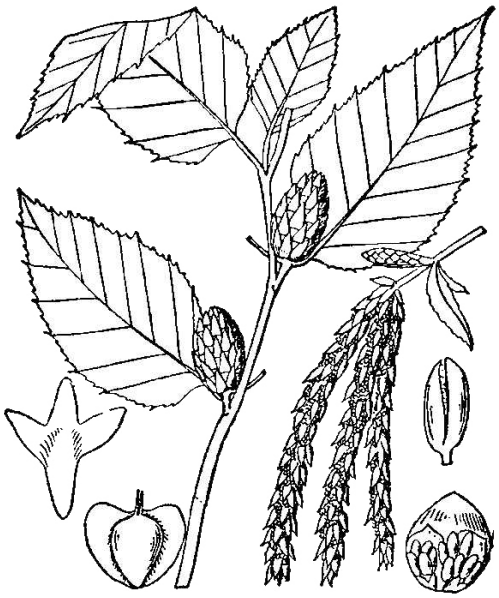
COSEWIC
Assessment and Status Report

on the

Cherry Birch
Betula lenta

in Canada



ENDANGERED
2006

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Production note:

COSEWIC would like to acknowledge John D. Ambrose for writing the status report on the cherry birch *Betula lenta* in Canada, prepared under contract with Environment Canada, overseen and edited by Erich Haber, Co-chair (Vascular Plants), COSEWIC Plants and Lichens Species Specialist Subcommittee.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur le bouleau flexible (*Betula lenta*) au Canada.

Cover illustration:
Cherry birch — Image from Britton and Brown, 1913.

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COSEWIC
Assessment Summary

Assessment Summary – April 2006

Common name
Cherry birch

Scientific name
Betula lenta

Status
Endangered

Reason for designation
A widespread deciduous tree of eastern North America that is known from a single small population in Ontario. This population has declined considerably over the past four decades with fewer than 15 trees remaining in the wild. Its habitat is surrounded by residential development and the population is at continued risk from storms, erosion and habitat loss and degradation.

Occurrence
Ontario

Status history
Designated Endangered in April 2006. Assessment based on a new status report.

COSEWIC
Executive Summary

Cherry Birch
Betula lenta

Species information

Cherry birch (*Betula lenta*) is a tree in the birch family (Betulaceae). It has alternate leaves that are simple and toothed. It is distinguished from the other birches by its dark bark breaking into large plates lacking curled edges. Twigs and catkins lack hairs. Flowers are small and clustered into separate male and female catkins on the same tree.

Distribution

It is a tree of the northeastern United States with one population in adjacent Ontario.

Habitat

Typical habitat is on moist, well-drained soils but is also found on coarse textured or rocky shallow soils. It occurs with upland hardwoods and eastern hemlock.

Biology

It is a relatively long-lived tree, attaining ages of 200 or more years. This species has both male and female flowers on the same tree with isolated individuals being able to produce fruit. Pollen and seeds are wind dispersed.

Population sizes and trends

There is one population in Ontario that has been declining since abundance was first recorded in 1967.

Limiting factors and threats

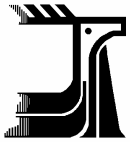
Land clearing and housing development have directly impacted the habitat for this population. Clearing has also indirectly impacted it by making the remaining habitat more prone to wind damage from storms off Lake Ontario.

Special significance of the species

The species was widely used by First Nations people as well as early settlers for a number of curative and cultural applications. There is only one natural population in Canada.

Existing protection

Although it has an N1 designation for Canada and an S1 designation for the province (both indicating that the species is critically imperilled) it is not protected federally or provincially. The species is “not ranked/under review” in the adjacent states of Ohio and New York and is secure in Pennsylvania.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5th 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS
(2006)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

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Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Cherry Birch

Betula lenta

in Canada

2006

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SPECIES INFORMATION

Name and classification

Scientific name:	*Betula lenta* L
Synonym:	*B. carpinifolia* Ehrh. (a name not in current use; see Newmaster *et al*., 1998)
Common name:	cherry birch, black birch or sweet birch; *bouleau flexible*
Family name:	Betulaceae (birch family)
Major plant group:	Eudicot flowering plant

Morphological description

Cherry birch is a medium-sized tree, up to 25 m tall and 95 cm in diameter, with simple alternate leaves with toothed edges and dark smooth bark with conspicuous lenticels. The bark breaks up into large plates and lacks the curling at the edges that is typical of other birches. Twigs and catkins are without hairs, distinguishing it from yellow birch. Yellow birch may sometimes have dark bark similar to cherry birch, but the bark of yellow birch has thin curling edges not found in cherry birch. The bark of cherry birch is strikingly similar to that of the escaped domestic sweet cherry, *Prunus avium* (L.) L. The latter species has become a common component of the forests of the Niagara Region and is often confused with cherry birch. Detailed technical descriptions and good illustrations can be found in Hosie (1979) and Waldron (2003); a brief description is included in Farrar (1995). A line drawing of a leafy branch with female catkins and a cluster of male catkins is reproduced in Figure 1 (Britton and Brown 1913).

