



Halton Regional Forest Five-Years Forest Operating Plan 2020-2024

May 15 2019



Halton Regional Forest Operating Plan 2020-2024

Table of Contents

1.0 Introduction	1
2.0 Review of Activities 2015-2019	3
2.1 Administration and Management of the Halton Regional Forest.....	3
2.2 Stewardship	3
2.3 Infrastructure Improvements 2015-2019	4
2.4 Jefferson Salamander Research.....	4
2.5 Forest Health Monitoring.....	5
2.6 Silvicultural Management 2015-2019.....	5
3.0 Management Activities Planned for 2020-2024	6
3.1 Natural Heritage Advisory Committee (NHAC)	6
3.2 Managing Threats to Forest Health.....	6
3.2.1 Climate Change	6
3.2.2 Non-Native Insect Infestations	7
3.2.3 Invasive Plants.....	8
3.2.4 Tree Diseases/Pathogens	9
4.0 Silvicultural Management 2020-2024.....	10
4.1 Tree Planting.....	10
4.2 Forest Inventory Update.....	10
4.3 Compartment Mapping.....	10
4.4 Stand Improvement Thinning 2020-2024.....	10
5.0 References.....	13
Appendix A - Maps to Accompany 5-Year Schedule of Stand Improvement	14
<i>List of Tables</i>	
Table 1. Summary of area treated and wood products from thinning operations 2010- 2014.	5
Table 2. Details of stand improvement thinning 2020-2024.....	12
<i>List of Figures</i>	
Figure 1. Key map of the Halton Regional Forest Tracts.	2

Five-Year Forest Operating Plan 2020-2024

Halton Regional Forest

1.0 Introduction

The Regional Municipality of Halton currently owns 704.28 hectares (ha) (1,740 acres) of forests on 14 separate tracts of land (Figure 1) that were previously managed by the Ontario Ministry of Natural Resources, under the former Agreement Forests program. The Halton Regional Forest forms part of the Natural Heritage System identified in the Halton Region Official Plan 2009.

Most of the Forest tracts fall within the Niagara Escarpment Plan Area, designated a World Biosphere Reserve by UNESCO. Six tracts (Cox, Britton, Robertson, Turner, Mahon, and Currie) are identified as being within the Halton Regional Forest South Provincially Significant Life Science Area of Natural and Scientific Interest (ANSI). These six tracts also lie within the Niagara Escarpment Plan (MNR&F 2017) area. This area is subject to the Niagara Escarpment Parks and Open Space System (NEPOSS) guidelines, objectives, and policies (MNR 2012).

Management objectives for the forest are described in a 20-year Forest Management Plan 2005-2024 and Addendum to the Forest Management Plan (Regional Municipality of Halton 2005, 2006). A companion document, *Profile of the Halton Regional Forest* (Gartner Lee *et al.* 2002), provides a historical perspective on the forests, baseline information on the present state of the forests and affiliated ecosystems, and an overview of the contribution of the forests to the surrounding landscape.

The Forest Management Plan was accompanied by a ten-year capital plan (2005-2014) and five-year Operating Plan (2005-2009). The Capital Plan was renewed for 2015-2024 and the Operating Plan was subsequently renewed for 2010-2014 and 2015-2019. The Operating Plan is now being renewed for another 5-year period 2020-2024.

This new Five-Year Operating Plan provides a summary of management activities completed during the 2015-2019 operating period, identifies activities for the 2020-2024 operating period, and provides a discussion of current and potential management issues.

