land Classification (ELC) work, as an example, is delivered by and a shared resource of both teams.
- **Planning and Regulations:** Our Planning and Watershed Management team provides planning expertise to help facilitate approvals for planning matters on our lands and regulatory oversight for ensuring that our parks operations and works comply with our legislation.

- Engineering: Our Engineering team manages dams and flood control structures which are located across our watershed. Forestry provides the operational support in the management of the treed areas bordering these structures
- Education: Our outreach and education teams are supported by Forestry in the delivery of a wide range of programs including Maple Town, the annual Water and Forest Festivals and Fall into Nature.

Not only is Forestry a key support and part of the output of each of these teams, but each of these teams provides support, advice, and expertise to our Forestry programs. This Plan attempts to encompass the totality of the Forestry programs at Conservation Halton, while focussing on the operational element of our forest resource.

The core focus of the Forestry Department is:

- To manage the existing forest resource using accepted best practices of government and industry
- To mitigate the effects of climate change
- To enhance the existing forest resource responsibly and sustainably
- To inspire and educate landowners on the importance of forested lands
- Build on our role as a leader in forest management within the watershed.
- To support the provision of safe and enjoyable recreational experience to those users of Conservation Halton lands.

## **Purpose and Scope of The Plan**

This document will be used to plan, prioritise, and meaningfully report on the management activities of Conservation Halton, designed to promote healthy and resilient forests now and into the future.

The delivery, and accomplishment, of the Plan objectives will rely upon the breadth of expertise at Conservation Halton. From engaging internal corporate services, such as Information Technology Services (IT) and Geographic Information Services (GIS), to collaborative work with all other Conservation Halton teams from Stewardship to Ecology, and Planning and Engineering to Communications, to working with divisional peers in our Parks, the delivery of this Plan relies on developing, maintaining and growing internal partnerships.

The Plan will enable Conservation Halton to maximise the efficiency and effectiveness of our external partnerships and relationships to reach our forest health goals. From supporting landscape-scale strategic approaches of provincial plans such as the Niagara Escarpment Plan, to providing a context for discussion with ministerial colleagues such as the Ministry of Natural Resources and Forestry (MNRF), the Plan will be a key tool guiding Conservation Halton's approach to implementing provincial forestry guidelines, processes and plans.

Further, the Plan is intended to redefine the forestry relationship with MNRF and the Municipal Property Assessment Corporation (MPAC). We have streamlined our role within the tax base we manage by replacing over 30 individual plans with a single document submitted to the Managed Forest Tax Incentive Program (MFTIP). Likewise, the potential impacts to the involvement in the Conservation Land Tax Incentive Program (CLTIP) will be planned for within this document providing a single overarching plan, empowering Conservation Halton to maximise the savings realized through these programs.

The Plan will also guide other external relationships and partnerships, such as with District School Boards, Municipalities and particularly the Halton Region. It will guide our delivery of services through Forests Ontario

and the 50 Million Tree program, which in turn establishes the basis and funding for supporting afforestation and increasing forest cover on private and public lands.

The Plan supports the delivery of a series of Master Plans that guide Conservation Halton's functions and services in our Conservation Areas. These Master Plans have developed a Forest Management and Sustainability Policy endorsed and supported by the Niagara Escarpment Commission which this Strategic Forest Management Plan mirrors, builds on and guides the implementation of healthy forests, across our land holdings (Appendix 1.1). Lastly, the Plan will provide a tool to enable Conservation Halton to budget for, and resource, its forest management operations, and activities. It will help us identify where there are expenses, savings, and revenue opportunities to offset activities.

This 20-year Plan will be reviewed each time the Managed Forest Tax Incentive Plan for Conservation Halton properties is being renewed (2027 and 2037) and will be formally updated in 2040.



## Forest Context

## Landscape Context

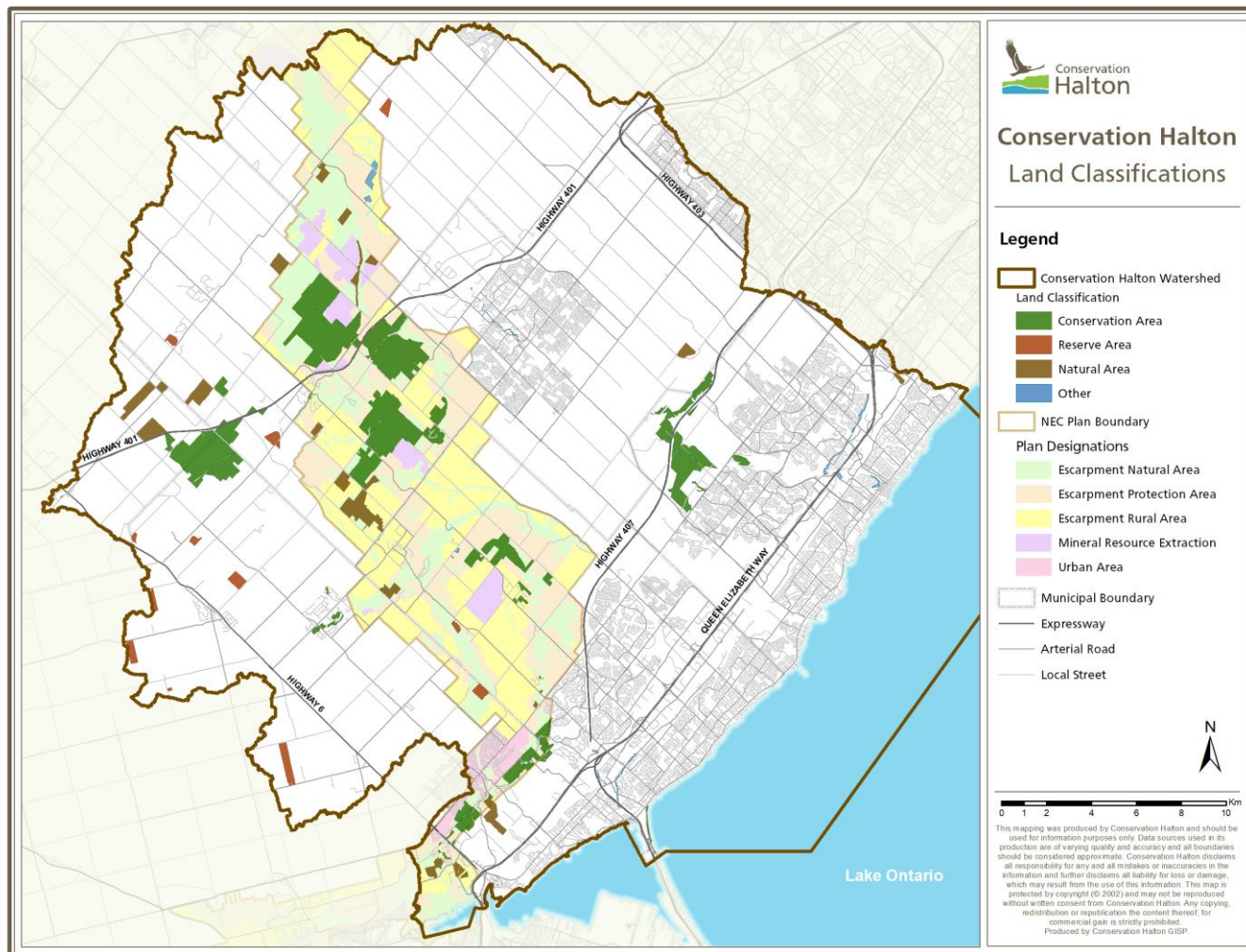


Figure 1. Conservation Halton land holdings by classification type.

The Conservation Halton watershed spans approximately 1000 km<sup>2</sup> of land, includes 17 flowing creeks, approximately 26 km of Lake Ontario shoreline, extensive forest cover and 80 km of Ontario's Niagara Escarpment (a World Biosphere Reserve). Conservation Halton recognizes three different conservation classifications for properties, based in part on conservation value, and are characterized by different management approaches and by the level of public access and support for recreational activities. Properties are classified as Conservation Areas (8062 acres), Conservation Reserve (665 acres), and Natural Areas (1904 acres) (Figure 1, Appendix 1. 1). Please refer to the Land Securement Strategy (2017) for the definitions of these classifications.

Of this land, 5,121 ac (2,072 ha) is enrolled in Ontario's Conservation Land Tax Incentive Program (CLTIP) (Figure 2). A further 1,744 ac (706 ha) is Managed Forest, forest managed under Ontario's Managed Forest Tax Incentive



Program (MFTIP). Based on MFTIP property data, coniferous (39%) and mixed (33%) plantations make up the bulk of the forest, and upland forest accounts for a further 11%.

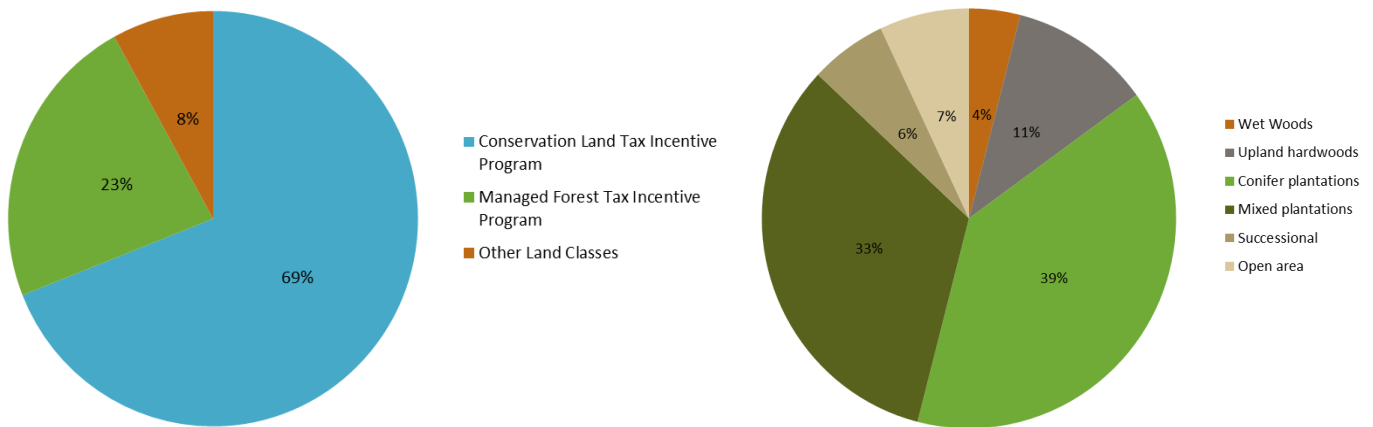


Figure 2 Conservation Halton holdings by land class type (left); Conservation Halton MFTIP holdings by forest type (right)

As of 2020, there are 26 Areas of Natural and Scientific Interest (ANSI) on Conservation Halton properties. These are terrestrial or wetland areas with features having high value for protection, natural heritage appreciation, scientific research or education. Five ANSIs located on Conservation Halton land have been declared as regionally significant, these include:

- Clappison Escarpment Woods
- Mountsberg Wildlife Centre
- Kilbride Swamp
- Lake Medad Meltwater Channel
- Clappison Escarpment Woods

Forests can also be riparian – as such they provide important benefits by filtering pollutants and sediment, cooling water and protecting habitat, and mitigating/ reducing the impacts of natural hazard processes like erosion and flooding. They are also part of the Natural Heritage System (NHS) as defined and identified by municipal Official Plan policies. Several NHS have been identified within the Conservation Areas. These areas warrant a high degree of careful management because they provide essential ecosystem services and may also provide ancillary benefits for scientific research, education or recreation. The following Conservation Halton lands lie within the designated NHS's of the Halton Region:

- Lake Medad Tract is situated with the Lake Medad and Medad Valley NHS
- Mount Nemo Conservation Area is situated within the Mount Nemo Escarpment Woods NHS
- Sixteen Valley Conservation Area is part of the Sixteen Mile Creek Valley NHS
- Crawford Lake Conservation Area (Tract 1) and Rattlesnake Point Conservation Area are within NHS
- Crawford Lake – Rattlesnake Point Escarpment Woods NHS

- Calcium Pits contains two Conservation Authority properties which include Crawford Lake Tract 2 and the Yaremko Ridley property (OHT)
- Hilton Falls Conservation Area is located within the Hilton Falls Complex, NHS
- Harrison Tract is situated within the Guelph Junction Woods NHS
- Moffat Swamp NHS contains the Bunker Tract
- Kelso Conservation Area lies with the Milton Heights NHS

One of Conservation Halton's properties is situated within NHS identified by the Wellington County Planning and Development Committee 1982:

- The McCrodan Tract lies within the Moffat Marsh NHS

Another is located across Hamilton, Wellington, and Halton municipalities:

- Mountsberg Conservation Area is situated within the Mountsberg Wildlife Area NHS

## **Recreation and Community Engagement**

Conservation Halton offers a wide variety of recreational opportunities that attract a high number of visitors to our Conservation Areas – approximately 1 million people a year. The use of forested lands has steadily increased in recent years and this trend is expected to continue. This upward trend in visitation is driven by several factors, not least of which is the proximity of the large urban centres- Milton, Oakville, Burlington, and Hamilton- within the watershed, but also the proximity of the Greater Toronto Area. Halton Region is the fastest growing community in Canada and is expected to double in population to more than 1 million residents by 2041. Combined with the iconic backdrop of the Niagara Escarpment and the shores of Lake Ontario, the area is seen as a mecca for outdoor recreation day trips, making Conservation Halton land holdings a favourite destination for a large population of southern Ontario. The Bruce Trail runs through several Conservation Halton owned and managed properties adding to Conservation Halton's trail network for hikers to enjoy the natural features of the watershed; mountain biking, snowshoeing, cross country skiing, rock climbing, geocaching, camping and down hill skiing are popular programs Conservation Halton offers at specific properties. Our forest and trail systems allow for ecological and recreational connectivity between Hamilton and Burlington as we work with many agencies under the Hamilton-Burlington Trails Council.

The delivery of recreational opportunities within our Conservation Areas is steered by Master Plans, trails policies, and Land Classification systems that support a diverse range of recreational opportunities across our forests. As an initiative, the support of recreation in a Strategic Forest Management Plan context indicates the importance of the provision and maintenance of access and recreational opportunities and the critical need for management programs that promote healthy forests within which recreation can occur. This will also indicate where recreational activities need to be limited to minimize disturbance to fragile ecosystems

Education about our woodlands is vital to creating awareness about ecosystem services and is delivered by a broad cross section of Conservation Halton departments. Our forestry staff engage the public through a variety of programs offered to landowners within the watershed through site visits, tree planting programs, forest management plans, and promotional materials. These efforts align with educational programs offered by other departments such as Science and Partnerships (including Stewardship and Festival programming), Communications and programming offered at our Conservation Areas. Ongoing education is an essential part of this plan and cements our roles within the watershed as experts.

These uses and the continuing growth in use of Conservation Halton properties contains challenges. Once rural properties and forests are now urban fringe greenspaces and experience high levels of informal visitation; our Conservation Areas, once visited by half as many people, are dealing with challenges in trail and user management. As use grows, so does the adverse pressure placed on our forest ecosystem. From direct impacts such as soil compaction, trail expansion and understory impacts, to indirect impacts such as invasive species introduction, litter and the threat of accidental fire damage, our forest management must account for and mitigate against the impacts of human use of our forests.

Conservation Halton is committed to engaging people in its work conserving our forests, be that through the provision and support of recreational facilities within our forests or the support of educational and outreach opportunities. Actively supporting people in being engaged in our greenspaces is critical in support of protecting and enhancing our forested lands.


## **Silvicultural Context**

The Halton Region Conservation Authority (now referred to as Conservation Halton) was formed in 1963 from an amalgamation of Sixteen Mile Creek (est. 1956) and Twelve Mile Creek (est. 1958) Conservation Authorities (CAs). An early recommendation for the original CAs was “that the Authority establish woodlot improvement projects on its own properties, to demonstrate the advantages of better forestry practices”. Since inception, Conservation Halton has been acquiring land for the purposes of natural resource management and environmental protection of a range of environmental features, and currently owns over 10,840 acres of land.


Throughout the next few sections, a list of recommendations will be provided to help accomplish the Strategic Forest Management Plan’s goals. For the full list of recommendations please see Summary of Plan Recommendations on page 49.

Conservation Halton has a rich history of forest management. Tree planting has been a priority for Conservation Halton since 1956; 4,359,334 trees have been planted through Conservation Halton forestry programs on private land, municipal properties, Regional properties, and Conservation Halton properties (Figure 3).

Conservation Halton has worked with many different provincial and federal programs to advance forest management, some of which are listed below.



*Ontario Power Generation (OPG) Carbon Sequestration/Biodiversity Management Program on Conservation Halton lands:* OPG, in 2000 announced the above program, to plant at least one million native trees and shrubs over three-years, as part of its carbon offset and sequestration program. The program sought to mitigate climate change through reforestation and restoration efforts, and enhanced habitat for threatened species that are at risk due to the loss and fragmentation of woodlot habitat. Key forested areas were to be expanded to connect and link fragmented forested patches and to create and protect interior forest habitat. Conservation Halton planted more than 300,000 native and non-native trees and shrubs across Conservation Halton properties between 2001 and 2005 as part of this program.



*Conservation Services on Private Land:* In the spring of 1998, Conservation Halton embarked on the largest single private property reforestation project. The landowner had become disillusioned with farming practices and decided to convert 60 ac of farmland to forest cover. A total of 58,150 trees were planted. Since 2005, Conservation Halton has been offering a private landowner tree planting program with the support of Forest Ontario. To date, this program has planted over 820,000 trees in our watershed.

Until the mid to late 1990's, forest management in Conservation Halton forests was proactive, guided by a series of forest management plans and implemented by Conservation Halton's 20-30 person forestry team. There were sufficient resources, both human and equipment, to manage the forests in this way. Management continued on a much smaller scale into the early 2000s but with the increasing environmental stressors, extreme weather and invasive species, forest management demands have increased. Set against more restrictive policies (NEC, MNRF, SAR), budgets, staffing, equipment, and lack of internal support for proactive management, the forestry program became reactive, responding to external factors such as ice damage, invasive insects, and diseases. In addition, the overall forest inventory is about 10-15 years out of date, further limiting our ability to manage these forests proactively. Updating the inventory is recognized as a key component of our Section 3 five year rolling operational plan.