Genetic description

There are no conspicuous barriers to gene flow within populations. Typical of the family, this species is monoecious with male and female flowers in separate catkins. There is no known evidence of self-incompatibility; fruit has been known to develop on individual trees.

Cherry birch is known to hybridize with *Betula pumila* to form *Betula* x *jackii* (Fowells, 1965). This species can be hybridized with yellow birch but natural hybrids are not known (Sharik & Barnes, 1971).

DISTRIBUTION

Global range

Cherry birch is a tree mainly of the eastern United States with one population in adjacent Ontario. It occurs from southern Maine, New Hampshire, Vermont, New York and Pennsylvania to eastern Ohio and down through the Appalachian Mountains to northern Alabama and Georgia (Figure 2).

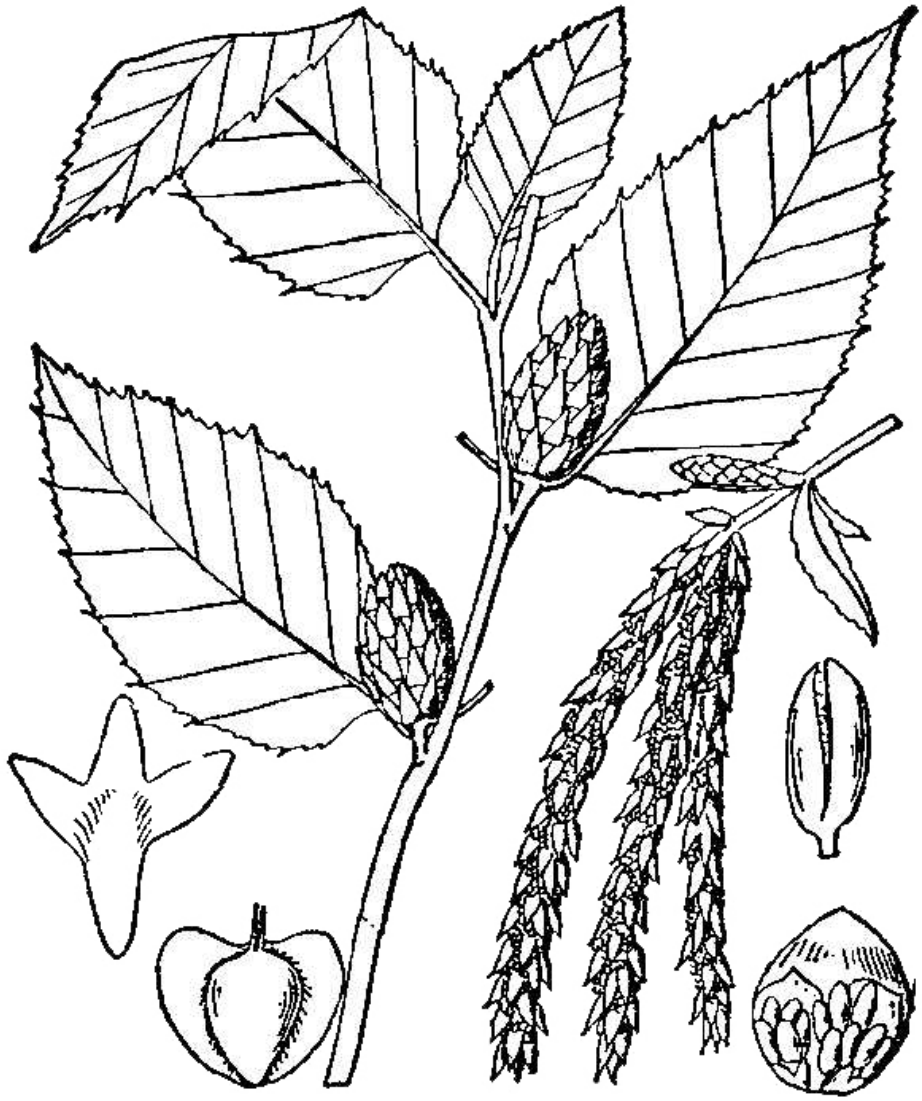

Figure 1. Illustration of the catkins and reproductive structures of *Betula lenta*: leafy branch with female catkins and tri-lobed catkin bract and winged fruit (bottom left); cluster of three male catkins with individual male flower and bract with anthers (right). Image from Britton and Brown 1913 (not copyrighted). Catkins approximately life size.

