Halton Regional Forest Management Plan

Prepared for
Regional Municipality of Halton

Submitted by
Gartner Lee Limited
Silv-Econ Ltd.
TSH Associates

February, 2005

Gartner Lee

Halton Regional Forest Management Plan

Prepared for
Regional Municipality of Halton

In association with
Archeological Services Inc.

February, 2005

Reference: **GLL 21-167**

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February 14, 2005

Mr. Paul Attack
Senior Environmental Planner
Regional Municipality of Halton
1151 Bronte Road
Oakville, ON L6M 3L1

Dear Mr. Attack:

Re: GLL 21-167 – Halton Regional Forest Management Plan

It is our pleasure to submit to you the completed Halton Regional Forest Management Plan. This document is preceded by a companion document, *Profile of the Halton Regional Forest* (Gartner Lee *et al.*, 2002). The Profile is a technical document that provides detailed background information on the historical and current state of the forest and is the basis for the Management Plan.

The Management Plan describes Silvicultural Management for the Halton Regional Forest, including a Five-Year Operating Plan and a Ten-Year Capital Plan. The Plan is a product of the involvement of Public Liaison and Technical Advisory Committees and the combined efforts of Gartner Lee Limited, Silv-econ and TSH Associates.

The formation of a Halton Regional Forest Advisory Committee (HRFAC) will follow the submission of this document. This committee will be integral in contributing to the short and longer-term management of the Halton Regional Forest.

It is our hope that you are as pleased this document as we are. If you have any questions, please do not hesitate to contact me.

Yours very truly,
GARTNER LEE LIMITED

Dale A. Leadbeater, B.Sc., B.Ed.
Senior Biologist

DAL:mm / Attach.

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Executive Summary

The Regional Municipality of Halton currently owns 665.72 ha (1,645 acres) of forests on 14 separate tracts of land. Most of the forest tracts fall within the Niagara Escarpment Plan Area, designated a World Biosphere Reserve by UNESCO. Nine tracts are located within Environmentally Sensitive Areas identified in the Region's Official Plan. The Halton Regional Forest was one of several Agreement Forests in Ontario previously managed by the Ontario Ministry of Natural Resources. However, with the expiry of the management agreement, Halton Region has assumed responsibility for its management. This 20-year Forest Management Plan reflects the Region's commitment to the sustainable stewardship of its forests.

Thirteen of the 14 Halton Regional Forest tracts are located above the Niagara Escarpment in the Flamborough Plain physiographic region. Only the Coulson Tract is located below the Niagara Escarpment in the Peel Plain physiographic region. The area above the escarpment is characterized by thin soil over bedrock. There are numerous wetlands throughout the Halton Regional Forest above the escarpment, suggesting that there is a perched water condition in this area. Much of the area above the escarpment has been characterized as hydrogeologically sensitive.

The Halton Regional Forest tracts are situated on the northern edge of the Eastern Deciduous forest region of Canada where it meets the Great Lakes-St Lawrence forest region. Almost half of the forested area in the Halton Regional Forest is deciduous forest dominated by Sugar Maple in association with other deciduous tree species. Conifer plantations are the second most common vegetation community within the Halton Regional Forest and are dominated by White Pine and Red Pine. The majority of forest stands are less than 70 years old, reflecting past land uses and management activities.

Wetlands such as deciduous swamps, marshes, thickets, and submerged wetlands are also an important component of several of the Halton Regional Forest tracts and represent about 23% of the total area. Most wetlands in the Halton Regional Forest support a rich community of plants and animals.

A total of 517 plant species was recorded across all 14 tracts. Of these, 65 are considered rare or uncommon in either Halton Region or the GTA. Three of these, Languid Poa (*Poa languida)*, Handsome Sedge (*Carex formosa)* and Green Violet (*Hybanthus concolor)* are provincially rare. Most rare plants were observed in the deciduous forests and wetlands.

The Halton Regional Forest provides rich and varied habitats for wildlife. A total of 95 avian species was recorded in the Halton Regional Forest in 2001, including some 35 species of area-sensitive forest breeding birds (i.e., species presence and productivity [breeding success] increases with increasing sizes of continuous habitat). Rare avian species found in the Halton Regional Forest include Red-shouldered Hawk (*Buteo lineatus*), Acadian Flycatcher (*Empidonax virescens*), Blackburnian Warbler (*Dendroica fusca*), Cerulean Warbler (*Dendroica cerulea*), among others.

Three salamander and seven frog or toad species were also recorded during the forest-level assessments conducted in 2001. The most significant amphibian recorded was the Jefferson Salamander (*Ambystoma jeffersonianum*), which is considered to be Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Egg masses and breeding pools were found in Britton, Robertson, Mahon, and Currie tracts, and breeding likely occurs in Turner Tract as well. These results suggest that the Halton Regional Forest is one of the premier habitats for Jefferson Salamanders in Ontario.

Public consultation and participation in determining the future of the Halton Regional Forest has been a cornerstone in the development of this Forest Management Plan. A Public Liaison Committee (PLC) consisting of 19 residents of Halton Region representing various interests was formed to aid in the development of the management plan. Two Regional Councilors were also represented on the PLC. A Technical Advisory Committee (TAC) was also assembled to provide technical input to the Project Team. Consultations included several workshops with the PLC and TAC and two public open houses. These consultations have been useful in identifying challenges and opportunities for the future management of the Halton Regional Forest and have helped to shape the vision, goals and objectives, and recommendations outlined in this management plan.

Four management goals, (i) Natural Heritage, (ii) Recreation, (iii) Education and Research, and (iv) Administration, form the basis for objectives and recommended actions for integrated forest management of the Halton Regional Forest. This has been accomplished through a proposed system of management areas. The forest management plan recognizes four classes of management area for the Halton Regional Forest - Restricted, Passive, Modified, and Access - based on natural heritage features and sensitivities of those attributes and functions to human use and management activities. Permitted uses and the level of silvicultural management in a particular stand will depend on the management area designation for that stand. Where silvicultural management is proposed, the silvicultural systems involved are designed to emulate natural disturbances.

A 5-year Operating Plan accompanies this forest management plan. The operating plan provides details of several management activities proposed for 2005-2009. Some of the priority management activities proposed for the 2005-2009 operating period are:

1. Strengthen the administration of the Halton Regional Forest by (i) assigning an appropriate Regional position with the responsibility for the administration and management of the forest, (ii) hiring (or retaining under contract) a registered professional forester to oversee the silvicultural management of the forest, and (iii) allocate sufficient operating and capital funds to ensure successful implementation of the management plan.
2. Continue to engage forest users and the public during the implementation of the management plan through (i) a Regional Forest Advisory Committee, (ii) consultations on the location and appropriate uses of recreational trails and, (iii) encouraging forest users to peer manage their activities.

3. Implement a system of management areas to conserve and protect the unique natural heritage of the Regional Forest while providing opportunities for recreation, research, and education.

4. Implement sustainable silvicultural management to enhance biodiversity, promote natural regeneration, and improve forest health. The potential to generate revenues from the sale of timber products while implementing silvicultural management is recognized. However, revenue generation should not be an objective for forest management; rather it is an outcome from sustainable forestry practices. Halton residents wish to see revenues from the sale of forest products "re-invested' in the management of the forest.

A 10-year capital plan is also included with this forest management plan. The capital plan identifies various priority infrastructure and other capital requirements that are recommended during the 2005-2014 period.

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1. Introduction

The Regional Municipality of Halton currently owns 665.72 ha (1,645 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. Twelve of the 14 tracts are in Conservation Halton's watershed and two are located within the Grand River Conservation Authority's watershed area. The Halton Regional Forest forms part of the Greenlands System identified in the Region's Official Plan. A summary of area by land class in the Halton Regional Forest is presented in Table 1.

Table 1. Land Classes Within the Halton Regional Forest

Land Class	Forest	Non-Forested Wetland	Meadow	Other[1]	Total
Area (ha)	561.34	98.13	4.98	1.27	**665.72**

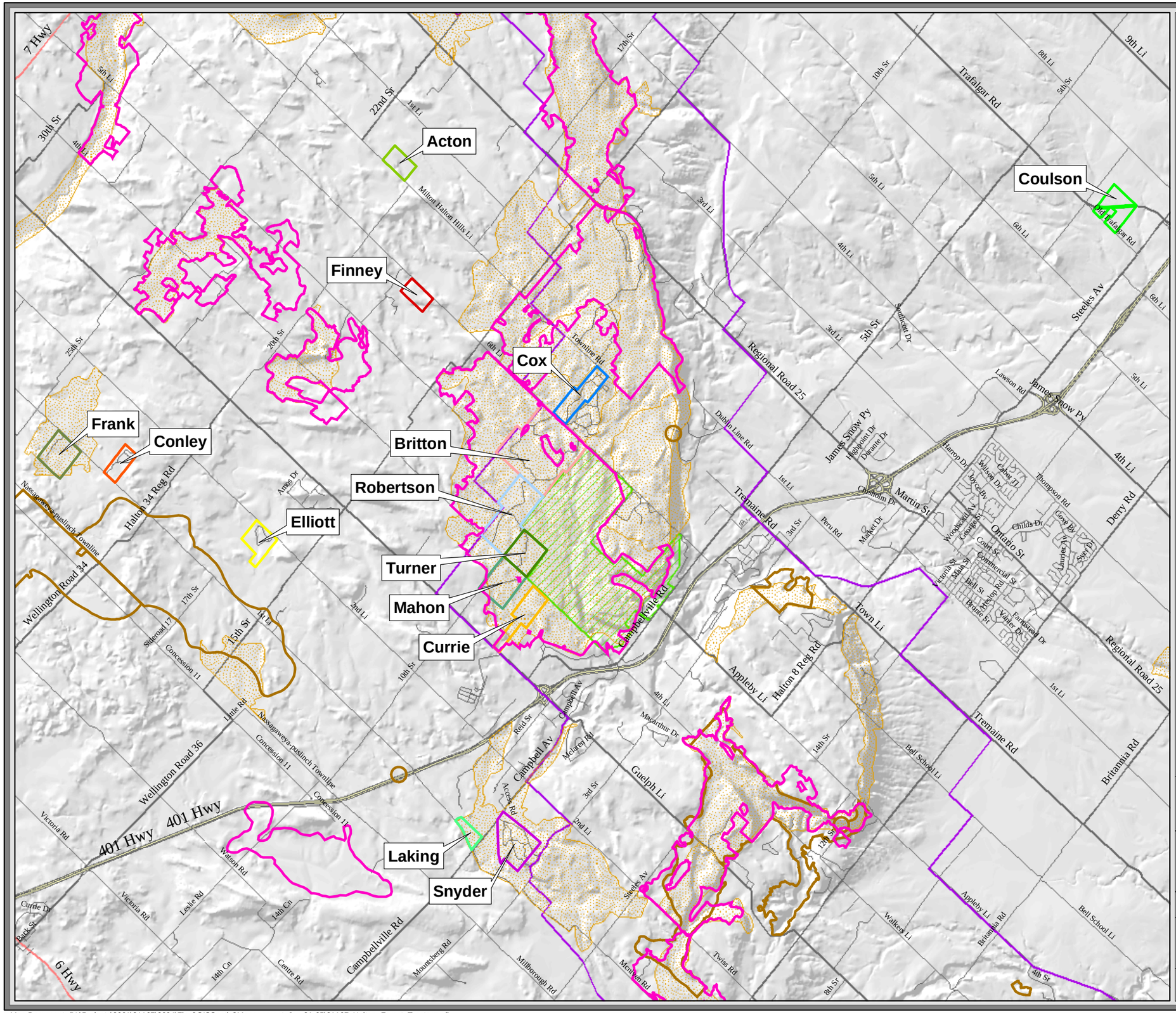
Note: 1. Dufferin Aggregates' road through the Cox Tract

Most of the Forest tracts fall within the Niagara Escarpment Plan Area, designated a World Biosphere Reserve by UNESCO. Nine tracts (Cox, Britton, Robertson, Turner, Mahon, Currie, Frank, Laking and Snyder) are located within Environmentally Sensitive Areas (ESAs) identified in the Region's Official Plan, and six of these tracts (Cox, Britton, Robertson, Turner, Mahon, and Currie) are also identified as being within the Halton Regional Forest South Life Science Area of Natural and Scientific Interest (ANSI) (Figure 1). These six tracts also lie within the Niagara Escarpment Plan (OMNR 1996a; MOEE undated) area. This area is subject to the Niagara Escarpment Parks and Open Space System (NEPOSS) guidelines, objectives, and policies (OMNR 1996a).

1.1 Past Management Activities

Halton Region began to acquire land for forestry purposes in 1939 with the purchase of the Cox Tract, and in 1950, entered into a 30-year management agreement with the Department of Lands & Forests (now OMNR) under the provincial Agreement Forests program (Ontario Department of Lands & Forests 1969). The initial agreement covered approximately 700 acres in nine forest tracts.

Afforestation of submarginal lands in the Halton Regional Forest first occurred in the Cox Tract in 1940 with the planting of 30,000 conifer seedlings. Subsequently, some 134 ha have been planted. Stand improvement work in the Halton Regional Forest began in 1949 with cutting to release crop trees in the Snyder Tract.



Location of Halton Forest Tracts | Figure 1

Halton Regional Forest Management Plan

Project 21167, February 2005

Gartner Lee Limited

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Subsequent silvicultural management has involved additional release cutting, improvement cutting in hardwoods for fuelwood and sawlogs, pruning, and commercial thinning in conifer plantations (Ontario Department of Lands & Forests 1969). Approximately 37% of the Halton Regional Forest (243 ha) has received some form of silvicultural management. However, very little silvicultural management activity has occurred in the forest tracts in the last seven to 10 years.

1.2 Forest Management Planning Process

The initial management of the Halton Regional Forest was directed at restoring degraded agricultural lands, conserving areas of existing forest cover, and conserving soil and water resources. However, management objectives have subsequently evolved to include conservation of wildlife and wildlife habitat, recreational uses, and production of good quality timber.

It is within this context that the Region initiated the development of this Forest Management Plan for the Halton Regional Forest in 2000. Key components of the management planning process include:

a) a detailed assessment of the natural heritage features of the forests (completed in 2001);

b) extensive consultation with forest users, technical experts, and members of the public;

c) identification of sensitivities, constraints, and opportunities;

d) identification and mapping of management areas;

e) development of vision, goals, and objectives for the forest and strategies for management; and

f) a review and discussion of appropriate sustainable approaches for silvicultural management of the forest and assessment of the sustainable timber management.

The Halton Regional Forest Management Plan is intended to guide management activities and uses within the Forest for a period of 20 years. The Management Plan consists of three component plans: a 20-year General Management Plan: 2005-2024; a five-year Operating Plan: 2005-2009; and a 10-year Capital Plan: 2005-2014. A new Operating Plan should be prepared every five years. Preparation of a new five-year Operating Plan also affords an opportunity to review progress toward achieving goals and objectives outlined in the 20-year forest management plan and to make adjustments where necessary. 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.

2. Natural Heritage of the Halton Regional Forest

It is widely accepted that an integrated, ecosystem-based approach to forest management is required to maintain the ecological integrity and productive capacity of the forest, while providing multiple benefits to society (Heilman 1990; Kimmins 1992). This paradigm, termed ecosystem management, is founded on the concept of sustainability.

Sustainable forest management is understood to involve a forest-level assessment of cultural, natural heritage, and earth science features, determination of sustainable timber supply for those areas that will be subject to commercial timber management, identification of sensitive sites and areas of concern, assessment of wildlife habitat and recreation potential, and consultation with forest users, other stakeholders, and the general public. This forest-level assessment is often accompanied by a study of the forests and their connectivity at the landscape level. Landscape functions, in part, determine the overall quality of a given forest unit.