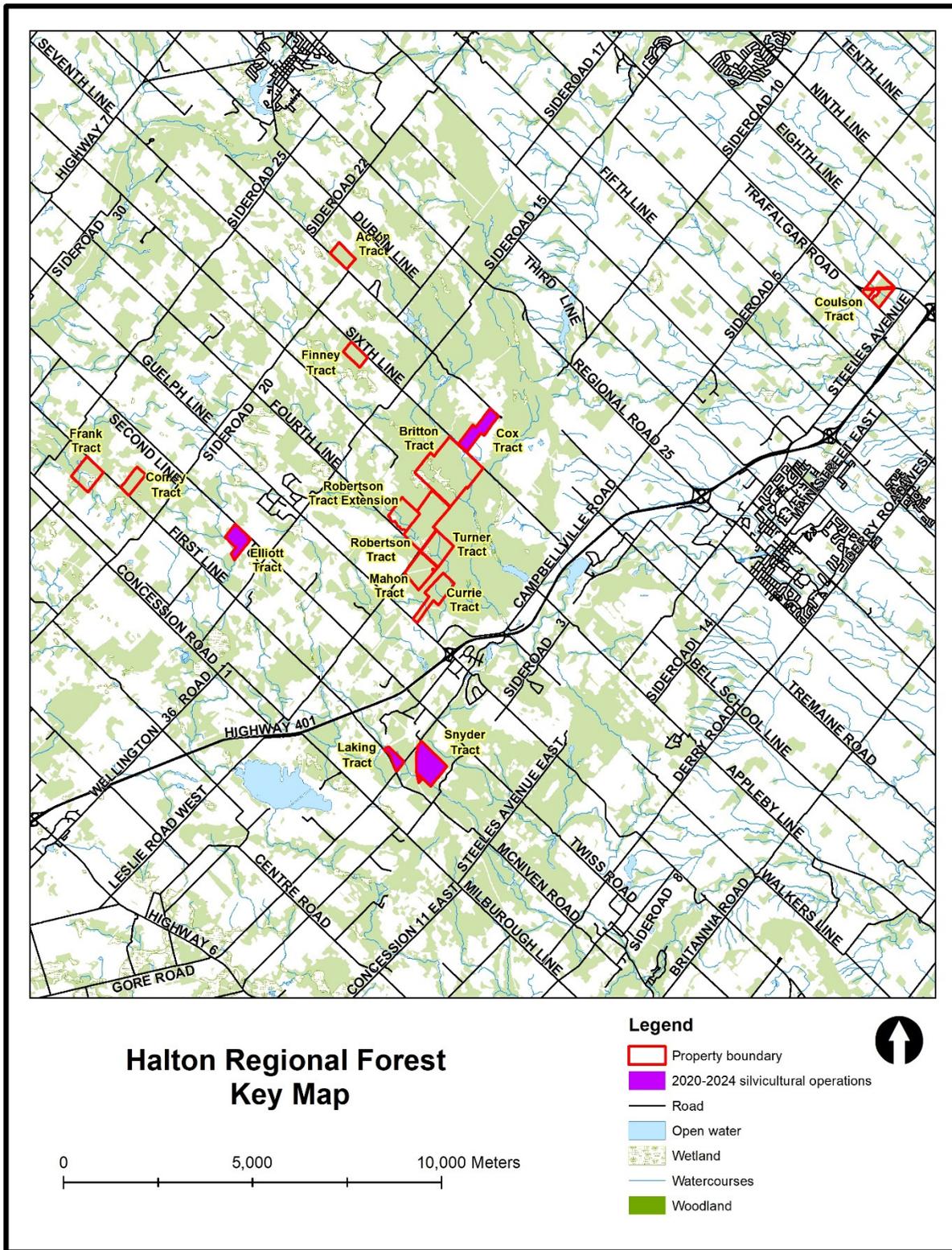


Figure 1. Key map of the Halton Regional Forest Tracts.

2.0 Review of Activities 2015-2019

A number of activities were carried out in the Halton Regional Forest during the 2015-2019 operating period including completion of several capital infrastructure projects, tree planting, and stand improvement thinning on 30.3 ha. A summary of these activities is given below.

2.1 Administration and Management of the Halton Regional Forest

The 20-year management plan identified several strategies for achieving effective administration of the Regional Forest including establishing an appropriate Regional position with the responsibility for implementing the management plan and allocating sufficient capital and operating funds to ensure the successful implementation of the plan.

Staff Report PPW59-05 (April 2005) endorsed the Halton Regional Forest Management Plan and recommended the hiring of a Forester. A Registered Professional Forester was hired in September 2006. The Regional Forester's primary responsibilities include:

- Daily and strategic management of Halton Regional Forest lands and other Regional forested lands
- Administration and enforcement of the Halton Tree By-law 121-05
- Administration and delivery of the Halton Region Woodland Stewardship Program
- Administration of the Forest Stewardship Council® (FSC®) certificate (FSC® C018800) for the Regional Forest is managed under the Eastern Ontario Model Forest Certification Program.

2.2 Stewardship

Public participation was an important component in the process of preparing of the Halton Regional Forest Management Plan. The Management Plan recommended that the Region establish a Regional Forest Stewardship Advisory Committee to build upon the spirit of co-operation and goodwill that emerged during the management planning process. The Committee's work during the previous operating periods has involved input on forest certification, hunting inquiries, wildlife management, forestry events, recreational use, geocaching protocols and issues related to biodiversity and natural heritage. In June 2014, Regional Council approved the consolidation and merger of the Regional Forest Stewardship Advisory Committee and the Region's Ecological and Environmental Advisory Committee (EEAC) through Report No. 32-14 to form the Natural Heritage Advisory Committee which now serves this purpose.

Forest Stewardship Council (FSC) Certification

In February 2015, the Halton Regional Forest achieved Forest Stewardship Council® (FSC®) certification (FSC® C018800) through the Eastern Ontario Model Forest's Forest Certification Program. The FSC® is an international, membership-based, non-profit organization that supports environmentally appropriate, socially beneficial, and economically viable management of the world's forests. Certification is granted for a period of five years during which the forest is subject to annual independent audits. The current certificate was issued January 28, 2018 and expires January 27, 2023.

Other Stewardship Initiatives 2015-2019

The Region has undertaken several other activities to promote stewardship of the Regional Forest during the 2015-2019 operating period. These include:

- Tree planting in the Coulson and Elliott tracts to increase tree cover and promote regeneration.
- Treatments to control Dog-strangling vine and Phragmites in the Robertson, Robertson Extension and Britton Tracts.
- Removal of hazard trees within striking distance of access roads in all Tracts.

2.3 Infrastructure Improvements 2015-2019

Infrastructure projects completed during the 2015-2019 operating period included:

- Construction of a 2.7 km loop trail in Robertson Extension and an additional 312 metres of trail to link the new loop trail with Robertson Tract trails.
- A 121 metre section of trail in the southeast edge of Robertson was decommissioned and a new 150 metre section of trail and a boardwalk were built. The purpose of the trail realignment was to reduce trail wetness and limit movement through the provincially significant wetland.
- Repairs to address rutting on sections of road in several tracts.