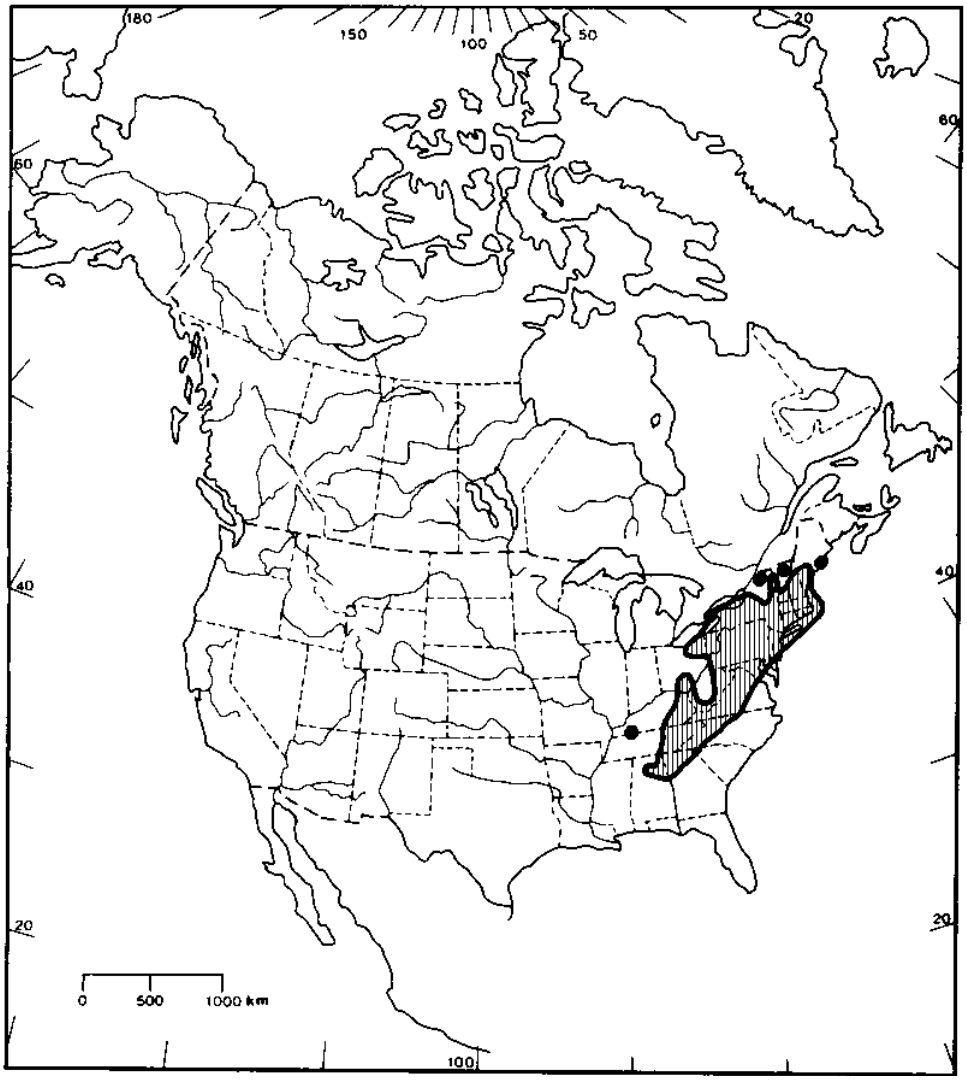

Figure 2. Global range of *Betula lenta* (adapted from Keddy, 1987)

Canadian range

There is only one confirmed wild population of cherry birch in Canada, in the Niagara Region of Ontario, within 50-70 km of populations in western New York (Figure 3). It occurs west of St. Catharines near the Lake Ontario shore at the mouth of 15 and 16 Mile Creeks. It was first documented in 1898 (W.C. McCalla, specimen at DAO, "Sixteen Mile Creek; Top of bank at mouth of Sixteen Mile Creek") close to the extant population. Hosie (1979) visited the site in 1967. Other reports in the Niagara Region have proven to be no longer extant or false but it is possible that additional individuals are yet to be found. Reports from Quebec are considered of doubtful validity and generally thought to be *B. alleghaniensis* (Marie-Victorin, 1935); however, it is still a species to watch for in the region from the Ottawa Valley to Montréal. There are cultivated specimens in places such as the Guelph Arboretum, but such *ex situ* trees are not included in the tally of this species in Canada.

