Recovery Strategy for Cucumber Tree (*Magnolia acuminata* L.) in Canada

Photo by Donald Kirk

May 2007

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Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of Ontario has given permission to the Government of Canada to adopt the Recovery strategy for Cucumber Tree (*Magnolia acuminata* L.) in Canada under Section 44 of the *Species at Risk Act* (SARA). Details are provided in the addenda of this document.

This recovery strategy is the recovery strategy of the Minister of the Environment of Canada for this species.

May 2007

Recommended Citation

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« Programme de rétablissement du magnolia acuminé (*Magnolia acuminata* L.) au Canada »

Responsible Jurisdictions

Cucumber Tree occurs in the province of Ontario, and the recovery strategy was developed by the province. The Canadian Wildlife Service - Ontario Region, on behalf of the competent minister (the Minister of the Environment), cooperated in the development of the recovery strategy

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Preface

The Cucumber Tree is under the management jurisdiction of the Ontario provincial government and Environment Canada (Canadian Wildlife Service – Ontario Region).

The *Species at Risk Act* (SARA, Section 37) requires the competent Minister to prepare a recovery strategy for all listed extirpated, endangered or threatened species. SARA Section 44(1) allows the Minister to adopt an existing plan for the species if it meets the requirements under SARA for content (Section 41).

The Cucumber Tree was listed as Endangered under SARA in June 2003. The Ontario Ministry of Natural Resources led the development of this recovery strategy for the species in cooperation with the Canadian Wildlife Service – Ontario Region, Environment Canada. An addenda to this document presents how responsible jurisdictions receive of this strategy.

Executive Summary

This Recovery Strategy outlines the objectives and strategies necessary to bring about the protection and recovery of Canadian populations of Cucumber Tree (*Magnolia acuminata* L.). The Recovery Strategy is based on a review of literature, historical collections and current population data and consultation with knowledgeable individuals.

Cucumber Tree has a very limited distribution in Canada, occurring in only two areas of southern Ontario. The total number of naturally occurring trees and saplings is currently 283, following recent intensive census and mapping exercises. In addition, over 100 seedlings have been counted most of which occur in one single population. The entire complement of trees represents 12 extant populations (i.e. aggregations of all sub-populations within 1 km) or a total of 22 separate and extant sub-populations. Limited recruitment within their forest habitats has been observed. The threat of landscape fragmentation and small population sizes needs to be better understood to refine recovery actions.

The goal of this Recovery Strategy is to conserve and if necessary restore Cucumber Tree to self-sustaining populations in both regions of its native Canadian range in extreme southwestern Ontario.

Some of the recovery approaches identified in this Recovery Strategy, beyond protecting what is there, are dependent on current and future research, to better understand the species pollination biology, seed dispersal, seedling establishment and population genetics. The report outlines and prioritizes research programs necessary to support the implementation of the recovery actions.

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I. RECOVERY

1. Recovery Goal:

To conserve and if necessary restore Cucumber Tree to self-sustaining (i.e., demographically viable) populations in both regions of its native Canadian range in southern Ontario (i.e. Norfolk County south and west of Simcoe and the Town of Pelham within the Regional Municipality of Niagara).

2. Recovery Objectives:

Objective I: Protect existing natural populations and their habitats, with priority on the critical habitats in the next 5 years (i.e., those identified in section 13.2).

> The landowner contact process for the regulation of remaining unregulated populations under the Ontario Endangered Species Act was completed in 2005. Significant habitat mapping for the purpose of the Conservation Land Tax Incentive Program (CLTIP) will be undertaken on eligible properties. The CLTIP offers landowners the option to participate in a tax reduction program on the portion of their property which has been identified as significant habitat for a regulated Endangered Species. Other means to protect and secure habitats should also be employed, such as stewardship, conservation easement agreements, use of income tax incentive programs such as the Ecological Gifts program, and other land securement measures, education and awareness within the local regions, partnering with landscape restoration programs, such as Carolinian Canada's Big Picture for the entire zone, and local projects of the Long Point and Niagara regions. Protection of identified endangered species habitat can be achieved by means of implementing Section 2.3 of the Provincial Policy Statement.