2.4 Jefferson Salamander Research

The Halton Regional Forest is recognized for its biological significance and, as a result, offers potential venues for scientific study and environmental education. One of the actions, under Halton Region's Biodiversity Strategy 2014, is to work with universities to conduct ecological research in the Regional forest. Subsequently, Halton Region staff connected with a PhD student at the University of Waterloo to conduct research on the Jefferson salamander (*Ambystoma jeffersonianum*), an endangered species, within the Regional Forest in partnership with Halton Region and the provincial Jefferson Salamander Recovery Team. Ten forest tracts were surveyed for potential Jefferson salamander breeding habitat and based on the results, water sampling and minnow trapping were conducted in vernal pools in five tracts. Adult salamanders were found in three of the locations with confirmed Jefferson salamanders through DNA analysis. An additional follow up study in the Britton Tract regarding the dispersal movements of juvenile salamanders from the pool to upland habitat was conducted in the summer of 2018. This study suggests that the success of the pool for breeding in 2018 was low as no juveniles were trapped during its implementation.

The Region also continued to support research to assess the short and long-term impacts of human disturbance on forest environments. On public lands within core protected areas along the Niagara Escarpment, including the Robertson and Cox Tracts, a series of one hectare plots (Robertson Tract) and 100 m² (Cox Tract) have been monitored on a 5 year rotation over the past 15 years through a partnership between the Niagara Escarpment Commission and the University of Waterloo. Data collected in these plots can allow for the evaluation and refinement of land use and management practices and can serve as

a baseline reference from which other monitoring and inventories of Escarpment forests can be compared <http://www.escarpment.org/education/monitoring/projects/index.php>).

2.5 Forest Health Monitoring

Forest health is the perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigour, presence of unusual levels of insects and disease, and resilience to disturbance both natural (e.g. wildfires, wind events, pathogens, insects) and human-induced such as those arising from public use.

Over the past several years the health of forests across southern Ontario, including the Halton Regional Forest, has been threatened by a number of invasive plants and insects and pathogen/insect-pathogen complexes. In 2009, the Region began conducting annual forest health surveys in Regionally-owned forested properties. The project includes the 14 Regional Forests and 12 other Regional forested lands. The surveys have documented the presence of several invasive plants, non-native insects, and pathogens in one or more of the Regional Forest tracts (Williams 2018).

2.6 Silvicultural Management 2015-2019

Timber production is not a primary objective for the Halton Regional Forest. Rather, it is a by-product of the periodic thinning of the forest to enhance forest health and wildlife habitat, and to promote natural regeneration of native trees and shrubs. The 20-year management plan included calculations of the long-term sustainable timber management for the Halton Regional Forest. Table 1 provides a summary of areas treated from thinning operations during the 2015-2019 operating period. The timber generated \$9,840 in stumpage revenues. Revenues generated through timber sales are used to help offset other forest management expenditures.

Table 1. Summary of area treated and wood products from thinning operations 2015-2019.

Tract	Area Treated (ha)	Silvicultural System	Volume of Wood Products Harvested All Species (m3)
Acton	8.22	Single tree selection	171
Conley	5.09	Row removal (every 4 th row)	217
Elliott	3.16	Overstorey removal of declining red pine in compartment 8e	67
Robertson	6.99	Row removal in red pine (every 4 th row) Shelterwood seed cut in white pine	160
Turner	6.84	Row removal + Single tree selection	178
Total	30.30		793

3.0 Management Activities Planned for 2020-2024

3.1 Natural Heritage Advisory Committee (NHAC)

In June 2014, Regional Council approved the consolidation and merger of the Regional Forest Stewardship Advisory Committee and the Region's Ecological and Environmental Advisory Committee (EEAC) through Report No. 32-14. The new, enhanced Natural Heritage Advisory Committee will provide broad oversight and advice on environmental management in Halton Region. The committee consists of:

Full Voting Members:

- i) 1 member of Regional Council and one alternate member of Regional Council, appointed by Council;
- ii) 1 member of Conservation Halton, selected by Conservation Halton;
- iii) 1 member of the Niagara Escarpment Commission, selected by the Commission;
- iv) A maximum of 14 citizens with demonstrated expertise in an environmental or forest management discipline, appointed by Regional Council.

3.2 Managing Threats to Forest Health

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

3.2.1 Climate Change

Recent years have brought the impacts of a rapidly changing climate and more extreme weather events. For example, in 2016, strong wind bursts caused a large block of trees to be uprooted in the Robertson Tract. The ice storm in December 2013 caused significant damage to trees in many parts of Halton Region and severe drought in 2016 through much of June, July and August caused stress to all forests and trees as noted in the 2018 Forest Health Report (Williams 2018).

In future, climate change is expected to continue, bringing generally warmer temperatures but more volatile conditions. As the climate changes, the length, frequency, and severity of droughts will likely increase. This is already affecting red pine, which puts down only shallow roots in the forest's alkaline soils and is therefore more stressed in times of drought. Red pine plantations in the Snyder Tract and other tracts are exhibiting symptoms of red pine decline, a fungal disease that appears to be more prevalent in older plantations.

Even without severe drought, soils will dry out more quickly and trees will lose moisture faster through transpiration because of higher temperatures. Shallow-rooted species such as white spruce and white cedar are likely to suffer moisture stress more often and for longer periods. Mixing them with deeper-rooted hardwood species will promote the

buildup of forest litter and humus, which will improve the ability of soil to retain moisture (Papadapol 1998, Liao 2010).

Managing the forest for biodiversity will also leverage the greater drought resilience of species that draw water from deeper in the soil, such as sugar maple, white ash, hickory species, red oak, and white pine.