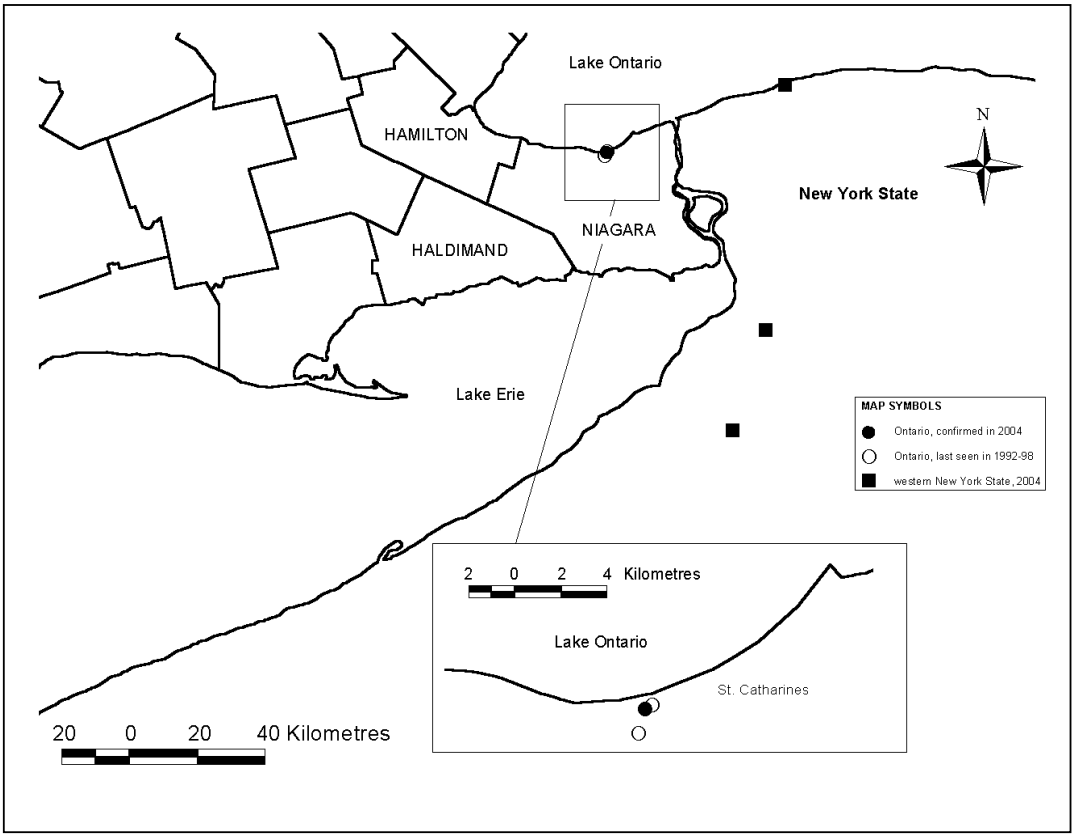

Figure 3. Canadian range of *Betula lenta*, in the Niagara Region of Ontario, and adjacent populations visited in New York State.

HABITAT

Habitat requirements

Cherry birch grows best on moist, well-drained soils but is also found on coarse textured or rocky shallow soils. At the Ontario 15 Mile Creek site it is growing on clay loam on a west-facing slope and has been sighted on the forested slopes above the nearby 16 Mile Creek valley. In adjacent western New York, it occurs on stony clay loam, organic rich clay loam and sand.

The species is described as shade intolerant (OMNR, 2000; USFS, 2004); however, in western New York seedlings were observed on areas of exposed fine gravel under an open forest canopy. Thus intermediate might be a better term for its optimal site for seedling establishment.

In Ontario, it occurs with red oak (*Quercus rubra*) and white oak (*Quercus alba*), sugar maple (*Acer saccharum*) and eastern hemlock (*Tsuga canadensis*); in western New York common associates are: sugar and red maple (*Acer rubrum*), beech (*Fagus*

grandifolia), eastern hemlock, black cherry (*Prunus serotina*); occasional associates include tulip tree (*Liriodendron tulipifera*), yellow birch (*Betula alleghaniensis*), paper birch (*Betula papyrifera*) and chestnut oak (*Quercus prinus*).