The results of the forest-level and landscape assessments for the Halton Regional Forest are reported in the companion document to this management plan, *Profile of the Halton Regional Forest* (Gartner Lee *et al.* 2002). Some of the more significant findings are described below.

2.1 Physiography and Surficial Geology

Thirteen of the 14 Halton Region Forest tracts are located above the Niagara Escarpment in the Flamborough Plain physiographic region as described by Chapman and Putnam (1984). Only the Coulson Tract is located below the Niagara Escarpment in the Peel Plain physiographic region. The area above the escarpment is characterized by shallow soil (i.e., < 30cm) over bedrock. The Halton Regional Forest tracts generally exhibit low relief in the order of a few metres or less. Bedrock is within a few metres of the surface at most locations and is locally exposed at surface. There are numerous wetlands throughout the Halton Regional Forest above the escarpment, suggesting that there is a perched water condition in this area. Much of the area above the escarpment has been characterized as hydrogeologically sensitive (Regional Municipality of Halton 1995a).

2.2 Flora

The Halton Regional Forest tracts are situated on the northern edge of the eastern deciduous forest region of Canada where it meets the Great Lakes-St Lawrence forest region. The eastern deciduous forest region is characterized by tree species such as maples *(Acer* species*)*, American Beech *(Fagus grandifolia)*, and oaks (*Quercus* species), as well as numerous other less common deciduous species that are found only in

this region within Canada (Farrar 1995). Relatively small numbers of conifers are naturally found in this region. Where conifers occur they are usually White Pine (*Pinus strobus*), Eastern Hemlock (*Tsuga canadensis*) or Eastern White Cedar (*Thuja occidentalis*) and the latter are often associated with groundwater discharge and north facing slopes. The Great Lakes-St. Lawrence forest region differs in that a smaller number of deciduous tree species occur and mixed deciduous-coniferous forests are much more common. Of the 665.72 ha of land present in the 14 Halton Regional Forest tracts, almost half is deciduous forest dominated by Sugar Maple (*Acer saccharum*), in association with other deciduous tree species such as White Ash (*Fraxinus americana*), Red Oak (*Quercus rubra*), Black Cherry (*Prunus serotina*), hickory (*Carya* sp.), American Basswood (*Tilia americana*) and others in various compositions.

Conifers have been historically planted throughout southern Ontario for a variety of purposes, including soil stabilization and reforestation (OMNR 1986). Conifer plantations are the second most common vegetation community within the Halton Regional Forest and are dominated by White Pine and Red Pine (*Pinus resinosa*), although smaller amounts of White Spruce (*Picea glauca*) and other conifers have also been planted.

The majority of stands in the Halton Regional Forest are less than 70 years old, reflecting past land uses and management activities. However, many of the tree species found in the Halton Regional Forest are known to live to 150 years of age or older under similar site conditions and climate.

Wetlands such as deciduous swamps, marshes, thickets, and submerged wetlands are also an important component of several of the Halton Regional Forest tracts and represent about 23% of the total area within the Forest. The wetlands have formed as a result of the water tables perched on the limestone with very shallow soils. Both surface water and groundwater fed wetlands are common and sometimes extensive. Eleven of the 14 tracts include a portion of a Provincially Significant Wetland complex. Most wetlands within the Halton Regional Forest are one of three types: deciduous swamp, shallow marsh or meadow marsh (Gartner Lee *et al.* 2002). Many deciduous swamps are dominated by Swamp Maple (*Acer freemanii*), with a smaller number of swamps treed primarily with Black Ash (*Fraxinus nigra*) or Green Ash (*Fraxinus pennsylvanica*). Large shallow or meadow marshes are found in Britton, Robertson, Turner and Frank tracts. Shallow marshes differ from meadow marshes in that water is present above ground for most of the growing season, whereas in meadow marshes, flooding usually only occurs in spring. Large shallow cattail or sedge-dominated marshes occur in the Frank and Britton tracts, and a variety of meadow marsh vegetation types are found in the main escarpment tracts. Whether large or small, most wetlands in the Halton Regional Forest support a rich community of plants and animals.

A total of 517 plants were recorded across all 14 tracts. Of these, 65 plants are considered rare or uncommon in either Halton Region or the GTA. Three of these, Languid Poa (*Poa languida)*, Handsome Sedge (*Carex formosa)* and Green Violet (*Hybanthus concolor)*, are provincially rare. Most rare plants were observed in the deciduous forests and wetlands. Butternut, designated endangered both provincially

and nationally, has been recorded as a minor species in stands in Britton (stands 10a and 10b), Mahon (stand 2a) and Robertson (stand 14) tracks. A list of all species at risk that have been identified in the Halton Regional Forest can be found in the companion document to this management plan, Profile of the Halton Regional Forest (Gartner Lee et al. 2002).

2.3 Fauna

2.3.1 Area-Sensitive Breeding Birds

A total of 95 avian species were recorded in the 14 Forest tracts during a breeding bird survey carried out in 2001 as part of this management planning exercise (Gartner Lee *et al.* 2002). Of these, some 35 species of area-sensitive forest breeding birds were identified. Area-sensitive bird species are defined as those whose presence and productivity (breeding success) increases with increasing sizes of continuous habitat (Freemark and Collins 1992; Robbins *et al.* 1989). This category also captures all of the species that may also be characterized as "forest-interior" breeding species, i.e. species that generally either do not occur or show low breeding success close to a forest edge or in a fragmented landscape (Freemark and Collins 1992; McCracken *et al.* 1998). At least one regionally or provincially rare bird was found in all tracts except Coulson, Mahon and Currie. Rare avian species found in the Halton Regional Forest include Red-shouldered Hawk (*Buteo lineatus*), Acadian Flycatcher (*Empidonax virescens)*, Blackburnian Warbler (*Dendroica fusca)*, Cerulean Warbler *(Dendroica cerule)*, among others. These factors suggest that all of the tracts, except perhaps Coulson, provide high quality productive habitat for breeding birds and therefore probably also for other wildlife.

2.3.2 Amphibians of Halton Regional Forest

Three salamander and seven frog or toad species were recorded during the forest-level assessments conducted in 2001 (Gartner Lee *et al.* 2002). At least some amphibian breeding habitat was present in all Forest tracts, although it is very limited in Finney, Coulson, and Cox tracts. Amphibian breeding habitat was most abundant at Britton, Robertson, Turner, Frank and Conley tracts.

The most significant amphibian recorded was the Jefferson Salamander (*Ambystoma jeffersonianum*), which is considered to be Threatened by COSEWIC. Egg masses and breeding pools were found in Britton, Robertson, Mahon, and Currie, and breeding likely occurs in Turner tract as well. These results suggest that the Halton Regional Forest is one of the premier habitats for Jefferson Salamanders in Ontario. The presence of this highly significant population is probably a result of an extensive block of relatively undisturbed mature forest containing a number of suitable fish-free breeding ponds.

2.3.3 Other Wildlife Attributes

Incidental observations of mammals were made while surveying for other organisms. No unusual sightings were made during the forest-level assessments. Of note was a large den of Porcupine (*Erethizon dorsatum*) in Snyder tract. Aerial photos and field observations indicate that Beaver (Castor canadensis) occur in several tracts including: Britton, Robertson, Turner and Currie. This species may also be present in other tracts with running water (such as Laking, Snyder, Elliott and Cox). Mammal records recorded by others include, tracts of a large cat, probably a Bobcat (*Lynx rufus*), observed in the Halton Forest South area in 1979 (Riley et al. 1996). Also in the Halton South area, the Water Shrew (*Sorex palustris*) was been recorded (Bell 1983). The Northern Flying Squirrel (*Glaucomys sabrinus*) is present in the Halton Falls ESA (Geomatics International 1993). The Southern Flying Squirrel (*Glaucomys volans*) is a provincially rare (S3) and nationally Special Concern species that may also occur here (Dobbyn 1994). Other mammals of conservation concern that have been recorded in Halton region in the Atlas of the Mammals of Ontario and that might be present in the Halton Regional Forests area: Small-footed Bat (*Myotis leibii* S2S3), Northern-long eared Bat (*Myotis septentrionalis* S3?), Eastern Pipistrelle (*Pipistrellus subflavus* S3?) and Woodland Vole (*Pitmys pinetorum* S3? Special Concern) (Dobbyn 1994).

2.4 Landscape Ecology of Halton Regional Forest

2.4.1 Core Natural Areas and Connectivity

Landscape features such as the type and age of habitat, the size and shape of a patch of forest, and its degree of connectivity to other natural areas contribute towards determining the presence, persistence and abundance of animals and plants within a geographic region. Of particular relevance are core natural areas and corridors or pathways connecting core natural areas. Core natural areas are large, productive, regional building blocks for natural heritage systems. Core natural areas are defined as areas with greater than 25 ha of contiguous natural habitat, with at least 4 ha that is 200 m or more away from a perimeter of differing habitat (such as a road, railway, field or residential development) (Sandilands and Hounsell 1994; Environment Canada *et al.* 1998).

Corridors are elongated areas of similar habitat usually at least 40 m to 50 m wide and generally continuously connected (Fielder and Jain 1992; Riley and Mohr 1994; Environment Canada *et al.* 1998). Corridors provide pathways of movement across the landscape and are considered important features in a fragmented landscape such as southern Ontario.

Eleven of the 14 Forest tracts are within core natural areas, while seven of these tracts (Britton, Robertson, Turner, Mahon, Currie, Frank, and Snyder) are by themselves large enough to meet core natural area criteria. These seven tracts, as well as Conley, Elliot, Acton and Finney, are also part of a broader network of corridors and pathways connecting areas of important natural heritage value (Gartner Lee *et al.* 2002).

3. Public Consultation

3.1 Public Consultation Process

Public consultation and participation in determining the future of the Halton Regional Forest has been a cornerstone in the development of this Forest Management Plan. A Public Liaison Committee (PLC) was formed to aid in the development of the management plan. Nineteen interested citizens were selected to participate on the PLC. Each PLC member was a resident of Halton Region and selected according to their special interest(s) relative to the forest. The composition of the PLC was designed to represent a wide cross-section of the different user groups, special interest groups and neighbours. Two Regional Councilors were also on the PLC. A list of the PLC members is given in Appendix A. Each of the PLC members completed an interview and questionnaire which is provided in the Halton Regional Forest Profile (Gartner Lee *et al.* 2002). The PLC was also invited to attend a Forestry Demonstration Day at the York Regional Forest. This demonstration of sustainable forest management was very informative and showcased the successful integration of cultural/recreational activities into managed forests.

A Technical Agencies Committee was assembled to provide technical input to the Project Team. Staff from the following agencies participated in the review of documents and a workshop: Conservation Halton, the Niagara Escarpment Commission, Town of Milton, Grand River Conservation, Town of Halton Hills, the Ministry of Natural Resources and Halton Region. A list of the TAC members is provided in Appendix A.

The PLC, TAC and Public were invited to participate in numerous meetings including:

a) PLC Interviews: August 2001;
b) PLC Workshop One: August 27, 2001;
c) PLC Workshop Two: December 12, 2001;
d) PLC Workshop Three: February 28, 2002;
e) TAC Workshop: December 12, 2001;
f) Public Open House: September 18, 2001;
g) PLC and TAC Reviews of a draft Management Plan: November 9, 2004;
h) Public Open house: November 25, 2004; and
i) Public Comments on draft Management Plan: December 20, 2004.

3.2 Challenges and Opportunities

It is often stated that forest management is the science and art of achieving a balance between short-term preservation of various existing forest values, management to ensure the long-term renewal of those values, and management for the sustainable production of materials and social values needed by society. The Halton Regional Forest is no exception.

The significant natural heritage features and functions of the Halton Regional Forest and the sensitivities of those attributes and functions to human use and management activities offer a number of challenges, as well as opportunities in managing the forest. Of utmost importance is the need to conserve the hydrologic functions, the native diversity of flora and fauna, and key forest attributes and functions. This will require innovative management strategies to minimize potential impacts from recreational use and adoption of forest management activities that conserve, enhance, and restore forest attributes and functions.

The Halton Regional Forest is used for a plethora of recreational activities and there is strong support for maintaining a variety of recreational uses. Low-impact, non-motorized recreational activities are considered to be compatible with one another and are generally consistent with the broader goal of conserving the natural heritage features and functions. However, it may be necessary to restrict or modify recreational activities in those areas of the forest that exhibit high sensitivities to human use, such as breeding habitat for Jefferson Salamander and core habitat areas.

Forest access roads and recreational trails are present in all 14 tracts. The preparation of this management plan provides an opportunity to involve forest users in reviewing the locations, maintenance requirements, and uses of the forest access roads and recreational trails.

Given the natural heritage features present in the forests and their proximity to several universities, it is highly likely that there will be considerable interest in the Halton Regional Forest as a venue for scientific study. The Forest has been the focus of scientific research in the past, including breeding bird and mammal surveys and research to assess forest growth and diversity. The implementation of this management plan provides the Region with an opportunity to effect a process for considering requests for the scientific use of the forest and for monitoring the impacts of such use.

A further challenge will be to build upon the goodwill and insightful input achieved through the Public Liaison Committee and the Technical Advisory Committee during the management planning process. This will require an administrative framework that continues to engage forest users and technical experts in meaningful and constructive dialogue and action during the implementation of this Forest Management Plan. This plan recommends that the Region establish a Halton Regional Forest Advisory Committee (HRFAC) with clearly defined terms of reference to assist in implementing this management plan.

Of concern to Halton residents and forest users is the level of custodial management in the forest tracts on a day-to-day basis; for example garbage collection, security, parking lot maintenance, and clearing of fallen trees across roads and trails. The Region will need to identify responsibilities and allocate operating funds for carrying out these day-to-day activities.

Finally, there is strong support for active and appropriate silvicultural management of the Halton Regional Forest. This support is predicated on the use of silvicultural systems that are appropriate for the forest communities involved, that biological diversity and wildlife habitats are maintained, and that any potential impacts of forest management activities on soil, groundwater, and habitats are minimized. The

potential of the Forest to generate revenues from the sale of timber is also acknowledged. However, Halton residents place a low priority on revenue generation as a management objective. Revenues from the sale of timber are considered to be a by-product of sustainable forest management and are not to be used as a rationale for timber harvesting. Residents suggest that any revenues from the sale of timber be "re-invested" in the forest to support the various management proposed in this management plan.

The opinions and suggestions from Halton residents, forest users, and technical experts have been consolidated into broad management goals, which in turn lead to objectives and recommended actions for integrated forest management of the Halton Regional Forest.

4. Vision, Goals and Objectives

4.1 Vision

The Halton Regional Forests will be…*A major system of regionally owned forested lands managed to maintain and enhance the structure and function of the forest, including ground and surface water, soils, vegetation and wildlife, while providing social and economic benefits.*

4.2 Goals and Objectives

Goal One: Conserve Natural Heritage Attributes and Functions

The ecological and biological significance of the Halton Regional Forest has been well documented (Gartner Lee *et al.* 2002). Most of the Forest tracts fall within the Niagara Escarpment Plan Area, designated a World Biosphere Reserve by UNESCO. Nine tracts are located within Environmentally Sensitive Areas, and six of these tracts, comprising approximately 364 ha, are also identified as being within the Halton Regional Forest South Life Science Area of Natural and Scientific Interest.

Thirteen of the 14 Halton Regional Forest tracts are located above the Niagara Escarpment, where much of the forest has been characterized as hydrogeologically sensitive. The physiography of the forest tracts above the escarpment is characterized by shallow soil over bedrock, numerous wetlands, and ephemeral ponds.