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

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

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

3.2.2 Non-Native Insect Infestations

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

An immediate threat to Regional Forest is the increasing populations of **Emerald ash borer** (*Agrilus planipennis*) (EAB) and associated ash mortality. The 2018 Forest Health Report (Williams 2018) noted that the percent composition of ash trees is low (<10%) on all Regional Forest tracts above the Escarpment, and losses when they occur will not cause significant change to the forest composition. The Region has worked with municipalities and Conservation Halton to develop A Strategic Plan to Manage Emerald Ash Borer in Halton Region (2009). The Region will continue to remove ash trees affected by EAB within striking distance of access roads, trails, public rights-of-way and private properties.

European Pine Shoot Beetle (*Tomicus piniperda*) (EPSB) is an introduced bark beetle that has been a problem in local pine plantations since the 1990's (Williams 2018). The larvae tunnel under the pine bark and the adults cause incidental damage by tunnelling through the young vegetative shoots late in the growing season. At higher populations, the larvae kill the trees by girdling and the adult beetles can cause a loss of vigour by reducing the amount of foliage. While its favoured host is Scots pine, it will also attack stressed red pine and the adults will attack white pine shoots. If red pine is healthy, it is

usually able to withstand heavy attacks of EPSB. If red pine is stressed by overstocking (too dense of a stand), drought, or poor site conditions, it can be killed by EPSB.

Background levels of EPSB are low throughout the pine plantations surveyed in 2018 and significant infestations were not noted. The pine plantations at the Frank, Currie, Finney, Robertson and Turner Tracts were thinned during the 2015-2019 operating period. This should improve tree and stand vigour (and resistance to EPSB), by reducing susceptibility and breeding habitat for EPSB. Red pine plantations in the Snyder and Cox Tracts are scheduled for a second thinning in the 2020-2024 operating period.

The annual Forest Health Surveys will continue to monitor for these and other non-native insects such as **Gypsy moth** (*Lymantria dispar dispar*), **Asian long horned beetle** (*Anoplophora glabripennis*), and **Hemlock woolly adelgid** (*Adelges tsugae*), an emerging threat.

3.2.3 Invasive Plants

Non-native invasive plants can quickly take over a forest site, crowding out native flora and in some cases overtopping small trees and shrubs. Of particular concern are Coltsfoot (*Tussilago farfara*), Garlic mustard (*Alliaria petiolata*), and two species of Buckthorn (*Rhamnus cathartica*, *Rhamnus frangula*), all of which are well-established in the Halton Regional Forest.

Emerging threats to the Regional Forest include Dog-strangling vine (DSV) (*Vincetoxicum rossicum*), invasive Phragmites (*Phragmites australis subsp. australis*) and Purple loosestrife (*Lythrum salicaria*).

Dog strangling vine (DSV) was introduced from Europe in the mid 1800's. Populations colonize ravines, hillsides, plantations, waste areas, fencelines and hedges, and other unmanaged areas and expand from there. DSV is a perennial milkweed that reproduces by seed (often spread by wind) and has an extensive root system (rhizomes); making it hard to control. It is very aggressive and forms dense patches that overwhelm other ground vegetation. DSV was particularly prominent in the Robertson and Robertson Extension. Control efforts for DSV over several years have been successful in reducing populations of this plant. The control measures will continue during the 2020-2024 operating period.

Phragmites was introduced to North America from Europe by early settlers and has become very common in Halton Region. It is a perennial reed that grows up to three meters in height, and reproduces rapidly by rhizomes. It is found in marshes, lake shores, pond margins, ditches, roadsides, and fields. It is very aggressive and forms dense patches that overwhelm other vegetation. Developing populations were noted in marsh areas in the Britton, Frank, Robertson, Currie and Turner Tracts. Measures to control Phragmites populations in Robertson and Britton Tracts began in 2017 and will continue during the 2020-2024 operating period.

Purple loosestrife is a perennial introduced from Europe in the early 1800's that has become naturalized in wet meadows, floodplains and roadside ditches. Heavy infestations crowd out native species such as cattails and can dramatically disrupt water flow causing a decline in biological diversity. Purple loosestrife was a significant concern before 1990, but successful biological control has reduced it significantly. This has changed and in the past few years large increases in populations were noted throughout the Region in areas traditionally having some small populations. Incidence has been increasing, and small patches were noted, at the Britton, Robertson, and Turner Tracts, over the past few years. In 2016 populations in the wetlands through the Britton, Robertson and Turner complex have expanded noticeably.

The 2018 Forest Health Report (Williams 2018) includes background information on these and other pests.

3.2.4 Tree Diseases/Pathogens

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

Red pine decline, caused by root-rotting fungi combined with certain soils that limit rooting depth and brought on by periods of drought stress, is widespread in Southern Ontario. It has recently been observed in the mature red pine plantations in the Cox, Finney, Frank, Elliott, and Snyder Tracts. The red pine overstory was removed in affected areas of the Finney, Frank and Elliott Tracts during the 2015-2019 operating period in efforts to control the spread of the fungus and release the advanced regeneration in those stands. Plantations in the Cox and Snyder Tracts are scheduled for thinning in the 2020-2024 operating period. As discussed in the section on climate change, red pine decline is probably a result of more frequent droughts, which stress older trees.

Butternut canker is caused by the combination of a fungus (*Ophiognomonia clavignenti-juglandacearum*) that affects the butternut tree. The butternut, which is now protected under Ontario's *Endangered Species Act* (2007), occurs naturally in the southern reaches of the Great Lakes-St. Lawrence forest zone and is present as a minor species in several deciduous stands in the Regional Forest. Once a tree is infected, halting the spread of the disease is difficult. Efforts focus on protecting the remaining healthy trees. This can include removing nearby competing species to provide more sunlight and promote health and vigour. A few relatively healthy trees were found in the Cox Tract north side and in the Currie, Frank and Snyder Tracts during the 2018 Forest Health Survey.