Habitat trends

There appears to be limited suitable habitat in the Niagara Region outside of the areas from which the species has been documented. Fox and Soper (1954) stated that "it seems quite possible that other stands of *B. lenta* may be located in the region between Port Dalhousie and the Niagara River since this species occurs in western New York state." However none have been found in the various inventories conducted in the area since. Sites that appear to have suitable habitat such as the forested Niagara Glen (where it was recorded by Hamilton (1943), but never documented) and the nearby Navy Island were field checked but none were found. Habitat in adjacent western New York appears to be in a steady state.

Habitat protection/ownership

The owners of the two extant adjacent sites and one recently extripated site are aware of this species and appear keen to protect it. The population extends into a small deep ravine at the back of the residential lots.

BIOLOGY

The following information is based on the author's field observations in Ontario, plus three sites in western New York, as well as a variety of references as noted.

Life cycle and reproduction

This species is a long-lived woody perennial attaining an age of 200 years or more. Fruiting began before the age of 16 years on the trees of the University of Guelph Arboretum living gene bank.

The species is monoecious with male and female flowers borne on separate catkins but on the same tree. Catkins develop the year before flowering, which occurs early in the spring before the leaves expand. Pollen is dispersed by wind. Hybrids with yellow birch can be artificially produced but are not known in nature (Sharik & Burton, 1971).

Seeds develop through the summer and are released in late fall to winter. Seeds germinate without stratification, but require light (OMNR, 2000; Kock, 1998). Seedling establishment was observed in western New York in openings in the forest canopy on areas of fine gravel but not in the duff covered part of the forest floor. Some of the trees had stilt roots indicating an origin on a decayed stump or nurse log. Saplings were also observed in this site. The species is dependent on sexual reproduction; clonal growth is not known beyond re-sprouting from cut stumps.

Herbivory

Birches are browsed by large herbivores and sometimes subject to defoliating insects but these were not observed as threats in any of the populations observed.

Physiology

In southern Ontario, soils are generally alkaline due to the presence of limestone bedrock. In the New York populations the soils were likely more neutral to acidic on the basis of the associated species (e.g., *Vaccinium* spp., *Quercus prinus*). In cultivation, the species does well on lime-rich soils; it appears that soil pH is not a limiting factor.

Dispersal/Migration

Seeds have small wings and are dispersed by wind; dispersal distances can be enhanced by blowing over snow and ice during winter release. The historical sighting of another tree in the same 15-16 Mile Creek valley was likely the result of dispersal from this one stand.

Interspecific interactions

This species is not dependent on animal vectors for pollination or seed dispersal. No negative interspecific interactions were observed.

Adaptability

Cherry birch can establish in small openings in the forest. Two saplings and a small tree were observed in the ravine below the main population at 15 Mile Creek.

This species can be grown readily from seed. The University of Guelph Arboretum has offspring from each mature individual of the northerly15 Mile Creek sub-population. In addition, the Region of Niagara Tree Advisory Committee purchased trees from Little Otter Tree Farm for planting throughout St. Catharines; the seeds came from the lakeshore trees that no longer exist. The trees acquired by the land owners at the northerly 15 Mile Creek and the lakeshore sites were from Niagara College, but also originally grown by Little Otter Tree Farm. Four of these were planted at the 15 Mile Creek site a few years ago where mature trees were recently lost to storm damage (May 2004 and before); two trees were planted at the lakeshore property and one survives.

POPULATION SIZES AND TRENDS

Search effort

The two adjacent sites at 15 Mile Creek were surveyed and each tree was located and measured; results were compared with the writer's 1984 observations at the northerly property. The adjacent lakeshore property was searched in 2005 and no

survivors were found, other than the seedling that the owners planted from their recently lost tree (trees were individually lost through the 1990s, up to the last one falling into the lake in 1998 [Fallding, 1998; University of Guelph Arboretum native tree records]). A recent report (Thompson, 1992) of a single tree in the slope forest of nearby 16 Mile Creek could not be found after about 6 person-hours of searching; one of the party, George Meyers, observed it here in the 1980s. A report (Soyka *et al*., 1977) of this species at the lakeshore park west of 4 Mile Creek was followed up with a visit but could not be found after about 8 person-hours of searching; the look-alike *Prunus avium* was abundant. Other likely sites were searched: the Niagara Glen (where reported in 1943) and Navy Island. One NHIC record with a valid specimen no longer had any cherry birch; another NHIC recorded sighting turned out to be *Prunus avium*.