The Halton Regional Forest supports diverse vegetation communities, including forests, wetlands, and meadows. Some 517 species of vascular plants have been identified in the Halton Regional Forest. Many plant species are rare or uncommon in either Halton Region or the GTA.

The Halton Regional Forest also provides a variety of habitats for wildlife. Some 95 avian species, including several species of area-sensitive breeding birds, seven species of frogs and toads and three species of salamander, including the rare Jefferson Salamander, have been documented. Healthy populations of mammals, including White-tailed Deer (*Odocoileus virginianus*), enable, and may actually require, a fall hunt every year to avoid an overpopulation of this ubiquitous herbivore.

Conservation of these unique natural heritage woodlands is of fundamental importance and will be achieved by:

a) conserving soils and ground and surface water quality and quantity; and

b) conserving biological diversity and key forest attributes and functions by protecting areas of high conservation value forest and by promoting diversity of naturally occurring forest types and age classes, including representative late seral ("old growth") forests.

Objectives for Conserving Natural Heritage Features and Functions

1. Conserve Soils and Groundwater and Surface Water Quality and Quantity

Management of the forest tracts will need to consider protection of the landforms and the susceptibility to groundwater contamination. Any resurfacing of forest access roads and recreational trails should be undertaken using soils or aggregates from quarries located outside of the Halton Regional Forest.

The Forest Tracts underlain by a thick sequence of fine-grained soil are considered to have low sensitivity to contamination. This includes the Conley and Coulson Tracts. The Frank Tract also has relatively thick soils (i.e., greater than 15 m), however in some areas they consist of permeable sand and gravel. These soil types will potentially allow for rapid movement of contaminants in the groundwater system and are therefore considered to be sensitive to groundwater contamination. All other tracts have shallow soils over bedrock and are sensitive to contamination.

The Cox Tract is bordered on the south with an existing bedrock quarry. The relatively deep excavation of the quarry may contribute to draining of the shallow water table beneath the Cox Tract. This may affect the viability of certain plant species that depend upon high soil moisture conditions. Forest management practices should take this into account when selecting plant species for introduction to the property.

2. Conserve and Enhance Native Diversity of Flora and Fauna and Key Forest Attributes and Functions

Healthy forests include a diversity of naturally occurring vegetation communities, habitats, and forest age classes. These features are achieved by employing a suite of management activities, including measures to protect highly sensitive areas such as wetlands, ephemeral ponds, habitat of rare plants and site- specific features such as Northern Goshawk (*Accipiter gentiles*) and other raptor nests.

Silvicultural systems and forest management practices can also be used to maintain or enhance forest diversity. For example, use of the individual-tree selection silvicultural system is highly effective for promoting growth and development in upland stands of shade-tolerant hardwood species such as Sugar Maple and American Beech (OMNR 2000b, 2002). However, mid-tolerant species such as oak, Basswood, Yellow Birch and often White Pine, may require larger canopy openings (10 to 20 m in diameter) for regeneration and development. It has been suggested that group selection may be a more appropriate silvicultural system for managing these mid-tolerant forest communities.

The Halton Regional Forest is dominated by stands less than 70 years of age. Only 17 ha (approximately 3%) of the Halton Regional Forest stands are 70 years of age or older and only 5 ha (<1%) are more than 90 years old. Stands in the late seral stage of succession (i.e., ≥90 years of age) often exhibit important habitat features such as large trees, and numerous cavity trees and snags, and down woody debris, not normally found in younger forests. The Region should implement a strategy to increase the area of late seral forest to approximately 25 ha (4.4% of the forest area) during the period of this management plan and to approximately 45 ha (8% of the forest area) over the next 40 years. Silvicultural systems and forest management practices can be modified to allow more stands within the Halton Regional Forest to mature to the late seral stage. Stabb (1996) and OMNR (1996a) provide general guidelines and practices for managing forests to retain or restore late seral features.

Eleven of the 14 Regional Forest tracts are within core natural areas, while seven of these tracts (Britton, Robertson, Turner, Mahon, Currie, Frank, and Snyder) are by themselves large enough to meet core natural area criteria. These seven tracts, as well as Conley, Elliot, Acton and Finney, are also part of a broader network of corridors and pathways connecting areas of important natural heritage value. The Region should consider acquiring additional lands (both adjacent and non-adjacent to existing tracts) to enhance landscape connectivity and enlarge the Halton Regional Forest.

3. Conserve and Enhance Areas of High Conservation Value Forests (HCVF)

Within the diverse ecological and physical features of the Halton Regional Forest there are sites that are unique within the context of the Halton Regional Forest itself and may also be unique within the regional or provincial landscape. Where possible, natural ecological functions (e.g., windthrow, natural succession) should prevail as the agents of change in HCVF areas. Active management in these areas should be limited to those activities that will protect or enhance the unique features of the forest. Active management might also include felling hazard trees and protecting the forest from invasive species, exotic forest pests, and excessive disturbance from human activities.

The following attributes are proposed for identifying potential areas of High Conservation Value Forest. These attributes are generally consistent with the attributes associated with the Restricted Management Areas proposed for the Halton Regional Forest.

a) significant portions of the habitat of Jefferson's Salamanders and other species at risk;
b) nest sites for significant species that are site-tenacious (i.e., return to the same nest annually) such as Northern Goshawk;
c) stands that contain regionally or provincially rare flora;
d) native stands (non-plantation) within 30 m of watercourses and ponds; and
e) woodlands that are in the late seral stage of development, (i.e., ≥ 90 years of age).

4. Adaptive Management and Monitoring

Adaptive management is a dynamic approach to forest management in which the effects of management treatments and decisions are continually monitored and used, along with research results, to modify management activities on a continuing basis to ensure that objectives are being met (Helms 1998). The frequency and intensity of monitoring should be determined by the scale and intensity of forest management operations as well as the relative complexity and fragility of the affected environment. Monitoring procedures should be consistent and replicable over time to allow comparison of results and assessment of change.

An active forest monitoring and adaptive management program includes:

a) monitor progress toward achieving silvicultural objectives including forest growth, species diversity, regeneration, age class distribution, and wildlife habitat features. This can be accomplished with regular updates to the forest inventory (usually every 5 years to coincide with preparation of a new 5-year operating plan);

b) annual monitoring of forest health including insects, pathogens, and invasive species and developing appropriate management strategies for responding to increased incidence of forest pests or the presence of new pests;

c) annual monitoring of forest access roads, recreational trails, and infrastructure for any impacts from use and maintenance requirements;

d) monitor the level of recreational activity. This can be accomplished through a variety of methods including car counts in parking lots, user-surveys, and feedback from user groups;

e) prepare an annual "State of the Forest" report including summary of progress toward achieving management objectives, results from monitoring activities, and recommendations and response for adaptive management.

Strategies for Achieving Natural Heritage Objectives

a) Establish a system of Management Areas based on natural heritage features and sensitivities and implement silvicultural and other management activities appropriate for maintenance of key forest attributes and functions.

b) Implement an active forest monitoring and adaptive management program including an annual "State of the Forest " report.

c) Establish a system of High Conservation Value Forest areas within the Halton Regional Forest.

d) Adopt international standards for sustainable forestry practices as embodied in various Forest Certification systems and consider Forest Certification for the Regional Forest.

e) Where feasible, acquire additional lands to enhance landscape connectivity and forest patch size.

f) Develop an outdoor interpretive program to include soil and groundwater conservation.

g) The use of fertilizers and pesticides should be carefully controlled and/or restricted from the forest tracts depending upon the sensitivity of the various tracts to groundwater contamination.

h) Any resurfacing of forest access roads and recreational trails should be undertaken using soils or aggregates from quarries located outside of the Regional Forest.

i) Use only native seed and planting stock from appropriate regional and local seed zones to encourage the regeneration and establishment of native forest communities.

j) Reduce populations of invasive non-native species from sites before silvicultural management takes place to reduce establishment and spread of unwanted species. Where possible avoid the use of pesticides and herbicides for controlling invasive species.

Goal Two: Provide Opportunities for Recreation Where Compatible with Objectives for Conserving Natural Heritage Attributes and Functions

The Halton Regional Forest tracts are used for a plethora of recreational activities. Regional By-laws 224-86 and 189-96 describe prohibited and permitted recreational uses in the former Halton Agreement Forest. Under these by-laws, permitted uses are hiking, snowshoeing, bicycling, cross-country skiing, horseback riding, nature appreciation (e.g., birdwatching, photography), and snowmobiling. Archery hunting and shotgun hunting during the respective controlled archery and shotgun deer hunting seasons as designated by the Minister of Natural Resources in all tracts except the Coulson and Cox Tracts. Prohibited activities under the by-laws are camping, making of fires of any type, using any open flame for cooking, heat, or light, operating motorized vehicles; except snowmobiles, and using or discharging of any weapon other than as specified for the controlled archery or shotgun deer season.

Managers of natural areas have long been concerned about the potential impacts from recreational activities to the ecology and features of natural ecosystems (Godin and Leonard 1979; Washburne and Cole 1983). Of interest in the Halton Regional Forest are the potential impacts to soils, vegetation, and wildlife and also to the enjoyment of the forest by all users.

Impacts of recreation on the ecology of an area can vary between activity types (Weaver and Dale 1978) and the level of recreational activity (Cole 1987; Thurston and Reader 2001). The Halton Regional Forest is frequently used for hiking, mountain biking, and horseback riding as well as a number of lesser-used activities. Recent studies suggest that activities such as hiking, mountain biking and horseback riding contribute to loss of vegetation (Cole 1987; Thurston and Reader 2001), loss of species richness (Cole 1987; Thurston and Reader 2001), and an increase in soil exposure (Bayfield 1973; Cole and Spildie 1998; Goeft and Alder 1998; Thurston and Reader 2001.) As might be expected, these impacts are most prevalent on recreational trails and diminish with increasing distance from the edge of trails (Thurston and Reader 2001) however trail extension and widening and soil erosion have been observed to increase over time and also with wetness, roughness, and steepness of the trail surfaces (Bayfield 1973; Goeft and Alder 1998). Further damage occurs when forest users leave the access roads or recreational trails and create side trails in the surrounding landscape, quickly crushing vegetation and causing erosion (Federation of Ontario Naturalists 2000, Thurston and Reader 2001).

In a recent comparison of the impacts from hiking and mountain biking, Thurston and Reader (2001) found that the impacts from both activities can be severe, and obvious trails will form after relatively few passes (i.e., less than 500) thereby contributing to vegetation loss, species loss, and soil exposure. However they also concluded that there were no significant differences between the impacts from either activity and that rapid recovery should be expected where trails are not allowed to persist (Thurston and Reader 2001).

The potential impacts of human activity on fauna have not been as widely studied. It is generally acknowledged that birds of prey are especially sensitive to disturbance near their nests. The adults may abandon the site if they are disturbed early in the breeding season. When adults are flushed from the nest, the eggs or young chicks may be chilled, or older chicks may tumble out (Sczuba and Naylor 1998).

Large mammals have been observed to flee when coming into contact with hikers and mountain bikers and in some cases have vacated suitable habitat due to the continued presence of recreational activities in their home ranges (Papouchis et al. 2001; Gander and Ingold 1997).

Increased awareness of the ecological sensitivities of the Halton Regional Forest has caused the Region to review all recreational uses in the forest and to establish a process for ensuring that recreational activities are compatible with the objectives for conserving natural heritage attributes and functions. Other recreational activities that have been identified by forest users include orienteering, dog-sledding, and mountain biking.

Snowmobiling and other forms of motorized recreation including ATV's, motorcycles, and 4WD vehicles are not considered compatible with the broader objectives for conserving natural heritage attributes and functions nor with other forms of passive recreation. This management plan recommends that motorized forms of recreation, including snowmobiling, not be permitted in any of the Halton Regional Forest Tracts. Regional By-laws 224-86 and 189-96 will need to be amended accordingly. This plan also recommends that wild food harvesting and removal of flora and fauna be prohibited except those activities associated with silvicultural management of the forest.

The population of Halton Region is expected to increase significantly over the 20-year period of this management plan. This will result in increased recreational pressures on the Regional Forest and other public forests in the Region. However, given the sensitive ecology of the forest and its current size, increased use is not desirable. Therefore extensive promotion of the forest for public use is not recommended.

Objectives for Recreation

1. Identify and Define Appropriate Recreational Uses and Define Temporal and Spatial Usage Limitations

   During the first two years of implementing this management plan, the Region should consult with the HRFAC and forest users to review locations of the recreational trails, trail safety, permitted uses, and timing of recreational activities. It may be necessary to re-locate some trails, construct boardwalks over some areas, or improve some trails to enhance trail safety or to protect sensitive sites. It may also be necessary to seasonally close some trails to conserve natural heritage features and functions. Several user groups have offered to assist the Region with trail maintenance and in peer managing their activities.

2. Access Management Area

   The Halton Regional Forest has a well-developed infrastructure of forest access roads and recreational trails. Only forest access roads and a limited number of recreational trails have been

mapped and displayed in this management plan. Forest access roads have been placed in an Access Management Area and are subject to specific management guidelines. However, most recreational trails have not been mapped.

3. Upgrade Parking Lots

Many of the existing parking lots have limited utility due to the presence of surface boulders and other obstacles. Resurfacing will improve their utility and safety. Aggregated used for re-surfacing should be obtained from quarries outside the Regional Forest. Approvals for some of the proposed parking lot upgrades may be required from regulatory agencies.

During busy periods, the parking lots of many of the forest tracts are fully occupied and some forest users are parking along the sides of Regional roads (Currie and Coulson Tracts) and along municipal roads (all other Tracts). Parking regulations on municipal and regional roads near the forest tracts are enforced. This is expected to continue.

There is no area for parking at the Coulson Tract. The Region will investigate possible locations for establishing a parking lot at the tract.

4. Promote Responsible Recreational Use and Awareness of the Importance of the Forests and Their Sensitivity to Users Through Education, Signage and Other Means

Many of the forest tracts do not have adequate signage to identify the name of the tract, property boundaries, and any regulations regarding the use of the woodlands. Ensuring proper signage and trail maintenance on the existing trails combined with educating the trail users as to the significance of the natural heritage of the Halton Regional Forest is expected to have favourable results for the Region and the forest users, while encouraging environmental protection and education.

Strategies for Achieving Recreation Objectives

a) Map all recreational trails and access roads that have not already been mapped, using GPS technology.

b) Consult with the HRFAC and forest users to review and approve locations and permitted uses of recreational trails.

c) Include approved recreational trails in the Access Management Area. Non–approved recreational trails should be abandoned and restored to native flora through natural succession or planting trees and shrubs where feasible. No new recreational trails should be constructed unless to re-locate existing trails away from sensitive areas.

d) Promote user awareness through education and develop a process for user groups to peer manage their activities to avoid conflicts with other uses and seek ways to complement their experience of the Forest.

e) Establish protocols for reviewing and approving requests from groups wishing to hold recreational events in the Halton Regional Forest.

f) Upgrade existing parking lots where necessary by re-surfacing. Approvals from regulatory agencies may be required.

g) Erect appropriate signage at all tracts including names of forest tracts, rules of forest use, contact information, emergency street locations (i.e., 911 street numbers) where applicable, and property boundaries.

Goal Three: Provide Opportunities for Education and Research Where Compatible with Objectives for Conserving Natural Heritage Attributes and Functions

The Halton Regional Forest is recognized for its biological significance and, as a result, offers potential venues for scientific study and environmental education. The Halton Regional Forest tracts have been the focus of scientific study in the past. This includes Provincial Growth and Yield research plots and a study on the harmful effects of small mammal populations on tree plantations in the Coulson Tract (Radvanyi 1975). Additional inventories to document the flora and fauna of region have been undertaken by naturalists' club members as well.