Beech bark disease causes defects and death in beech trees. An insect, the beech scale (*Cryptococcus fagisuga*), feeds on the American beech, creating holes in the bark. These become entry points for a fungus (*Neonectria faginata*), which causes the disease. The stress of the insect attack also decreases the trees' resistance to the fungal infection. Most Halton Regional Forest tracts have limited beech populations and while the loss of

beech from the forest is a significant loss to the biodiversity and wildlife, the nature of the forest should not be affected significantly (Williams 2018). However, the dead trees can present hazardous situations when the trees are located near trails or other areas with high use.

4.0 Silvicultural Management 2020-2024

Silvicultural management embodies a suite of management practices and treatments for maintaining the ecological functions of the forest, advancing forest health, and promoting species and habitat diversity. This may include stand improvement thinning to enhance forest health and wildlife habitat and to promote natural regeneration of native trees and shrubs, tree planting in stands where regeneration is lacking, and monitoring forest health.

4.1 Tree Planting

Tree planting may be required to establish native tree species in stands where natural regeneration is lacking or where an increase in species diversity is desirable. No planting is proposed during the 2020-2024 operating period. Recently established plantings in the Coulson and Elliott Tracts will be monitored for survival and growth.

4.2 Forest Inventory Update

A forest inventory is a fundamental tool for assessing the current state of a forest and serves as a baseline for monitoring and assessing the short- and long-term results of the treatments as well as changes to the forest due to biotic and abiotic factors. A comprehensive forest inventory of the Halton Regional Forest was completed during the development of the 2005-2024 Management Plan. The inventory will be updated during the 2020-2024 operating period in preparation for the next 20-year Management Plan 2025-2044.

4.3 Compartment Mapping

The most recent property boundaries (used for boundary marking) do not always match the compartment boundaries originally done when the 20-year Forest Management Plan was created. The compartment boundaries will be revised to fit the property fabric following the completion of the forest inventory update.

4.4 Stand Improvement Thinning 2020-2024

The schedule of silvicultural management activities planned for the Halton Regional Forest over the 2020-2024 operating period is based on the analysis of the sustainable timber management described in the 20-year forest management plan. The determination of the area eligible for treatment is an important part of the forest management planning process. Equally important is the allocation process that identifies candidate areas that are eligible to receive treatment or sites to be selected for treatment over a period of time.

Controlling harvest and treatment levels is an important tool to ensure the balance of growth and harvest is maintained and that the forest remains healthy. Planning and

scheduling activities also help to achieve many forest management objectives such as providing a variety of habitat types, producing a range of stands across the successional spectrum, and promoting diversity of flora and fauna.

Thinning is proposed on approximately 69.6 hectares during the 2020-2024 operating period. Details of the compartments to be treated including estimated expenses and revenues are presented in Table 2. Forest stand maps of the stands proposed for treatment during the 2020-2024 operating period are included in Appendix A.

Implementation of the silvicultural treatments on the selected stands involves pre-harvest assessment and preparation of silvicultural prescriptions by a Registered Professional Forester and tree marking by Provincial Certified Tree Markers. These prescriptions will consider the species and habitat requirements for listed species at risk and will comply with the *Endangered Species Acts 2007* or its successors. Monitoring of the silvicultural operations should be undertaken by a Registered Professional Forester. The forest inventory for these stands is updated following treatment.

The Halton Regional Forest has achieved Forest Stewardship Council® (FSC®) certification (FSC® C018800) through the Eastern Ontario Model Forest and timber harvested from the forest can be sold as FSC® certified timber. 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 the Regional Forest.

Table 2. Details of stand improvement thinning 2020-2024.

TRACT	STAND ID	HECTARES ¹	FOREST TYPE	SILVICULTURAL SYSTEM	EST. EXPENSES ² (\$)	EST. REVENUES ³ (\$)
Cox	1a	8.79	Red pine plantation	Shelterwood system or Single tree selection system	1777	5412
Cox	1b	1.23	Scots pine plantation	Shelterwood system or Single tree selection system	242	418
Cox	1f	23.02	Upland hardwoods	Single tree selection/ Group selection system	5586	17460
Elliott	8a	2.41	White pine plantation	Shelterwood system or Single tree selection system	493	1250
Elliott	8c	6.36	White pine/White spruce plantation	Shelterwood system or Single tree selection system	108	275
Snyder	5c	8.30	Mixed conifer plantation – red pine dominant	Shelterwood system – removal of declining red pine and white ash	1710	5208
Snyder	5d	14.50	Mixedwoods – natural origin	Shelterwood system or Single tree selection system	3191	7290
Snyder	5e	1.75	Mixed conifer plantation	Shelterwood system or Single tree selection system	359	910
Laking	9a	3.24	Mixed conifer plantation	Shelterwood system or Single tree selection system	638	1102
Total 2020-2024		69.60			14104	39325

¹ Area to be thinned (Hectares) excludes any restricted and passive management areas.

² Estimated expenses includes silvicultural prescriptions, tree marking, site visits with harvesting contractors, and harvest monitoring.

³ Estimated revenues. Conifer plantations \$340-600/ha; Mixedwoods \$450/ha; Upland hardwoods \$750/ha.