In total, about 27 person-hours were spent searching and documenting recorded sites and another 20 person-hours searching potential sites within the region. In addition, a two-day expedition to western New York State was undertaken with four people in 2004, to observe the species in three different sites in order to have a better concept of typical cherry birch habitat and ecology.

Abundance

Fourteen naturally occurring trees, 13 to 62.5 cm dbh (diameter at breast height), currently exist at the 15 Mile Creek sites (Table 1). Six were fruiting. In addition, the northerly owners have had four additional trees planted from the local seed source where others have been lost. It is possible that an additional few trees exist on the forested slopes around the bay.

Fluctuations and trends

In 1984, nine trees 14-95cm dbh were recorded by the author at the northerly 15 Mile Creek bay slope site(1a in Table 1). Thompson (1992) reported 14 trees 10-93 cm dbh at this site and an adjacent lakeshore site to the northeast, 1c (but not including the southwesterly property, 1b; Thompson, pers. comm.). The lakeshore site, above the Lake Ontario shoreline, three properties to the northeast from 1a, was reported in the St. Catharines Standard (Fallding, 1998). A few trees were noted as having recently been there but only one remaining at the time of the article; it fell into the lake later that year. Herbarium records for the general area of this set of three adjacent sites date back to 1898 (McCalla, OAC). The first quantitative record was in 1967; Hosie (1979) reported that:

> "There are approximately 50 trees of different ages and sizes at this location. Several medium-sized trees are dead, a few others appear to be dying, but a good number are healthy. Two or three of the probable originators have been growing along the top of the slope for at least 75 years."

Table 1. Reports of *Betula lenta* in the Niagara Region of Ontario.

#	Population location		Tree number and size		
		First dates and numbers (if reported)	Ambrose 1984	Thompson 1992	Ambrose 2004-05
	Confirmed 1992-2004:				
1a.	Louth Tp., east slope, mouth of 15 Mile Creek; EO 1937*	1898: McCalla collection (DAO) 1967:about 50 (Hosie, 1979)	9 (14-95 cm dbh)	14 (10-93cm, dbh)	6 (27.5-62.5cm, dbh) + 4 planted from local seed source
1b.	SW of 1a., slope down to bay behind residence	new 2005		— (not known)	8 trees (13-38cm dbh)
1c.	Shore of Lake Ontario near 1a; EO 1937	early 1990s: a few trees remain (Fallding, 1998).	—	included with 1a	0 (last tree lost in 1998); 1 planted sapling.
1d.	15 Mile Creek, inland from Lake Ontario; EO 1937	1980s, G. Meyers observed additional tree(s) south along bank	—	1 (27cm dbh)	0—site searched with G. Meyers and 3 others; none seen
	apparently extirpated (or erroneous?)				
2.	Martindale Pond/ W bank of 12 mile Creek; EO 5230	1967 & 1969 specimens	—	—	0--site searched; only *Prunus avium*
3.	Niagara Glen	Hamilton (1943): "several trees flourish in the Niagara Glen"	—	—	0—none seen 2004, nor reported by NPC (R. Ritchie, pers. comm.)
	Erroneous records:				
4.	West Pelham, small woodlot N. of Fonthill; EO 1938	1989 report	—	—	0—site searched, only *Prunus avium* & *P. serotina* present.
5.	Grimsby, Irish Grove; EO 22349	1980	—	—	0—checked earlier by G. Meyers; only *Prunus avium*
6.	Lakeshore park west of 4 Mile Creek	Soyka *et al*. (1977) not documented with a specimen.	—	—	0—searched in 2005; only *Prunus avium*
7.	S. of QEW at Andrews Court		—	—	0—large old *Betula allegheniensis*

*EO = element occurrence identifier (EO_ID), as used in the Ontario Natural Heritage Information Centre

It is assumed that this report was of a stand extending from the bay slopes to the shores of Lake Ontario, including all of the above three sub-sites. Although there has been no apparent decline in numbers between 1992 and 2004, despite the loss of the 3 largest trees and the loss of all of the lakeshore trees, this is due to the discovery of additional trees to the southwest along the bay. However, the occurrence of new naturally occurring saplings is a positive indication, while the open location lacking protection from lake storms is a continuing threat.