The information that has been gathered as a result of these studies is useful for identifying baseline forest conditions for a variety of possible long-term scientific studies such as growth rates in various forest communities, management systems for conserving biological diversity, and techniques for maintaining forest interior habitats. These kinds of studies are typically long-term and require the stability and continuity of ownership and management that is apparent with the Halton Regional Forest.

Objectives for Education and Research

1. To Support Scientific Research

   The Halton Regional Forest should continue to support scientific research related to the forest environment and forest use. This would usually involve providing sites for scientific study but could, where feasible, involve funding or in-kind support.

2. To Foster Forest Awareness Through Public Education

   The Halton Regional Forest also provides opportunities for environmental education, especially for area schools. The Ontario curriculum includes several topics on the environment for which field

studies are an integral component of the teaching and learning experience. Several Forest tracts could be used as possible sites for environmental education due to their proximity to area schools and the diverse environments available for study.

Forest awareness can also be fostered by developing partnerships with Conservation Halton, forest user groups, field naturalists, and other interested parties and through appropriate signage and educational materials.

3. Demonstrate Sustainable Forestry Practices

A cornerstone in promoting forest awareness involves the demonstration of sustainable forestry practices. Of particular concern is the use of silvicultural systems that are appropriate for the forest communities involved, that biological diversity and wildlife habitats are maintained, and that any potential impacts of forest management activities on soil, groundwater and habitats are minimized.

The Halton Regional Forest provides an opportunity to demonstrate leadership and excellence in forest management through the proposed system of Management Areas and by employing state-of-the-art management techniques including the GIS database that has been developed as a result of this management planning exercise, ongoing consultation with forest users, and the use of appropriate silvicultural systems. Leadership in forest management can be further demonstrated by applying international standards for sustainable forestry practices as embodied in various Forest Certification systems.

Strategies for Achieving Education and Research Objectives

a) Develop a protocol to review research proposals.

b) Develop and install appropriate signage indicating permitted uses, forest rules, etiquette, and forest significance.

c) Consider requests from interest groups and schools for use of the forest for environmental education.

d) Develop a forest awareness brochure/guide.

e) Adopt international standards for sustainable forestry practices as embodied in various Forest Certification systems.

Goal Four: Provide Efficient and Effective Administration and Management of the Halton Regional Forest

In the past, the Ministry of Natural Resources managed all activities relating to the Halton Regional Forest. This included developing yearly work plans, operational maintenance, and silvicultural activities under a management agreement with the Region. With the termination of the management agreement, the Region has assumed full responsibility for the management of the Forest.

Objectives for Administration and Management

1. Retain Regional Ownership and Administration of the Halton Regional Forest

   Halton residents are steadfast in their desire to have the Forest remain under Regional ownership and administration. Regional Council has demonstrated its commitment to the Halton Regional Forest through the development of this management plan, broad public consultation on the future of the Forest, a current forest inventory, participation in natural heritage studies and scientific research, and a review of appropriate forest uses.

   The management of the Halton Regional Forest is the responsibility of the Region's Corporate Services Department. The Corporate Services Department has guided the development of this management plan and will be directly responsible for its implementation. However the Region does not currently possess the technical and professional forestry expertise to implement the management plan. There are several options available to the Region including hiring (or retaining under contract) a professional forester or entering into a co-management agreement with another resource manager having the necessary professional forestry expertise to implement the management plan.

   It is recommended that the Region hire (or retain under contract) a professional forester to oversee the implementation of the management plan. The forester's role will likely need to be supported by contract forestry services for activities such as silvicultural prescriptions and tree marking. This approach to management has been successfully employed by other Regional and County forests.

   Day-to-day custodial management of the Halton Regional Forest is also a high priority. Options include using Regional employees or contractors. Other Regions and Counties often use a combination of Regional/County employees and contractors to provide custodial services in their forests. Sufficient operating funds will need to be allocated to custodial management services.

2. Establish a Halton Regional Forest Advisory Committee

   The development of this management plan has benefited greatly through the participation of forest users on the PLC. It will be important to build upon the spirit of co-operation and goodwill that has been evident throughout the planning process, as the Region moves forward with the implementation of the management plan.

This plan recommends that the Region will establish a Halton Regional Forest Advisory Committee. Other public forests in southern Ontario and elsewhere have established similar committees. Successful forest advisory committees function under clearly defined terms of reference; represent a range of interests including forest users, technical experts, representatives from NGO's, local politicians and others; and work co-operatively for the betterment of the forest.

3. Maintain Infrastructure for Forest Management and Emergency Access

Good forest access is a fundamental requirement for sustainable forest management. The Halton Regional Forest contains approximately 25 km of access roads and trails (Gartner Lee et al. 2002). Most of the tracts are accessible to light vehicles, however most access roads could not accommodate large emergency vehicles such as fire trucks or ambulances. Some access roads will require repairs during the first 5-year period of this management plan. The Region should consider developing an Emergency Access Plan for the Forest as one component in a proposed Health and Safety Plan.

4. Annual Budget Appropriated for the Forest

Implementation of this management plan will require a long-term commitment to forest management and the associated strategies for achieving management objectives. The Region should allocate sufficient funds to ensure the successful implementation of this management plan including routine activities such as security and garbage collection. Initial management expenses are identified in the 5-year Operating Plan and the 10-year Capital Plan.

Forest management activities will provide revenues from the sale of timber. However, revenue generation should not be the rationale for timber extraction. Rather, timber harvesting should be used as a mechanism for achieving a variety of silvicultural and management objectives. Revenues from the sale of timber are expected to offset direct costs associated with stand-level management activities such as preparing silvicultural prescriptions, tree marking, and harvest supervision. Any excess revenues from the sale of timber should be "re-invested" in the forest to achieve forest management and use objectives identified in the plan. However, revenues from timber sales may not be sufficient to fully support other proposed management activities and the Region should allocate sufficient capital and operating funds to ensure the successful implementation of this management plan.

5. Develop a Fire Management Strategy for the Halton Regional Forest

Developing a fire management strategy for the Halton Regional Forest is a high priority. With the advance of climate change, it can be expected that drier weather will prevail with associated drier conditions in the forests of Southern Ontario and increased threat of forest fires. With increased use of the forests by the public, the probability of fire also increases.

The fire management strategy should contain (i) appropriate measures for the prevention of wildfires (e.g., fuel management, public awareness), (ii) clearly defined responsibilities for fire suppression, (iii) infrastructure improvements and maintenance required to facilitate fire prevention and suppression (e.g., forest access roads), among other contents that may be appropriate for fire management in the forest tracts.

6. Develop a Health and Safety Plan for the Halton Regional Forest

The Halton Regional Forest is a multi-use forest with objectives for environmental protection, recreation, and research and education within the framework of sustainable forest management. The management plan is designed to minimize environmental impacts from management activities and potential conflicts among the various uses. However, it is beyond the scope of this management plan to address the potential risks associated with various recreational and other uses of the forest. A Health and Safety Plan, including an Emergency Access Plan should be prepared for the Forest in consultation with the Region's insurers.

Strategies for Achieving Administration and Management Objectives

a) Identify, assign, and fund an appropriate Regional position with the responsibility to implement the management plan.

b) Hire, or retain under contract, a professional forester to assist with implementing the silvicultural management outlined in the management plan.

c) Allocate sufficient capital and operating funds to ensure the successful implementation of the management plan.

d) Assign Regional responsibility for day-to-day custodial management and make the necessary arrangements to ensure that custodial management activities are carried out.

e) Establish and undertake a monitoring protocol to evaluate and modify management.

f) Regularly assess and monitor key forest attributes and functions.

g) Enforce forest restrictions and rules.

h) Re-invest net revenues from timber sales and other opportunities into forest management.

i) Work with area municipalities, technical experts, and Conservation Halton to develop a fire management strategy for the Halton Regional Forest.

j) Work with the Region's insurers to develop Health and Safety and Emergency Access Plans for the forest.

k) Regularly inspect trails for hazard trees and other hazards that could affect public safety.

5. Management Areas Within the Halton Regional Forest

5.1 Rationale and Criteria for Management Areas

The adoption of an integrated approach to forest management often involves the establishment of management areas within the forest as a means of conserving natural heritage features, protecting cultural features, minimizing impacts from recreational and other uses, and enhancing forest health through different management intensities.

The use of area differentiation within public forests is a proven concept (Puttock 1985). A similar approach has been adopted elsewhere in North America, including on some Crown management units and other municipal forests in Ontario. Among the recognized benefits of area differentiation is the flexibility to customize management activities to suit specific forest conditions and management objectives.

The Forest Management Plan recognizes four classes of management area for the Halton Regional Forest – Restricted, Passive, Modified, and Access - based on natural heritage features and sensitivities of those attributes and functions to human use and management activities. The criteria and rationale for the four classes of management area are listed in Table 2. A fifth class of management area – Passive-Modified – is a joint designation that includes the buffers adjacent to the wetlands. It has been identified because the wetland buffers could possibly benefit from management in order to increase the diversity of the forest structure, thereby increasing landscape function.

Table 2. Management Areas, Criteria and Rationale

Management Area	Criteria	Rationale
Restricted *Highest Level of Protection*	♦ Significant portions of the habitat of Jefferson's Salamanders, including semi-permanent and ephemeral ponds defined as the pond plus adjacent forest within a 250 m radius.	♦ Protection of breeding ponds and summer through winter upland habitat to avoid changes in drainage patterns and compaction of soil.
	♦ Watercourses, ponds, submergent and emergent marsh.	♦ Protection of coldwater habitat for fisheries, and protection of features sensitive to contamination
	♦ Northern Goshawk, Red shoulderd hawk, & Coopers hawk nests (follow Provincial guidelines OMNR 2000b).	♦ Species that will re-occupy the same nest annually. Fledged young remain in the vicinity of the nest.
	♦ Habitat of all rare plants. Plant or colony should be buffered by 1.5 times the height of the canopy. To be located at the time of prescription writing.	♦ Avoid changes in insulation, drainage patterns and compaction of soil.

Table 2. Management Areas, Criteria and Rationale

Management Area	Criteria	Rationale
Passive *High Level of Protection*	♦ Wetlands other than those identified above, plus a 30 m buffer from the wetland boundary defined by the occurrence 50% upland plants in the community.	♦ Protection of wetland attributes, but not as sensitive to contamination. Selective removals possible in winter for wildlife habitat management objectives.
	♦ A buffer of 30 m from the defined bank or wetted edge of watercourses, ponds, and marshes.	♦ Protection of wetland attributes and protection of features sensitive to contamination.
	♦ Significant portions of the habitat of Acadian Flycatcher, i.e. an open understorey with 70+% canopy cover created by large, tall trees (Friesen et al. 1999) and Cerulean Warbler (supercanopy trees), and other designated species that may occur in the future.	♦ Endangered, Threatened or Vulnerable Species as identified by COSEWIC, but may benefit from managed forest prescriptions.
Modified *Moderate Level of Protection*	♦ Forested habitat that includes some area-sensitive species, and those with specialized habitat requirements.	♦ Protects habitat for area sensitive species and rare species, as well as disturbance tolerant species. ♦ This category encompasses tremendous variability in terms of wildlife function from habitat for species of conservation concern to virtually unconstrained at present, but with management may increase in function. Therefore, the tract summaries (Table 3) must be used to provide additional detail to aid in writing prescriptions for these properties.
Access	♦ Existing forest access roads, parking lots, and approved recreational trails. Recreational trails to be reviewed in consultation with forest users and the Halton Regional Forest Advisory Committee. ♦ Access zone is based on average existing width of 3.5 m	♦ These management areas provide access for silviculture and other management activities, recreation, and public safety. ♦ Width of access zones is based on the minimum width required for large emergency vehicles

Guidelines for silviculture, recreation, education/research, and amenities and infrastructure for each class of management area are given in Table 3. A summary of management area by tract is given in Table 4. Maps depicting the management areas and tract specific management features are contained in Appendix C.

Table 3. Management Area Guidelines for the Halton Regional Forest

Management Area	Silviculture	Recreation	Education / Research	Amenities and Infrastructure
Restricted	♦ On demand for limited silvicultural activities for habitat maintenance. ♦ No machines.	♦ Permitted recreational activities should be confined to forest access roads and approved recreational trails included in the Access Management Area. ♦ Recreational activities that could extend beyond the Access Management Area and into the Restricted Area should be prohibited.	♦ No education activities. ♦ Limited research activities.	<u>Access roads and Recreational Trails</u> ♦ Existing forest access roads within all management areas should be maintained. ♦ Recreational trails within all management areas will be reviewed in consultation with forest users and the HRFAC. ♦ No new recreational trails permitted unless to re-locate existing trails to avoid sensitive sites. ♦ Boardwalks may be required over some areas to protect sensitive sites <u>Signage, Fencing, and Property Boundary Markers</u> ♦ Signage to be located at tract entrances and trail heads ♦ Property boundaries to be marked where required. ♦ Fencing to be erected only where required and in consultation with adjoining property owners.
Passive	♦ On demand. ♦ Limited silvicultural activities for habitat maintenance and biological diversity. Machines permitted but no new forest access roads (i.e., landing areas outside passive areas).	♦ Permitted recreational activities should be confined to forest access roads and approved recreational trails included in the Access Management Area. ♦ Low-impact group activities, e.g., orienteering may be permitted depending on timing and provided appropriate approvals have been obtained.	♦ Education and research permitted.	
Modified	♦ Silvicultural prescriptions are modified to account for special features present by stand. ♦ Machines permitted. ♦ No new access roads.	♦ Permitted recreational activities should be confined to forest access roads and approved recreational trails included in the Access Management Area. ♦ Low impact group activities, e.g., orienteering may be permitted depending on timing and provided appropriate approvals have been obtained.	♦ Education and research permitted	
Access	♦ Fell hazard trees within one tree length of access roads and recreational trails.	♦ Permitted recreational activities can take place within the Access Area.	♦ Education and research permitted	<u>Parking lots</u>. Maintain current parking lots. Some parking lots require surface grading and gravel. <u>Culverts.</u> Maintain and repair where necessary to avoid flooding. Approvals from regulatory agencies may be required. <u>Access Control</u> ♦ Reduce width of trails through restricted areas to 5 m wide where feasible

Table 3. Management Area Guidelines for the Halton Regional Forest

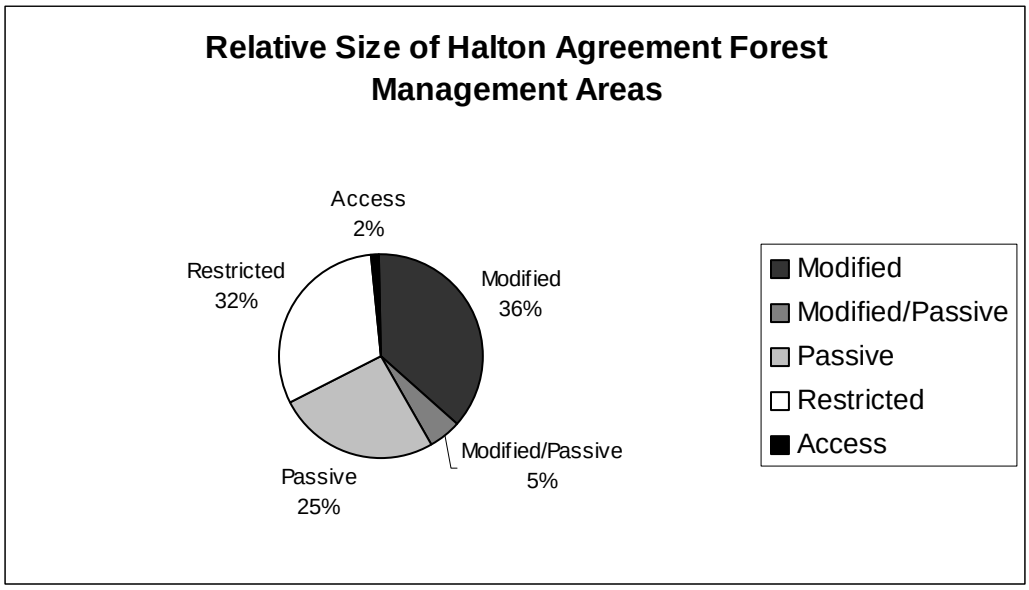
Management Area	Silviculture	Recreation	Education / Research	Amenities and Infrastructure
				♦ Maintain gates and access control structures at tract entrances to restrict access by motorized vehicles including snowmobiles, ATV's, 4WD vehicles, and motorcycles (except where required for public safety and management). ♦ Discourage unauthorized entry to adjacent private property and Hilton Falls Conservation Area through signage, appropriate access control structures, and enforcement where necessary. <u>Recreational Trails:</u> ♦ Map all recreational trails using GPS technology. ♦ Review location and uses of recreational trails with forest users and the HRFAC. ♦ Include approved recreational trails in the Access Management Area. ♦ Abandon recreational trails that are not approved and Restore native flora where feasible.