5.0 References

- Gartner Lee Limited, Silv-Econ Ltd., TSH and Associates and Archaeological Services Inc., 2002: Profile of the Halton Regional Forest. Regional Municipality of Halton. 175p + appendices.
- Liao C, Luo Y, Fang C, Li B (2010) Ecosystem Carbon Stock Influenced by Plantation Practice: Implications for Planting Forests as a Measure of Climate Change Mitigation. PLoS ONE 5(5): e10867. doi:10.1371/journal.pone.0010867. Accessed March 29, 2018.
- Ministry of Natural Resources & Forestry. 2017. Niagara Escarpment Plan (2017). Queens Printer for Ontario. 165p.
- Ministry of Natural Resources. 2012. Niagara Escarpment Parks and Open Space System Planning Manual. (March 2012). Queens Printer for Ontario. 83p.
- Ministry of Natural Resources. 2000. A silvicultural guide to managing southern Ontario forests, Version 1.1 Ontario Ministry of Natural Resources. Queen's Printer for Ontario. Toronto. 648p.
- O'Brien, J. G., M.E. Mielke, D. Starkey, and J. Juzwick. 2011. How to identify, prevent, and control oak wilt. USDA Forest Service, Northeastern Area State and Private Forestry. NA-FR-01-11. Atlanta, GA. 30p.
- Papadopol, C. 1998. Forest hydrology in relation to climate change. *In*: The impacts of climate change on Ontario's forests. S.J. Colombo and L.J. Buse eds. Ontario Forest Research Institute. Research Information Paper No. 143. Ontario Ministry of Natural Resources. 56p.
- Regional Municipality of Halton. 2006. Halton Regional Forest Management Plan Addendum. April 2006. Britton, Cox, Currie, Mahon, Robertson and Turner Tracts. 12p.
- Regional Municipality of Halton. 2005. Halton Regional Forest Management Plan 2005-2020. 52p + appendices.
- Regional Municipality of Halton. 2004. Halton regional forest capital projects. March 2004. 6p + appendices.
- Scarr, T. 1998. Insects and climate change. *In*: The impacts of climate change on Ontario's Forests. S.J. Colombo and L.J. Buse eds. Ontario Forest Research Institute. Research Information Paper No. 143. Ontario Ministry of Natural Resources. 56p.
- Williams & Associates. 2018. Halton Region Forest. 2018 Forest Health Report .November 2018. 21p.

Appendix A - Maps to Accompany 5-Year Schedule of Stand Improvement

(Only Tracts with scheduled operations are shown)