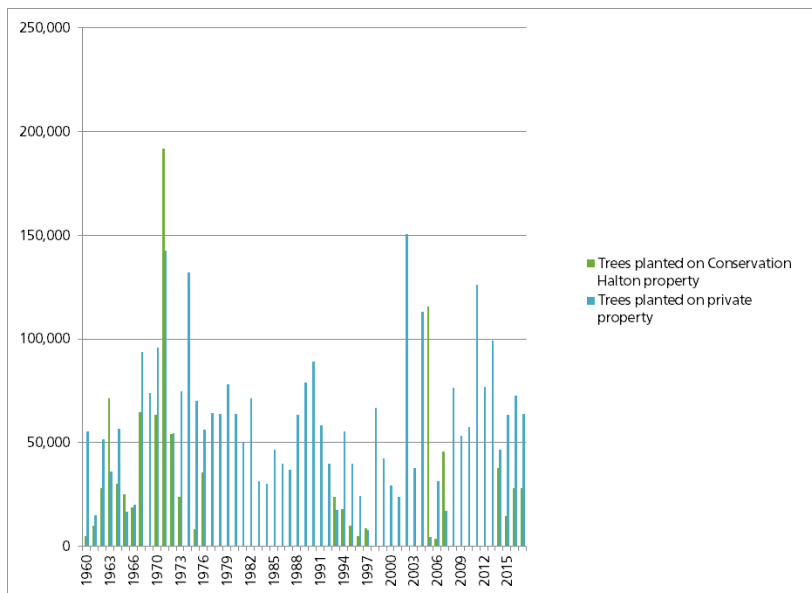
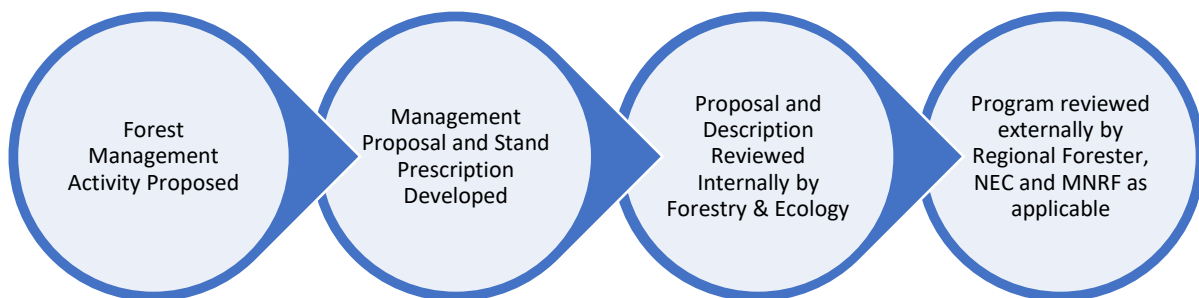


Figure 3 Number of trees planted by Conservation Halton per year 1960-2017

### RECOMMENDATION 1: Update Forest Inventory to inform strategic forest management.

Where forest management activities are proposed, management proposals and stand prescriptions are reviewed by a Registered Professional Forester and internal staff to ensure that ecological and recreational values are properly recognized. This process will be followed before any operations commence to ensure that recreational opportunities and other programs are minimally disrupted. Once internally approved, the Regional Forester is contacted for bylaw consideration and the Ministry of Natural Resources and Forestry and Ministry of Environment, Conservation and Parks will be engaged to provide further guidance and approvals as needed. Prescriptions for properties within the Niagara Escarpment Plan area are also reviewed by the Niagara Escarpment Commission (NEC).



This process, for a simple management operation, might take as little as 2 – 6 months; for a complex operation, this process could take five years.

Some examples of good forest management planning and implementation that Conservation Halton has undertaken with partners include:

1. *Silviculture/ Upland Hardwood Management*: In 1999, The Forestry Department proposed forest management operations on a 36.6 ac stand of sugar maple and red oak (Stand 'E') in the Rattlesnake Point Conservation Area. Management objectives included improving forest health and mitigating visitor risk by removing hazard trees along trails; maintaining ecological integrity and wildlife habitat and improving stem form and vigour. A single tree selection silvicultural system was prescribed and implemented during the winter of 1999-2000, with operations adhering to Good Forestry Practices. Total volume harvested was 475.6 m<sup>3</sup> and resulted in \$37,160 in stumpage revenues.
2. *Oak Decline, Mount Nemo Conservation Area, 2003*: In the fall of 2002, forestry staff observed a decline in the health of red oak at the ecologically significant Mount Nemo Conservation Area. During the same period, the Town of Oakville observed similar decline issues at the Iroquois Shoreline woods park. A panel of experts recommended reducing stand vulnerability and maximizing stand and tree growth and vigour by removing high-risk trees while maintaining and/or increasing tree species, age class and structural diversity within the stand. Of critical importance, the site was to continue to provide suitable wildlife and interior forest habitat for vulnerable species at risk (SAR) known to inhabit the area. A thinning prescription was written to target poor quality stems and to remove healthy trees to maintain recommended provincial spacing and stocking standards. Hazardous trees along walking trails were removed. A buffer was established along the escarpment brow to protect ecologically fragile areas. With the harvesting of the declining trees, the health of the stand was improved, and the shade density of tolerant competitors was decreased to attempt to maintain the relative abundance of oaks in the forest. The harvest of this 59ac stand resulted in \$46,260 in timber sales. It is also an example of the constructive networking with the Ministry of Natural Resources and Forestry (MNRF), Town of Oakville,



Niagara Escarpment Commission (NEC), the Halton Region and the US Forest Service (USFS), to achieve the desired results as prescribed.

3. *Plantation Thinning*: Conservation Halton has a long history of reforestation and afforestation efforts across the watershed dating back to the early 1960's. Plantations were created to foster the conversion of marginal and fragile lands to mixed forests over time. After establishment, these plantations require periodic thinning to allow the natural regeneration to occur. During the period of 2005-2008, 119 ac of conifer plantations located on six properties were thinned to create canopy gaps thereby allowing for greater amounts of sunlight to reach the forest floor to allow germination of hardwood seedlings that will eventually convert the stand to mixed hardwood forests. Over the next 10-15 years, these same stands will require a second thinning or selection/improvement cuts to promote the better-quality stems that remain. Thinning plantations for stand conversion are an important part of the five-year outlook of this Strategic Forest Management Plan initiative.

## Relevant Legislation and Policies

Forest management planning and prescriptions for Conservation Halton are compliant with federal and provincial Acts and policies, as well as municipal by-laws and internal Conservation Halton policies and regulations (Table 1).

The Conservation Authorities Act helps manage renewable natural resources and protects people and property through the management of watersheds. The purpose of the Act is “to provide for the organization and delivery of programs and services that further the conservation, restoration, development and management of natural resources in watersheds in Ontario.”

responsibilities and governance in resource management and environmental protection.

Mandatory programs under the Act include programs and services related to the conservation and management of lands owned or controlled by the authority.

The Halton Tree By-Law, for example, was enacted to prohibit or regulate the destruction or injury of trees in Halton Region. It is a tool to promote healthy forests, protect forest ecosystems and prevent clearcutting of woodlands. Conservation Halton adheres to all elements of the Halton tree bylaw and follows Good Forestry Practices through tree harvest permit applications, administered and reviewed by the regional Forester.

Provincial Acts such as the Endangered Species Act (ESA) provide science-based assessment, automatic legal protection for species classified as endangered or threatened, as well as protection of the species' habitat. When the presence of an endangered or threatened species is identified within the area of potential forestry operations, Conservation Halton's forestry group in collaboration with MNRF and Conservation Halton ecologists and biologists, reviews the species of concern and its habitat. Conservation Halton applies for cutting permits and follows the guiding principles and policies on categorizing and protecting habitat under the ESA, with an emphasis on the use and characteristics of the affected habitat.

Another example is the federal Migratory Birds Convention Act. It provides protection to migratory birds during periods of nesting, breeding, and fledging. Nesting periods are associated with broad geographical areas across Canada, referred to as nesting zones. Conservation Halton's watershed lies within nesting zone C2, with a

nesting period from the end of March to the end of August. Conservation Halton will not undertake any non-emergency forestry operations during the aforementioned dates. Further, Conservation Halton will ensure that ecological support is sought to provide advice in a pre-planning phase, for undertaking and managing any such operations.

*Table 1 Acts, Policies and Regulations Informing Forest Management Planning and Activities*

Jurisdiction	Act or Policy
Federal	Migratory Birds Conservation Act Department of Fisheries and Oceans Acts and Policy Forestry Act Plant Protection Act Species at Risk Act
Provincial	Niagara Escarpment Planning and Development Act Endangered Species Act Professional Foresters Act Environmental Assessment Act Fish & Wildlife Conservation Act Forestry Act (Ontario) Greenbelt Act Planning Act Invasive Species Act Ontario Heritage Act Conservation Authorities Act and Regulations Pesticides Act
Local	Official plans of Halton, Hamilton, Peel and County of Wellington by-laws & regulations, e.g. Halton Region Tree By-law (121-05) Watershed/Sub-watershed Studies
Internal	Conservation Halton regulations re: development, wetland interference and alterations to shoreline and watercourses (Ont. Reg. 162/06)

## Partners, Stakeholders and Linkages

Conservation Halton collaborates with several Provincial agencies. The NEC and the MNRF both have an advisory role in the management of our forests. We are the property steward for the Ontario Heritage Trust properties that are located within our watershed (Yaremko, Yaremko-Ridley and the Little Tract), providing management, monitoring, and reporting. We manage and are actively rehabilitating Glenorchy, one of Infrastructure Ontario's properties.

Conservation Halton also has partnerships and collaborations with local municipalities. Collaborative relationships include land management agreements, and consultation on land and forest stewardship. For example, we assist Halton Region in managing Regional lands, providing technical expertise in tree planting, trail maintenance, invasive species, and hazard tree management. Conversely, 2 Conservation Halton properties in Burlington (Kerncliff Park, Burlington Beach strip) are managed by City of Burlington staff. Additional partnership planting projects have taken place with Ontario Hydro, Enbridge, Union Gas, and CRH Canada Inc (Dufferin Aggregates).

Conservation Halton is a Planting Delivery Agent for Forests Ontario's 50 Million Tree program. This program endeavors to plant 50 million trees in Ontario by 2025. To date Conservation Halton has planted approximately 820,000 under the 50 Million Tree and other Forests Ontario tree planting Programs, averaging approximately 65,000 trees/year on both private and public lands. As of 2019, the annual planting rates are closer to 30,000 – 50,000/year. In addition to planting on private land, we have delivered tree planting projects for the municipalities of Burlington, Oakville, Milton, Hamilton, and the Halton Region.

We partner with several research groups with our involvement ranging from sitting in on committee meetings to offering Conservation Halton lands for data collection. The Forest Gene Conservation Association (FGCA) is a science and research partner for woody species at risk planning and management. Their mission is to broadly promote forest gene conservation, and to advise and assist members and associates to apply genetic resource management principles within their forest conservation and management programs in urban and rural landscapes in southern Ontario. Conservation Halton plans on supporting this mission through partnerships and projects related to climate change and afforestation, as well as reporting on and collecting seed from healthy target species at direction from FGCA and partner nurseries. Assisted migration trials will also soon be underway as a part of mitigating climate change.

Bioforest, Canadian Food Inspection Agency (CFIA) and Conservation Halton formed a partnership in late 2016 to create a simulated Asian Long Horned Beetle (ALHB) infestation at Kelso Conservation Area and at Mountsberg CA. The goal was to assess the practicality and utility in using drone technology to detect simulated signs of ALHB infestation (oviposition pits chew marks, exit holes etc.). The drone used was a military grade unit equipped with a camera capable of thirty times magnification. It was flown by AirVu, a company specializing in drone flight and image analysis. The flight was repeated in the spring of 2017 and can be used into the future as a teaching tool both internally and by other partnerships agencies.

Other research partnerships include a Canadian Forestry Service butternut monitoring project in 2010. University of Toronto research on American Elm resistance to Dutch Elm disease was conducted in our forests.

**RECOMMENDATION 2: Continue to build, support and develop relationships with partners and agencies where there is a joint benefit.**

At a corporate level, Conservation Halton is working toward recognizing indigenous rights, and engaging with First Nations, Metis, and indigenous communities by fostering an open line of communication. In particular, the Forestry Department has been in communication with the Mississaugas of the Credit First Nation.

**RECOMMENDATION 3: Develop and sustain meaningful relationships with First Nation, Metis and Indigenous partners that seek opportunities for increased engagement and mutually beneficial partnerships.**

An external Forestry consultant was hired to develop the SFMP along with Forestry and Ecology staff. Going forward, internal staff will continue to provide input and advice about management of Conservation Halton forests, and will expand to include park staff and other potential stakeholders. MNRF and NEC review and permits/approvals will be sought out where necessary.

Ecology and Forestry staff at Conservation Halton are actively involved with programs such as the Ontario Invasive Plant Council (OIPC), the Early Detection Rapid Response (EDRR) Network of Ontario and the Hemlock Woolly Adelgid (HWA) working group for forest managers, with goals of early detection and management planning for significant invasive species. In addition, the Ecology team support an extensive network of Environmental Monitoring and Network (EMAN) Forest plots that are being studied for long-term environmental changes on Conservation Halton properties. Permanent sample plots (PSP) were established in 2002 across the watershed to monitor gypsy moth populations using the Modified Kaladar Plot system and are remeasured on an annual basis. Forestry staff helped Parks staff set up a permanent sample plot at Mountsberg CA called Climate Change SOS for educational purposes. This plot is based on EMAN protocols and is remeasured annually with various high school groups.

## Land Securement, Land Management & Stewardship

### Land Securement

Land securement is the activity of acquiring lands via direct ownership transfer or conservation easements and has been an important aspect for Conservation Halton to ensure long-term environmental protection and resource management. Since 1956, Conservation Halton has acquired 10,860 acres, 1,200 acres of these have been secured over the last 20 years. With the recent approval of a new Conservation Halton's Land Securement Strategy, 2017, it is hoped that new land might come available for afforestation projects.

Specific to forestry, land securement has allowed for the growth of sustainable forest management within the Halton Watershed as well as afforestation uptake through a consistent and ongoing planting program by the Forestry team. In addition to Conservation Halton owned and managed forests, afforestation efforts supported by private landowners enable Conservation Halton to meet afforestation targets. These partnerships also open up significant opportunity for relationship building towards future land donations and securement of privately owned lands. Land Securement will be a critical tool in achieving long-term afforestation targets and would help connect forests via linkages or enhance existing natural areas by increasing forest interior habitat.

**RECOMMENDATION 4: Support active land securement by building relationships with private landowners through landowner education regarding Ecogifts program and/or designate a percentage of timber revenues to the Land Securement budget.**

### Land Restoration/Rehabilitation

Land restoration is the process of improvement or recovery of damaged, degraded or destroyed ecosystems. In this process, land is rehabilitated to provide higher functional levels of services and productivity, however, the land does not recover its pre-existing condition or function.

Restoration is a valuable tool in delivering improved ecosystem services and creates a visual landscape that helps to engender support for conservation efforts. Restoring brownfield sites, creating tree buffers along creek systems, and restoring areas of abandoned farmlands to natural heritage systems all help deliver improved regional ecosystem services and forest cover. They are also ideal opportunities for public engagement as restoration works can be impactful on local landscapes and provide opportunity for community participation.

### Stewardship

To create and maintain a healthy environment, it is essential to promote a culture of environmental stewardship with private landowners. Stewardship programs are an outreach service offered by Conservation Halton to willing landowners who wish to learn more about the natural features that exist on their properties or who may be prepared to implement water quality and habitat improvement projects on their lands. Stewardship staff provide expertise and support in developing and implementing enhancement projects. They also provide financial assistance towards the implementation of projects when funding is available. Projects range in scope

from large scale creek restoration, to agricultural projects like manure storage, to smaller scale community-based projects such as rain gardens. Stewardship projects often incorporate tree and shrub planting and forest management activities and include corporate and other community volunteer events.

In addition to providing education and assistance to private landowners, Conservation Halton also recognizes landowners who are environmental stewards through a voluntary award program called the Watershed Stewardship Award. Landowners who are offered and accept this award receive a metal plaque, to display at the end of their laneway or keep indoors, to proudly show the efforts they have made on their property to protect the natural features. As of 2020, there are over 4,480 acres (1,813 ha) of privately owned lands that have been recognized for good environmental stewardship.

## **Forest Values**

### **Canada Target 1**

The Federal government has made a commitment to meeting an internationally agreed target of protecting 17% of land and inland waters for the conservation of Canada's biodiversity by 2020. This has become known as Target 1, which has been adopted as a guideline or principle by every province and territory. The 17% must be reflective of all areas and ecosystem zones of Canada, i.e. it cannot be achieved by protecting large areas of northern Canada. Currently (2019), around 11.8% is recognized as protected; this reflects only lands held by the Provincial or Federal governments. Work in 2017 and 2018 recognized the significant contribution made by others, such as Conservation Authorities, Municipalities and Land Trusts, to meeting this target, however, even with these additional contributions Ontario will still fall short of the 17% Target 1. The development of the Conservation Halton Strategic Forest Management Plan is particularly timely as our Forests will help deliver on Target 1. Our goal of Maintaining and increasing where possible Forest Cover, will help deliver further lands contributing to the delivery of Target 1, and our goals to Improve Forest Health and Species Diversity help ensure that this contribution is managed to protect and enhance the biodiversity value of our forests over time.

## **Ecosystem Services**

Ecosystem services, or ecological good and services, is a term that is used to describe the wide range of economic and cultural benefits people derive from an ecosystem. In forests, there are several non-timber values that the ecosystem provides either directly or indirectly. For example: harvesting timber from an "over-mature" forest can sequester substantial additional carbon, because (a) the forest is currently sequestering little additional carbon (the amount stored is large, but annual addition from tree growth is small or even negative), (b) the timber can continue to store carbon for decades in long-term solid wood products, and (c) the newly established stand can sequester large amounts of carbon through its vigorous growth. The carbon released by harvesting operations substantially exceeds the additional carbon sequestered by new forest stands.