Table 4. Summary of Management Area by Tract

Tract	Management Area					Grand Total (ha)
	Modified (ha)	*Modified / Passive (ha)*	*Passive (ha)*	*Restricted (ha)*	*Access (ha)*[1]	
Acton	7.61	3.40	10.80	0.04	0.19	**22.03**
Britton	44.86		32.44	85.79	3.02	**166.11**
Conley	8.24	5.03	7.62		0.83	**21.72**
Coulson	32.66		1.06	2.08	0.12	**35.92**
Cox	38.38		1.15	0.75	0.57	**40.85**
Currie	16.47		2.85	19.29	0.59	**39.19**
Elliott	10.50	7.09	12.64	0.04	0.45	**30.72**
Finney	18.23	0.37	0.36		0.71	**19.67**
Frank	8.93	4.53	23.27	4.84	0.21	**41.77**
Laking	3.43	1.83	6.31	1.18	0.10	**12.84**
Mahon	7.03	0.12		41.39	0.53	**49.07**
Robertson	5.70	4.31	41.97	34.25	1.13	**87.36**
Snyder	36.88	2.60	3.41	13.61	1.28	**57.77**
Turner	5.51	3.40	24.39	6.92	0.40	**40.62**
Grand Total	**244.40**	**32.66**	**168.27**	**210.17**	**10.13**	**665.63**

1. Number of hectares occupied by forest access roads is based on an average access road width of 3.5m.

Figure 2. Relative Size of Halton Agreement Forest Management Areas



5.2 Halton Regional Forest and the Niagara Escarpment Parks and Open Space System

Six of the Halton Regional Forest tracts, (Cox, Britton, Robertson, Turner, Mahon and Currie) lie within the Niagara Escarpment Plan area (OMNR 1996a, MOEE undated). This area is within public lands and therefore is subject to the Niagara Escarpment Parks and Open Space System (NEPOSS) guidelines, objectives, and policies (OMNR 1996a). These guidelines specifically concern areas of *public lands* within the Niagara Escarpment Plan management area. NEPOSS is not a land use designation, but the lands are subject to NEPOSS policy. The objectives of NEPOSS are:

a) to protect unique ecological and historical areas;
b) to provide adequate opportunities for outdoor education and recreation;
c) to provide for adequate public access to the Niagara Escarpment;
d) to complete a public system of major parks and open space through additional land acquisition and park and open space planning;
e) to secure a route for the Bruce Trail;
f) to maintain and enhance the natural environment of the Niagara Escarpment;
g) to support tourism by providing opportunities on public land for discovery and enjoyment by Ontario's residents and visitors; and
h) to provide a common understanding and appreciation of the Niagara Escarpment.

As part of the public lands system, the six Halton Regional Forest tracts, together with Hilton Falls Conservation Area, are considered one larger NEPOSS area also named Hilton Falls Conservation Area (despite separate ownership of the two parts) (OMNR 1996a). This larger area, including the six Forest tracts, shall be referred to in this section as 'NEPOSS HFCA' to distinguish it from the current conservation area of the same name. NEPOSS divides NEP public lands into six land classes: Nature Reserve, Natural Environment, Recreation, Historical, Escarpment Access, and Resource Management Areas. NEPOSS HFCA is classed as a Natural Environment park. The NEP describes Natural Environment lands as 'those characterized by the variety and combination of outstanding features, historical resources and outstanding landscape'. Natural Environment parks also provide opportunities for high quality recreation and for the protection of important natural and cultural features (OMNR 1996a).

For the purposes of management and land use decisioning, up to seven zone types are used on public lands within the NEC. The seven zone types are: Nature Reserve, Natural, Access, Historical, Development, Resource Management, and Bruce Trail Corridor. Most zones can exist in most land classes, with a few exceptions.

The aims and guidelines for Natural Environment parks that apply to the Halton Regional Forest include the following:

a) to protect the natural environment setting and to provide those types of outdoor recreation that will afford public enjoyment without impairing the natural environment or resources;

b) management directed primarily towards NEPOSS objectives 1, 2, 7, 8;

c) forestry will only be permitted in historical and resource management zones; trees may be removed in natural or nature reserve zones where the perpetuation of natural features and conditions depends on these activities;

d) decisions on hunting, trapping and fishing will be made during park management planning through public consultation;

e) motorized land vehicles and watercraft are not permitted, except in development and access zones, with some exceptions (including snowmobiles in designated trails if compatible, vehicles used by the park agency for public conveyance and management purpose and in resource management zones to carry out resource management activities); and

f) large group visitation is allowed with scope and intent carefully defined in the plan.

The plan for management of the six Halton Regional Forest tracts within the NEPOSS HFCA support the above guidelines for Natural Environment parks. The four Management Area classes described in the Halton Regional Forest Plan and the concordant NEPOSS zones that apply are summarized in Table 5.

Table 5. Comparison of Halton Regional Forest Management Areas and NEPOSS Zones

Halton Regional Forest Management Area	NEPOSS Zone
Restricted	Nature Reserve
Passive	Natural
Modified	Resource Management
Access	Access Zone

Small portions (e.g., parking areas) of the Halton Regional Forest Modified areas would be considered to be categorized as NEPOSS Access zones, but these have not been differentiated in the Halton Regional Forest plan. Table 6 provides additional explanation of the relative attributes of the Halton Regional Forest Plan Management Areas versus NEPOSS zones.

Table 6. Equivalence Between Halton Regional Forest Plan Management Areas and NEPOSS Zones

Halton Regional Forest Plan Management Area	Goal *(refer to Table 2 in this plan for full details)*	NEPOSS Zone	Goal *(refer to Section 2.13 in NEPOSS manual [OMNR 1996a] for full details)*
Restricted	• manage to conserve and protect highest natural heritage sensitivity and key species (provincially rare) and their habitat; also includes aquatic features	**Nature Reserve**	• protect the provincially significant earth and or life science features within the park
Passive	• manage to conserve natural heritage sensitivity, core wildlife habitat areas and wetlands; low-intensity recreational activity	**Natural**	• include natural landscapes which permit the minimum level of development required to support low-intensity recreational activities
Modified	• manage moderate natural heritage sensitivity, general wildlife habitat areas; includes plantations; enhance selected recreational activity	**Resource Management and Access**	• **Resource Management** – include landscapes in which minimum development is required to support low-intensity recreational areas, demonstration areas, agricultural uses and forestry
Access	• provides for the existing forest access roads, parking lots, and approved recreational trails	**Access Zone**	• Access – serve as staging areas, a means of both providing and regulating use in areas of a park geared towards extensive recreation

NEPOSS recommends that Resource Management zones not be established in lands that are Life Science Areas of Natural and Scientific Interest. Britton, Robertson, Turner, Mahon and Currie (but not Cox) tracts are within the Halton Regional Forest South ANSI. Exceptions to this guideline are listed in Section 3.1.5 of the NEP (OMNR 1996a). One exception is that a Resource Management zone (i.e., Halton Regional Forest Modified areas) will be permitted in an ANSI if its purpose is "to maintain or protect the unique features of an ANSI, where such features would otherwise disappear without active management". This is the case for the relatively small portion of Modified area within the ANSI where many of the forest stands are conifer plantations and where the objective is to convert the plantations to native deciduous and mixed woodlands through sustainable forestry practices.

NEPOSS provides guidelines that indicate which resource management activities (Table 7) and which recreational activities and facilities (Table 8) are encouraged or discouraged within each NEPOSS zone (OMNR 1996a). These show that the management activities proposed in the Halton Regional Forest Management Plan are in agreement with these guidelines. For instance, no buildings or industrial activities are proposed for the six tracts, activities generally discouraged in natural environment parks. Additionally, any silviculture advocated in this plan for the Restricted or Passive Management Areas will be limited to habitat maintenance and for enhancing biological diversity.

Table 7. NEPOSS Natural Environment Park Guidelines for Resource Management[1]

Resource Management	Park Zones			
	Nature Reserve	*Natural*	*Access*	*Resource Management*
Administrative structure/facilities	N	N	M	N
Aggregate extraction	N	N	N	N
Agricultural Uses	M	M	N	M
Bait fishing	N	M	M	M
Boardwalks	**Y**	**Y**	**Y**	**Y**
Can and bottle restrictions	M	M	N	N
Commercial facilities/operations/uses	N	N	N	N
Commercial hydro development	N	N	N	N
Commercial trapping	N	N	N	N
Fire suppression: • natural	N	M	Y	Y
• human-caused	Y	Y	Y	Y
Fish habitat management	**M**	**Y**	**M**	**Y**
Fish stocking: • native species	N	Y	Y	Y
• non-native species	N	N	M	M
Fisheries management	**M**	**Y**	**M**	**Y**
Food and beverage facilities/concessions	N	N	M	M
Forestry[2]	**N**	**N**	**N**	**M**
Group size restrictions and access quotas	M	M	M	M
Insect/disease suppression: • native	N	M	M	Y
• non-native	Y	Y	M	Y

Table 7. NEPOSS Natural Environment Park Guidelines for Resource Management[1]

Resource Management	Park Zones			
	Nature Reserve	*Natural*	*Access*	*Resource Management*
Interpretive/visitor centres	N	N	Y	N
Land disposition: • private use	N	N	N	N
• commercial use	N	N	M	N
• organized/educational use	N	N	N	N
Marinas	N	N	N	N
Micro-hydroelectric generators	N	N	N	N
Operational structures/facilities	N	N	M	N
Organized/educational group use	**M**	**Y**	**Y**	**Y**
Parking facilities	**N**	**N**	**Y**	**N**
Prescribed burning	M	N	N	Y
Public utilities	N	N	M	N
Recreated historical buildings	N	N	N	N
Research facilities	N	N	M	M
Residential use	N	N	N	N
Restrictions on mechanized uses[3]	**Y**	**M**	**M**	**M**
Restrictions on motorized vehicles:				
• private	Y	Y	N	Y
• commercial	Y	Y	M	M
Road construction	N	N	Y	Y
Special events: • commercial	N	N	M	N
• private	N	N	M	N
• organized/educational	N	N	M	M
Sports fields/courts/arenas	N	N	N	N
Towers	N	N	M	N
Vegetation management[2]	**M**	**M**	**Y**	**Y**
Viewing platforms/lookouts/staircases	M	Y	Y	Y
Water access structures	N	N	M	M
Water control structures	N	M	Y	M
Wildlife habitat management[2]	**M**	**M**	**M**	**Y**
Wildlife population management	**M**	**M**	**M**	**Y**

Notes: *1. Source: Ontario Ministry of Natural Resources, 1996a*

2. Any silviculture that occurs in nature reserve/restricted or natural/passive zones is for the purposes of vegetation or wildlife habitat management.

3. Only for limited and qualified trail use.

Y = normally encouraged in this zone

M = may be encouraged in this zone where appropriate

N = normally discouraged in this zone

Activities in bold are those proposed or discussed in the Halton Regional Forest Plan.

Table 8. NEPOSS Natural Environment Park Guidelines for Activities and Facilities

Activities and Facilities	Park Zones			
	Nature Reserve	*Natural*	*Access*	*Resource Management*
Aircraft	N	N	N	N
Amusement rides/facilities	N	N	N	N
Arenas	N	N	N	N
Boating (powered): • commercial	N	M	M	M
• private	N	M	M	M
Bruce Trail	**M**	**Y**	**Y**	**Y**
Campgrounds: • car camping	N	N	M	N
• backcountry	M	Y	N	M
• group	N	N	M	N
Canoeing/kayaking	M	Y	Y	Y
Cross-country skiing: • unimproved trails	**M**	**Y**	**Y**	**Y**
• improved trails	**N**	**Y**	**N**	**Y**
Demonstration areas	N	N	N	Y
Downhill ski facilities	N	N	N	N
Food and beverage concession: • commercial	N	N	N	N
• public	N	N	N	N
Gift shops: • commercial	N	N	N	N
• public	N	N	N	N
Golf facilities	N	N	N	N
Hiking	**M**	**Y**	**Y**	**Y**
Historical appreciation	M	Y	Y	Y
Horseback riding[2]: • trail	N	M	M	M
• corral	N	N	N	N
Horticultural displays	N	N	N	N
Institutional uses	N	N	N	N
Mountain biking[2]: designated trails	**N**	**M**	**M**	**M**
Nature appreciation: • self-guided	**Y**	**Y**	**Y**	**Y**
• **large group-guided**	M	Y	Y	Y
Off-road travel: • ORV/ATV	**N**	**M**	**M**	**M**
• snowmobile	**N**	**M**	**M**	**M**
• mountain biking/bicycle	N	M	M	M
Orienteering: • small groups	M	Y	Y	Y
• special events/large groups	N	M	Y	Y
Overnight accommodations: commercial, institutional, organized groups/educational groups	N	N	N	N
Painting/Photography:				
• individual/small groups	**Y**	**Y**	**Y**	**Y**
• guided/large groups	M	Y	Y	Y
Picnic grounds	N	N	Y	M
Playgrounds	N	N	N	N
R/C hobbycraft	N	N	N	N
Recreation programs (organized): commercial, organized groups/educational groups, public	N	N	M	M

Table 8. NEPOSS Natural Environment Park Guidelines for Activities and Facilities

Activities and Facilities	Park Zones			
	Nature Reserve	*Natural*	*Access*	*Resource Management*
Restaurants	N	N	N	N
Rock/sport climbing: • self-guided	M	M	M	M
• commercial	M	M	M	M
Sailing/sailboarding	M	Y	M	M
Scuba and skin diving	M	M	M	M
Slide rides	N	N	N	N
Snowshoeing	**M**	**Y**	**Y**	**Y**
Spelunking (cave exploration)	M	Y	Y	Y
Sport fishing	**M**	**Y**	**Y**	**Y**
Sport hunting[3]	**M**	**M**	**M**	**M**
Sport playing fields	N	N	N	N
Swimming: • natural waterbody	M	Y	Y	Y
• facility-based	N	N	Y	N
Tennis courts	N	N	N	N
Toboggan runs	N	N	N	N
Youth camps: commercial, institutional/ organized groups	N	N	N	N

Notes: 1. Source: Ontario Ministry of Natural Resources, 1996a
2. In nature reserve/restricted zones, this activity restricted to existing access roads; not generalized access.
3. By-law excludes hunting from Cox tract (and Coulson, which is outside NEP area).
Y = normally encouraged in this zone
M = may be encouraged in this zone where appropriate
N = normally discouraged in this zone
Activities in bold are those proposed or discussed in the Halton Regional Forest Management Plan.