Objective II: Increase population size to 50 reproductive individuals in at least two sites within each of the two regions where this species occurs over the next 25 years.

> Population increases could be achieved by natural recruitment, through management or restoration that will allow reconnection of forest fragments and thus better contact of sub-populations on adjacent properties. Achieving populations in the range of 50 reproductive individuals is seen as a measure of success to ensure stable populations and will be used as an initial population and distribution goal. However, as research continues on the demographic rates of this species, revised objectives may be required to reflect improved knowledge of the species' population and distribution needs for recovery. Management to achieve a habitat matrix for pollinators and seed dispersers (once they are better understood), and seedling recruitment (once guidance can be provided from current studies) may also be important to promote population expansion through natural processes.

Objective III: Conduct research to better understand this species biology and ecology with respect to its state of jeopardy over the next 3 years.

Undertake a preliminary assessment of pollination biology, seed dispersal, seedling establishment, population genetics and how these are affected by fragmentation of Cucumber Tree habitat in the landscape of southern Ontario. Develop a research plan to address the information gaps and provide guidance necessary to effectively manage Cucumber Tree and its ecosystem.

Objective IV: Develop and carry out a landscape restoration plan to reduce the impacts of fragmentation or other factors on the identified habitats. Include public awareness and opportunities for landowner stewardship and community participation, with site specific management plans over the next 5 years.

Work with land owners and seek willing participants; seek partnerships with funding organizations to cover expenses and community volunteers to carry out work. Participate with partners in landscape restoration initiatives to reduce the habitat fragmentation and maximize effectiveness in natural landscape restoration for Cucumber Tree, including Carolinian Canada's Big Picture project, stewardship councils and local initiatives in both regions.

3. Approaches to Meeting Recovery Objectives:

Table 1. Recovery Strategy Priorities for *Magnolia acuminata* L.

Priority	Objective	Broad Approach	Specific Steps	Anticipated Effect	Threats Addressed
Urgent	I	Legal and Policy Protection	• Complete regulation of new sites under provincial Endangered Species Act (ESA) • Develop and apply provincial habitat mapping guidelines for application of the Provincial Policy Statement and Endangered Species Act • Provide mapping and information on the status and protection of the species to affected municipalities • Identify and map critical habitat on federal lands	• Legal and policy protection of the species and its habitat	• Poor forest management practices • Habitat fragmentation
Urgent	I	Habitat protection-Stewardship	• Contact eligible landowners to encourage	• Landowner cooperation to protect occupied	• Poor forest management practices

Priority	Objective	Broad Approach	Specific Steps	Anticipated Effect	Threats Addressed
			participation in the Conservation Land Tax Incentive Program (CLTIP) • Secure land where appropriate through conservation easement agreements and use of income tax incentive programs such as the Ecological Gifts program • Encourage stewardship of sites	habitats • Enhanced cooperation over wider habitat area • Community awareness	• Habitat fragmentation
Necessary	II	Habitat Management	• Assess best opportunities for restoring connections between small populations • Connect small populations to increase recruitment • Encourage sustainable forest management to protect habitat and trees and increase recruitment	• Increased size of small populations (short-term) • Enhanced ability of populations to be self-sustaining • Increased recruitment at managed sites	• Fragmentation of habitats • Poor forest management practices • Low connectivity and small population size
Urgent/ necessary	III	Research	• Complete a preliminary assessment of the effects of habitat fragmentation on pollination	• Improved understanding of this threat • Development of management & restoration approaches to mitigate threat • Improved understanding of biology and ecology to direct management action • Development of management & restoration approaches and guidelines	• Fragmentation of habitats
Necessary	III	Conduct research	• Conduct detailed pollination, demographic and seed dispersal studies	• Improved understanding of biology and ecology to direct	• Low connectivity and small population size