# Ecosystem Services of a Tree

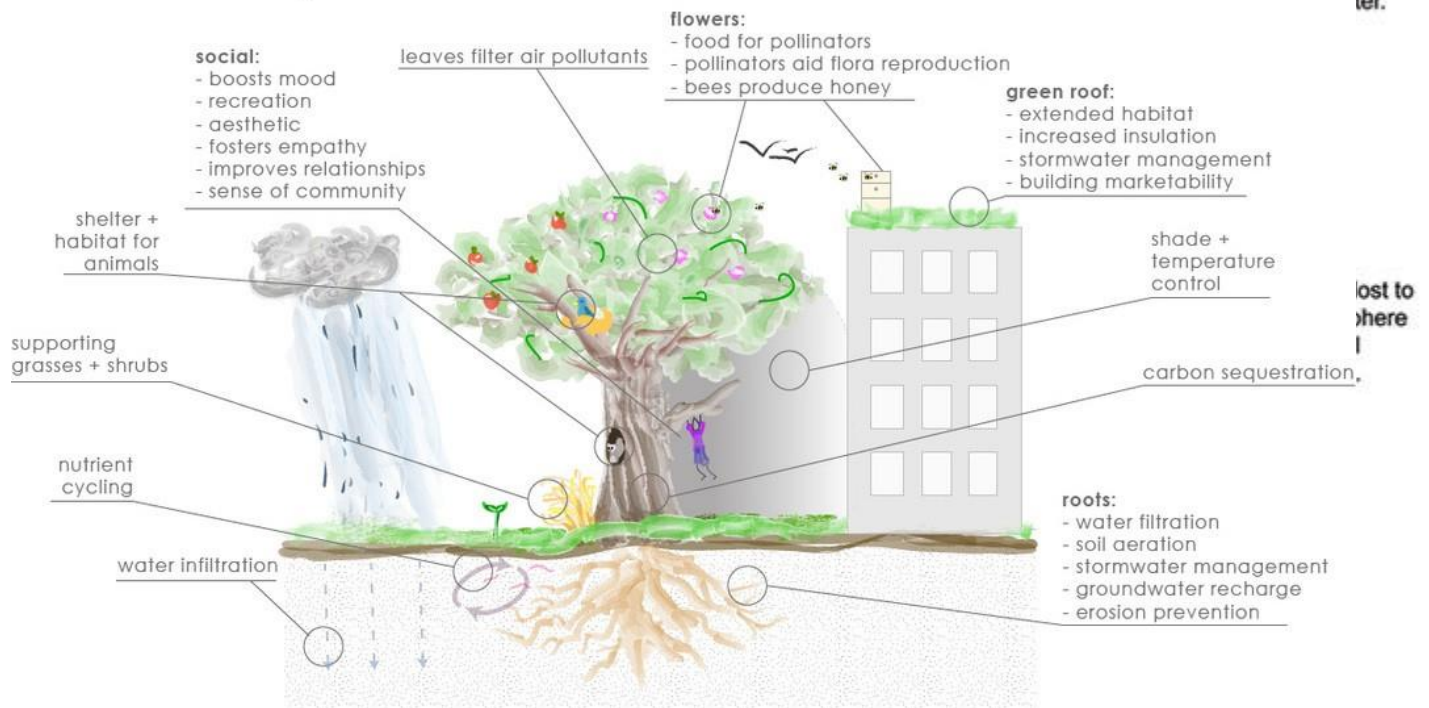


Figure 5 Ecosystem services of a tree (photo from <https://myarborsmith.com/>)

**Carbon sequestration and storage:** Our forests are sinks into which carbon is stored. As trees photosynthesize and grow, they take carbon from the atmosphere into their biomass (Figure 4). This carbon is stored until such a time as the tree breaks down. Atmospheric carbon is a greenhouse gas, the emissions of which are subject to trading, offset and tax; therefore, the amount of carbon that can be stored within a tree becomes a tradable and marketplace item. Total tree carbon in young and old forest varies drastically with twice as much carbon sequestered by young forests than old forests.

**Watershed services (water regulation, flood control, water quality):** Trees and forested lands act as filters for run off into aquifers and water courses while helping reduce sedimentation. This benefits stream and lake biota. Water that enters systems that supply potable water in this way require less treatment. Forests that are near settled areas also contribute to watershed regulation – forests have a great capacity to keep water on the landscape, helping it absorb and thereby helping reduce flooding and maintain the water table.

**Wildlife habitat and biodiversity:** Forests provide key habitat for many species of animals, birds, insects, trees, shrubs, and plants. Maintaining heterogeneous forests helps to conserve these forest species.

### Recreation and Health (both mental and physical):

Forests are an important resource for outdoor recreation especially in densely settled areas such as Halton Region. Social and health benefits of the outdoors are substantial, and there is an increasing area of awareness of the role of trees. Numerous studies from North America and Europe have provided evidence of the role of the natural environment in promoting human health such as decreased stress levels by being in an

outdoor area for a few minutes, reduced recovery times where there is a view of the outdoors, and holistic benefits from walking in a forest setting. Providing forests and woodlands that are accessible and provide access to a destination for people to support health and wellbeing is an important role for Conservation Halton.

Ecosystem Services is a developing field of work, and while a great deal of work needs to be done on how to adequately quantify values delivered by the environment, there is now a consensus that our environment has a value which can be expressed in dollars and a financial expression beyond the 'feel good' factors. A recent estimate of the value of ecosystem services for a southern Ontario rural forest is \$4443/ha/yr (\$5146 in 2017) (Troy and Bagstad 2009). This would equate to an Ecosystem Value of Conservation Halton's forests of approximately \$22M.

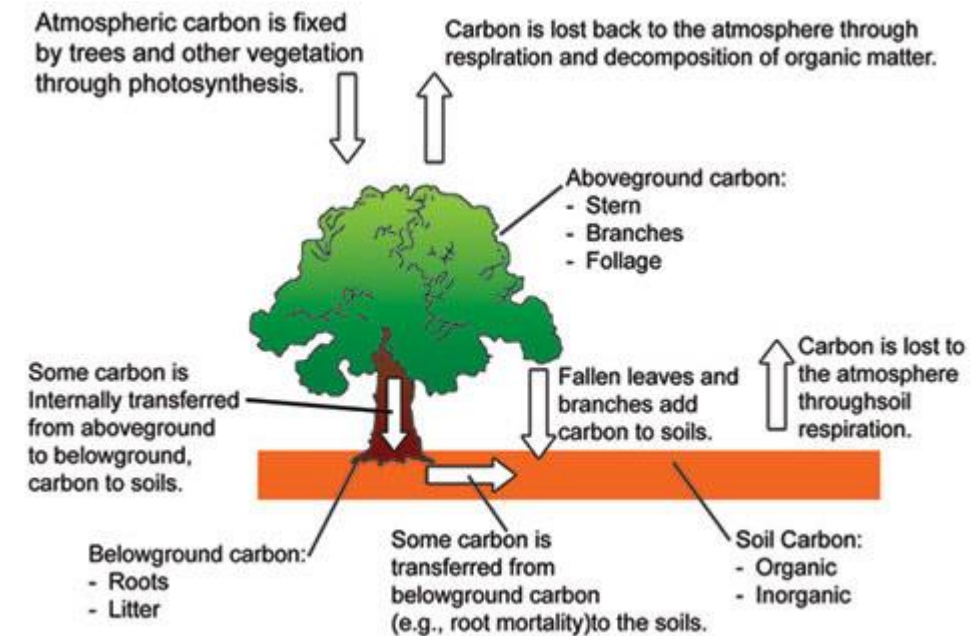


Figure 4 Carbon sequestration in agriculture and forestry (Environmental Protection Agency, 2007)

### Municipal Natural Assets Initiative for Grindstone Creek

Forests and natural spaces within watershed are key natural assets and play a vital role in maintaining resilience to climate changes on the landscape, which in terms helps buffer the impacts of intense storms and drought, especially to avoid costly storm water management repairs downstream or avoid the costs of oversizing infrastructure in urban areas and to moderate/lessen the flooding/erosion impacts.

Municipal Natural Assets refers to the stocks of natural resources or ecosystems that contribute to the provision of one or more services required for the health, well-being, and long-term sustainability of a community and its residents. The Municipal Natural Assets Initiative (MNAI) provides expertise to support and guide local governments in identifying, valuing and accounting for natural assets in their financial planning and asset management programs and developing leading-edge, sustainable and climate resilient infrastructure.

The objective of the MNAI in Ontario's Greenbelt Project is to "help participating local governments identify, prioritize, value and manage key natural assets. This will result in the natural assets providing core services such as storm water management in a cost-effective and reliable manner for the long-term, which can in turn: save

money relative to engineered alternatives; reduce risk and potential liability and result in sustainable service delivery to the community."

Conservation Halton, Burlington, Hamilton, and Royal Botanical Gardens put forward a proposal for the Grindstone Creek watershed. Grindstone Creek, with headwaters in Hamilton, flows through urban Burlington to its mouth in Hamilton Harbour. The proposal was successful, and a launch workshop was held in December 2019. Over the coming year, the project will comprise additional workshops, technical work, and collaboration across a range of organizations to assess, plan for and finally implement effective strategies to understand, measure, value and manage natural assets in the Grindstone Creek Watershed and eventually well beyond. To support effective decision-making, the project will consider a variety of scenarios including climate change impacts and different management and land-use practices.

Ultimately, the project will:

- Enhance the services that natural assets provide to local communities and their well-being.
- Manage community financial and asset risk: natural assets can, in some cases, provide the same benefits or services to municipalities as engineered assets, at a lower cost.
- Help make the watershed more resilient to climate change.
- Create a replicable model and natural asset management approaches that can be applied to other watersheds within CH’s jurisdiction and other regions or other watersheds across Canada.
- Promote and support collaborative watershed planning and management.

**RECOMMENDATION 5: Ensure that the ‘value’ provided by the forest infrastructure on Conservation Halton lands is reflected in the emerging asset management framework.**

**Timber Values**

There is a direct financial value to the management of our forests through the sale of forest products (see Silvicultural Context section for examples). Markets for local, small scale timber products are growing and large commercial markets are also drivers. Whilst there is a commercial value to timber production, Conservation Halton will explore the potential sale of timber not as a driver of operations, but as a secondary consideration to planned operations.

Revenues from the sale of timber are expected to offset the costs of preparing detailed prescriptions, tree marking and operations monitoring. Any net revenues from timber sales can be reinvested in the management of Conservation Halton’s forests.

**RECOMMENDATION 6: Establish a Forest Reserve Budget to enable timber revenues to be dedicated toward the continued growth and improvement in Conservation Halton Forests.**

# Forest Health and Management

## Forest Health and Resilience

Forest health is more than just an absence of pests and pathogens. A healthy forest is a resilient ecosystem with the capacity to tolerate external stressors and disturbances while maintaining a balance of desirable species of all sizes and ages. The fragmented nature of southern Ontario forests leads to compromised resilience of the forest ecosystem throughout the Conservation Halton watershed. Forest resilience, however, can be maintained or improved by sustainable forest management.

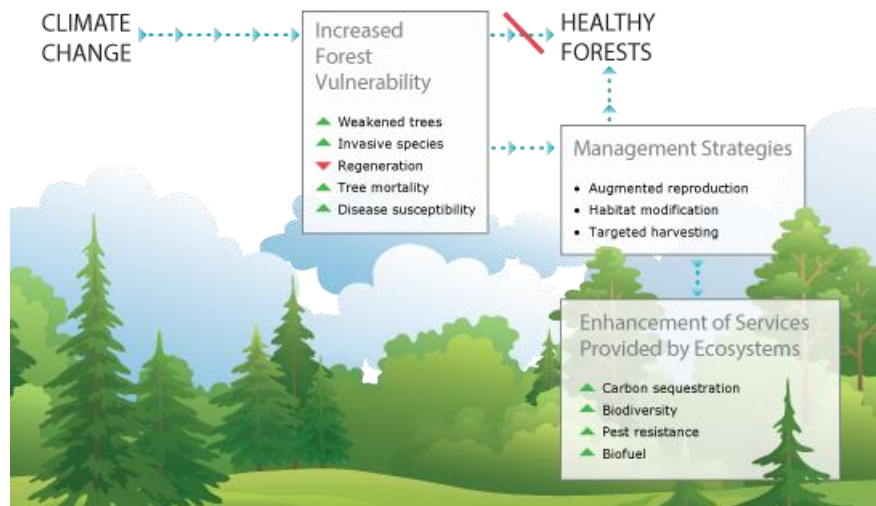


Figure 6 Climate change effects on forests

Maintenance of compositional (genetic, species, and community), structural and functional diversity at various scales (stand, landscapes, ecosystem), maintaining or improving forest connectivity, reducing competition by invasive species, and reducing the use of non-native tree species for afforestation or reforestation projects also preserves and improves resilience (Thompson et al. 2009). Objectives and activities of the Plan are to develop and implement a program designed to maintain and enhance forest resilience which in turn will help to maintain a healthy watershed.

Conservation Halton's overall forest condition is varied throughout our land holdings depending on a variety of factors including forest type, age, past management activities and recreational usage. However, generally, our forests are in a less than ideal condition and are, at times, in a poor condition. To date, varied forest health has occurred for a wide range of reasons, for example:

- Forest fragmentation is impacting species regeneration; there are minimal opportunities in this fragmented landscape for genetic diversity in natural seed source; there is little opportunity for the natural replacement that occurs in forests across a broader geographical area.
- Abiotic factors such as extreme weather events, shallow soils, increasing temperatures, precipitation or lack thereof, combined with the other factors listed here contribute to decreased forest health and resiliency
- Invasive plants have colonised and dominate in some areas reducing understory diversity. For instance, garlic mustard is present in many areas and impacts soil pH, and dog-strangling vine (DSV) has formed understory monocultures in Waterdown Woods, Grindstone Creek and Nicholson.
- Native forest pest population spikes, when combined with abiotic factors such as repeated years of drought can cause heavy mortality across entire stands
- Invasive insects and pathogens such as emerald ash borer (EAB), gypsy moth, butternut canker, and beech bark disease currently impact forest health and diversity and become a hazardous component of the woodland.

- Plantations that were planted for rapid growth with the intention of conversion to more natural stands have missed necessary thinning resulting in several stagnant monoculture conifer stands in need of management. Additionally, diseases such as blister rust and fomes root-rot has increased the amount of unacceptable growing stock or caused high mortality within these stands. This can especially cause issues in red pine plantations.
- Overly intense recreation can cause species loss, erosion issues, and provides a conduit for a wide spectrum of invasive species.
- Our formal Conservation Area Parks tend to manage recreational pressures well, but many Natural Areas have not had such proactive management due to unavailable resources and funds.
- Deer populations are escalating, and deer browse is preventing a natural regenerative cycle in native plant and tree species. Methodologies to measure and track the impact of deer browse on regeneration will be investigated and implemented for management consideration.
- New pressures such as forest foraging are causing the decline of desirable plant and mushroom species.

## Forest Health Metrics

To monitor forest health over time, and to evaluate trends, we have identified a set of robust metrics for assessing forest health. The first three metrics are based on standard data collected during forest resource inventories, while the fourth measure is assessed by the Ecology Team prior to forest management .

1. Growing stock condition. Our goal, based on Ontario silviculture standards, is to attain 70% acceptable growing stock (AGS) stems to 30% Unacceptable Growing Stock (UGS) stems at the stand and landscape level. This will allow us to achieve a high proportion of healthy, high quality stems, distributed evenly over various size classes at any given time. The 30% UGS trees will allow the priority removal of undesirable stems, such as those exhibiting major infectious diseases and trees that are impeding the development of potential AGS stems. It will further allow for the retention of trees exhibiting wildlife habitat characteristics. This target also aligns with our goals to improve forest health; and to improve stand and species diversity.
2. Presence of desirable natural regeneration in the stand prior to thinning operations. This will reflect stand capacity for sustainable regeneration or will indicate follow up planting requirements. Stands may be understocked (<1000 stems/ha<sup>2</sup>), adequately stocked (1000-3000 stems/ha) or overstocked (>3000stems/ha). The goal is to have adequate stocking in all stands.
3. Assess and manage invasive species, forest pests and disease. Both the population size and invasiveness of plant and insect species present are factors impacting forest health. However, some invasive species are difficult to control or manage either because of the aggressiveness of the species and/or the lack of effective control options (see Invasive Species section in this document). The goal is to maintain or reduce the abundance of invasive species, forest pests and disease in Conservation Halton forests. Control or management approaches and priorities will species be developed based on species abundance, habitat value, impact and future threat of , control success and overall stand management needs (Appendix 2.1).

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<sup>2</sup>1 All categories of regeneration combined (saplings, advanced regeneration (>1.4m tall), and early regeneration (<1.4m tall))

4. Presence or absence of habitat for species at risk (SAR) or confirmed presence of SAR. The goal is to maintain all SAR habitats identified and to assist in creating more interior forest habitat. Management planning will consider SAR protocols (Appendix 1.3 as a baseline, or superseding legislation or science).

**RECOMMENDATION 7: Monitor and improve overall forest health and wildlife habitat throughout Conservation Halton forests.**

Wetland woods are lacking a forest inventory due to challenging terrain and access, however had been evaluated using the Ontario wetland evaluation system. These properties or stands are often enrolled in the CLTIP and do not require a forest inventory component for enrollment in the program. However, these stands are still subject to invasive species and pests that can severely affect the composition of the stand (e.g. Black Ash swamp heavily infested with EAB or a common buckthorn understory). These stands would benefit from assessment for future management opportunity and should be inventoried by Conservation Halton Forestry staff or assessed by Conservation Halton Ecology staff to determine quality.

## **Forest Cover**

Forest cover is a measure of the percentage of an area covered by forest canopy with a minimum density of 60% (e.g. SOLRIS Technical Team 2008) and is monitored and measured by aerial imagery. Environment Canada (2013) suggests that, an average of 30% - 50% forest cover is necessary to maintain species diversity on the landscape, and to maintain natural functions and processes.