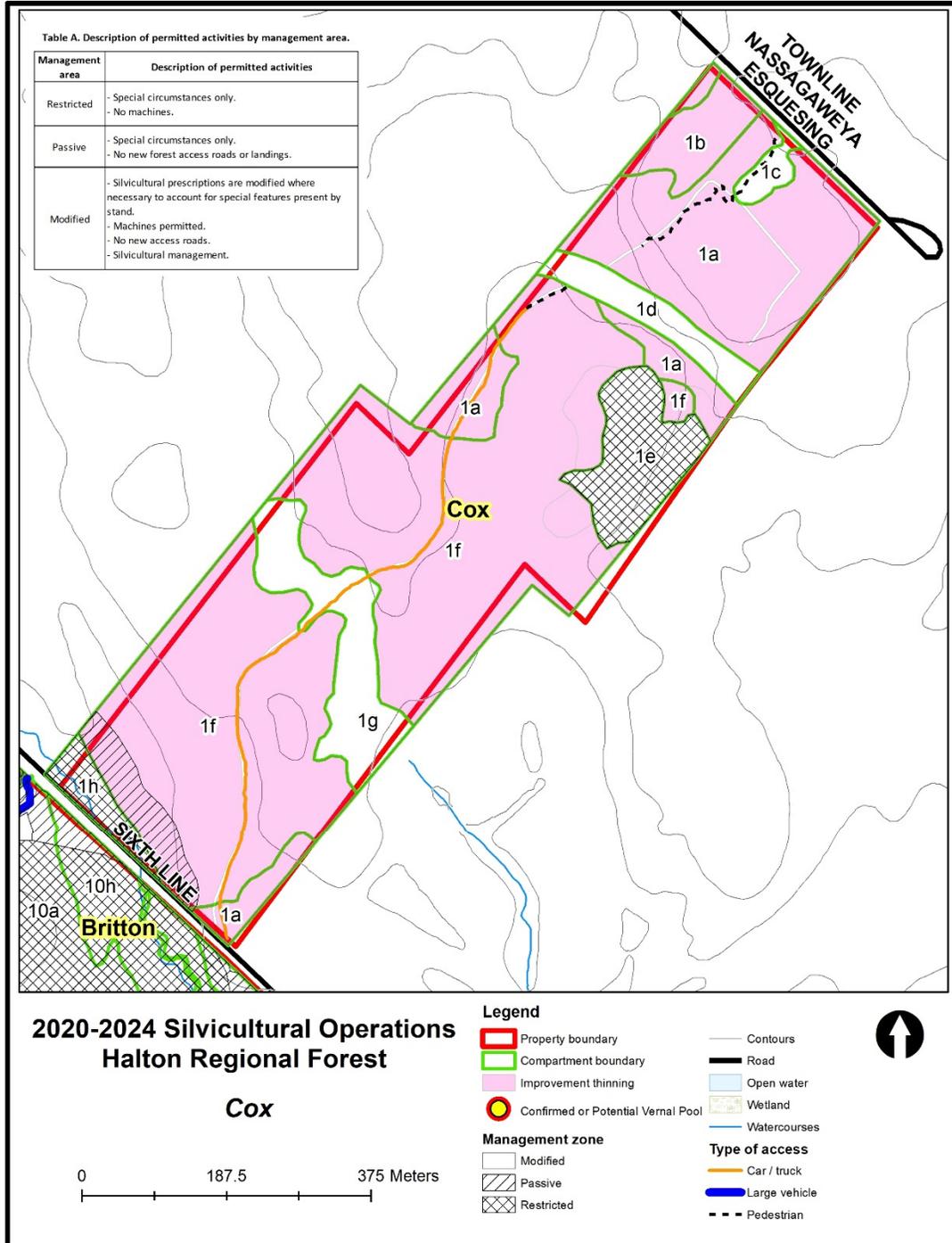
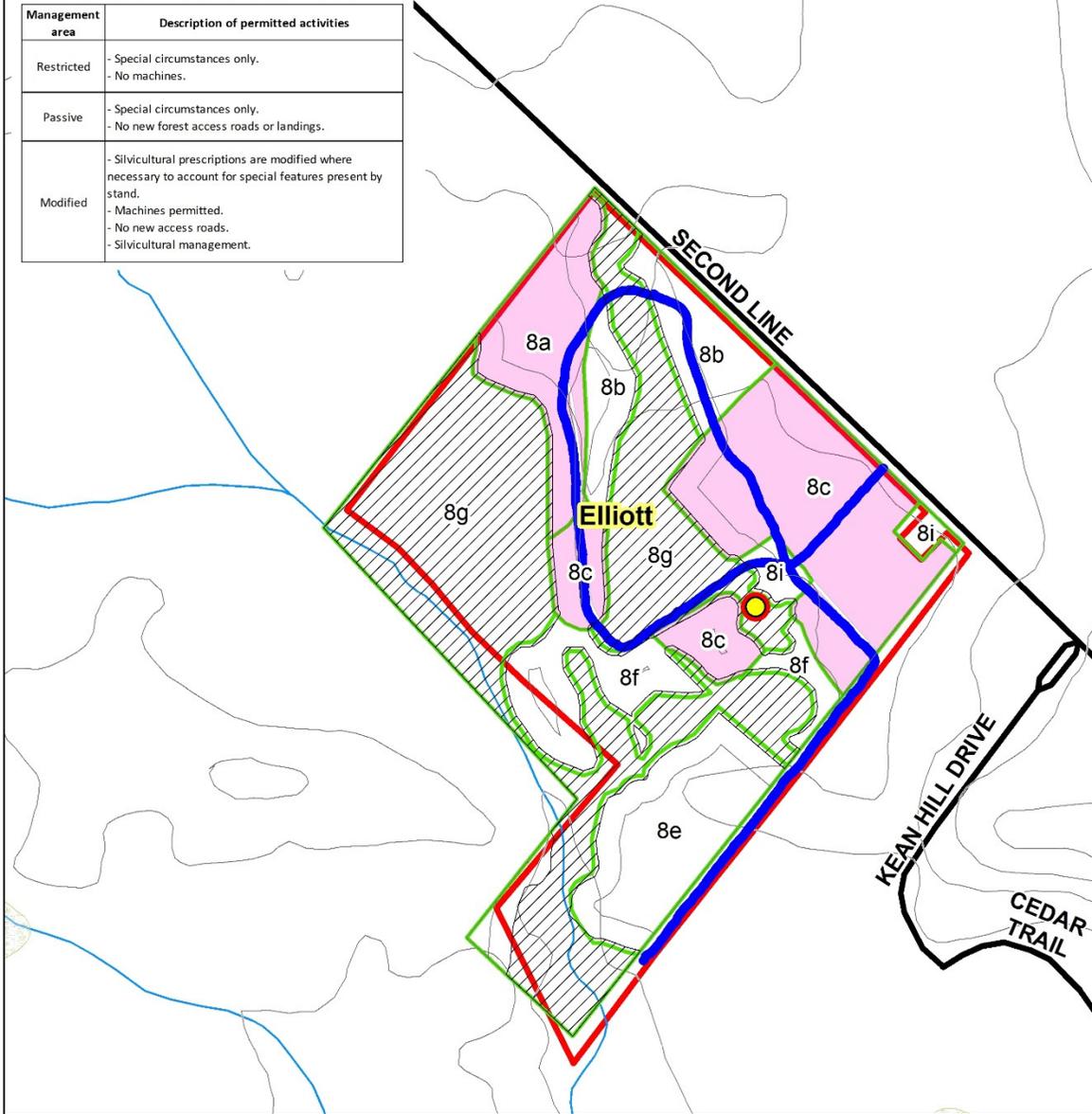


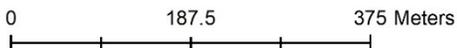
Table A. Description of permitted activities by management area.

Management area	Description of permitted activities
Restricted	- Special circumstances only. - No machines.
Passive	- Special circumstances only. - No new forest access roads or landings.
Modified	- Silvicultural prescriptions are modified where necessary to account for special features present by stand. - Machines permitted. - No new access roads. - Silvicultural management.