Priority	Objective	Broad Approach	Specific Steps	Anticipated Effect	Threats Addressed
			• Determine genetic composition of populations • Characterize critical habitats • Develop forest management guidelines to mitigate the effects of forest harvest and promote recruitment	management action • Development of management & restoration approaches and guidelines	• Poor forest management practices
Necessary	IV	Landscape restoration (long term)	• Assess best opportunities for creating landscape connections between populations • Seek willing landowners and volunteers to participate in restoring landscape connectivity • Develop and implement regional and site-specific management plans • Cooperate with other organizations involved in landscape restoration (ex. Carolinian Canada, stewardship councils, etc.)	• Increased habitat for recruitment • Increased effective population sizes • Improved connectivity between populations • Guidance for targeted landscape restoration activities • Coordination among partners for more effective actions and use of resources	• Low connectivity and small population size
Beneficial	IV	Public awareness and participation	• Seek willing land owners and volunteers to carry out planting	• Raise profile • Increase interest by local community	• Low connectivity and small population size • Habitat fragmentation • Poor forest management practices

4. Potential Impacts of Recovery Strategy on Other Species/Ecological Processes:

From management trials we know that regeneration of this species can be enhanced in its natural habitats. We must also examine impacts (positive and negative) on other species and the ecosystem as a whole. Contact and cooperation with other recovery teams and taxonomic group specialists will be important before recommending management throughout the two regions. Management for this species has shown that sensitive opening of the forest promotes regeneration. For management recommendations the form and size of openings will need to be better defined. However, it is also important to consider the positive or negative impacts that such management would have on other species in the forest ecosystem.

5. Actions Already Completed or Underway:

Cucumber Tree was first regulated by individual sites under the *Endangered Species Act* in 1986. New sites representing natural and/or regenerating populations have been discovered since then and were put in regulation under the Act in 2005. Endangered Species Habitat Mapping was completed for OMNR for the Conservation Land Tax Incentive Program (CLTIP) (initial mapping in 1998, additional sites completed in 2000). OMNR is currently assessing suitability of identified habitats for CLTIP and, pending the availability of resources, may initiate a new round of landowner contact sometime in the near future.

Carolinian Canada has produced the mapping for the Big Picture Project, including core natural areas and best connections for restoration. These need to be viewed in light of this species' habitats and assess where restoration action would be best sited.

Long Point Region Conservation Authority (LPRCA) and the University of Guelph (Uof G) are conducting habitat surveys and analysis of recruitment under different conditions that will add to our understanding of Cucumber Tree habitat characterization and regeneration dynamics.

In 2002, the Department of Environmental Biology at the University of Guelph conducted investigations on the pollination dynamics of Cucumber Tree, which included the trapping of potentially important pollinators and the examination of their bodies for pollen. In addition, preliminary monitoring was carried out on mammalian and avian fruit and seed dispersers. This work continued into 2003.

LPRCA received funds from the Habitat Stewardship Program (HSP) in 2004 to complete a project titled Long Point Region Natural Heritage Woodland Special Species Protection. This included inventories and the preparation of management plans for LPRCA properties to assist with the recovery of species at risk. In 2005 and 2006 the LPRCA embarked on a Cucumber Tree habitat management program for the Smith Tract. In the winter of 2006 other species of trees and saplings were carefully marked and culled in order to reduce competition and promote the regeneration of Cucumber Tree.

Management options are currently under consideration for the Shining Tree Woods property. A document was prepared to investigate the available options and a final decision will be made by the North American Native Plant Society board. Management options under consideration include: removing some mature trees to open the canopy and promote Cucumber Tree regeneration, encourage the expansion of habitat into the adjacent old fields so that Cucumber Trees might colonize when conditions are favourable, and more active restoration of the old fields including planting some Cucumber Trees from the local seed source.

6. Statement of when One or More Action Plans in Relation to the Recovery Strategy will be Completed.

An action plan addressing implementation of the recommendations in the strategy will be prepared by 2008 dependent on priorities and constraints of the lead and participating organizations.