The 38 year period (1967-2005) represents approximately one generation (assuming an average age of 40 years for mature trees). It is likely that the greatest decline occurred in the last 40 years and one can only speculate on the decline over the past three generations—about 120 years. This is an area of early European settlement, beginning in the 1780s (Marsh, 1985), thus the largest trees observed in the last 20 years probably dated back to this time (see age calculations under Special Significance of the Species). Early moderate clearing may have actually opened additional habitat for seedling recruitment, but as land clearing intensified in this significant tender-fruit growing region, and more recently, as lakeshore residential development intensified, the rate of decline certainly increased rapidly. Thus, one could speculate that the population was stable through to the end of the 1800s and early 1900s, but began to decline in the early to mid-1900s (Hosie noticed several dead and declining trees in 1967) and continued declining to near present times.

In summary, the population had been in an apparent decline at the time of Hosie's record in 1967 and continued to decline until Thompson (1992) recorded only 14 of the previous count of about 50. However, since eight additional trees were discovered in 2005, the 1992 number does not appear to represent all the trees existing in that year. Seven or eight (four at 1a, a 'few' at 1c and 1d uncertain) trees are known to have been lost in the last thirteen years, so the apparent lack of current decline is misleading. A potential decline from 1967 to 2005 (about 1 generation), taking into account previously undocumented trees, appears to be about 72% (14 trees currently remaining out of a possible 50 in 1967).

Rescue effect

The three populations visited in adjacent western New York appeared healthy and some regeneration was observed. Climatic conditions are similar and it is expected that progeny from these sources would do well in Ontario, should stock from outside of Ontario be needed. It is unlikely that propagules from these sites would make it into Ontario through natural migration pathways in less than a geological timescale.

LIMITING FACTORS AND THREATS

The high levels of land clearing and development in the Niagara peninsula have reduced the amount of potential habitat for cherry birch and other Carolinian species. Residential development has occurred all around the presently occupied habitat and only the steep slopes down to 15 Mile Creek and associated ravines remain in natural forest cover. Likewise, the other sightings are on narrow strips of habitat, one on the lakeshore bank of a residential property and another along the forested slopes of the adjacent 15 Mile Creek watershed to the south, with a small fruit farm on the level land above. With less forest cover, storms coming off Lake Ontario have a higher impact on the remaining vegetation, as exemplified by the loss of trees of this species in a violent storm in May of 2004. Other trees were lost in the late 1990s, including the big Honour Roll tree (OFA, 2005) on the bay slope and the large tree on edge of the eroding lakeshore bank.

SPECIAL SIGNIFICANCE OF THE SPECIES

This single population of cherry birch is likely an extension from its more abundant occurrence in New York State and to the east. It could well have been more common in the Niagara peninsula before land was cleared for agriculture and human settlements. However, its absence in other protected potential habitats such as the Niagara Glen suggests that it may have always been an isolated occurrence.

There is the possibility that early settlers brought this species with them and planted it, or that First Nations people brought it from across the Niagara River. However, being on a natural slope not far from natural populations in New York and one tree being recorded as 95 cm dbh before its demise suggests that it may have been of considerable age, likely more than 200 years (based on the growth rate of remaining trees). Its growth from 1976 (Honour Roll measurement of 92 cm; OFA, 2005) to 1984 (95 cm) was 0.1875 cm of radius per year; extrapolating back would put it at 253 years old. Growth rates from three cored trees in New York ranged from 0.12 to 0.16 cm radius per year, a slightly less rate than the above calculation, thus this estimate appears reasonable and possibly conservative.

Early settlers used this species for its wintergreen oil that could be extracted from twigs. The oil was used externally to alleviate the pain of sore muscles; the bark has astringent properties and was used in treating wounds (numerous web sites provide information on herbal uses, e.g., Holisticonline, 2005). First Nations had many uses for this species, using leaves, twigs and bark for a number of curative purposes. The fibre from the bark was used in buildings and canoes, while the bark was used for storage containers as well as ceremonially for placing on top of coffins while burying the dead (Moerman, accessed October 2004).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Cherry birch is listed as G5, N1 in Canada and S1 in Ontario, but currently has no official status (NatureServe, 2004). In the adjacent states of occurrence in Ohio and New York cherry birch is recorded as not ranked/under review but is secure in Pennsylvania (NatureServe, 2004). The landowners of the largest population in Ontario are aware of the importance of this species and are taking measures to protect it.