The Halton Region and its local municipalities have determined that a realistic target across the Region is 30% forest cover, reflecting the minimum federally established recommendation. Currently forest cover across Halton Region is 24.4%; on the way to achieving this target but falling short. To achieve this goal would require approximately 9000 acres of forested land across the regional watershed. However, the Region is under significant pressure as the watershed continues to see the fastest levels of urban growth in Canada and is forecasted to continue to see growth throughout the 20-year lifespan of this plan. With the continuous removal of canopy to make way for growth, even maintaining current forest cover level is an ambitious target.

Increasing forest cover addresses many elements of Conservation Halton's goals and approaches. By maintaining or increasing forest cover on CH lands, we can increase the net benefit of ecosystem services such as carbon storage, air and water quality, and amenity values and species diversity. Afforestation also creates opportunities for the future sale of timber, and therefore financial sustainability in woodland management.

Conservation Halton is strategically positioned to be the delivery agency in trying to meet this target being the largest single land owner in the Region and having the ability to work on both its own lands and with other public and private landowners through our tree planting, managed forest planning and outreach programs.

**RECOMMENDATION 8: Maintain current forest cover percentage through the management of the Conservation Halton forests and by working with watershed partners.**



Relationships formed through this initiative of maintaining or increasing forest cover are important for Conservation Halton in terms of encouraging stewardship and engagement with private and public landowners. Through programs like MFTIP, CH creates management plans that help maintain and even increase tree cover on CH properties.

## Tree Planting Programs

Trees are planted within Conservation Halton's watershed through a variety of programs and planting is delivered by a broad team at Conservation Halton:

- Forestry plants approximately 30,000 - 50,000 trees annually through the 50 Million Tree Program and private landowner outreach services
- Stewardship supports the planting of trees through private landowner outreach and as part of restoration programs on public-partner owned lands
- Communications supports the planting of trees as part of an outreach and educational opportunity
- 95%+ of our farm leases were cancelled and those lands were afforested over the course of 4 years (2002-2005)
- Our Conservation Area programs support tree planting via management programming and trail management

Each tree planting program focuses on different sets of objectives but are encompassed by a commitment to reforestation and afforestation. Through planting programs, a wide range of objectives and initiatives can be achieved. Conservation Halton is committed to ensuring that the right trees are planted in the right places to maximize future forest health and reduce management interventions.

Restoration is a valuable tool in delivering improved ecosystem services and a visual landscape change that helps to engender support for conservation efforts. Restoring brownfield sites, creating tree buffers along creek systems, and restoring areas of abandoned farmlands to natural heritage systems all help deliver improved regional ecosystem services and forest cover. They are also ideal opportunities for public engagement in so far as restoration works can be impactful on local landscapes and provide opportunity for active engagement.

**RECOMMENDATION 9: Promote private landowner tree planting programs to engage a wider community in the importance and value of forested landscapes.**

## Seed Stock

Conservation Halton currently plants tree material that is grown from local seed sources (Zone 34 and 37) including stock grown from seed collected by staff. Staff collect local seeds because they are genetically adapted

to withstand local climate conditions. To mitigate the impacts of climate change on Conservation Halton forests, it is suggested that we introduce a percentage of material sourced from more southerly locations which is expected to be better adapted to climate change (Ledig and Kitzmillar 1992, Boysen 2016). The amounts of each will depend on our confidence in climate change prediction over the course of the plan and stock availability from our neighbours to the south.

A key factor in determining tree stock availability from more southerly seed zones is ensuring that the nurseries who grow the stock have a ready supply of genetically diverse seed and stock being purchased as it will need to meet the same level of quality we are currently receiving from local nurseries. With an extensive area of forested lands and a diverse mix of species, Conservation Halton will continue to play a key role in seed collection to provincially recognized standards on its own lands as part of its support of forest health across the region.

**RECOMMENDATION 10: Continue to support a vibrant local seed stock within southern Ontario nurseries by providing a reliable, local seed source.**

## **Forest Establishment and Growth**

Planting trees is not the end of establishing a forest but is simply the beginning. Forest establishment requires management; short term tending over 1-, 2- and 5-year periods initially, and the need for repeated assessment for the initial 10 years after planting. If, after five years, the survival remains above 60%, then the forest can be left to grow. After 10 years, the forest is becoming established, and ideally at 20 years a first thinning (especially in the case of conifer plantations) and management operation will be required to ensure a diverse and resilient woodland. However, forest growth and establishment require a sustained commitment by Conservation Halton, regardless of whether it is an owned, managed or partner-managed property.

# Foundations of Forest Management

## Sustainable Forest Management

Sustainable forest management is the care and use of forests such that their environmental, social, and economic values and benefits are maintained into the future (Natural Resources Canada 2017). Maintaining forests sustainably requires a science-based methodology for assessment, decision-making and management planning, and requires a re-evaluation of methods with scientific advancements and changing environmental conditions. Laws, regulations, and policies are in place to promote sustainable management practices in all provinces (Table 1). Registered Professional Foresters and Forestry Professionals are responsible for ensuring that these high standards are implemented in individual forests. It is these approaches that define international standards (e.g. Forest Stewardship Council (FSC) certification) for forest management.

All Conservation Halton forest management activities will meet or exceed any applicable, generally accepted standards of sustainable forest management, as outlined the MNRF’s “A Silvicultural Guide to Managing Southern Ontario Forests”, Natural Resources Canada’s “State of Canada’s Forests” and Forest Stewardship Councils “Principles and Criteria” for well-managed forests. This form of management maintains and enhances the long-term health of the forest ecosystem for present and future generations. It is the tool with which Conservation Halton will manage its forests to improve their overall health.

To effectively address forest health challenges, Conservation Halton must implement sustainable forest management across all its forests, not just planted single-species stands. Sustainable forest management is the way we can enhance our iconic escarpment woodlands to better achieve forest health and resilience including maintaining characteristics for which lands are recognized, removing diseased and hazard trees, promoting vigorous growth, thinning over stocked areas and proactively addressing potential hazards.

**RECOMMENDATION 11: Manage for long term forest health by promoting and utilizing Sustainable Forest Management principles and practices that meet or exceed current standards.**

Our approach to sustainable forest management was developed as part of the Master Planning process and is reflected within Conservation Area Master Plans and will follow and adopt international standards defining ‘Sustainable Forest Management’ as captured by FSC Principles and Criteria for well managed forests and other recognized standards (e.g. Canadian Standards Association Sustainable Forest Management standards, Sustainable Forestry Initiative (SFI)). This applies to any other similar standards that might arise through the lifespan of this Plan as the science of sustainable forestry develops.

## Mimic Natural Disturbance

Conservation Halton manages a relatively small extent of what would have been a region-wide forest less than 200 years ago. Over time, these extensive forests have become marginalised and disconnected from each other, to the narrow scope of forest that we manage today within Halton. When our forests were an interconnected landscape, they would have been influenced by areas of loss and natural deforestation, and periods of forest

renewal. These natural processes caused by disease, storm and fire would have provided a complex matrix of diverse forest age stands. The degree to which tree planting and subsequent management emulates the structural complexity, variability and key features of natural regeneration through the forestry cycle determines the diversity and composition of the biotic community at stand and landscape levels (Franklin et al., 2002; Hansen et al., 1991; Spence et al., 1999).

Today, in a vastly reduced and fragmented forest complex, our aim is to conserve and promote diverse and resilient forests on the landscape. To do so, we must minimise the 'risk' of a natural loss such as fire. With smaller, isolated woodlands such as ours, these natural processes threaten entire woodland areas, or the removal of a species from a forested land holding. To maintain species diversity, a healthy forest and a forest that is resilient to climate change, these natural processes of loss and regrowth need to be re-created through silvicultural management such as stand improvement thinning, under planting with native species where necessary, and controlling invasive plants and undesirable regeneration.

## **Old Growth & Interior Forest Habitat**

Forest cover expansion is key to meeting nationally recognized standards to support healthy ecosystems; however, the quality of the forest is also critical.

Old Growth is a term often used in forestry but has an indistinct meaning. The MNRF characterizes old growth forests by high turnover of overstory trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris (2015b). This provides a wealth of microhabitats for insects and wildlife. For a white birch forest, this might be 80 or more years old, whereas an old growth stand of cliff edge white cedars range in ages from 500-1000 years. In Halton Region, old growth would reflect forests that are 200 or more years old.

Interior Forest Habitat is the inner area of a forest that is at least 100m in from the forest edge (MNR 2005). An interior forest has a unique and rich biodiversity and is home to species that avoid the more disturbed edge environments. These areas have become increasingly rare as forests have become fragmented – smaller pockets of woodland may add up to a total that is more significant, but do not contain the interior habitat relied on by many species. When looking at active parks, areas with trails or other recreational activities within the interior forest would disrupt these ecosystems.

Growing and enhancing the amount of old growth and interior forest habitat within the watershed is a measure of the quality of the forest ecosystem being provided. Conservation Halton will manage for old growth characteristics, where possible. However, given the pressures on our woodlands and forests, it is unlikely that most of our forests would be considered undisturbed.

## **Management Challenges and Opportunities**

Sustainable forest management for Conservation Halton must be based on the assumptions that: the climate will change, with concomitant impacts on the forest; the introduction and impact of invasive species will continue and potentially increase; development pressures will continue and increase; and, that recreational use of the forests will increase.

## Structural and Biological Diversity

The architecture, or pattern, of a forest influences the flora and fauna that inhabits it. Key structural components include stand complexity, both horizontal and vertical, the presence of canopy gaps or glades, the quality and volume of both downed woody debris and snags, and forest floor complexity. At a stand level, maintaining or enhancing structural diversity to mimic that of natural forests will help to maintain diversity of flora and fauna at a local level. In addition, managing the forested landscape to conserve or restore a mosaic of forest species, sizes, successional stages, and regeneration cycles is necessary for enhancing environmental and economic resilience, and as such is required by international certification programs such as FSC.

Species diversity, or biodiversity, is the spectrum of flora and fauna that inhabit our forests. Included in this diversity are species at risk – species in danger of becoming extinct because of environmental or human-induced changes that threaten either species or its habitat. Ecosystems that have a wide variety of plants and animals tend to be healthier and more resilient than those with a low level of biodiversity. Rapidly changing conditions caused by climate changes and human activity have the potential to reduce biodiversity and degrade the natural environment. Among the threats to biodiversity are habitat degradation, loss, and fragmentation, along with pollution, introduction of invasive species and unsustainable forest practices.

Conservation Halton Forests lie within the Great Lakes-St Lawrence region and Carolinian zones, with most upland tolerant hardwood forests – a critical location for species diversity. Carolinian influences and escarpment topography, a climate influenced by the presence of the Great Lakes, and the unique environment of the Niagara Escarpment, make the forests of the region particularly ecologically valuable and diverse. However, this diversity and species richness is also under pressure. Conservation Halton's forests are located within the fastest growing region in Canada with major population centres expected to grow significantly over the lifetime of this Plan. This is likely to result in further habitat loss for many species, as well as increased habitat fragmentation and greater pressures on our current forest resources. With the Greater Toronto and Hamilton Area (GTHA) on the doorstep of our forests, the risk to species diversity is a key driver and theme of this Strategic Forest Management Plan.

The responsibility for biodiversity driven through the Strategic Forest Management Plan ensures that Conservation Halton must manage the forest ecosystem as a unit. Conservation Halton's approach to strategic forest management goes beyond the traditional perspective of tree management and shadows our strategic commitment to landscape, ecosystem wide management for the overall net benefit of our biodiversity.

**RECOMMENDATION 12: Identify and manage appropriate stands toward 'old growth' characteristics recognising that the human environment surrounding our forests will rarely allow for true old growth forests.**

## Climate Change

Climate Change is occurring and will continue to influence our watershed into the future. Temperatures are increasing - the mean yearly temperature is higher (Environment Canada 2017), and extreme weather events are becoming more common (e.g. 2013 ice storm, increased forest fires in Ontario 2019-2020, increased flooding events in Canada 2020). Though predictions of the eventual outcomes vary, the scientific community predicts that the impacts of climate change will include hotter summers, more variable winter temperatures, more variable precipitation, and an increase in extreme weather events. These factors will affect Conservation

Halton forests, potentially impacting ecosystem health and biodiversity. This ongoing change is a key driver for forest management to improve ecosystem health and species diversity.

These changes are already being experienced and are a driver for sustainable forest management in three key ways:

- 1) Healthy forests that are resilient to the changes in weather and conditions and can recover from extreme events
- 2) Forests of a species mix that is adaptable to the longer-term changes in climate, such as temperature and precipitation levels and that can tolerate new species of insect that will extend in range with changing climate
- 3) Forests that help mitigate the impacts of climate change to human society – that support clean water supplies and that offset heat island effects and deliver a broad range of ecosystem services that will be facing increasing pressure

Our ability to value and deliver ecosystem services through strategic forest management in response to climate change creates potential new areas for growth and management services of Conservation Halton. It is vital that we manage our forests to prepare for the impacts of climate change using scientifically sound approaches (Appendix 1.5). This requires a proactive approach for all our existing woodlands. This includes managing species aided by climate change. Through a more flexible approach to woodland management, managing our existing forests to ensure that should one species of tree start to be impacted by climate changes, there is a diversity of appropriate species to maintain effective forest cover.

Anticipated climate change pressures should be reflected in tree planting and forest cover targets. We must plant a species mix that is equipped to deal with a climate not only as it is today, but as science suggests it will be in 20, 50 and 100 years from now. This requires maintaining a highly skilled technical forestry unit that is at the forefront of forest science and able to implement programs and techniques that enable us to deliver a sustained forestry program, that is both equipped to deal with the changes in climate but is also able to deliver ecosystem services that are going to change in need as we mitigate the impacts of climate change.

**RECOMMENDATION 13: Build resiliency in our forests with climate change mitigation and adaptation by maintaining and enhancing forest science knowledge for forest management practices.**

## **Invasive Species**

Invasive species are flora and fauna, not native to the ecosystem, that when introduced cause harm to the environment. Generally, these are non-native species that can exploit local conditions, have no local predators/control and either kill or damage (insects or pathogens) or outcompete (plants) native species. Invasive species have a range of mechanisms for altering ecosystems. The presence of host-specific pests and pathogens such as EAB, beech bark disease and butternut canker, that tend to kill all or most of their preferred host can dramatically impact the structure and function of a wooded area in the short and medium term. Woodlands can take decades to recover from these devastating impacts, and some may never recover. Invasive plants such as garlic mustard, DSV, phragmites and buckthorn are very rapid growers and quickly dominate an area. Without competition or effective predators – mainly insects, these species exclude native species from the areas they colonise and compromise ecosystem diversity. In some cases, such as DSV, the tree regeneration can be compromised. Species such as garlic mustard have an allelopathic impact on forest

soils – garlic mustard’s ubiquitous nature makes this a significant threat to our forests. Species such as giant hogweed have significant human health implications having a sap which can cause severe burns when skin is exposed to sunlight. If discovered on our properties Conservation Halton will strive to manage populations. Existing and potential invasive insects, plants and pathogens are potential threats to forest health and resilience in Conservation Halton forests. Conservation Halton has noted the presence of invasive plant and insect species, at times multiple invasive species, in most of its forested lands (Table 2).

*Table 2 Invasive plants, insects, and pathogens of concern in Conservation Halton forests*

<b>Plants</b>	<b>Insects</b>	<b>Pathogens</b>
Dog-strangling vine	Emerald ash borer	Butternut canker
Phragmites	Gypsy moth	Beech bark disease
Common and Glossy Buckthorn	Asian longhorned beetle*	Oak wilt*
Giant hogweed	Hemlock woolly adelgid*	Thousand canker disease*
Japanese knotweed		
Garlic mustard		
Tartarian Honeysuckle		
Oriental bittersweet		
Periwinkle		
Five-leafed aralia		
Goutweed		
Daylily		
Privet		
Japanese Angelica Tree		
Multiflora rose		

\*Not yet known to be present

The presence of invasive species in Conservation Halton forests creates management challenges. For example, we must ensure tree species diversity over the landscape to mitigate the impact of emerging and potentially catastrophic invasive pests and pathogens such as Asian Longhorned Beetle (ALHB). Planning for, and managing, invasive plants in the understory before and after forestry operations will be necessary to ensure tree regeneration and understory diversity. Conservation Halton has Standard Operating Procedures in place to reduce the spread of invasive plants during forestry operations. Invasive plant species vary in their invasiveness, re-introduction potential and the success of treatment (Table 3). Some plant species, such as Manitoba maple are more readily controlled, whereas others, such as DSV present ongoing management challenges.

We have several concerns relating to invasive species and human use of woodlands. Firstly, one impact of invasive species is in creating hazard trees, which creates risk to users of the woodland areas. In many instances, the driver of management of invasive species is not for forest health, but instead is to address risks



that these indirect impacts can create. Secondly, invasive plant spread is aided by humans, animals and equipment that unwittingly carry and disperse seed.

*Table 3 Plant characteristics and treatment success*

Species	Invasiveness *	Spread/re-introduction potential	Treatment success
Dog-strangling vine	Major	High	Mechanical: variable, needs continuing efforts to maintain. Chemical: good control when done when plants flowering and with late season follow up treatment. (Lawlor and Raynal 2002; Aitken 2008)
European buckthorn	Major	High	Chemical: Herbicide treatment of cut stumps is treatment of choice but variable results; may depend on herbicide and timing of application; subsequent saplings need to be treated (Gale 2000; Zouhar 2011). Eradication not likely, but decreasing control effort over time (Zouhar 2011)
Garlic mustard	Major	High	Mechanical: Hand pulling effective for satellite populations, eradication (vs. control) sometimes achieved (Drayton and Primack 1999). Chemical: information about herbicide efficacy is difficult to find. Will require several consecutive years of treatment.
Manitoba maple	Minor	Unknown	Un-described
Tarterian honeysuckles	Moderate	Moderate	Mechanical: Pulling small plants effective; with larger stems cutting followed by treating stumps and subsequent sprouts with herbicide effective (in Munger 2005).