7. Evaluation:

Performance measures for evaluating the success of recovery planning and efforts will include the extent to which goals and objectives have been met, specifically:

1. Changes in population size, trend, recruitment, productivity, with explanations for the changes.
2. Characterization and identification of critical habitat.
3. Proportion of identified critical habitat that has been protected.
4. The extent to which stakeholders have been consulted with or become involved in recovery activity.
5. Success in mitigating threats.
6. Level of public support for recovery work.

II. BACKGROUND

Date of Assessment: May 2000
Common Name: Cucumber Tree
Scientific Name: *Magnolia acuminata*
COSEWIC Status: Endangered
Reason for Designation: This species is present in two disjunct and very limited areas with critically low numbers of reproducing trees.
Canadian Occurrence: Ontario
COSEWIC Status History: Designated Endangered in April 1984. Status re-examined and confirmed Endangered in April 1999 and in May 2000. Last assessment based on an existing report.

OMNR Status: **Endangered (regulated)**

8. Species Information

8.1 Description of the Species:

The Cucumber Tree is the only native *Magnolia* species in Ontario. It is a forest species which can grow to a height of 30 m in its Ontario range. The leaves are large, simple and without teeth. They can be 10 to 24 cm in length and half that in width. Large greenish-yellow flowers emerge in early summer and are pollinated by beetles and other insects. The fruit matures in late summer and is composed of many red, fleshy pods, each containing one or two seeds. The tree is named for the slight resemblance of the immature fruit to a cucumber.

9. Distribution

9.1 Global Range:

Cucumber Tree is a minor forest tree species of eastern North America, with its central distribution from south-eastern New York to northern Georgia, with outlying populations occurring in southern Ontario to Florida (including Indiana, Illinois, Missouri, Oklahoma and Louisiana) (see Figure 1).

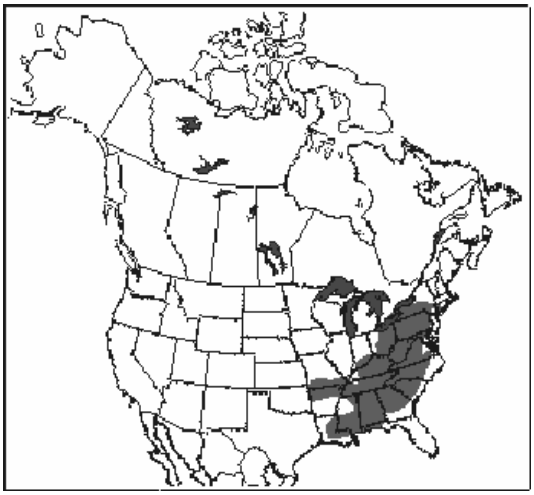

Figure 1. Natural Distribution of *Magnolia acuminata* in North America (after Ambrose, 1987).

9.2 Canadian Range:

Cucumber Tree only occurs in two regions of southern Ontario: Town of Pelham in the Regional Municipality of Niagara and south and west of the Town of Simcoe in Norfolk County (see Figure 2).