Recreational activities permitted in the Halton Regional Forest Management Areas are generally similar to those suggested for each NEPOSS zone, and are for the most part low-intensity activities such as hiking, cross-country skiing on unimproved trails, nature appreciation, photography, snowshoeing, and archery and shotgun hunting (during the controlled deer hunting season). Recreational activities and trails within all management areas will be mapped using GPS technology and reviewed in consultation with forest users and the HRFAC. No new recreational trails will be permitted unless to re-locate existing trails to avoid sensitive sites. Boardwalks may be required over some areas to protect sensitive sites. Motorized recreational uses (snowmobiles, ATV's, motorcycles, 4WD vehicles) will not be permitted in the Halton Regional Forest.

6. Silvicultural Management of the Halton Regional Forest

6.1 Ecological Foundations for Silviculture

Agriculture, land clearing, logging, and wind have shaped the forest landscape of Southern Ontario and have greatly influenced the temporal and spatial distribution of forest cover, flora, and habitats. Clearcut logging and large areas of blowdown caused by catastrophic wind events, stimulated the establishment and growth of relatively even-aged stands that were comprised of a mixture of shade-tolerant (e.g., Sugar Maple, American Beech, and Eastern Hemlock), mid-tolerant (e.g., Red/Silver Maple, Yellow Birch, Black Cherry, Red Oak, and hickory species) and intolerant hardwoods (e.g., Poplar species, White Birch). At the other extreme, minor wind events and natural senescence caused the death of individual trees or small groups of trees. Individual tree gaps encouraged the regeneration of shade-tolerant trees and the perpetuation of an uneven-aged forest comprised of tree species such as Sugar Maple, American Beech, and Eastern Hemlock. Slightly larger, multi-tree gaps in the forest canopy encouraged regeneration of even-aged patches of species such as Basswood and Yellow Birch and perpetuated uneven-aged forests of shade tolerant and mid-tolerant hardwoods (OMNR 2000b).

The silvicultural systems proposed for the Halton Regional Forest tend to emulate some important aspects of natural disturbance processes that would normally occur in central Ontario, and thus take advantage of the natural adaptations of the tree species comprising these associations (OMNR 2000b, 2002). For example, shelterwood systems tend to emulate the light conditions produced by moderate intensity fires. Group selection and individual-tree selection silvicultural systems tend to emulate the light conditions produced by multi-tree and single-tree gaps, respectively, that are created by minor wind events or natural tree senescence. These silvicultural systems are appropriate for promoting forest health and regeneration of native species, while conserving the ecology of those forest communities found in the Halton Regional Forest. In some cases, these approaches to management may need to be modified in order to conserve the diversity of floral or faunal communities, habitat for rare species, protect Core Forest areas, promote late seral ("old growth") characteristics, and minimize site disturbance and establishment and spread of invasive non-native species (Annand and Thompson 1997, Dey and Parker 1996, Dickson *et al.* 1993, Elliott 1998, Goodburn and Lorimer 1998, OMNR 1996b, O'Hara 1998, Stabb 1996). Consideration must also be given to factors such as rotation age/cutting cycle and the size, shape, and dispersion of operating blocks to emulate the mosaic of age classes, forest types, and landscape patterns created by natural disturbances.

6.2 Forest Communities in the Halton Regional Forest

The Halton Regional Forest is biologically diverse, with a rich array of flora and fauna. Some 36 tree species were identified during the 2001 forest inventory, with some stands containing up to 12 different species (Gartner Lee *et al.* 2002). The size of trees is quite variable, ranging from seedling size to 88 cm dbh. Most (90%) however, are less than 30 cm dbh.

There are 64 distinct forest stands within the 561.34 ha forest area, ranging in size from 0.31 ha to 97.15 ha. Stands are land units that are relatively homogeneous in their vegetation composition, age, history and productivity. The majority of stands in the Halton Regional Forest are less than 70 years old, reflecting past land uses and management activities. Coulson stands out as an exception, in that the majority of the tract has only been reforested in the last 30 years. However, many of the tree species found in the Halton Regional Forest are known to live to 150 years of age or older under similar site conditions and climate. Stands can be grouped according to 10-year age classes. The distribution of area by age class is presented in Table 9. There are no stands less than 20 years of age, however every forest stand contains some regeneration (i.e., seedlings and saplings less than 20 years old). White Ash, Black Cherry, and Sugar Maple can be found in the regeneration layer throughout most of the forest. White Pine, Eastern White Cedar, and Balsam Fir regeneration are also common. Eastern Hemlock, Hickory, and Oaks (Red, White, and Bur Oak) are found infrequently in the regeneration. Regeneration of these species could be encouraged through silvicultural management including single-tree selection and group selection thinning.

Table 9. Distribution of Age Classes in the Halton Regional Forest

Age Class	Regen.[2]	0-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101+
Area (ha)	561	0	9	83	70	181	202	10	1	5	0
Percent of Total	100	0%	2%	15%	12%	32%	36%	2%	<1%	<1%	0%

It is often useful to classify stands according to forest type when establishing forest-level management objectives and strategies. The forest type is determined according to (i) the most common species, by basal area, in the stand, and (ii) the species composition of the stand. Eight forest types are associated with the Halton Regional Forest. Table 10 provides a description of the forest types found in the Halton Regional Forest and the criteria used for classifying stands according to forest type.

6.3 Wildlife Habitat and Biodiversity

Forestry operations can have a profound effect on wildlife habitats and the diversity of forest communities. However, silvicultural activities can also be used to enhance habitat features and to promote biodiversity. A general discussion of wildlife habitat requirements and biodiversity considerations can be found in A *Silvicultural Guide for Managing Southern Ontario Forests* (OMNR 2000b). Habitat components of special importance that can be enhanced through well-crafted silvicultural prescriptions and tree marking protocols are (i) snags (dead standing trees), (ii) cavity trees, (iii) coarse woody debris, (iv) stick nests, (v) mast trees, and (vi) conifer cover.

2. Regeneration area refers to the forest area containing seedlings and saplings less than 20 years old.

Table 10. Description of Forest Types in the Halton Regional Forest (Gartner Lee *et al.* 2002)

Forest Type	Area (ha)	Vegetation Characteristics	Environmental Characteristics	History
Sugar Maple 	271.44	• Deciduous tree species ≥ 75% of species composition by basal area. • Sugar Maple dominant and > 40% of species composition basal area. • Heavily managed, grazed or disturbed sites tend to be relatively lacking in shrub understory vegetation. • Trillium spp, Wild Sarsaparilla, Blue Cohosh, Wild Leek, among others.	• Moderately dry (0) to fresh (1,2,3) soil moisture regimes. • Rapid (2) to well (3) drained sites. • Typically on upper to middle slopes or tablelands.	• Originated following clearcutting, fire, pasture or combinations of them. 34% of the area (93 ha) received stand improvement work in the last 10 to 20 years. Some stands girdled to thin one stem of double-stemmed trees.
Conifer Plantation 	116.49	• Planted conifer tree cover > 60% of species composition by basal area.	• Sandy soils. • Community resulting from cultural activities.	• 58 % of the area (68 ha) was thinned in the past. Thinning included 3rd and 4th row removal, sometimes combined with selection. Thinned only once.
Mixed *(Deciduous & Coniferous species)* 	96.81	• All tree species < 40% of species composition by basal area. • Mixture of a variety of tree species which may include Eastern Hemlock, Sugar Maple, Red/Silver Maple, White Ash, Yellow Birch, and Eastern White Cedar. • Starflower	• Typically on the moist end of the moisture regime gradient. • Lower slopes, seepage areas and bottomlands.	• These stands contain many large - old white pine stumps. With evidence of historic fire. Approximately 37% of the area (36 ha) was cut in the last 20 years. Some stands were clearcut, other sreceived stand improvement work.

Table 10. Description of Forest Types in the Halton Regional Forest (Gartner Lee *et al.* 2002)

Forest Type	Area (ha)	Vegetation Characteristics	Environmental Characteristics	History
Red/Silver/Swamp Maple 	35.43	• Deciduous tree species ≥ 75% of species composition by basal area. • Red Maple dominant and > 40% basal area.	• Standing water or vernal pooling > 20% of ground coverage. • Mineral and organic soils. • Bottomlands	• All stands originated following clearcutting many years ago. Large stumps still evident throughout the stands. 90% of the area (32 ha) was cut in the last 15 to 25 years. Group selection was implemented.
Mixed Plantation 	13.8	• Tree cover > 60 % of species composition by basal area. • Natural hardwoods in plantations > 40% BA of species composition by basal area.	• Sandy soils • Community resulting from cultural activities.	• 50% of the area (7 ha) was thinned in the past.
Oak 	8.82	• Red Oak dominant and > 40% BA of species composition by basal area.	• Moderately dry (0) to fresh (1,2,3) soil moisture regimes. • Rapid (2) to well (3) drained sites. • Typically on upper to middle slopes or tablelands.	• Originated following clear felling, fire, pasture or combinations of them. No previous management.

Table 10. Description of Forest Types in the Halton Regional Forest (Gartner Lee *et al.* 2002)

Forest Type	Area (ha)	Vegetation Characteristics	Environmental Characteristics	History
Cedar 	8.72	• Eastern White Cedar dominant and > 30% BA of species composition by basal area.	• Moist (4,5,6) to fresh (2,3) soil moisture regimes. • Sands, coarse loams and fine loams; typically have finer silt and clay components. • Typically on basic or carbonate substrates and bedrock; moist yet well drained. • Middle to lower slopes, bottomlands.	• 30% (2.5 ha) of the area was thinning in the last 10 to 20 years.
Poplar and Birch 	6.32	• White Birch or Poplar spp. dominant and > 40% BA of species composition by basal area. • Trembling Aspen, Largetooth Aspen with some Sugar Maple, Red Maple, Black Cherry, White Elm, White Ash and White Birch. • Typically represents an early successional stage with high shrub and herb cover and specie richness. • Bracken Fern, Trillium, Bedstraws, and Large Leaved Aster.	• Moderately dry (0) to fresh (1,2,3) soil moisture regimes. • Shallow substrates over sand. • Upper to middle slope.	• 93% of the area (6 ha) harvested about 15 years ago.
Deciduous Plantation 	3.51	• Planted deciduous tree cover > 60% of species composition by basal area.	• Sandy soils • Community resulting from cultural activities.	• No previous management.

Goodburn and Lorimer (1998) provide information on the abundance of snags, cavity trees, and coarse woody debris in late seral ("old growth") forests. This information is a useful benchmark for comparing and enhancing wildlife habitat features in other forests. For example, in comparison to late seral forests, the Halton Regional Forest provides a moderate level of these habitat features (Gartner Lee *et al.* 2002). This is not surprising, given the relatively "middle" age class distribution of stands in the Halton Regional Forest. As the forest ages, greater abundance of these habitat features can be expected. However, their abundance can also be enhanced through appropriate silvicultural management. The *Ontario Tree Marking Guide* (OMNR 2002) provides guidelines for the provision of these important habitat features and for maintaining biodiversity. Other guidelines cover the habitat requirements for individual indicator species such as Pileated Woodpecker *(Dryocopus pileatus*) (Naylor *et al.* 1996). These guidelines should be consulted during the development of forest management prescriptions prior to silvicultural management activities.

The Halton Regional Forest tracts are also habitat for a variety of southern or Carolinian bird species, some of which are classified as rare or threatened (Gartner Lee *et al.* 2002). The habitat requirements for these species vary. As with other areas of concern, silvicultural systems should be suitably modified to ensure that forestry operations serve to maintain or enhance habitat conditions. A forest-level approach to bird habitat management is recommended over the traditional stand-level approach to management. In this regard, there are several references that can be used to guide the development of appropriate silvicultural systems (Dickson *et al.* 1993, Thompson *et al.* 1993, Thompson *et al.* 1995, Annand and Thompson 1997).

6.4 Tree Planting

Planting can be an effective means for restoring native tree species, enhance wildlife habitats and promoting biodiversity on Halton Regional Forest properties. It is also possible that the Region will acquire additional properties that may require afforestation. Tree planting projects can also be used to promote environmental awareness and encourage responsible land stewardship. Native planting stock should be derived from appropriate regional and local seed zones.

6.5 Sustainable Timber Management

6.5.1 Area Subject to Management

The long-term sustainable timber management for the Halton Regional Forest is estimated following the approach described in "BOREAL: A tactical planning system for forest ecosystem management" (Puttock

et al. 1998). The system projects outcomes of management alternatives in terms of sustainable harvest area. System components include descriptive statistics and other information that describe the state of the forest, silvicultural systems and yield tables, and various policy scenarios.

It is assumed that stands within the Restricted Management Areas will form the foundation of the proposed system of High Conservation Value Forests within the Halton Regional Forest. These areas have not been included in the assessment of the long-term sustainable timber management since it is anticipated that they would receive limited management activity such as might be appropriate for habitat enhancement. Based on this assumption, some 127 ha within the Passive Management Areas can be considered for limited management, primarily for habitat enhancement and biological diversity. Another 241 ha within the Modified Management Areas can be managed for a broader range of values. A further 34 ha fall within the combined Passive-Modified Management Areas (Table 11). However, it is possible that additional area within some stands would not be managed due to operating constraints, e.g., sensitive sites, adjacency requirements, wildlife habitat requirements, or other considerations. These areas are best identified during the development of stand-specific forest management prescriptions prior to any silvicultural activities.

6.5.2 Silvicultural Systems and Forest Yield

Uniform shelterwood and uneven-aged individual-tree and group selection are the dominant silvicultural systems proposed for managing the timber resources in the Halton Regional Forest. The *Silvicultural Guide to Managing Southern Ontario Forests* (OMNR 2000b) provides an excellent discussion of these silvicultural systems.

Following Plonski (1974), normal yield tables were developed for each forest type. The yield tables were then modified to reflect the average stocking for each forest type. The modified yield tables were used to determine gross merchantable harvest volumes based on proposed silvicultural specifications and management criteria as given in Table 12.

Silvicultural specifications in Table 12 are for Modified Management Areas. It is assumed that basal area removed in Passive Management Areas will be ¼ to ½ of the basal area harvested in Modified Management Areas. Actual basal area reductions would be determined on a stand-specific depending on management objectives. It is also assumed that the growth factors in Passive Management Areas will be comparable to that of non-managed forests of similar forest type and stocking.

Table 11. Management Areas by Age Class and Forest Type with Average Stocking (Gartner Lee *et al.* 2002)

	Age Class	Sugar Maple	Conifer Plantation	Mixed	Red/Silver/ Swamp Maple	Mixed Plantation	Oak	Cedar	Poplar-Birch	Deciduous Plantation	Total
Passive Management Areas	1-10										
	11-20										
	21-30		0.38	5.74							6.12
	31-40		2.62	0.29							3.43
	41-50	4.33	0.80	11.64		0.03		1.43			18.23
	51-60	15.99		3.01	15.55			1.47		1.48	37.50
	61-70	44.80			15.82			0.25	0.40		61.27
	71-80										
	81-90										
	91+										
	Total	**65.12**	**3.80**	**20.68**	**31.37**	**0.54**		**3.16**	**0.40**	**1.48**	**126.55**
Modified Management Areas	1-10										
	11-20					1.61					1.61
	21-30		16.86	1.09							17.95
	31-40		35.93	1.11		6.50	8.78	1.22	0.39		53.93
	41-50	4.41	31.10	4.90		1.65		0.04			42.10
	51-60	45.48	9.02	34.65	2.39			0.26		1.24	93.04
	61-70	7.08		14.81	0.08			1.12	3.60		26.69
	71-80	1.27									1.27
	81-90										
	91+	2.01		2.23							4.24
	Total	**60.25**	**92.91**	**58.79**	**2.47**	**9.76**	**8.78**	**2.64**	**3.99**	**1.24**	**240.83**
	Average Stocking[1]	1.10 Tol. Hwd SC1	0.90 Red Pine managed	1.10 Tol. Hwd SC1	1.10 Tol. Hwd SC1	1.0 White Pine SC2	1.1 Tol. Hwd SC3	0.91 Black Spruce Sc1	0.71 Aspen SC3	1.0 Tol. Hwd SC1	
Passive-Modified Management Areas	1-10										
	11-20										
	21-30		2.25	1.71							3.96
	31-40		10.93	1.11		0.76					12.80
	41-50		4.1	3.52		0.14					7.76
	51-60			1.14	1.21			0.79			3.14
	61-70	3.64			0.36			0.84	1.94		6.78
	71-80										
	81-90										
	91+										
	Total	**3.64**	**17.28**	**7.48**	**1.57**	**0.90**		**1.63**	**1.94**		**34.44**

Note: 1. Average stocking = Average basal area at age 60/ Normal basal area at age 60 from Plonski's Yield Tables.