\*After White et al. 1993 and consistent with plant biology (reproductive success, seed dispersal abilities, breadth of habitat tolerance, and ability to outcompete other plants through extended growing season and/or allelopathy)

Ironically, invasive species are a key and valuable tool in engaging communities. The scale of climate change and the challenges our global species at risk face present a daunting and at times apparently insurmountable battle to our regular visitors and local communities. In contrast, invasive species are a local issue that have local

**RECOMMENDATION 14: Establish an Invasive Species Management Program and manage invasive and non-native plant species on Conservation Halton properties, where possible.**

impacts and can be readily placed in context by many users and communities. Be it a concern of the impact of giant hogweed, or the understanding of the impacts of EAB or ALHB through the publication of firewood movement bans, invasive species on the doorstep can inspire communities to action. They are also an ideal opportunity for engagement as many invasive species such as garlic mustard and buckthorn can be managed. Management options are very resource-heavy meaning the more people involved the more effective the effort. These situations give an ideal opportunity for volunteerism and active participation in local greenspaces.

## Species at Risk

Several species at risk reside in Conservation Halton forests (Table 4) - from iconic species such as the Jefferson salamander, a species at risk that finds its only refuges in the vernal ponds and pools common through our

forests, to plant species like American cumbro, which require the climate and soils here as well as open canopy areas in which to thrive, to tree species such as butternut that is threatened by a fungal pathogen, butternut canker. These species are listed as locally, regionally, provincially, or nationally threatened, with the most significant species and habitats protected by Species at Risk legislation (Table 1). Through our forest management, Conservation Halton will adopt the highest standards of approach to working with species at risk. Protecting species and their habitats requires good management, and through our forest health approach to sustainable forest management, Conservation Halton commits to striving to protect species and their habitats. Forest management plans and harvest prescriptions will address best practices for the conservation of these species. Appendix 1.3 includes recommended forest management strategies for these species. This is a living Appendix and will be updated accordingly.

**RECOMMENDATION 15: Adopt leading practice through sustainable forest management to conserve and improve forest habitat for the benefit of Species at Risk.**

Table 4 Potential terrestrial species at risk in Conservation Halton forests

Species	SARO Status	Species	SARO Status
<b>Amphibians</b>		<b>Mammals</b>	
Jefferson Salamander	Endangered	Eastern Small-footed Myotis	Endangered
		Little Brown Myotis	Endangered
<b>Birds</b>		Northern Myotis	Endangered
Bank Swallow	Threatened	Tri-colored Bat	Endangered
Barn Swallow	Threatened	Woodland Vole	Special Concern
Bobolink	Threatened		
Canada Warbler	Special Concern	<b>Plants</b>	
Cerulean Warbler	Threatened	American Chestnut	Endangered
Chimney Swift	Threatened	American Colombo	Endangered
Common Nighthawk	Special Concern		
Eastern Meadowlark	Threatened	Broad Beech Fern	Special concern
Eastern Wood-Pewee	Special Concern	Butternut	Endangered
Golden-winged Warbler	Special Concern	Dense Blazingstar	Threatened
Grasshopper Sparrow	Special Concern	Eastern Flowering Dogwood	Endangered
Henslow's Sparrow	Endangered	Harts-tongue Fern	Special concern
Least Bittern	Threatened	Hoary Mountain Mint	Endangered
Louisiana Waterthrush	Special Concern	Red Mulberry	Endangered
Olive-sided Flycatcher	Special Concern		
Peregrine Falcon	Special Concern	<b>Snakes and Lizards</b>	
Prothonotary Warbler	Endangered		
Red-headed Woodpecker	Special Concern	Eastern Ribbonsnake	Special Concern
Short-eared Owl	Special Concern		
Whip-poor-will	Threatened	<b>Turtles</b>	
Wood Thrush	Special Concern	Blanding's Turtle	Threatened
Yellow-breasted Chat	Endangered	Eastern Musk Turtle	Threatened
<b>Insects</b>		Northern Map Turtle	Special Concern
Gypsy Cuckoo Bumblebee	Endangered	Snapping Turtle	Special Concern
Monarch	Special Concern	Spiny Soft-shell Turtle	Threatened
Mottled Duskywing	Endangered	Wood Turtle	Endangered
Rusty-patch Bumblebee	Endangered		
West Virginia white	Special Concern		
Yellow-banded Bumblebee	Special Concern		

## Hazard Tree Management

Hazard trees in our woodlands are a concern for risk management. A hazard tree is defined by Conservation Halton policy as a tree that has a propensity to fail, in all or part, and strike a target, a target being an asset of the authority – trails, building etc., or an asset of a neighbour (e.g. house) (Appendix 1.6). Currently, hazard trees are managed as a stand-alone program by arborist staff. Staff survey trails on a regular basis, identify

hazard trees and act as needed. However, hazard trees are mostly a symptom of a woodland that is in less than optimum health. A healthy forest does not support a significant hazard tree concern, as these trees are managed early and proactively as part of Sustainable Forest Management to achieve forest health. Through delivering Goal 1, Conservation Halton will in turn be limiting and reducing the challenges associated with hazard tree management.

**RECOMMENDATION 16: Maintain a responsive hazard tree program and reduce risk of hazard trees through proactive Sustainable Forest Management.**

## **Recreational Use**

As stated under Ecosystem Services, forests play a key role in human health and well-being. Recreational activities can stimulate stewardship for nature and the forest, create grassroots monitoring of forest health by locals. Recreational use can negatively impact forested areas in a number of ways including: soil compaction from foot traffic, widening of existing trails, creation of unsanctioned trails, and unauthorised use of off road vehicles; trampling of plants and regenerating understory trees; and the introduction and spread of invasive species (City of Toronto, Parks, Forestry 2013). The presence of trails can change wildlife movement patterns with resulting increased exposure of prey to predators. There is a balance to be identified and maintained between recreational access and ecological protection in forest management planning. With that said, recreational and visitor use can also stimulate a desire for stewardship of nature and forests with the public.

## **Development Pressure**

Increased urbanization and development are causing a reduction in natural, agricultural, and other green space in southern Ontario. Impacts will include increasing isolation of Conservation Halton's natural areas and attendant pressures on the diversity and function of flora and fauna within them, worsening air pollution, and the likelihood of increasing recreational pressures on our forest with increased populations.

## Forest Health Monitoring

Conservation Halton forests are under a great deal of stress from drought, extreme weather events, invasive plants, pathogens and insects, outbreaks of native and invasive insects and recreational pressures; these stressors are likely to escalate in coming years. Conservation Halton undertakes regular monitoring to evaluate factors that impact health and resilience of its forests. Staff also attend annual forest health conferences with the MNRF and Forest Ontario to learn about up and coming forest issues and pests.

Monitoring becomes most effective when it is ongoing and cyclical. The establishment of the detailed Forest Inventory as Section Two of the Strategic Forest Management Plan is a key activity in our monitoring program as it establishes the shared resource that allows greater collaboration across Conservation Halton departments. With a shared, updatable, and evolving inventory, and a cyclical pattern of management activities, monitoring becomes embedded within the delivery of the Strategic Forest Management Plan. This in turn delivers the ability to report on Forest Health associated outcomes. There are several forest health monitoring programs currently in place that will inform forest management planning:

*Forest health and biodiversity monitoring:* Conservation Halton monitors long-term tree health, tree regeneration, and biodiversity of shrubs/small trees and ground vegetation using the standardized EMAN plot survey protocols (Roberts-Pichette and Gillespie 1999). These protocols provide a robust methodology for monitoring and documenting forest ecosystem change over time. There are 12 permanent EMAN monitoring sites, nine on Conservation Halton holdings, two on Town of Oakville property and one on Town of Milton land. The full suite of monitoring is completed on rotation every four years with tree mortality monitored each year at all sites.

*Forest bird monitoring:* Conservation Halton conducts yearly forest bird monitoring at permanent point count stations at 10 sites. Forest bird monitoring follows Canadian Wildlife Service's Forest Bird Monitoring Protocol.

*Soil temperature:* Changes in soil temperature impact nutrient uptake, moisture content and root growth. Soil temperature monitoring was implemented in 2019 across the forest health sites and will continue annually at all sites.

*Soil chemistry:* The chemical structure of soil is important in holding and distributing nutrients. Soil chemistry was collected at forest health sites in 2019. Chemistry analysis will be completed in future years as needed.

*Tree inventory, and pest and pathogen monitoring:* Permanent Sample Plots (PSP's) were originally established for the detection of gypsy moth on Conservation Halton lands in 2000. Plots were established in Conservation Halton natural areas across the watershed, and strategically located in woodlands dominated or co-dominated by oak, aspen, birch, maple, beech and or white pine species. The plots are monitored regularly for insect and disease signs and symptoms, along with the collection of tree inventory data. Monitoring and tree inventory updates will be included in Section 3.

*Natural Heritage Annual Monitoring:* As property steward for three Ontario Heritage Trust properties (Yaremko, Yaremko-Ridley and the Little Tract), several tasks are required. They include an annual site visit and a report on matters impacting the health of the forests on these properties including the maintenance of natural features and biodiversity and minimizing disturbance to restore any natural features suffering adverse impacts. Various observations are documented such as invasive species; human disturbances (e.g. ATV usage, encroachment by neighbours, horseback riding, littering, campfires, and/or erosion); wildlife and flora; signage concerns, hazard trees, and/or trail decommissioning and encroachments. All observations are included in the annual monitoring report. To complete the property assessment a list of required actions and recommendations are proposed and forwarded to the Ontario Heritage Trust.

*Planting Quality Assessment:* Are undertaken on all forest planting sites during and immediately post plant. A minimum 90% quality must be attained at this point.

*Survival Assessment:* Assessments are completed at 2 and 5-year intervals after planting for each property planted by Conservation Halton. A minimum of 2% of the total trees representing a range of tree species, site condition and planting method are selected for quality assurance monitoring. Planting must attain a minimum of 60% survival, anything less requires follow-up action.

*Emerald Ash Borer:* Emerald Ash borer was detected in the Halton area in 2008. Conservation Halton forestry staff conducted detection surveys using green prism traps, as recommended by the CFIA to determine the insect's presence in our parks and other land holdings. The presence of EAB was confirmed in most if not all Conservation Areas and Natural Areas during this period. In 2014, stem injections were undertaken for amenity ash trees exhibiting > 70% live crown, and in the more developed areas of the parks and along woodland trails, to protect amenity trees and trees with potential seed source value. During staff turn over, unfortunately stem injections treatments missed two years of treatment starting in 2017. If a year of treatment is missed, the effectiveness of the injection is compromised, and future treatments may not be effective. As such, no further treatments were conducted from 2019 onward. Regular monitoring of previously injected trees continues annually. Hazardous ash trees in the developed areas of our parks and along trails, near park assets and infrastructure are also marked for removal.

*Asian Long Horned Beetle:* Asian longhorned beetle has not yet been found in Halton Region. With the assistance of CFIA, we have trained forestry staff in looking for exit holes and egg laying sites on maple trees and have 2 sites within our parks, where ALHB simulated signs and symptoms have been re-created. Staff respond quickly to trees that exhibit any potential signs and symptoms of ALHB infestation.

*Hemlock woolly adelgid:* Hemlock woolly adelgid is not yet known to be established in Ontario, though is established in neighbouring states. Conservation Halton staff have participated in detection workshops and participate in a forest manager working group for HWA. Conservation Halton forestry staff will work with CFIA to monitor for this pest.

Current [survey methods](#)<sup>3</sup>

Current [management options](#)<sup>1</sup>

*Oak wilt:* Oak wilt is not yet found in Ontario but is established close to the Ontario border in Michigan. Conservation Halton staff have participated in an oak wilt detection workshop. Conservation Halton forestry staff will work with CFIA to monitor this disease. Where possible, staff have adapted their pruning practices to prevent this disease from establishing. As this disease approaches our watersheds, more active surveying will take place.

Current [survey methods](#)<sup>1</sup>

Current [prevention and management options](#)<sup>1</sup>

**RECOMMENDATION 17: Continue to monitor for forest pests and diseases, including invasive species, and establish greater interdepartmental collaboration on monitoring programs**

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<sup>3</sup> Best practices at time of publication.

## Summary

Conservation Halton will work towards the three goals laid out in the Strategic Forest Management Plan by implementing the recommendations described throughout this section (also listed on page 49).

This 20-year Plan will be reviewed each time the Managed Forest Tax Incentive Plan for Conservation Halton properties is being renewed (2027 and 2037) and the Plan will be formally updated in 2040. By which time we will have improved forest health conditions, maximized the value of our forests and maintained, and where possible, increased forest cover across our watershed.



# Objectives of Forest Management

## Goals and Approaches

To accomplish the Plan's Goals, staff will implement a series of Approaches. The Approaches are umbrella statements encompassing multiple tasks. The table below demonstrates how each Approach helps accomplish one or more Recommendations (summarized on page 49). Section 3 of the Plan includes an expanded version of this table with action items, time frames, and Key Performance Indicators.

Goals	Approaches	Recommendations (see below table for list)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<b>#1 Improve forest health conditions using current and future accepted methodologies and science</b>	Sustainable Forest Management																	
	Invasive species management																	
	Forest Inventory																	
	Wildlife Habitat																	
	Monitoring																	
	Forest Information Management System																	
	Strat Plan Implementation, Admin, and Partnership																	
<b>#2 To maximise the value of our forests in delivering environmental goods and services, social and health benefits, and enhanced forest diversity</b>	SOPs and BMPs																	
	Wildlife Habitat																	
	Invasive Species																	
	Seed forecasting and collection																	
	Sustainable Forest Management																	
	Manage for climate change impacts																	
	Value matrix																	
<b>#3 To maintain, and where possible, increase forest cover across our watershed through afforestation</b>	Secure land																	
	Maintain or enhance afforestation programs																	
	Internal partnerships																	
	Sustainable Forest Management																	
	Outreach and Education																	

Goals	Approaches	Recommendations <i>(see below table for list)</i>																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
of Conservation Halton land acquisitions and on private lands, and through land securement, public education, and landowner outreach programs																		

### Summary of Plan Recommendations

1. Update Forest Inventory to inform strategic forest management.
2. Continue to build, support and develop relationships with partners and agencies where there is a joint benefit.
3. Develop and sustain meaningful relationships with First Nation, Metis and Indigenous partners that seek opportunities for increased engagement and mutually beneficial partnerships.
4. Support active land securement by building relationships with private landowners through landowner education regarding Ecogifts program and/or designate a percentage of timber revenues to the Land Securement budget.
5. Ensure that the 'value' provided by the forest infrastructure on Conservation Halton lands is reflected in the emerging asset management framework
6. Establish a dedicated Forest Reserve Budget to enable timber revenues to be dedicated toward the continued growth and improvement in Conservation Halton Forests.
7. Monitor and improve overall forest health and wildlife habitat throughout Conservation Halton forests.
8. Maintain current forest cover percentage through the management of the Conservation Halton forest and by working with watershed partners.
9. Promote private landowner tree planting programs to engage a wider community in the importance and value of forested landscapes.
10. Continue to support a vibrant local seed stock within southern Ontario nurseries by providing a reliable, local seed source.
11. Manage for long term forest health by promoting and utilizing Sustainable Forest Management principles and practices that meet or exceed current standards.

12. Identify and manage appropriate stands toward 'old growth' characteristics recognising that the human environment surrounding our forests will rarely allow for true old growth forest
13. Build resiliency in our forests with climate change mitigation and adaptation by maintaining and enhancing forest science knowledge for forest management practices
14. Establish an Invasive Species Management Program and manage invasive and non-native plant species on Conservation Halton properties, where possible
15. Adopt leading practice through sustainable forest management to conserve and improve forest habitat for the benefit of Species at Risk
16. Maintain a responsive hazard tree program and reduce risk of hazard trees through proactive Sustainable Forest Management
17. Continue to monitor for forest pests and diseases, including invasive species, and establish greater interdepartmental collaboration on monitoring programs

## Definitions

**Acceptable Growing Stock (AGS):** Trees suitable for retention in the stand for at least one cutting cycle (15-25 years). They are healthy, robust trees. They may or may not have commercial value.

**Approach:** An umbrella statement that encompasses multiple tasks and helps accomplish Recommendations. The Approaches have action items, time frames for completion and Key Performance Indicators.

**(Climate Change) Adaptation:** Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory, autonomous, and planned adaptation (EPCC 2009).

**Afforestation:** The planting of new forests on lands which, historically have not contained forests (IPCC nd).

**Climate Change:** a change in climate over time whether due to natural variability or because of human activity (EPCC 2009).

**Conservation Area:** Lands that are of significant natural and/or cultural heritage value and that are managed for the long-term conservation of these features and are often also used for large scale flood and water control structures. These properties provide the focus of management to support public recreational use and access to these heritage areas. (Conservation Halton Land Securement Strategy, 2017)

A Conservation Area is generally a larger property, often with a key attraction, and is characterised by a higher level of public access and recreation. These properties frequently have significant assets and resources in support of recreational and educational use. Conservation Areas are promoted as a destination for visitors, they will have signage, trail maps and may have a gate house. Conservation Areas will generally have a Master Plan for land management and use of the property. Through forest inventory work, staff will highlight management needs and special sensitivities on these properties.

**Conservation Land Tax Incentive Program (CLTIP):** A voluntary tax incentive program, where landowners agree to protect provincially important natural heritage features that have been evaluated and identified by MNRF. These lands are assessed at the CL property class and are tax exempt (MNRF 2010).

**Conservation Reserve:** Represent the least publicly accessible and include some of the most significant natural heritage communities in the Authorities ownership. Public access is not encouraged or supported on these lands. (Conservation Halton Land Securement Strategy, 2017)

A Conservation Reserve is generally a smaller and more isolated property. These lands may be heavily protected and regulated by existing policy frameworks and may provide extremely challenging access. These properties will generally not have Master Plans in place but will be included within forest inventory work which will highlight management needs and special sensitivities of the property.

**Ecosystem Services:** The benefits provided to people by ecosystems. They include provision of clean water, fuel and wood, the regulation of climate, flooding, and water purification, the support of nutrient cycling, soil formation and primary production, and have aesthetic, spiritual, educational and recreation value (Millennium Ecosystem Assessment 2005).

**Forest/Woodland** An ecosystem characterized by a more or less dense and extensive tree cover, often consisting of stands varying in characteristics such as species composition, structure, age class, and associated processes and commonly including meadows, streams, fish and wildlife (Helms 1998).