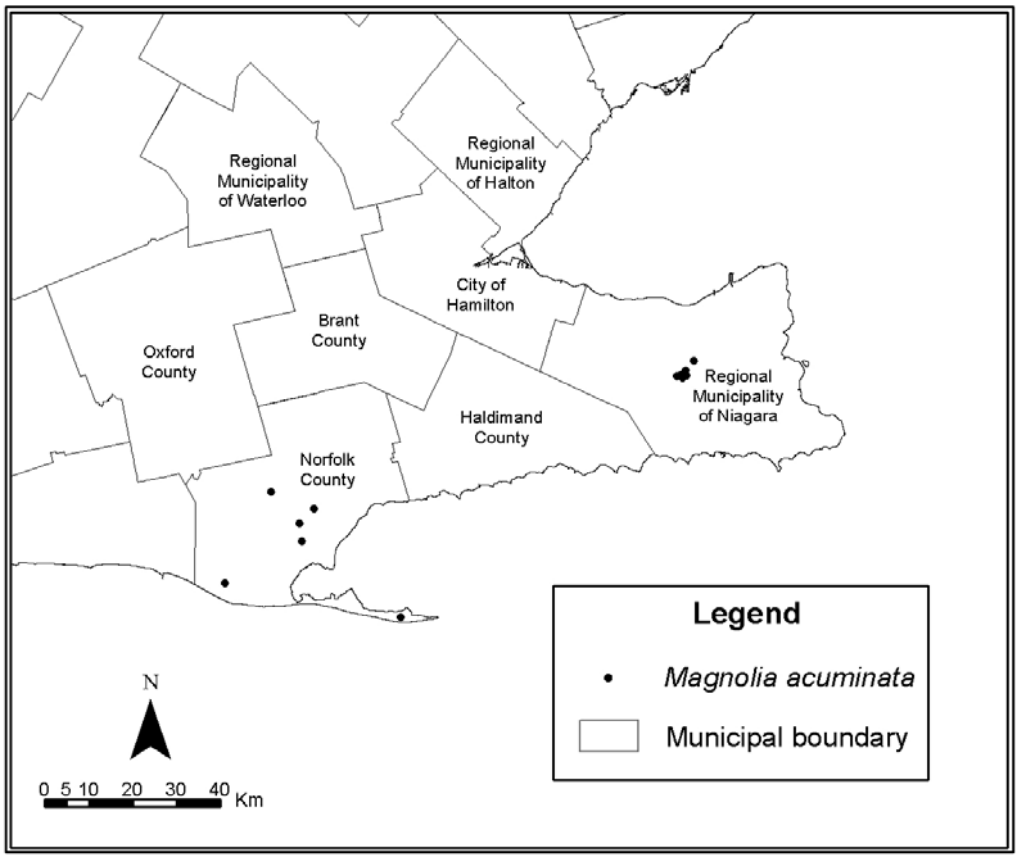

Figure 2. Natural Distribution of *Magnolia acuminata* L. in Canada

9.3 Percent of Global Distribution in Canada:

It is unlikely that the Ontario populations represent more than a fraction of a percent of the entire distribution, since populations in their central range are not designated and thus assumed to be more abundant. Isolated populations occur in peripheral areas, some with sufficient restriction to warrant listing by state authorities.

9.4 Distribution Trend:

It is difficult to determine the rate of change in geographic distribution because of a lack of complete historical records and a recent intensified effort to search for Cucumber Trees. Although the number of records has increased in recent years, this does not necessarily represent an expansion of the species range in Canada. This increase is more likely a result of the intensified effort to study the species. Of the 31 known locations for Cucumber Tree in Ontario, 8 have been lost since 1930; 4 were in Norfolk County and 4 were in Niagara Region.

10. Population Abundance:

10.1 Global Range:

This species is considered secure globally with a rank of G5, thus there are assumed to be numerous populations of this species in its central Appalachian range. While widespread in eastern North America, it is listed as S1 in three states (Indiana, Oklahoma and Florida), S2 in Ontario and secure in only two states (North Carolina and Pennsylvania: S5). In all other states Cucumber Tree remains unranked (S?) or only as reported without rank (SR), according to the current NatureServe (2004) web site. See Table 2.

Table 2. Natural Heritage Rankings for *Magnolia acuminata* (NatureServe, 2004)

Level	Heritage Status Rank
Global	G5
Canada	N2
Ontario	S2
USA	N5
Alabama	SR
Arkansas	SR
Connecticut	SR
Florida	S1
Georgia	SR
Illinois	S?
Indiana	S1
Kentucky	S?
Louisiana	SR
Maine	SE
Missouri	SR
New Jersey	SE

New York	S?
North Carolina	S5
Ohio	SR
Oklahoma	S1
Pennsylvania	S5
South Carolina	SR
Tennessee	SR
Virginia	SR
West Virginia	S?