Table 12. Silvicultural Systems and Management Criteria for the Halton Regional Forest

Forest Type	Silvicultural System	Thinning Stages	% Basal Area Cut	Basal Area Growth Factor in Managed Stands[2]
Sugar Maple, Oak & Deciduous Plantation	Individual tree or group selection	1st thinning at age 70 Subsequent thinning at 15-year cycles	All thinnings 20% - 30% depending on site conditions and management objectives	0.35 m^2/ha/yr
Conifer Plantation	Uniform Shelterwood 3-cut for white pine and spruce 10-yr cycles for red pine	White pine and spruce 1st thinning at age 40 2nd thinning at age 70 Final thinning at age 90.	White pine and spruce 1st –40% 2nd – 50% final- 72%	White pine 0.65 m^2/ha/yr White spruce 0.60 m^2/ha/yr
		Red pine 1st thinning at age 40 Subsequent thinning at age 50, 60, 70, & 90	Red pine 1st – 25% subsequent 20% final 75%	Red pine 0.62 m^2/ha/yr after 1st thinning 0.78 m^2/ha/yr after 2nd thinning
		Stands convert to Mixed		
Mixed & Mixed Plantation	Individual tree or group selection	1st thinning at age 70 (age 40 for mixed plantations) Subsequent thinning at 15-year cycles	All thinnings 20% - 30% depending on site conditions and management objectives	0.35 m^2/ha/yr
Red/Silver/ Swamp Maple	Individual tree or group selection	1st thinning at age 70 Subsequent thinning at 15-year cycles	All thinnings 20% - 30% depending on site conditions and management objectives	0.35 m^2/ha/yr
Cedar	Uniform Shelterwood 3-cut	1st thinning at age 80 2nd thinning at age 100 Final thinning at age 120	1st - 30% 2nd – 50% final - 50%	0.15 m^2/ha/yr
Poplar-Birch	Uniform Shelterwood 3-cut	1st thinning at age 70 2nd thinning at age 90 Final thinning at age 100	1st - 30% 2nd – 50% final - 90%. Retain 4m^2/ha.	0.15 m^2/ha/yr

Notes: 1 Basal area growth factor represents the average increase in basal area (m^2/ha) per year in managed stands
*** Tract specific modifications for habitat of rare species will apply.*

6.5.3 Sustainable Timber Management Policies

The BOREAL planning system is driven by a number of user-defined policies and criteria for sustainable timber management. These include one or more policy objectives and management constraints, a planning horizon and planning cycle, and required outcomes from the timber management analysis.

A 100-year planning horizon was established with 10-year planning cycles. Harvesting was assumed to take place at the beginning of each period. The outcomes of the analysis included volume and area harvested by period. A management policy to optimize timber production over the 100 year planning horizon was considered. This policy was assessed for several management scenarios including area and volume

regulation (control). Following a review of the results, a policy that optimized timber production under sustained yield area control was chosen. Area regulation was selected because it is relatively simple to administer and provides a more even harvest flow over time.

Sustained yield area control was imposed by limiting period-to-period variation of area harvested. The general form of the constraint is:

$$A_{t+1} \geq (1\text{-}a)A_t \text{ and } A_{t+1} \leq (1+a)A_t \quad (1)$$

where: A represents area harvested in hectares, t is period t (t = 1.10), and a is the permitted period-to-period variation in area harvested - set at 15%.

Finally, constraints limiting the area of each forest unit and age class are specified as:

$$AREAij = X \quad (2)$$

where: i and j represent the forest community and age class respectively and X denotes area available for harvest (from Table 7).

6.5.4 Sustainable Timber Management Area Projections

Sustainable timber management area and volume projections are given in Table 13. The results from the sustainable timer management analysis are used to develop a schedule for silvicultural operations for the 5-year Operating Plan.

Table 13. Halton Regional Forest Maximum Sustainable Area Harvested by Planning Period for All Forest Types

Period	Total Area (ha)	Estimated Volume (m^3)
2005-2014	162.65	6,337
2015-2024	171.89	6,777
2025-2034	206.26	7,705
2035-2044	207.98	7,998
2045-2054	201.90	7,425
2055-2064	161.52	5,750
2065-2074	129.22	4,777
2075-2084	111.05	4,386
2085-2094	133.26	4,208
2095-2104	159.92	4,833

Forest management activities will provide revenues from the sale of timer. However, revenue generation should not be the rationale for timber extraction. Rather, timber harvesting should be used as a mechanism for achieving a variety of silivicultural and management objectives. Net revenues from timber sales should be re-invested in the management of the Halton Regional Forest.

7. Five-Year Operating Plan

7.1 Implementation of the Forest Management Plan

7.1.1 Priority Management Activities

The Five-Year Operating Plan sets out a schedule of activities necessary to meet the objectives and targets established in the strategic twenty-year Forest Management Plan. The operating plan outlines the silvicultural management, access and infrastructure requirements over a five-year planning horizon.

The Forest Management Plan contains several management recommendations for the Halton Regional Forest for the next 20 years. Many of these recommendations can be implemented with minimal effort and expenditure over a relatively short timeframe. Others, such as access and infrastructure improvements, will take time and will require the allocation of funds beyond normal operating costs. The implementation of the operating plan and its action items are necessary to achieve the short-term management objectives within the 2005-2009 planning period and should be given the highest priority for implementation (Table 14).

Table 14. Halton Regional Forest Priority Management Activities 2005-2009

Objective	Management Activity	Year(s)
Administration of the Halton Regional Forest	Identify and assign appropriate Regional position with the responsibility to oversee the administration and management of the Halton Regional Forest	2005
	Hire, or retain under contract, a professional forester to assist in implementing the silvicultural management outlined in this plan.	2005 - 2006
	Allocate sufficient capital and operating funds to ensure the successful implementation of the management plan	2005 - 2009
	Establish terms of reference and membership for the Halton Regional Forest Advisory Committee (HRFAC)	2005 - 2006
	Review management plan and prepare new 5-year operating plan for 2008-2012	2009

Table 14. Halton Regional Forest Priority Management Activities 2005-2009

Objective	Management Activity	Year(s)
Natural Heritage	Establish the system of Management Areas recommended in this forest management plan	2005
	Implement silvicultural and other management activities appropriate for maintenance of key forest attributes and functions	2005 - 2009
	Establish a system of High Conservation Value Forest areas within the Halton Regional Forest	2005 - 2009
	Adopt international standards for sustainable forestry practices as embodied in various Forest Certification systems and consider Forest Certification for the Regional Forest	2005 - 2009
Recreation	Map recreational trails and forest access roads using GPS technology.	2005
	Consult with the HRFAC and forest users to review and approve locations and permitted uses of recreational trails. Include approved recreational trails in the Access Management Area	2005 - 2006
	Develop and implement a process for user groups to peer manage their activities.	2006 - 2007
	Establish protocols for reviewing and approving requests from groups wishing to hold recreational events in the Halton Regional Forest.	2005 - 2006
Education & Research	Develop and install appropriate signage indicating permitted uses, forest rules, etiquette, and forest significance	2005-2006
	Develop a forest awareness brochure/guide	2007
	Develop a protocol for evaluating, approving and monitoring requests to conduct scientific research in the Halton Regional Forest	2006
	Consider requests from interest groups and schools for use of the forest for environmental education	2006 - 2009

7.2 Sustainable Silvicultural Management 2005-2009

The schedule of forest management activities planned for the Halton Regional Forest over the next 5 year period is based on the analysis of the sustainable timber management as described in Chapter 7. The determination of the area available 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.

7.2.1 Areas Allocated for Silvicultural Treatment

All forest stands within the Passive, Modified, and Passive-Modified Management Areas were assessed for management requirements based on current forest conditions and past silvicultural treatments. The total area scheduled for silviculutural treatments over the 2005-2009 operating period has been identified and is consistent with sustainable forestry objectives as described in Chapter 7.

Attempts were made to distribute the treatment areas over a few tracts as possible in any one year. It is assumed that 2005 will be a start-up year in which no silvicultural management will be scheduled. This will free up staff and other resources to implement other management activities. Silvicultural management is scheduled for 2006-2008 (years 2-4). Silvicultural management is not scheduled for 2009 (year 5). This will allow time to review the forest management plan and prepare a new 5-year plan for the 2010- 2014 operating period.

A summary of scheduled thinning treatments by forest type is given in Table 15. The detailed 5-year schedule for silvicultural management appears in Appendix D. Forest stand maps proposed for the treatment during the 2005-2009 planning period are also included in Appendix D.

Implementation of the silvicultural treatments on the selected stands involves pre-harvest assessment, development of silivicultural prescriptions by a Registered Professional Forester and tree marking by Provincial Certified Tree Markers. Supervision and monitoring of the silvicultural operations should be undertaken by a Registered Professional Forester. Revenues from the sale of timber are expected to offset the costs of preparing detailed prescriptions, tree marking and operation supervision. Any additional net revenues from timber sales should be re-invested in the management of the Halton Regional Forest. Estimated expenses and revenues from silvicultural management are given in Appendix D.

Table 15. Summary of Scheduled Thinning Treatments by Forest Type for the 5-year Operating Period of 2005-2009

Forest Type	Total Area (Ha)
Cedar	0.31
Mixed	41.03
Red pine plantation	17.35
White pine plantation	10.77
Spruce plantation	2.68
Mixed plantation	8.37
Total Hectares	80.51

8. Ten-Year Capital Plan

8.1 Rationale for the Capital Plan

The Halton Regional Forest Priority Management Activities 2005 – 2009 as listed in Table 14 of this plan outline the general components of the 10-year capital plan. The capital plan provides a collection of projects that are recommended in order to address infrastructure type deficiencies and recreational, including education and research, related opportunities. The suggested works are un-obtrusive and passive in nature corresponding to this Plan's underlying management theme of nurturing these forest tracts as ecologically significant resources first and recreational facilities second.

Table 16 lists the Capital Plan components under their respective categories, either infrastructure or recreation. Infrastructure components include works that are required to maintain the security, safety, accessibility and management of the Tracts. Recreational components include works that will manage the circulation of and increase the enjoyment for users. Both categories of work reinforce the Restrictive, Passive and Modified Goals as defined in Table 3 of the Master Plan.

Table 16. Halton Regional Forest Capital Works.

Plan Category	Management Activity and Associated Works	Year(s)
Infrastructure	In consultation with the HRFAC and forest users, evaluate the need for and maintenance requirements of fencing, access roads and recreational trails, gates, parking lots, trash cans and signs. *The Capital Plan includes allowances for the actual repair, enhancement and/or construction of these infrastructure related works.*	2005-2009 and 2010-2015
Recreation, Education & Research	In consultation with the HRFAC and forest users, develop and install appropriate signage indicating permitted uses, forest rules, etiquette, and forest significance. *The Capital Plan includes allowances for the fabrication and installation of entry and etiquette signage.*	2005-2009 and 2010-2015
	In consultation with the HRFAC and forest users develop and install recreation related improvements that are required to manage the circulation of and increase the enjoyment for users. *The Capital Plan includes allowances for the actual repair, enhancement and/or construction of pathways, boardwalks, and plantings.*	2005-2009 and 2010-2015

The 10-Year Capital Plan suggests phasing of capital works based upon a two-stage timeframe. Both the infrastructure and recreational related works are broken into first and second priorities. The priorities have been determined based upon popularity and usage demand for each Tract and comparative need for

the work. The first priority works are planned to be completed within Years 1-5 and co-ordinate with 2005-2009 Forest Operating Plan. The second priority works are planned to be completed within Years 6-10 and will co-ordinate with 2010-2015 Forest Operating Plan.

8.2 The Capital Works

Table 17, the 10-Year Capital Works spreadsheet identifies the various capital works that are suggested for each Tract and further broken-down by priority. The capital works include both infrastructure and recreation related works.

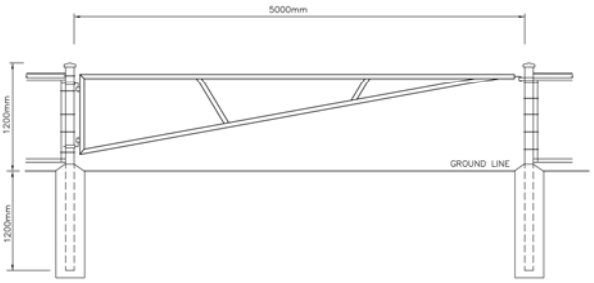
Infrastructure Related Works

- **Parking Lot Resurfacing**

  Resurfacing will include work within the extent of existing lots and could include grading, new granulars and compaction. A $2,000 allowance per lot for regrading and granulars has been included in the capital plan. The number of lots in each Tract is included in the Table.

- **Gates**

  The existing gates and rock barriers require updating and a consistent treatment to facilitate efficient access when required and control of unwanted entry. A $1,500 allowance per installed gate has been included in the capital plan. Gate is a 16 feet wide and 3 inch diameter steel pipe tri-frame and includes 2 anchor posts. The number of gates in each Tract is included in Table 17.



- **Perimeter Fences**

  The existing fencing around each tract is inconsistent in type and extent. The management plan recommends that fencing along tract boundaries be considered only where required and following consultation with adjoining property owners. An allowance for perimeter fencing has been included in the capital plan.