**2020-2024 Silvicultural Operations
Halton Regional Forest**

Elliott



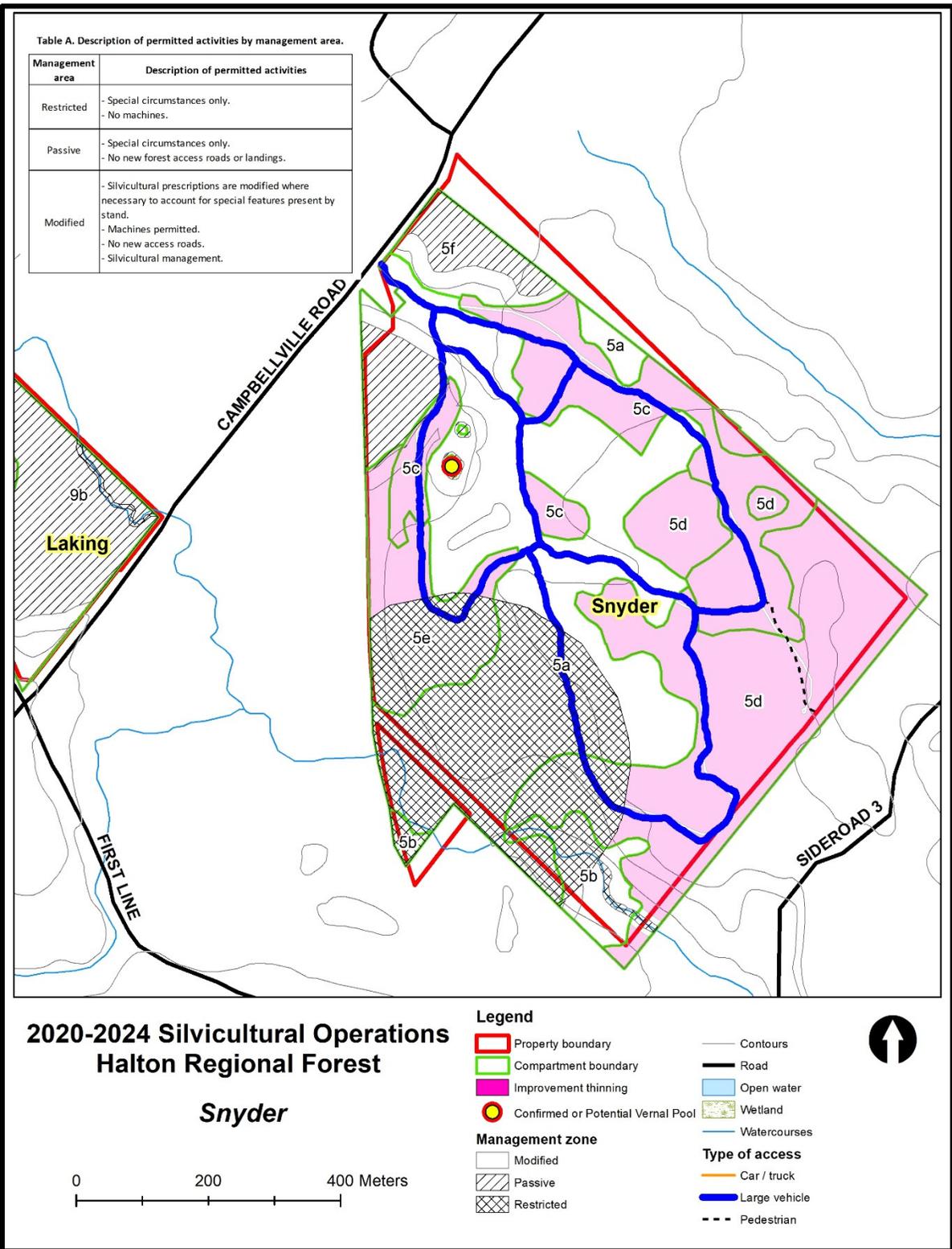
Legend

- Property boundary
- Compartment boundary
- Improvement thinning
- Confirmed or Potential Vernal Pool
- Modified
- Passive
- Restricted
- Contours
- Road
- Open water
- Wetland
- Watercourses
- Type of access
- Car / truck
- Large vehicle
- Pedestrian



Table A. Description of permitted activities by management area.

Management area	Description of permitted activities
Restricted	- Special circumstances only. - No machines.
Passive	- Special circumstances only. - No new forest access roads or landings.
Modified	- Silvicultural prescriptions are modified where necessary to account for special features present by stand. - Machines permitted. - No new access roads. - Silvicultural management.



2020-2024 Silvicultural Operations
Halton Regional Forest
Snyder

0 200 400 Meters

Legend

- Property boundary
 - Compartment boundary
 - Improvement thinning
 - Confirmed or Potential Vernal Pool
 - Contours
 - Road
 - Open water
 - Wetland
 - Watercourses
- Management zone**
- Modified
 - Passive
 - Restricted
- Type of access**
- Car / truck
 - Large vehicle
 - Pedestrian



Table A. Description of permitted activities by management area.

Management area	Description of permitted activities
Restricted	- Special circumstances only. - No machines.
Passive	- Special circumstances only. - No new forest access roads or landings.
Modified	- Silvicultural prescriptions are modified where necessary to account for special features present by stand. - Machines permitted. - No new access roads. - Silvicultural management.



**2020-2024 Silvicultural Operations
Halton Regional Forest**

Laking

0 187.5 375 Meters

Legend

- Property boundary
 - Compartment boundary
 - Improvement thinning
 - Confirmed or Potential Vernal Pool
 - Contours
 - Road
 - Open water
 - Wetland
 - Watercourses
- Management zone**
- Modified
 - Passive
 - Restricted
- Type of access**
- Car / truck
 - Large vehicle
 - Pedestrian