G: global, N: national, S: sub-national
1: Critically Imperilled
2: Imperilled (i.e., extremely rare or especially vulnerable)
3: Vulnerable (i.e., rare and uncommon)
4: Apparently Secure (i.e., uncommon but not rare)
5: Secure (i.e., common, widespread, and abundant)
?: Unranked
R: Reported (i.e., reported but not ranked)

10.2 Canadian Range:

There is some evidence that *Magnolia acuminata* has experienced decline in Canada, specifically Ontario, over the past century. Historical records suggest Cucumber Tree was previously more abundant in both regions of Ontario than at present. Some sites are confirmed to have been lost within the past 20-70 years (Ambrose & Aboud, 1983); (see section 19). Over the past 20 years thorough and systematic searches have been made of Cucumber Tree populations by OMNR staff, consultants and scientists. During this same period new populations have been discovered by forestry staff of OMNR and private landowners. In the past two years more thorough field surveys have led to the discovery of one new population and additions of individual trees and saplings to known populations. Recent mapping has confirmed the presence of 283 trees and saplings on 32 properties (or 13 endangered plant communities (EPC), since some share the same EPC). While the loss of a few individual trees has been documented, there likely has not been a significant decline of this species since its designation, due to the increased awareness of its jeopardy and increased actions for its protection.

A report of a tree near Ipperwash, already cut down when reported by Fox and Soper (1952), was possibly erroneous. It may have been confused with Tulip Tree (*Liriodendron tulipifera*) which is abundant in that area. John Goldie, in his journal of 1819, states "in this part of the country [New York State] the inhabitants call it [Liriodendron] Cucumber Tree."

Table 3 presents all available data on extant and extirpated populations of *Magnolia acuminata* in Canada that are believed to be naturally occurring. It should be noted that for the purposes of this recovery strategy, populations are considered to be independent if separated by one kilometre or more, and that groupings of trees separated by less than one kilometre are considered sub-populations (NHIC, March 2001). The sighting for Ipperwash in Lambton County will be assumed to be erroneous unless more supporting evidence can be found. The absence of this species in adjacent Michigan and north-western Ohio (Voss 1985; Barnes & Wagner, 1981) leads to further questioning of this sighting.

10.3 Percent of Global Abundance in Canada:

The percent of global abundance in Canada is not known, however is estimated to be less than one percent.

10.4 Population Trend:

The rate of population change cannot be accurately measured due to incomplete records prior to 1978. However, based on complete records since 1978, there has been a documented loss of 13 trees from 4 sites and regeneration noted at 8 sites. This indicates that there has not likely been a significant decline of abundance in recent years.

Table 3. Estimated Abundance of *Magnolia acuminata* L. in Canada

Population Name & #	Geographic Township and/or Municipality	No. of individual trees and saplings (not including coppice stems or seedlings)	Regeneration
NORFOLK COUNTY			
I. Smith Tract + adjacent properties	Charlotteville Geo. Tp	88	Yes
II. Baker Tract & adjacent property	Charlotteville Geo. Tp.	11	Minor
III. Walsh	Charlotteville Geo. Tp.	17	Yes
IV. Lynedoch (Delhi Big Creek ANSI)	Charlotteville Geo. Tp.	20	Yes
V. Shining Tree Woods +adjacent properties	Houghton Geo. Tp.	33	Yes
VI. Long Point National Wildlife Area.	South Walsingham Geo. Tp	11	Minor
REGIONAL MUNICIPALITY OF NIAGARA			
VII. North Pelham Valley ANSI	Town of Pelham	2	No
VIII. Fonthill Kame: West Slope	Town of Pelham	8	No
IX. North Fenwick Footslope Forest ANSI	Town of Pelham	35	Minor or no regeneration
X. Fenwick Slough Forest Woodlot + nearby woodlot	Town of Pelham	41	Yes
XI. Northwest Fenwick Forest ANSI	Town of Pelham	16	Yes (102 seedlings counted)
XII. Memorial Drive	Town of Pelham	1	
TOTAL	**12 extant populations**	**283 trees and saplings**	**8 sites with regeneration**

11. Biologically Limiting Factors:

Pollination:

Out-crossing promotes higher seed set (Ambrose & Kevan, 1990). While this species is not fully self incompatible, the reduced seed set of individual trees reduces the reproductive potential of isolated, small populations. Furthermore, the pollinators may further limit reproductive potential; only preliminary information is known about the beetles and other insect pollinators of this species (Thien, 1974; Ambrose & Kevan, 1990). Better defining the major pollinators and understanding their foraging behaviour will help assess what impact forest management practices and habitat fragmentation may have on limiting out-crossing in this species.