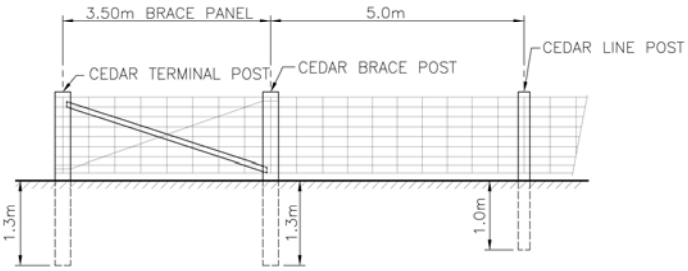


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Table 17: 10 Year Capiltal Plan: Works

		Infrastucture Related Work								Priority	Recreation Related Work			Priority
		parking lot resurfacing (ea)	gates (ea)	perimeter fences (lin m) Priority 2	culverts (ea)	forest road repairs (ea)	main forest sign (ea)	rules of the forest sign (ea)	garbage cans (ea)		boardwalk possible requirements (lin m)	trail mapping & maintenance Priority 1	disguise any unauthorized trails as appropriate (ea) Priority 1	
	Unit Cost:	**$2,000**	**$1,500**	**$15**	**$1,200**	**$5,000**	**$3,500**	**$250**	**$350**		**$100**	**$20,000**	**$5,000**	
TRACTS	***Note:***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***		***9***	***Allowance***	***Allowance***	
Acton		1	1		0	0	1	1	1	**2**	0			
Britton		2	2		6	1	2	2	2	**1**	100			**1**
Conley		1	1		1	1	1	1	1	**2**	0			
Coulson		0	3		0	1	1	2	1	**2**	0			
Cox		0	2		0	0	1	2	1	**1**	0			
Currie		1	1		2	1	1	2	1	**2**	0			
Elliott		1	1		1	1	1	1	1	**1**	0			
Finney		1	1		0	0	1	1	1	**1**	0			
Frank		1	1		2	2	1	1	1	**2**	0			
Laking		0	1		0	0.5	1	1	0	**2**	0			
Mahon		0	2		1	1	1	1	1	**1**	0			
Robertson		1	1		0	1	1	1	1	**2**	200			**1**
Snyder		1	1		0	2	1	1	1	**1**	0			
Turner		0	0		1	1	0	0	0	**1**	200			**1**
Total		**10**	**18**	**4000**	**14**	**12.5**	**14**	**17**	**13**		**500**			

1 Parking lot resurfacing: $2,000 allowance per lot for regrading and granulars.
2 Gates: $1,500 per gate installed. Gate is a 16 feet wide and 3 inch diameter steel pipe tri-frame and includes 2 anchor posts in concrete.
3 Perimeter fences: Allowance for 4000m at $15 per metre of 4 foot high page wire fence with cedar posts and bracing.
4 Culvert: $1,200 per sixteen foot long 12 inch diameter CSP installed.
5 Forest Road Repairs: $5,000 allowance for granulars, brushing, grading typically required at flooded locations.
6 Main forest sign: $3,500 per sign including logo, name, map, activity icons installed on two posts anchored in concrete.
7 Rules Sign: $250 installed.
8 Garbage Cans: $350 installed. Can is a 45 gallon steel drum including lockable lid.
9 Boardwalk: Possible requirements. $100 per metre of 3 foot wide cedar boardwalk including material and installation.
Trail mapping and maintenance allowance $20,000
Disguise Trails to be closed: $5,000 allowance for temporary wooden barriers, signage and plantings at each end of trail.

Capital works items have not been ground truthed. Budgets include an allowance for site inspection and design confirmation.

Infrastructure Priorities
1 Complete work within Years 1-5 and coordinate with 2005-2009 Forest Operating Plan.
2 Complete work within Years 6-10 and coordinate with 2010-2015 Forest Operating Plan.

Recreation Priorities
1 Complete work within Years 1-5 and coordinate with 2005-2009 Forest Operating Plan.
2 Complete work within Years 6-10 and coordinate with 2010-2015 Forest Operating Plan.

- **Culverts**

  Wherever existing forest access roads have experienced drainage restrictions and/or washouts a new corrugated steel pipe (CSP) pipe has been recommended. Beaver resistant baffles should also be installed. Approvals from regulatory agencies may be required.

  An allowance of $2,000 per installed sixteen-foot long 12-inch diameter CSP has been included in the capital plan. The allowance includes the cost of installing beaver baffles where required. The number of culverts required at each Tract is included in Table 17. The following websites provide information on various designs for beaver baffles.

  - *http://www.ces.ncsu.edu/nreos/wild/wildlife/wdc/beavers.html*
  - *http://www.dec.state.ny.us/website/dfwmr/wildlife/beaver/handout.htm*
  - *http://el.erdc.usace.army.mil/elpubs/pdf/tnwrap01-1.pdf*

- **Forest Road Repairs**

  No new forest access road construction is proposed. Existing access roads are in generally acceptable condition. Where flooding has historically occurred the roads have been damaged. These damaged sections have been identified and a $5,000 allowance for granulars, brushing and grading included for each occurrence. The number of sections of road needing repair has been included in Table 17.

- **Main Forest Sign**

  Each major Tract entrance should have a new entry sign that provides the Regional logo, Tract name, map or air photo illustrating the roads and trails and other features and a collection of icons depicting that Tract's permissible activities. The sign should be sturdy and large enough to be read from the road. An allowance of $3,500 per sign including graphics, fabrication and installation on two posts anchored in concrete is included. The number of signs per Tract are included.

- **Rules Sign**

  Combined with the entry sign a "rules of the forest" sign should be erected in a visible and accessible location. The content of the rules sign will be developed in consultation with the HRFAC and forest users. An allowance of $250 per installed sign has been included. The number of signs per Tract is included in Table 17.

- **Garbage Cans**

Each parking lot should have a 45 gallon steel drum garbage can with lid. The cans should be chained to a post to minimize theft and vandalism. A $350 allowance per installed can is included. The number of cans per Tract is included in Table 17.

Recreation Related Works

- **Boardwalk**

  Where existing trails pass through wet areas, cedar boardwalk sections are recommended. At these locations the plan includes a $100 per lineal metre allowance for the length of 3-foot wide cedar boardwalk including material and installation. The cost allowance includes a low impact on-grade installation using pressure treated or cedar timber for the sub frame and eastern white cedar planks for the boardwalk surface. The lineal metres of boardwalk that may be required for each Tract is included in Table 17.

- **Trail Mapping and Maintenance**

  All existing recreational trails will be mapped. Locations of approved trails and any trail improvements, relocations, or closures that may be required will be determined in consultation with the HRFAC and forest users. An allowance for trail mapping and trail improvements is included in Table 17.

- **Disguise Unauthorized Trails**

  Where recreational trails are recommended to be abandoned, their terminations should be disguised to discourage continued use. Trails can be disguised through the use of plantings to screen the view, re-grading to introduce berming and physical barriers such as fencing, bollards and railings. An allowance of $5,000 has been included. Installations could include temporary wooden barrier, signage and plantings at each end of trail.

8.3 Ten Year Capital Budget

Table 18, the 10-Year Capital Budget spreadsheet identifies the various capital works that are suggested for each Tract and includes the associated budget allowances. The allowances include design, materials and installation but are approximate.

The Priority One total includes $365,305 for infrastructure works and $180,000 for recreation works for a total of $545,305. Over the first five years, this equates to an average annual expenditure of $109,000.

The Priority Two total includes $361,355 for infrastructure works and $102,000 for recreation works for a total of $463,355. Over the second five years, this equates to an average annual expenditure of $93,000.

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Table 18: The 10 Year Capital Budget

	Infrastucture Related Work										Recreation Related Work					
	parking lot surfacing (ea)	gates (ea)	perimeter fences Priority 2	culverts (ea)	forest road repairs (ea)	main forest sign (ea)	rules of the forest sign (ea)	garbage cans (ea)	Priority	Subtotal Costs	boardwalk possible requirements (lin m)	trail mapping & maintenance Priority 1	disguise any unauthorized trails as appropriate (ea) Priority 1	Priority	Subtotal Costs	Total Costs
Unit Cost:	**$2,000**	**$1,500**	**Allowance**	**$1,200**	**$5,000**	**$3,500**	**$250**	**$350**			**$100**	**Allowance**	**Allowance**			
TRACTS																
Acton	1	1		0	0	1	1	1	**2**	$7,600	0				$0	**$7,600**
Britton	2	2		6	1	2	2	2	**1**	$26,700	100			**1**	$10,000	**$36,700**
Conley	1	1		1	1	1	1	1	**2**	$13,451	0				$0	**$13,451**
Coulson	0	3		0	1	1	2	1	**2**	$13,502	0				$0	**$13,502**
Cox	0	2		0	0	1	2	1	**1**	$7,001	0				$0	**$7,001**
Currie	1	1		2	1	1	2	1	**2**	$14,901	0				$0	**$14,901**
Elliott	1	1		1	1	1	1	1	**1**	$13,451	0				$0	**$13,451**
Finney	1	1		0	0	1	1	1	**1**	$7,251	0				$0	**$7,251**
Frank	1	1		2	2	1	1	1	**2**	$19,651	0				$0	**$19,651**
Laking	0	1		0	0.5	1	1	0	**2**	$7,750	0				$0	**$7,750**
Mahon	0	2		1	1	1	1	1	**1**	$12,951	0				$0	**$12,951**
Robertson	1	1		0	1	1	1	1	**2**	$12,250	200			**1**	$20,000	**$32,250**
Snyder	1	1		0	2	1	1	1	**1**	$17,251	0				$0	**$17,251**
Turner	0	0		1	1	0	0	0	**1**	$6,200	200			**1**	$20,000	**$26,200**
Allowances			***$60,000***						***2***	$60,000		***$20,000***	***$5,000***	***1***	$25,000	**$85,000**
Subtotal Priority One Works + Priority 1 Allowances										**$90,805**					**$75,000**	**$165,805**
Subtotal Priority Two Works + Priority 2 Allowances										**$149,105**					**$0**	**$149,105**
Grand Total										**$239,910**					**$75,000**	**$314,910**

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Appendices

Appendix A

List of Committee Members

- **Public Liaison Committee Members**
- **Technical Agencies Committee Members**

Appendix A

List of Committee Members as of August 1, 2004

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Appendix B

Glossary

Appendix B

Glossary

Afforestation: Establishment of forest crops by artificial methods, such as planting or sowing on land where trees have not been present for several years (USDA Forest Service 1989 amended by Silv-Econ Ltd.).

Age class: A category that describes trees or stands of trees of a similar age, usually within a range of 20 years. In hardwood stands age class is often determined by measuring the diameter of a tree's trunk, rather than its actual age. The following age classes are commonly used in Canada: (Landowner Resource Centre 1999)

- seedlings .....tiny sprouts
- saplings.....1 to 9 centimetres dbh
- polewood .....10 to 25 centimetres dbh
- small sawlogs.....26 to 40 centimetres dbh
- medium sawlogs .....41 to 50 centimetres dbh
- large sawlogs .....greater than 50 centimetres dbh

Basal Area Growth Factor: The annual change in basal area (m2/ha/yr) in managed stands. Usually there is an increase in basal area following thinning. (Silv-Econ Ltd. 2002)

Basal Area of a Forest: The area in square metres per hectare, of the cross-section of all trees measured 1.3 metres above the ground. (Landowner Resource Centre 1999)

Blowdown: A tree or group of trees that has been blown down by the wind. (Landowner Resource Centre 1999)

Cavity trees: A standing tree, dead or live, that has a hole or holes where wildlife can make nests or dens or escape predators. (Landowner Resource Centre 1999)

Clearcut: A large opening created by cutting all the trees in one harvest. Usually regenerates to an even-aged forest. (Landowner Resource Centre 1999)

Clearcutting: A logging method in which all the trees are cut in one harvest. (Landowner Resource Centre 1999)

Coarse Woody Debris: The decaying logs that lie on the forest floor. Provides habitat for many life forms and a source of soil nutrients. Provides the nutrient-rich, moist conditions some tree species need to germinate and grow. (Landowner Resource Centre 1999)

Crop Trees: A tree that is selected to grow until the final harvest. Usually selected for its location, rate of growth, species and straightness. (Landowner Resource Centre 1999)

Dbh: Diameter at breast height. The diameter of a tree trunk measured 1.3 m above the ground. (Landowner Resource Centre 1999)

Ecosystem: An interacting system of living organisms and their environment. (Landowner Resource Centre 1999)

Habitat: Food, water, shelter, cover and other elements of the environment that living organisms need to survive. (Landowner Resource Centre 1999)

Even-aged Forest: A forest in which all the trees are within 20 years of the same age. (Landowner Resource Centre 1999)

Group Selection System: The technique of cutting small patches (< 0.8 ha) widely dispersed throughout a forest stand in an effort to naturally regenerate shade-intolerant species while creating an uneven-aged forest (Silv-Econ Ltd. 2002).

Hard Maple: Refers to Sugar Maple (Acer saccharum) which has a harder wood than Silver Maple (A. saccharinum) or Red Maple (A. rubrum).

Intolerant Species: Shade tolerance is the ability of the a plant to germinate and grow in shade. Intolerant species, such as White Birch, poplar, Black Cherry, need full sunlight – also referred to as pioneer species. (Landowner Resource Centre 1999)

Mast: The fruit and seeds produced by trees and shrubs. An important source of food for wildlife. Soft mast are fleshy fruit such as berries. Hard mast are shelled nuts such as acorns. (Landowner Resource Centre 1999)

Mid-Tolerant Species: Shade tolerance is the ability of the a plant to germinate and grow in shade. Mid-tolerant species, such as oak ,ash and white pine, need some sunlight to grow. (Landowner Resource Centre 1999)

Pruning: Removing dead and living branches from trees. Reduces the size of the knots in the wood and increases a tree's value for wood products such as lumber and veneer. (Landowner Resource Centre 1999)

Reforestation: Establishing a new forest after the trees are cut. (Landowner Resource Centre 1999)

Regeneration: Young trees (noun) or the process of growing young trees (verb). The growth of young trees can be promoted through natural or artificial means. Trees naturally regenerate by producing seeds or by coppice growth. People artificially regenerate forests by dispersing seeds, planting trees or stimulating coppice growth. (Landowner Resource Centre 1999)

Release Cutting: Removing the vegetation near a tree that might compete with it for sunlight, water and nutrients. Increases a tree's growth rate and chances of survival. (Landowner Resource Centre 1999)

Sapling: see Age Class

Sawlog: A log of sufficient size and quality to be sawn into lumber. Size and quality specifications vary according to species and the grade of lumber being produced.

Seedling: see Age Class

Selection System: Individual or groups of mature and/or unhealthy trees are harvested. Leaves most of the trees and a variety of age classes to grow and regenerate the forest. (Landowner Resource Centre 1999)

Shade-Tolerant Species: Shade tolerance is the ability of the a plant to germinate and grow in shade. Tolerant species, such as maple, hemlock and beech can grow in shade. (Landowner Resource Centre 1999)

Shelterwood System: Mature trees are harvested in a series of two or more cuts. Encourages natural regeneration in the shelter and shade of remaining trees. The first cut, called a seed cut, removes about half of the large trees, leaving the rest to develop large crowns, which provide seeds and shade for regeneration. Subsequent cuts, called removal cuts, are conducted when saplings are well-established beneath mature trees. By removing the mature trees, the final cuts provide new growth with sunlight and room to grow. (Landowner Resource Centre 1999)

Silviculture: The science of growing trees. (Landowner Resource Centre 1999)

Silvicultural Systems: Methods for growing, harvesting and regenerating trees. Three main systems are used in Ontario: clearcutting, selection and shelterwood. (Landowner Resource Centre 1999)

Single-tree Selection: The cutting method that describes the silvicultural system in which trees are removed individually, here and there, each year over an entire forest stand. The resultant stand usually regenerates naturally and becomes all-aged. (OMNR 2000)

Snag: A standing dead tree that is decaying. Can provide habitat for many species. Can be a safety hazard during logging operations. (Landowner Resource Centre 1999)

Stands: A group of trees that can be distinguished from other vegetation by its composition, age, arrangement or condition. (Landowner Resource Centre 1999)

Stick nest: Nests built by raptors (hawks, eagles, owls) and other large birds (herons, crows). Generally constructed using sticks, twigs and boughs. (Silv-Econ Ltd. 2002)

Succession: The process of change that occurs naturally in a forest over time as one community of living organisms replaces another. In southern Ontario, open fields and meadows often succeed to forests of intolerant species (see tolerance), which later evolve into mixed forests. (Landowner Resource Centre 1999)

Thinning: Removing some trees from a stand. Decreases the density of a forest, reduces competition and gives the remaining trees room to grow larger and faster. (Landowner Resource Centre 1999)

Uneven-aged Forest: A forest with trees of all ages and sizes, usually with at least three age classes. (Landowner Resource Centre 1999)

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