**Forest Ecosystem resilience:** The capacity of an ecosystem to return to the pre-condition state following a perturbation, including maintaining its essential characteristics taxonomic composition, structures, ecosystem functions, and process rates (Thompson et al 2009 after Holling 1973).

**Forest Fragmentation:** The conversion of formerly continuous forest into patches of forest separated by non-forested lands (roads, agricultural land, urban areas, or other development). This impairs the forest's structure and function. Temperature, moisture, and light regimes are altered which impacts habitat for flora and fauna, and effects processes such as water and air purification (Rusak nd).

**Forest Health:** The perceived condition of a forest derived from concerns about such factors as its age, structure, composition, vigour, presence of unusual levels of insects, disease, invasive species, and resilience to disturbance (Helms 1998).

**Forest Management:** Application of business methods and technical forest principles to the management of forest property (MNR 2000).

**Forest Management Activities:** These include, but are not limited to, physical works to manage a forest from high pruning, limbing and other tree health activities, to thinning (selective removal of trees to promote growth in remaining trees), felling and extraction of timber, felling and removal of hazard trees, marking of trees for removal by certified forestry professionals where a prescription for works has been approved. Management will take place in accordance with good forestry practices.

**Forest Management Unit (Type):** The term used to group stands of similar character in composition and development to differentiate them from other groups of stands (MNR 2000).

**Goal:** A primary target set out with measurable success based on completed Recommendations.

**Good Forestry Practices:** Silvicultural activities conducted in ways that enable the stand to maintain ecological processes and wildlife habitats as well as grow healthy plants. Silvicultural activities should lead to ecological sustainability of managed stands by minimizing harm to the forest values and by protecting significant features that help to maintain the integrity and long-term health of the stand (MNR 2000).

**High Conservation Value Forest:** High value conservation forests have biological, ecological, social or cultural value(s) of outstanding significance or critical importance and would include species diversity; landscape level ecosystems and mosaics; ecosystems and habitats; ecosystem services; community needs; and cultural values" (Forest Stewardship Council 2017).

**Interior Forest:** Habitat within the forest or woodland, 100m away from the forest edges and open habitat and not influenced by either one. Interior forest is reminiscent of contiguous, historic forests. Larger woodlands, and those with shorter perimeters tend to have greater amounts of forest interior (vs narrow forests) (MNR 2000). Activities such as motorized trail bikes, all terrain vehicles, horses, and mountain bikes that heavily compact the soil should be isolated or excluded. These activities can also disrupt the soil enough that exotic invaders can establish more easily. MNRF "A Land Manager's Guide to Conserving Habitat for Forest birds in Southern Ontario".

**Key Performance Indicator:** A measure of success for the action item associated with an Approach.

**Managed Forest Plan:** A written plan for the organized handling and operation of a forest property. It includes data and prescribed measures designed to provide optimum use of forest resources according to predetermined objectives (MNR 2000).

**Managed Forest Tax Incentive Plan (MFTIP):** A tax saving program offered by MNRF, to landowners who apply, qualify and have Managed Forest eligible lands, designed to increase landowner awareness about forest stewardship and encourage responsible management of forests (MNRF 2017).

**(Climate Change) Mitigation:** an intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks (EPCC 2009).

**Natural Area:** Lands that have been acquired through a variety of mechanisms and primarily reflect the conservation and natural resource management roles of Conservation Halton. Management of these lands is focussed on resource and conservation management, and limited public access is supported. (Conservation Halton Land Securement Strategy, 2017)

A Natural Area is typically a smaller property characterised by a significantly lower level of public recreational use than a Conservation Area, and minimal if any infrastructure to support that use. These areas may have limited signage and may have access trails. Public activities will be limited to passive recreational activities. Natural Areas will generally not have Master Plans in place but will be included within forest inventory which will highlight management needs and special sensitivities of the property.

**Natural Disturbance:** The historic patterns (frequency and extent) of natural processes such as fire, insect outbreaks, and wind events that affect the ecosystems. Natural disturbance regimes can differ between forest and site types.

**Natural Heritage System:** a system of natural heritage features and areas, linked by natural corridors, which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state (Provincial Policy Statement 2005).

**Old Growth Forest:** A relatively old forest that show little or no evidence of human disturbance. This term is misapplied by many to describe any forest that appears to be old. Individual trees in this type of forest are usually over 200 years old and there are large standing and fallen dead trees throughout the stand. (A Silvicultural Guide to Managing Southern Ontario Forests, 2000)

**Recommendation:** An actionable item that will help Conservation Halton work towards accomplishing the three Goals of this Plan. Recommendations serve as the backbone of the Plan.

**Sustainable Forest Management:** Sustainable forest management is the care and use of forests such that their environmental, social, and economic values and benefits are maintained into the future (Natural Resources Canada 2017).

**Unacceptable Growing Stock:** These trees have a high risk of dying and are expected to decline over the next cutting cycle. They include trees that are diseased, of poor form and/or low quality. UGS trees are not always

marked for removal. UGS trees may contain important wildlife habitat features (cavities, stick nests) and may also have potential to produce seed.

**Woodland:** Treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products (MNR 2005).



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## **Appendices**

## Appendix 1.1 Forest Management and Sustainability Policy

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- Assess and prioritize forest unit protection needs, identify an appropriate management regime for areas with different sensitivities (e.g. provincially rare vegetation communities) and management requirements (e.g. passive management, active management, etc.);
- Incorporate global warming information into management plans including documenting the role Conservation Halton forests play as sinks for greenhouse gasses;
- Assess and manage invasive species, forest pests and disease;
- Promote species at risk recovery and conservation;
- Assess appropriate forest fire management;
- The White-tailed Deer (*Odocoileus virginianus*) carrying capacity of conservation areas should be evaluated to determine the optimal size of deer population that may be sustained. This evaluation should assess browse impact on forest habitats and possible influence on the regeneration of young trees. This study should include all forest habitats in the study area, especially areas considered sensitive; and
- Improve and monitor habitat and biodiversity within managed forest landscapes in a manner that is consistent with the long-term protection of the conservation area's forest community.
- Every forest operations prescription shall include descriptions of the following:
  - Current structure and condition of the forest in the area to which the prescription applies;
  - Forest renewal and maintenance activities to promote forest health, regeneration and biodiversity;
  - The expected results and future structure and condition of the forest; and
  - Standards or guidelines used in developing the prescription.

All prescription activities must comply with good forestry practices as described in Halton Region Tree Conservation By-Law (Regional Municipality of Halton 2005), the Ontario Ministry of Natural Resources' *A Silvicultural Guide to Managing Southern Ontario Forests* (MNR 2000) and the *Niagara Escarpment Plan* (NEC 2005). The forest management plan should demonstrate leadership in forest management by applying international standards for sustainable forestry practices as embodied by one of the three independent forest certification systems in Canada (e.g. Canadian Standards Association's Sustainable Forest Management Standard, the Forest Stewardship Council Standard and the Sustainable Forestry Initiative). This management system should also complement the restoration plans for the conservation area and, where appropriate, refine the management of forest restoration areas in a manner that allows the development of mature forest communities found in the adjacent natural areas.

## Appendix 1.2 Conservation Halton Properties by Land Class

Conservation Reserve			Conservation Areas		
R1	Lake Medad	66.57ac	C1	Hilton Falls	1619.77ac
R2	Medad Valley	23.73ac	C2	Kelso	1135.80ac
R3	Plaikner	55.26ac	C3	Rattlesnake Point	730.65ac
R4	Knight	45.89ac	C4	Crawford Lake	873.44ac
R5	Albert	76.66ac	C5	Mountsberg	1376.02ac
R6	Guelph Junction	69.69ac	C6	Mount Nemo	504.53ac
R7	Fuciarelli	148.78ac	C7	Robert Edmondson	76.53ac
R8	Kassam	41.08ac	C8	Carlisle	68.39ac
R9	Croft	84.82ac	C9	Campbellville	3.18ac
R10	Paiment	28.51ac	C10	Glenorchy	999.8ac
R11	Middletown	5.25ac	C11	Kerncliff	92.22ac
R12	Andrusyshyn	18.56ac	C12	Waterdown Woods	296.89ac
		<i>Total area</i>	C13	Clappison Woods	211.33ac
		664.80ac	C14	Stewart	51.58ac
Natural Areas			C15	Burlington Beach	21.78ac
N1	Shanahan	169.30ac			<i>Total area</i> 8061.91ac
N2	Kilbride	311.38ac	Other		
N3	Esquesing	37.64ac	O1	Administration	7.89ac
N4	Moffat-Badenoch Swamp	396.59ac	O2	Morrison Wedgewood Channel	54.72ac
N5	Sixteen Valley	75.48ac	O3	Hagar Rambo Channel	26.59ac
N6	Tirion	49.77ac	O4	Scotch Block Channel	82.11ac
N7	Escarpment	69.14ac	O5	Milton Channel	11.86ac
N8	Ontario Heritage Trust	216.22ac	O6	Cockshutt	1.06ac
N9	Kiwanis	101.86ac	O7	Morrison	1.86ac
N10	Bronte Gorge	75.50ac	O8	Forster and Burt	13.19ac
N11	Grindstone Creek	157.65ac	O9	Queen Elizabeth way	10.11ac
N12	Nelson Escarpment Woods	13.17ac			<i>Total area</i> 209.39ac
N13	Pleasantview	141.20ac			
N14	Speyside Nature Reserve	64.66ac			
N15	Wildflower Woods	23.99ac			
		<i>Total area</i>			
		1903.55ac			

## Appendix 1.3 Invasive Species Evaluation and Prioritization

After Jacquart (2009) and OIPC (nd)

To facilitate decision making about prioritizing invasive plant control, the following questions are considered for each plant species in each land holding. The number of points are totalled for each species at each site; species/sites with the lower scores are higher priority for treatment.

### Abundance

Points	How much is there?
1	Small amount; spreading
2	Moderate amount
3	Extensive

### Habitat value

Points	How valuable is the habitat?
1	Many rare plants or community types nearby
2	A few rare plants or community types nearby
3	Disturbed areas or edges; low value habitat

### Impact

Points	What is the impact?
1	Plant is aggressive and changes the area; few other species survive
2	Invades undisturbed areas and outcompetes native species
3	Does not out-compete native species but native species do not regenerate
4	Only invades disturbed areas

### Control success

Points	How likely is control?
1	Easily controllable; one treatment
2	Multiple treatments required, but treatment successful and native species will regenerate
3	Multiple treatments required; will need restoration
4	No effective treatment known



## Appendix 1.4 Management Recommendations for Species at Risk

Species at risk statuses change frequently and will be revisited regularly. Management recommendations will also be updated periodically to reflect the most current science and government regulations/permitting policies.

*Bats: eastern small-footed myotis, little brown myotis, northern myotis (aka northern long-eared bat), tri-coloured bat*

**Status:** Endangered provincially (all four species); northern myotis and little brown myotis also endangered federally.

**Range:**

Eastern small-footed bat (ESFB): In Ontario, south of Georgian Bay to Lake Erie, east to Pembroke, also Bruce Peninsula, Espanola, and Lake Superior PP.

Little brown myotis (LBM): Widespread in Ontario, as far north as Moose Factory and Favourable Lake. Across Canada (from boreal forest south of the tree line and south to US) except Nunavut, and most of the US.

Northern myotis (NM): Forested areas in southern Ontario to north shore Lake Superior. Occasionally as far north as Moosonee and west to Lake Nipigon. Throughout Canada except Nunavut - boreal forest south of the tree line and south through forested areas.

Tri-coloured bat (TCB): Southern Ontario north to Espanola; also, eastern North America to Central America.

**Habitat:** Each species of bat has: 1) overwintering habitat (hibernacula) used for hibernation; 2) summering habitat (maternity roosts, roosts for males, and foraging habitat); and, 3) swarming habitat used late summer and early fall for mating (swarming sites are often at the entrance to the hibernaculum). Hibernacula for all four bat species include caves, abandoned mines, wells, tunnels, or underground openings. Where distributions overlap, different species may overwinter in the same hibernaculum. Species typically show fidelity to overwinter sites, returning to them year after year. Summer roost selection is influenced by characteristics of the site and of the bat, so it is difficult to define. LBM, NM and TCB all preferentially roost in older forest stands which may be due to snag availability and closed canopy sites for foraging. Males of the three species roost in a variety of structures including rock crevices, raised bark, foliage, and tree cavities. Male LBM and NM often roost in tall snags with large diameters in early to mid-stage of decay, in or near small open patches in mature or over-mature forest. Bat species may switch summer roosting sites regularly but typically use a network of roosts within an area.

ESFB summer roosts are in and under rocks, rock outcrops, in buildings, under bridges, in caves, mines or hollow trees. Overwinters in caves and abandoned mines; this species tolerates cold temperatures better than other bat species, so is often near the cave/mine entrance where temperature and humidity are lower. Forested areas with abundant rock outcrops are good foraging habitat for ESFB. This species is more secretive than other bat species so less is known about it.

LBM summer roosts are in trees (cavities, foliage, tree bark), buildings and other anthropogenic structures (e.g. bat boxes), and crevices in cliffs. Maternity roosts tend to be in large-diameter trees; females show roosting fidelity, returning to same sites which may be used for 10 years or more. Overwinters in caves or abandoned

mines, and unlike other species can overwinter in buildings, at least in western Canada, where winter temps are relatively high. Foraging bats are associated with open habitats (ponds, roads, open canopy forests), and are also found within the forest.

NM maternity roosts are associated with forest cover, streams, and several tree characteristics. Females prefer tall, large diameter trees in early to mid-stages of decay, but switch roosts every few days, staying within an area. They favor shade-tolerant deciduous stands. Males roost under raised bark or in tree cavities (mid-decay stage). These bats often forage over water, also along and within forests. They hibernate in caves and abandoned mines.

TCB are found in a range of forest habitats. Day roosts and maternity colonies are in older forest or sometimes barns or other structures. They seem to show fidelity to roosting area. Foraging is in riparian areas, and over water. This species is less known.

**Threats:** LBM, NM, and TCB were emergency listed as Endangered in 2014 because of sudden and rapid declines in population due to white-nose syndrome (WNS); these three species are thought to be the most vulnerable to WNS. ESFB may be less susceptible to WNS than other species because they tend to hibernate in cooler, drier part of the cave where fungus may be less virulent. Regardless, WNS is the greatest threat to all four bat species described here. Other threats include destruction or degradation of hibernacula or roosts, including tree removal and forestry operations. Destruction, degradation, or conversion of foraging habitats is also a concern. Wind turbines are also a threat – the degree of issue not known and likely varies between bat species.

#### **Recommendations:**

Any site where any of the four bat species has been observed hibernating, or where swarming has been observed, at least once since 1995 is considered critical habitat. Critical habitat for other functions is not yet identified. Consult with MNRF re: locations of known hibernacula. A 200m buffer around known hibernacula is recommended (required in MB and NF). Cave openings should never be blocked, nor should caves be entered. Manage forests to maintain snags whenever possible and retain healthy trees to provide future snags. If possible, retain trees in riparian zones to maintain quality of feeding zones.

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## Butternut

**Status:** Endangered provincially and nationally.

**Range:** Central and eastern North America, in Canada found in Ontario, Quebec and New Brunswick. In Ontario butternut is found in the southwest, north to the Bruce Peninsula and south of the Canadian Shield (OMNR 2014).

**Habitat:** Rich moist sites in tolerant hardwood forest in the southern parts of the Great Lakes-St Lawrence forest. Shade intolerant – often found in gaps and on forest edges. Often found along streams. Also, it may be found on well-drained gravel sites and rarely on dry rocky soil (OMNR 2014).

**Threats:** Threatened by an introduced pathogen – the butternut canker (*Ophiognomonia clavigigenti-juglandacearum*) that is ubiquitous across the range of butternut (Poisson and Ursic 2013). Although no trees are known to have resistance to the pathogen, indiscriminate harvesting of butternut could remove genetic material which has not yet developed resistance, or which has resistance that is not yet detected (in Poisson and Ursic 2013).

**Recommendations:** Maintain healthy butternut individuals and remove non-retainable ones. Healthy butternut are those that have more than 70% live crown, and less than 20% of the combined circumference (Diameter at Breast Height (DBH)) of the bole and root flare affected by cankers, or, that have 50% or more live crown and no cankers visible on the bole or root flare (OMNR 2010). Develop suitable stand conditions for butternut; butternut shows more vigour and regeneration in open conditions. Selection harvest parameters developed for butternut are: in pockets  $\geq 0.5$  ha within stands with 5-15 healthy butternut group selection openings of 30-70m diameter should be created, retain healthy butternut seed trees along openings, within openings fell all stems except retainable butternut, and employ competition control if necessary. For shelterwood systems, in pockets  $\geq 0.5$  ha within stands with  $>5$  healthy butternut use a uniform shelterwood system with full crown spacing, retain 30-60 trees/ha at 12-20 m spacing, fell non-crop trees, and use control competition if necessary (OMNR 2010; in Poisson and 2013). Forest management plans should identify opportunities for butternut regeneration (OMNR 2010). Most butternut seedlings establish within 25-50m of parent tree, therefore it is recommended to maintain a protected area within a distance of 25m from the base of an established, healthy tree where the species has the highest likelihood of regenerating (Poisson and Ursic 2013).

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## Jefferson salamander

**Status:** Endangered provincially and nationally.

**Range:** Jefferson salamander is found in southern Ontario, mainly along the Niagara escarpment, as well as the northeastern US (OMNR 2014). Known populations in Ontario as of 2010 occur in Haldimand, Norfolk, Wellington, Brant, Grey and Elgin counties; forested habitat along the Niagara Escarpment from Hamilton to Orangeville; isolated locations in Halton, Peel, Waterloo, York and Niagara regions; and, Dufferin County east of the Niagara Escarpment (JSRT 2010).