Seed dispersal:

Primary seed dispersal is most likely by birds. The fruit has the typical characteristics of bird dispersal and van der Pijl (1969) gives *Magnolia* as an example of this syndrome. However, it is not know what species of birds may be responsible for seed dispersal in Ontario populations. How the seeds are consumed and dispersed have important implications for the distance of individual dispersal events and thus the genetic mixing or isolation of sub-populations. However, frugivorous birds have been observed to disperse more seeds in treefall gaps than the surrounding forest (Hoppes, 1988) which is beneficial for shade intolerant species such as Cucumber Tree. Squirrels and small ground mammals may also play a secondary dispersal role, but they are more likely to consume or otherwise damage a higher proportion of the seeds that they have contact with. While germination of some seeds with impervious seed coats can be improved with scarification, this is not the case with this species (Kock, 1998).

Shade intolerance:

Some opening of the forest canopy appears to be important for effective seedling recruitment. Forest management that leaves small forest openings has been shown to be effective at promoting natural regeneration in southern Ontario (OMNR, 2000). Currently a study is underway by the Long Point Region Conservation Authority (LPRCA) and the UofG, to compare regeneration under different forest canopy conditions, some of which have been opened by experimental forestry operations (Reader and de Gruchy, pers. comm, 2001).

12. Threats:

Fragmentation of habitats:

Many populations are isolated due to habitat fragmentation, which likely reduces cross-pollination, range of seed dispersal and effective population size. Fragmentation likely also impacts habitat for pollinators and seed dispersers thus reducing optimal pollination and seed dispersal. Actual habitat loss appears to be a less significant threat, possibly because many of the habitats are in wet, headwater area woods that have been left when higher land was cleared for agriculture.

Low Connectivity and Small Population Size:

Less than optimal connectivity between sub-populations and their small population sizes may reduce opportunities for gene exchange. Over time, this can result in a species' decreased ability to adapt to change and possibly extirpation or extinction. Several Cucumber sites have small populations that are isolated from others and two populations appear to be based on single parents.

Forest Management:

Poor forest management can be detrimental to the health and survival of Cucumber Tree populations. The effects include indiscriminate cutting, bark abrasion to trees adjacent to skidder trails or felled trees, smothering of saplings by slash piles, soil erosion and soil compaction. However, selective harvesting using good forestry practices can provide conditions which promote regeneration and most landowners respond positively to this knowledge about the species.

Alteration of Soil Moisture Regime:

Cucumber Trees are primarily found in moist to mesic forests with imperfect to well-drained soils and they do not tolerate overly wet or overly dry conditions. Some reports claim that although Cucumber Tree is moderately drought tolerant, prolonged alteration of soil moisture may adversely affect the tree's survival, especially in mature specimens. Although there are no reports of a decline in Cucumber Trees resulting from this threat, its potential should be considered when activities are undertaken nearby.

Table 4. Evaluation of Human-induced Threats to *Magnolia acuminata*

Population Name & #	Source of Threat	Threat Type	Spatial Extent	Temporal Extent	Certainty
I. Smith Tract and adjacent properties	Logging	Contributing	One sub-population	periodic	Confirmed
Forestville, Norfolk Co.	Logging	Complete loss	Through site	one time	Confirmed
IV. Lynedoch, Norfolk Co.	Logging	Complete loss	One sub-population	one time	Confirmed
IV. Lynedoch, Norfolk Co.	ATV trail	Potential	Local	episodic	Speculative
Fairground, Norfolk Co.	Logging	Complete loss	Through site	one time	Confirmed
XI. Fonthill Kame, west slope	Roadside maintenance?	Complete loss	One sub-population	periodic	Speculative
XII. Fenwick Slough Forest Woodlot	Construction activity	Contributing	One sub-population	one time	Confirmed

13. Habitat Identification:

13.1 Habitat Needs:

The generalized habitat characteristics of viable populations of this species in Ontario are an upland moist deciduous or mixed forest, often in a headwaters area with undulating topography of low swampy areas interspersed with rises (Ambrose & Aboud, 1983). The established trees occur in the better drained areas within this matrix and regeneration is seen where the forest cover is partially open. Table 5 provides a summary of vegetation community information gathered at each Cucumber Tree population for the purpose of habitat mapping (Dougan & Assoc, 1998; Ambrose, 2000). In addition to overstory and understory species characterization, corresponding ELC codes and general forest community descriptions are provided.