TECHNICAL SUMMARY

Betula lenta
cherry birch bouleau flexible
Range of Occurrence in Canada: north shore of Niagara Peninsula, Ontario

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* **The shoreline area around the one known population where local dispersal is feasible**	2 km²
• *Specify trend in EO*	no change
• *Are there extreme fluctuations in EO?*	no
• *Area of occupancy (AO) (km²)* **The one known population plus 2 adjacent recent historical sightings**	0.75 km²
• *Specify trend in AO*	recent decline
• *Are there extreme fluctuations in AO?*	no
• *Number of known or inferred current locations*	one
• *Specify trend in #*	loss of 1-2 historical sites
• *Are there extreme fluctuations in number of locations?*	no
• *Specify trend in area, extent or quality of habitat*	gradual decline in area over the last 1-2 generations due to loss or degradation of habitat
Population Information	
• *Generation time (average age of parents in the population)*	(flowering age,16-200+ years) generation time perhaps 40+ years
• *Number of mature individuals [over 12 cm dbh]*	14
• *Total population trend:*	declining
• *% decline over the last 10 years or 3 generations.*	72% decline over about 40 years (1 generation)
• *Are there extreme fluctuations in number of mature individuals?*	no
• *Is the total population severely fragmented?*	yes, from main distribution in US
• *Specify trend in number of populations*	currently one; possibly two smaller populations lost
• *Are there extreme fluctuations in number of populations?*	no
Populations with number of mature individuals in each: 1) 15 Mile Creek: 14 mature trees; plus lost or unconfirmed in nearby sub-sites.	
Threats (actual or imminent threats to populations or habitats)	
The open site is prone to periodic severe storms off Lake Ontario.	
Rescue Effect (immigration from an outside source)	
• *Status of outside population(s)?* **USA: 3 populations within 70 km in western New York; an occasional forest species in the centre of its distribution.**	
• *Is immigration known or possible?*	unlikely
• *Would immigrants be adapted to survive in Canada?*	yes
• *Is there sufficient habitat for immigrants in Canada?*	limited additional habitat in Niagara
• *Is rescue from outside populations likely?*	possible but appears unlikely
Current Status COSEWIC: Endangered (2006)	

Recommended Status and Reasons for Designation

Status: Endangered	**Alpha-numeric code**: A2ac, B1ab (ii, iii, v) +2ab (ii, iii, v), C1 + 2a (i, ii), D1

Reasons for Designation:
A widespread deciduous tree of eastern North America that is known from a single small population in Ontario. This population has declined considerably over the past four decades with fewer than 15 trees remaining in the wild. Its habitat is surrounded by residential development and the population is at continued risk from storms, erosion and habitat loss and degradation.

Applicability of Criteria

Criterion A: (Declining Total Population): Meets Endangered A2ac based on a loss of about 72% of trees in a single generation as noted by direct observation and is also associated with a decline in area of occupancy and quality of habitat.

Criterion B: (Small Distribution, and Decline or Fluctuation): Meets Endangered B1ab (ii, iii, v) +2ab (ii, iii, v) due to the very small extent of occurrence and area of occupancy, presence of a single population and continuing decline in area of occupancy, quality of habitat and number of mature trees.

Criterion C: (Small Total Population Size and Decline): Meets Endangered C1 + 2a (i, ii) based on the very small population size, likely continued decline of at least 20% in 2 generations and the single population has fewer than 250 mature trees.

Criterion D: (Very Small Population or Restricted Distribution): Endangered D1 with only 14 trees and two saplings remaining.

Criterion E: (Quantitative Analysis): Not available.

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

John Ambrose came to the University of Guelph Arboretum in 1974, after receiving a PhD in Botany from Cornell University. At the Arboretum, in addition to being the Curator, he developed a program based on the rare woody plants of the Carolinian Zone of southern Ontario, including field surveys, status reports and detailed studies of their population and reproductive biology. After 17 years there, he moved to the Toronto Zoo as Curator of Botany/ Manager of Horticulture. There he developed new natural habitat exhibits and a naturalization program for peripheral lands of the site, in addition to his exhibit responsibilities. These reflect his growing interest in restoration ecology. In 1999 he left the Zoo to teach a new course in restoration ecology at the University of Guelph. He currently is self-employed and continues to work with endangered species recovery planning, serving on four recovery teams for Carolinian trees and Carolinian Woodlands.

COLLECTIONS EXAMINED

Herbarium records and sightings previously compiled by the author at the University of Guelph Arboretum were consulted. Element Occurrence reports from the Natural Heritage Information Centre and mapped occurrences in the MNR database were consulted. The Martindale specimen collected by F. Montgomery and B. Miller was examined at OAC (Herbarium, University of Guelph).