**Habitat:** Deciduous or mixed forest. Require microhabitat, such as moist, loose soil under logs or in leaf litter. Uses wetland ponds to breed - these are usually vernal pools (without predators) fed by groundwater, snowmelt, or surface water, but occasionally permanent or semi-permanent water (JSRT 2010). Ponds are usually in, or adjacent to a woodland. The salamander needs plant materials such as shrubs, twigs, branches, or submerged or emergent vegetation to attach their egg masses to. They have high breeding pond fidelity. The habitat used by the salamanders extends to 157m from the edge of their breeding ponds (2003).

**Threats:** Habitat loss and degradation of woodlands and breeding ponds due to urban development, draining of wetland and resource extraction (OMNR 2014). Widespread aggregate extraction in the Niagara Escarpment is an especially significant threat (JSRT 2010). There are small populations of salamanders in isolated pockets, therefore, there is a risk of local extinction due to floods, fire, or other catastrophic events. Other mortality factors include road mortality or an altered water table. Anything that alters the water table or disrupts groundwater flow has the potential to alter wetlands and therefore breeding habitat as well. Removal of forest cover can lead to premature drying of vernal ponds. Forestry activities that result in the filling of vernal pools, alternation of vernal pool hydrology, sedimentation, removal or alteration of associated upland habitat (removal of canopy cover, stumps, logs and leaf litter, and alternation of nutrient input by leaves), pollution and fragmentation or isolation of vernal pools from the terrestrial habitat (JSRT 2010).

**Recommendations:** Protect vernal pools and breeding ponds from draining, filling, run off and development. Maintain forested land around known breeding ponds. Use a no cut buffer of 30 m around vernal pools or pool depressions. Up to 140m from the pool (or 180m if possible) retain 70% or more of the area with 75% or more canopy cover or equivalent basal area, of trees 9m or more in height distributed proportionally around the pond (NHESP 2007). If vernal pools are clustered, patch cuts or landings should not be located between the pools. Vernal pools are difficult to detect in the dry season so should be carefully surveyed and marked prior to forestry operations. Where possible leave 2 snags or older/dying trees per acre to provide woody debris. Leave sections of downed wood of 30cm diameter and larger (40cm or more long) for microhabitat. Maintain existing woody debris. Winter harvest is best to minimize forest floor disturbance (NHESP 2007).

### References:

- COSEWIC. 2010. COSEWIC assessment and status report on the Jefferson salamander *Ambystoma jeffersonianum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.
- Faccio, S.D. 2003. Post-breeding emigration and habitat use by Jefferson and spotted salamanders in Vermont. *Journal of Herpetology*. 37: 479-489.

Jefferson Salamander Recovery Team. 2010. Recovery strategy for the Jefferson Salamander (*Ambystoma jeffersonianum*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario.

Natural Heritage and Endangered Species Program. 2007. Massachusetts Forestry Conservation Management Practices for MESA-listed mole salamanders. Version 2007.1. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, Massachusetts, USA.

OMNR. 2014. Jefferson salamander

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[Accessed May 2014]

## *Snapping turtle*

**Status:** Special concern provincially and nationally.

**Range:** In Canada, from Saskatchewan to Nova Scotia; in Ontario primarily in the south. Range extends to Ecuador (OMNR 2014).

**Habitat:** Prefers shallow water (they hide in mud and leaf litter). Females travel overland in early and mid summer to find nesting sites in gravelly or sandy areas along streams. May use man-made structures including roads, dams, and aggregate pits (OMNR 2014).

**Threats:** Takes 15-20 years to reach sexual maturity and low survival rate of immature turtles (<0.1%). Egg predation by raccoons and skunks. Adult mortality due to motor vehicles as turtles crossroads to look for mates, food, and nesting sites and due to and legal hunting (OMNR 2014; Anon. 2012).

**Recommendations:** Recommend winter operations and physically avoid running over them.

### **References:**

Anon. 2012. The road to extinction: a call to end the snapping turtle hunt. Ontario Nature, David Suzuki Foundation and Kawartha Turtle Trauma Centre.

OMNR. 2014. Snapping turtle.

[http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR\\_SAR\\_SNPPNG\\_TRTL\\_EN.html](http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_SNPPNG_TRTL_EN.html)

[Accessed May 2014]

## West Virginia white

**Status:** Special concern provincially

**Range:** Ontario and Quebec, south through New England and the Appalachians to Georgia. Common in parts of its range, but rare in Ontario. In Ontario, central and southern Ontario, with some sites north to Manitoulin and St. Joseph island. More common in the western Lake Ontario region.

**Habitat:** Interiors of mesic deciduous and mixed forest. Confined to mature forest - avoids forest edges, unshaded stream crossings, utility corridors and open fields, though it can cross small roads that are under canopy. Sites typically have closed canopy with minimal shrub but abundant herb layer – i.e. open understory. The butterfly is oligophagus and only feeds on a small number of closely related plants. Toothworts (mustard family), preferably two-leaved toothwort, are the larval food source. These plants are usually abundant where the butterfly occurs. Males are often associated with forest streams and damp areas; females may require sunny glades.

**Threats:** This species has likely always been rare in Ontario. Habitat fragmentation is a problem as this butterfly primarily flies within wooded areas and prefers not to cross open fields or another unshaded habitat. Garlic mustard outcompetes the white's host plant and may also act as an egg sink, as female butterflies sometimes mistakenly lay eggs on garlic mustard; garlic mustard is toxic to the larvae in most of its range. Increase in wind and temperature in the understory dry the soil and may impact toothworts. Forestry activity disrupting the forest floor may impact host plants directly or indirectly. Silvicultural activities such as clear cutting, replanting to conifer, use of biocontrol agents such as Btk and Maimaga for insect control, and the development of roads, park or other human-use areas all have negative effects on the butterfly.

**Recommendations:** Although its presence is not guaranteed on all sites with two-leaved toothwort, the likelihood of occurrence increases in large tracts of unbroken forest where many patches of the host plant exist. Manage garlic mustard to conserve toothworts. Manage the stand to maintain closed canopy condition – this includes managing for pests and pathogens, however, Btk use for insects such as gypsy moth could affect the white depending on timing of application. Maintain canopy cover over access roads and trails.

### References:

Burke, P. 2013. Management plan for the West Virginia white (*Pieris virginiensis*) in Ontario. Ontario Management Plan Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough ON. [http://files.ontario.ca/environment-and-energy/species-at-risk/mnr\\_sar\\_mtpln\\_wvgnwht\\_en.pdf](http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_mtpln_wvgnwht_en.pdf)

USDA Forest Service, Eastern Region. 2005. Conservation assessment for the West Virginia white (*Pieris virginiensis* Edwards) [https://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/fsm91\\_054237.pdf](https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054237.pdf)

West Virginia White [Accessed Dec 2016] <https://www.ontario.ca/page/west-virginia-white>



## Appendix 1.5. Forest Management Approaches for Climate Change.

Possible forest management approaches to mitigate the impacts on Ontario's forests (From Columbo et al 1998)

Activity	Purpose
Shorten rotation lengths, where appropriate	Harvest chronically stressed stands of low vigour and slower growth rates that are susceptible to insects and disease
Thinning	Reduce insect and disease susceptibility, and increase vigour through thinning, when stands are under prolonged and severe moisture stress
Plant drought-adapted species and genotypes	Regenerate drought prone habitats with deeply rooted species; select and breed drought tolerant genotypes
Increase use of alternatives to clearcutting (e.g., shelterwood, selection systems)	Protect regeneration from future warmer, drier seedling environments. Increase the amount of carbon stored by increasing the period a site is occupied by trees, decreasing disturbance to forest floor, and increasing the rate of reforestation where advance reproduction is used
Increase insect pest management preparedness	Greater incidence of extreme events and drought are expected to increase tree stress and susceptibility to insect pests
Plant climate-adapted species	Introduce southern species beyond recent northern range limits when temperature averages and extremes have warmed sufficiently
Maintain genetic and biological diversity	Protecting diversity increases the likelihood that there will be individuals, species, and ecosystems that are adapted to future climate conditions; requires strategies for genetic conservation and ecosystem protection
Rapidly re-establish trees in harvested forests	Increasing the amount of carbon stored by increasing the period a site is occupied by trees
Use climate-based seed zones	Periodic updating of seed zones based on temperature averages and extremes
Increase forest fire suppression	Longer growing seasons, warmer temperatures and reduced precipitation may already have increased forest fire activity. Protection of valued forests requires a compensatory increase in forest fire suppression
Afforest non-forested land	Increasing the amount of carbon stored by increasing the area covered by forests
Preferentially regenerate trees for use in long-lived wood products	Increasing the amount of carbon sequestered by increasing the length of time it is sequestered (e.g., in order of increasing sequestration time: non-recyclable paper; recyclable paper; books; lumber and construction board)
Increase use of advance reproduction	Advance reproduction requires less energy input compared to artificial regeneration and increases the rate of reforestation; need to develop and use modified harvesting techniques to protect reproduction and residual overstory when logging

## **Appendix 1.6. Managing Hazard Trees Policy**

*(Policy as of 2012)*

### **Background**

Extensive portions of Conservation Halton properties contain trees as natural features. Trees can be found near structures or in areas where the public and staff are invited to be present and, in some cases, may present a potential hazard. It is generally accepted that trees have a finite lifespan and even a tree in excellent condition has the potential to fail. However, there are certain defects that can occur in any age of a tree that can be detected that may increase the potential for failure. Recognizing potentially hazardous trees and taking proper corrective actions can protect property and save lives.

### **Policy Statement**

CONSERVATION HALTON WILL TAKE REASONABLE STEPS TO MAINTAIN THE SAFETY OF ITS LANDS FOR THE PUBLIC AND ITS STAFF, FROM TREES THAT ARE IDENTIFIED AS HAZARDS.

Conservation Halton reserves the right to prohibit access to or close an area (which may include, but not be limited to; buildings, designated parking areas, viewpoints, campsites, picnic sites and trails) due to unsafe conditions, if it is deemed necessary to do so. Such areas will be re-opened once the hazard has been effectively managed.

The purpose of this Policy is to define a Hazard Tree Program and sets the responsibilities of the designated departments involved in managing hazard trees. The need to develop such a program stems from the Duty of Care and responsibility that Conservation Halton has to its visitors and staff.

Therefore, this Policy sets out to:

- Provide an inspection strategy designed to monitor potential hazard trees in a routine and systematic way and to ensure that trees identified as potential hazard trees are dealt with in a timely manner
- To clearly identify the roles and responsibilities of different departments within Conservation Halton with respect to hazard tree management

# Strategic Forest Management Plan

## **SECTION TWO: Forest Inventory**

Conservation Halton | 2020



## Introduction

**Section Two** establishes the current resource by way of a comprehensive inventory. Each forest stand will be recorded, each parcel of land managed by Conservation Halton will be reflected within this inventory. Maps that capture the current condition and pressures on our forests will be developed. Much of this stems from extensive records already developed, however, there are areas that we do not yet have full details on, and areas with outdated information on them. The Plan will lay out a tool for undertaking this inventory, populated with information that is current. It is envisioned that Section 2 will eventually be an electronic resource through Geographical Information Systems (GIS) technology. The goal will be to keep all inventory current within 5 years so this will be an ongoing inventory and will be updated especially after forest management activities.

## Inventory Approach

Data attributes that could be collected for forest stands are summarized in Appendix 2.1. They include an assessment of the overstory, understory regeneration, ground vegetation (e.g., dominant herbaceous plants), invasive species (species and abundance), forest values (e.g. stick nests, snags, and woody debris), and recommended management.

This inventory provides the data required for planning forest management activities that meet or exceed generally accepted standards of sustainable forest management in Ontario. In addition, this approach provides data for three of our four forest health metrics (Table 5) and provides data toward determining the presence or absence of habitat for SAR. This will allow Conservation Halton to monitor forest health over time, and to evaluate trends.

*Table 5 Forest health metrics and goals\**

<b>Metric</b>	<b>Goal</b>
Growing stock condition	70% AGS, 30% UGS
Natural regeneration	Maintain adequate stocking (1000 – 3000 stems/ha)
Invasive plants	Maintain or reduce abundance
Species at risk	No net loss of habitat

Full descriptions available in Section 1 of the Plan

In addition, this data will give us:

- An ability to track progression of plantations to a natural mixed/hardwood forest
- The necessary detail for us to develop silvicultural prescriptions and management recommendations
- Quantification of timber volumes which can be used to project revenues
- An indication of the woodlands most at risk to spreading invasive species
- An ability to scan the data for species at risk or their habitat

## Appendix 2.1. Example of Compartment Attributes Collected during Forest Inventory

Attribute collected	Description of attribute	Sample data	
TRACT	Tract name	Main	Main
COMPARTMENT	Compartment number	07a	11a
HECTARES	Area in hectares	10	6
NUMBER OF PLOTS	# of prism sample plots	3	5
FOREST TYPE	ELC vegetation type	Red Pine Coniferous Plantation Type	Dry-Fresh Oak Hardwood Deciduous Forest Type
SPECIES COMPOSITION (TREES > 9 CM DBH)	Overstory composition	Pr5 Pw4 Be1 (Aw)	Or4 Mh2 Aw1 Be1 Mr1 (Bw He lw Pt)1
SAPLING COMPOSITION (TREES 6-8 CM DBH)	Advanced tree regeneration	Pw8 Mh2	Mh7 lw3
DBH(CM) (TREES > 9 CM DBH)	Average stem diameter of overstory trees	30	23
AGE	Average age of working group	78	70
HT	Average height of working group	26	24
DENSITY (STEMS/HA > 9CM DBH)	Density of overstory (Stems/hectare)	357	641
TOTAL STEMS (> 9 CM DBH)	# of trees in the overstory within the compartment	3570	3846
%AGS	% acceptable growing stock	100	82
BASAL AREA (SQ M/HA > 9 CM DBH)	Basal area of the overstory (m <sup>2</sup> /hectare)	25.5	25.6
TOTAL BASAL AREA (SQ M > 9 CM DBH)		255	154
SAPLINGS-BA (6-8 CM DBH)	Basal area distribution (m <sup>2</sup> /hectare)	2.7	1.2
POLES-BA (10-24 CM DBH)		2.8	9.2
SMALL-BA (26-36 CM DBH)		6.1	9.6
MEDIUM-BA (38-48 CM DBH)		14.6	5.6
LARGE-BA (50-60 CM DBH)		2.0	1.2
XLARGE-BA (60+ CM DBH)		0.0	0.0

Attribute collected	Description of attribute	Sample data	
HARDWOOD SAWLOG VOLUME (BOARD FEET/HA)	Estimated timber volumes	0	6275
TOTAL HARDWOOD SAWLOG VOLUME (BOARD FEET)		0	37650
CONIFER AND HARDOOD FUELWOOD VOLUME (CUBIC METERS/HA)		229	90
TOTAL CONIFER AND HARDOOD FUELWOOD VOLUME (CUBIC METERS)		2290	540
SAPLINGS-DENSITY (6-8 CM DBH)	Density distribution by size class (stems/hectare)	644	238
POLES-DENSITY (10-24 CM DBH)		172	470
SMALL-DENSITY (26-36 CM DBH)		70	130
MEDIUM-DENSITY (38-48 CM DBH)		105	37
LARGE-DENSITY (50-60 CM DBH)		10	4
XLARGE-DENSITY (60+ CM DBH)		0	0
ADVANCED REGEN COMPOSITION	Understory composition and density by species (saplings and seedlings <6 cm DBH / hectare)	Pw10	none
ADVANCED REGEN DENSITY		1836	0
EARLY REGEN COMPOSITION		Or5 Pw2 Mh2 Be1	Or6 lw3 Be1 (Mh Pw Aw Mr)
EARLY REGEN DENSITY		4772	14097
SHRUB COMPOSITION	Shrubs present and their abundance (stems / hectare)	wild red raspberry10 (serviceberry)	Maple-leaved viburnum7 witch hazel2 leatherwood1
SHRUB DENSITY (STEMS/HA)		23127	13214
SNAG-DBH (CM)	Habitat features (stems / hectare)	45	20
SNAG-DENSITY (STEMS/HA)		9	64
CAVITY-DBH (CM)		0	26
CAVITY-DENSITY (STEMS/HA)		0	8

Attribute collected	Description of attribute	Sample data	
CWD-DBH (CM)		21	0
CWD-DENSITY (STEMS/HA)		50	0
HERBS (%COVER)	Ground vegetation (% cover)	6	6
MOSS (%COVER)		0	0
GRASS/SEDGE (%COVER)		0	6
GROUND VEGETATION SPECIES		Canada may lily, wood fern, woodland strawberry	Canada may lily, Solomon's seal, Sarsaparilla
COMMENT	Comments		butternut in stand, very rugged, rolling
INVASIVE SPECIES	Invasive species observed and abundance (see Table below)	GARLMUST (MANY), MANIMAPL (MANY)	
RECOMMENDATION MANAGEMENT SCHEDULE	Period scheduled for management & description of management	2020 Selection thin 30%	

Categories representing invasive plant population abundance.

Abundance Category	Population Size
Few	<4m <sup>2</sup> (2x2m)
Small	4-25m <sup>2</sup> (5x5m)
Many	25-100 m <sup>2</sup> (10x10m)
Heavy	> 100 m <sup>2</sup> (10x10m)



# Strategic Forest Management Plan

## **SECTION THREE: Implementation**

### **Operational Plan**

Conservation Halton | 2020

## Introduction

**Section Three** will establish activities for achieving the goals through a one-year operational plan. Activities will be listed with annual targets for operations across forests, and each year, activities completed will be reviewed and the list revised to ensure it always maintains a five-year outlook. Section Three will be supported by the development of forest management prescriptions for each stand.

## Conservation Halton's Managed Forest

Conservation Halton owns and manages more than 10,840 acres of land across its watersheds. Of this land, 5,121 ac is enrolled in Ontario's Conservation Land Tax Incentive Program (CLTIP). A further 1,744 ac is Managed Forest, forest managed under Ontario's Managed Forest Tax Incentive Program (MFTIP). Based on MFTIP property data, coniferous (39%) and mixed (33%) plantations make up the bulk of the forest, and upland forest accounts for a further 11%.

The CLTIP is a voluntary tax incentive program, where landowners agree to protect provincially important natural heritage features that have been evaluated and identified by MNRF. These lands are assessed at the CL property class and are tax exempt (MNRF 2010).

The MFTIP is a tax saving program offered by MNRF, to landowners who apply, qualify, and have Managed Forest eligible lands, designed to increase landowner awareness about forest stewardship and encourage responsible management of forests (MNRF 2017). An approved Managed Forest Plan is required for properties enrolled in MFTIP.

Through the Strategic Forest Management Plan, Conservation Halton will replace over 30 individual Managed Forest Plans with a single document submitted to the MFTIP. As well, the impacts to the potential involvement in the CLTIP will be planned for within the Strategic Forest Management Plan providing a single overarching Plan, empowering Conservation Halton to maximise the value delivered through these two provincial programs. The stands that are scheduled for sustainable forest management during the 2020-2025 operational period are currently participating in MFTIP. Table 6 provides a summary of properties participating in the CLTIP and MFTIP.

Goals in Action Throughout this Plan, success will be measured by working on the tasks listed below:

**Goal 1:** To improve forest health conditions using current and future accepted methodologies and science.

To improve forest health conditions using current and future accepted methodologies

Approaches	Description/ Action	Proposed Schedule	Key Performance Indicator
<b>Sustainable Forest Management</b>	Identify rolling schedule of forest management operations across Conservation Halton forested lands (plantation and hardwood woodlands). This would include: <ul style="list-style-type: none"> <li>• Pre-harvest stand assessments</li> <li>• Silvicultural prescriptions approved by a member in good standing with the OPFA</li> <li>• Tree marking by Certified Tree Markers</li> </ul>	Starting 2020  Refer to Table 7	15 active forest operations over a five-year period,  will be adaptable to internal & external pressures and priorities
<b>Invasive Species</b>	Conduct herbaceous invasive species inventory & update every 5 years thereafter: <ul style="list-style-type: none"> <li>• Identify invasive species present in Conservation Halton woodlands</li> <li>• Investigate management options available</li> <li>• Implement a program of invasive species management alongside sustainable forest management operations</li> </ul>	At time of pre-harvest assessments	Collaborate with CH ecology teams and detect invasive species at stand assessment, prior to every forestry operation  Conduct invasive species inventory within operation areas & update every 5 years thereafter  Manage invasive species described in inventory where feasible
<b>Forest Inventory</b>	Update forest inventory on all lands owned by Conservation Halton: <ul style="list-style-type: none"> <li>• Identify forest management units, forest management pressures, ecological and environmental sensitivities and required management activities</li> </ul>	Inventory starting 2020	Complete the forest inventory, followed by a rolling update based on forestry operations  Prioritize forest inventory for MFTIP designated woodlands

Approaches	Description/ Action	Proposed Schedule	Key Performance Indicator
	<ul style="list-style-type: none"> <li>Monitor, review and revisit the inventory on an as needed basis to ensure that it remains accurate</li> </ul>		
<b>Wildlife Habitat</b>	<p>Identify and map:</p> <ul style="list-style-type: none"> <li>Species at Risk</li> <li>Old Growth and Interior Forest Habitats</li> </ul> <p>In addition, continue converting softwood plantation to mixed hardwood stands to improve species diversity and wildlife habitat</p>	Continuous	<p>Identify and quantify old growth and interior forest habitat</p> <p>Follow best practices for SAR and implement within 1 year</p> <p>Improve and expand habitats and provide growth opportunities for SAR</p>
<b>Monitoring</b>	<p>Monitor during and post-harvest operations to ensure objectives for careful logging, forest health, regeneration and invasive species are delivered. Identify remedial actions that may be required</p> <p>Monitor tree planting/restoration projects</p>	Continuous depending on operational schedules	<p>Operational audit during harvest</p> <p>Post harvest site restoration assessment</p> <p>Regeneration assessments after 2-3-years post planting/operation</p>
<b>Forest Information Management System (FIMS)</b>	Develop a collaborative tool for sharing forest inventory information across the Authority	By 2022	Implemented within 2 years
<b>Strategic Plan Implementation, Administration, and Partnerships</b>	<p>Maintain an Ontario Professional Foresters Association member within the team</p> <p>Engage in partnerships on forestry health topics as needed</p>	Ongoing	<p>Maintain at least one Ontario Professional Foresters Association certified staff member</p> <p>Keep open lines of communication between forestry staff, internal CH teams MNRF b, municipal partners, NEC r, for proposed management operations</p> <p>Maintain partnerships with CFIA, FGCA, MNRF on forest health issues. Attend MNRF's annual forest health conference for trends in forest health.</p>

**Goal 2:** To maximise the value of our forests in delivering environmental goods and services, social and health benefits, and enhanced forest diversity.

To maximise the value of our forests in delivering environmental services, social and health benefits, and enhanced forest diversity

Approaches	Description/Actions	Proposed Schedule	Key Performance Indicator
<b>Standard Operating Procedures and Best Management Practices</b>	Develop SOPs for: <ul style="list-style-type: none"> <li>• Forest inventory</li> <li>• Forest Management Prescriptions</li> <li>• Monitoring</li> </ul> Review SOPs every two years  Follow Best Management Practices (BMPs) for Areas of Concern (e.g. SAR, riparian zones, stick nests, etc.)	2020	Develop Standard Operating Procedures for forestry operations  Follow BMPs for SAR
<b>Wildlife Habitat</b>	Implement management options that preserve and create habitats and provide growth opportunities for species at risk  Convert monoculture plantations to diverse mixed wood forests.  Align partner strategies to help provide greater opportunities for undisturbed interior forest habitats	Ongoing	Identify and manage interior forest and old growth forest characteristic  Conversion of plantations Communicate land securement opportunities with the Lands Department and stewardship opportunities with the Science and Partnership Department
<b>Invasive Species</b>	Monitor and treat invasive species	Ongoing	Conduct invasive species inventory within forestry operation areas & update every 5 years thereafter  Manage invasive species described in inventory where feasible
<b>Seed Forecasting and Collection</b>	Maintain an active seed forecasting and collection program annually and supply seed to local nurseries	Ongoing	Supply seed to local nurseries  Three Certified Seed Collector (CSC) staff members with seed forecaster training; Volume of seeds collected per year

Approaches	Description/Actions	Proposed Schedule	Key Performance Indicator
<b>Sustainable Forest Management</b>	Sustainable Forest Management operations that mimic natural processes, emphasis on removal of diseased trees and consideration of alternative techniques	2022	Mimic natural disturbances in at least one mixed hardwood stand annually
	Continue converting softwood plantation to mixed hardwood stands	2021	15 active forest operations over a five-year period, will be adaptable to internal & external pressures and priorities
<b>Climate Change Mitigation and Adaptation</b>	Keep up to date on climate science so that we can have a flexible and responsive forestry program to enhance mitigation to climate change	Ongoing	40 continuing education hours annually for 2 forestry staff (e- lectures, seminars, workshops)
	Implement an assisted migration trial supported by the Forest Gene Conservation Association (FGCA) – Use at least 25% of seeds from more southerly seed zones		Establish an assisted migration trial within 5 years
<b>Value Matrix</b>	Develop communications tools around ecological service values of forests	By 2023	Create a value matrix to express value of Conservation Halton Forests

**Goal 3:** To maintain, and where possible, increase forest cover across our watershed through the afforestation of Conservation Halton land acquisitions and on private lands, and through public education and landowner outreach programs. To maintain overall forest cover on Conservation Halton properties and where possible across our watershed through the afforestation of Conservation Halton land acquisitions and promote the same on public and private lands, through education and landowner outreach programs.

Approaches	Description/Actions	Proposed Schedule	Key Performance Indicator
<b>Land Securement Strategy</b>	Support the Land Securement Strategy and implementation thereof	2020	Based upon priority ranking system and funding availability in any given year
<b>Forestry Initiatives, Stewardship and Outreach</b>	Implement a program to support public and private landowner forestry initiatives including:	Ongoing	Plant 30-50,000 trees annually
	<ul style="list-style-type: none"> <li>Tree planting – 50M Program</li> <li>Pre-plant preparation</li> </ul>		Post-plant survival assessments 2 and 5 years after planting

Approaches	Description/Actions	Proposed Schedule	Key Performance Indicator
	<ul style="list-style-type: none"> <li>• Post-Plant Survival Assessments</li> <li>• Forest Management Plans e.g. MFTIP</li> <li>• Education and Outreach</li> </ul>		Number of Managed Forest Plans written per year
<b>Internal Partnerships</b>	Support programs across Conservation Halton including the sourcing and supply of tree stock to partner departments such as Stewardship and Restoration	Ongoing	Work collaboratively with internal departments to facilitate their tree planting related programs
<b>Sustainable Forest Management</b>	Conduct survival and regeneration assessments for Conservation Halton's new and managed plantations	Ongoing	60% plantation survival for new plantings and ensuring sufficient regeneration rates for postharvest
	Seek out opportunities for forest restoration	Ongoing	Collaborate with stewardship/restoration initiatives
<b>Outreach and Education</b>	Plan and implement a series of public outreach and educational events	Ongoing	1-2 per year
	Explore other options for formal and informal educational outreach. New outreach streams including watershed tour of harvesting, restoration, and planting		

### **Appendix 3.1. Management Plan**

A working list of Conservation Halton properties that require forest management through MFTIP are listed in Table 6. These properties all have MFTIP designated stands or areas that must follow their own forest management plans. In addition, other Conservation Halton lands classified as CLTIP will be inventoried and assessed for forest management needs.

The pine plantations and mixed hardwood stands are itemized with their approximate stand size. All plantation stands are due for management based on their thinning cycle and will be prioritized according to severity of stand conditions following updated forest inventory data. The status of the mixed hardwood stands is unknown and will be determined following forest inventory data collection. As inventory work is completed, harvest prescriptions will be written by staff and approved by a Registered Professional Forester.

The Operational Plan of this document (Table 7) outlines the properties and stands that Conservation Halton plans to manage in the first year of this SFMP. As forest inventory data is updated for all Conservation Halton properties, forest management needs will be assessed at each property and operational planning will be prioritized accordingly. This data will allow us to create a five-year outlook. This will become a fluid five-year operation plan because some stands will require different permitting than others. As approvals are acquired, stands will be confirmed for the following year's Operation Plan.

Monitoring will be incorporated throughout the planning, implementation, and audit stages of the operations. Monitoring will be three-fold, starting with screening for species at risk and invasive species before work commences. The second phase will take place during the harvest to ensure best management practices are being followed. The last phase of monitoring will evaluate the, site restoration needs and regeneration success post management activities. A detailed plan will be developed to outline the protocol for monitoring these factors throughout the forest management operation.

To carry out forest management activities, various permits must be acquired. In certain circumstances permits will be required for works occurring within or near provincially significant wetlands, species at risk habitat and other regulated areas. This could require different levels of permitting from Conservation Halton, the Niagara Escarpment Commission, and the Ministry of the Environment, Conservation and Parks. The properties presented in the Management Plan are located within either Wellington County, City of Hamilton, or Halton Region which requires a permit for forest management activities, under their respective local By-laws. Each property involved in forest management activities will go through the appropriate internal and external screening and permit application processes.



Table 6 Management Plan: CH properties that require forest management under MFTIP

	Property Summary		Area on Assessment acres	Conservation Lands Tax Incentive Program participating acres	Managed Forest Tax Incentive Program participating acres	MFTIP Stand Types			
	Property Name	Roll #				Conifer plantations acres	Mixed plantations acres	Mixed wood stands acres	Wet woods acres
1	Mountsberg CA	2301 000 005 21500	362.3	225.35	128	48.65	70.95	8.4	
		2518 303 970 40000	467.71	368.65	94.64	72.84		8.52	
		2518 303 970 40200	291.08	157.66	60.28	45.88		14.4	
		2409 030 002 42500	198.22	111.69	86.53	43.75		28.22	
2	Moffat Badenoch---McCrodan	2301 000 007 03500	180	103.23	76.77	42.75		42.27	
	Moffat Badenoch---McLean	2301 000 007 04500	166.3	135.19	31.11	31.11			
3	Mount Nemo	2402 030 306 03800	329.2	257.62	69.85	16.63	53.22		
	Colling	2402 030 305 08700	84.94	55.01	29.93	29.93			
	Paletta	2402 030 308 08310	19.22	0	19.22			19.22	
4	Harrison	2409 030 002 24200	59.68	47.59	12.09			12.09	
5	Kiwanis	2409 030 001 21200	100	90.12	9.88	6		3.88	
6	Hilton Falls-Mahon tract	2409 030 001 80050	21.15	0	21.15	21.15			
	Hilton Falls	2409 030 001 76700	1595.12	1467.51	77.06	14.85	12.2	34.6	
7	Edmondson	2409 030 002 25200	76.58	49.41	26.17	4.65		16.52	
8	Shanahan	2409 030 002 38400	167.03	142.06	24.97	23.35		1.62	
9	Twiss	2409 070 301 11300	51	27.16	23.84	18.84		5	
10	Rattlesnake Pt	2409 070 302 01600	607.6	461.11	126.93	94.11	15.52	17.3	
	MacDonald	2409 070 302 01900	118.97	75.42	43.55		43.55		
11	Crawford Lake	2409 070 302 03900	550.2	457.65	80.05	30	45.05	5	
12	16 Valley	2409 090 070 09800	70	27	43	30.97	12.03		
13	Esquesing	2415 070 002 24800	37.31	27.43	9.88	9.88			
14	Fuciarelli	2518 302 510 24600	148.88	131.28	16.6		16.6		
15	Plaikner	2415 070 004 09000	55.28	29.28	26	3.8			22.2
16	Waterdown Woods	2518 303 310 12600	118.58	84.65	33.93		33.93		

	WW Robinson	2402 020 204 07221	18.58	0	18.58			18.58	
17	Grindstone	2402 010 102 05710	158.75	144.17	14.58		14.58		
18	Kelso	2409 030 001 80000	962.66	390.61	366.39	52.55	212.57	11.77	18.5
	Kelso Quarry	2409 030 001 84400	175.67	8.27	84.69	9.5	58.25		
19	Knight	2518 302 910 00175	45.92	33.18	12.74	12.74			
20	Heaslip	2409 070 301 17200	89.97	13.03	75.69	18.29	10.63	24.08	22.69
	<b>Totals for MFTIP properties:</b>		<b>7327.9</b>	<b>5121.33</b>	<b>1744.1</b>	<b>682.22</b>	<b>599.08</b>	<b>271.47</b>	<b>63.39</b>

Table 7 Operational Plan Example: CH properties that require forest management in 2021

Property	Compartment	Stand Composition	Area (ac)	Treatment Type	SAR and Sensitive Species Consideration	Regulated by CH	Municipal, Regional, NEC, MECP, Permit	Previous Operation
					Species	Yes/No		
Shanahan (N1)	A	Pr5, Pw5	3.71	Thinning	Bobolink, Chorus Frog, Snapping Turtle, West Virginia White Butterfly, Milk snake	Yes	Halton Region & MECP	Thinned 2005
	D	Pr8, Pw1, Sw1	2.97	Thinning				Thinned 2005
	G	Pr7, Pw3	6.91	Thinning				Thinned 2005
	N	Pr8, Pw2	8.4	Thinning				Thinned 2005
Total			21.99					

Mountsberg (C5) (Mackenzie-Davis)	L	Pw5, Pr5	2.72	Thinning	Painted Turtles, Blue Spotted Salamander, Prong Horn Clubtail, Bobolink, West Virginia White Butterfly	Yes	Halton Region & MECP	Thinned 2005
	M	Sw10	1.98	Thinning				Thinned 2005
	N	Pr10	1.40	Thinning				Thinned 2005
	O	Pr10	6.42	Thinning				Thinned 2005
	P	Sw10	2.72	Thinning				Thinned 2005
	R	Pw10	2.47	Thinning				Thinned 2005
	S	Pr5, Pw3, Sw2	9.39	Thinning				Thinned 2005
	U	Sw7, Ce3	4.45	Thinning				Thinned 2005
	V	pr10	2.47	Thinning				Thinned 2005
	W	Pr4, Sw3, Pw3	3.21	Thinning				Thinned 2005
Total			37.22					

Robert Edmondson (C7)	2 (E)	Pw10	2.96	Thinning	West Virginia White Butterfly, Western Chorus Frog, Broad winged Hawk, Eastern Wood Pewee	Yes	Halton Region & MECP	Thinned Pre 2000
	H	Pw10	2.96	Thinning				Thinned Pre 2000
TOTAL			5.93					
Overall TOTAL			65.13					

<b>Afforestation Program</b>	~30,000 – 50,000 tree seedlings per year @ ~2,000/ha...50ha of new forest...combined private landowners, CH lands and municipalities. Supported through Forests Ontario, 50 Million Tree Program	2020-2025
<b>Seed Collection</b>	~Up to 10 hectolitres of native tree and shrub seed is collected by CH Certified seed collectors in seed zones 34 and 37 annually. Collections of up to 20 species are undertaken during spring through the fall depending on the species and the demand of the supply nurseries. High quality, locally adapted seed is the foundation of the CH Afforestation Program, and best able to withstand the stresses of a changing climate.	2020-2025

NOTES:

Ac	Acres
AGS	Acceptable Growing Stock
ANSI	Areas of Natural and Scientific Interest
AGS	Acceptable Growing Stock
CA	Conservation Authority
BMP	Best Management Practices
CLTIP	Conservation Land Tax Incentive Program
CFIA	Canadian Food Inspection Agency
CSC	Certified Seed Collector
DBH	Diameter at Breast Height
EAB	Emerald Ash Borer
ESA	Endangered Species Act
Ha	Hectare
FIMS	Forest Information Management System
FSC	Forest Stewardship Council
FGCA	Forest Gene Conservation Association
Hdwds	Hardwoods
Inv	Inventory

MBCA	Migratory Bird Convention Act
MFTIP	Managed Forest Tax Incentive Program
NE	Niagara Escarpment Commission
NHS	Natural Heritage Systems
OMNRF	Ontario Ministry of Natural Resources and Forestry.
OHT	Ontario Heritage Trust
OIPC	Ontario Invasive Plant Council
OPG	Ontario Power Generation
PSP	Permanent Sample Plots
S.A.	Survival Assessment
SAR	Species at Risk
Spp	Species
Rx	Silvicultural prescription
USFS	US Forest Service
UGS	Unacceptable Growing Stock