Table 5. Summary of Species Noted in Habitats Occupied by *Magnolia acuminata* L. in Ontario Populations.

Population Name & #	Overstorey	Dominant Understorey	Ecological Land Classification (ELC) Description	Number of Trees
NORFOLK COUNTY				
I. *Smith Tract* + *adjacent properties*	Red Maple, Beech, Yellow Birch, Tulip Tree, Red Oak, White Oak, Trembling Aspen, Bigtooth Aspen, Black Gum, White Ash	Witch Hazel, Sassafras, Spicebush	**SWD3-1** – Red maple mineral deciduous swamp **SWD3-2** – Silver maple mineral deciduous swamp **SWD4-3** – White birch - poplar mineral deciduous swamp **FOD8-2** – Fresh – moist poplar, sassafras deciduous forest **FOD6** – Fresh- moist sugar maple deciduous forest **SWT3-11** – Spicebush organic thicket swamp	88 trees and regeneration
II. *Baker Tract & adjacent property*	Red Maple, Sugar Maple, Beech, Black Cherry, Red Oak, White Oak, Trembling Aspen, Bigtooth Aspen, White Pine	Witch Hazel, Sassafras, Maple-leaved Viburnum, Spicebush	**FOD8-1** – Fresh moist poplar, sassafras **SWD3-1** – Red maple mineral deciduous swamp **FOD2-4** – Dry fresh oak hardwood deciduous forest	6 trees and regeneration
III. *Walsh*	White Pine, Red Maple, Sugar Maple, Black Cherry, Black Oak, White Elm	Sassafras, Black Walnut, American Chestnut	**CUP3-2** – White pine plantation interspersed with hardwoods **FOD2-1** – Dry fresh red oak, white pine, red maple	17 trees and saplings
IV. *Lynedoch*	White Pine, Scots Pine, Red	White Ash,	**CUP3-3** - Scots pine	1 tree and 19

Population Name & #	Overstorey	Dominant Understorey	Ecological Land Classification (ELC) Description	Number of Trees
(Delhi Big Creek ANSI)	Maple, Sugar Maple, Red Oak, White Oak, Shagbark Hickory, Bigtooth Aspen, Norway Maple	Sassafras, American Hazel, White Mulberry	plantation **FOD5-9** – Dry-fresh sugar maple, red maple deciduous forest	saplings
V. Shining Tree Woods + adjacent properties	Red Maple, Beech, Sugar Maple, White Ash, Eastern Hemlock, Tulip Tree, Trembling Aspen, Red Oak	Sassafras, Witch Hazel, Spice Bush	**FOM6-2** – Fresh moist hemlock, red maple, yellow birch, sugar maple **FOD9-2** – Fresh moist red oak, white oak, red maple, silver maple	32 trees and regeneration
VI. ***Long Point National Wildlife Area***	White Oak, Chinquapin Oak, White Pine, White Ash, Red Oak	No data	**FOM-1** - Dry oak – pine mixed forest	11 trees and regeneration
REGIONAL MUNICIPALITY OF NIAGARA				
VII. ***North Pelham Valley ANSI***	Sugar Maple, Red Maple, Red Oak, Eastern Hemlock, Basswood, White Oak, Red Oak, Tulip Tree, Bigtooth Aspen, White Birch	Sassafras, Spicebush, Maple-leaved Viburnum	**FOD1-4** – Dry–fresh mixed red oak, white oak, black oak deciduous forest **FOD6-5** – Fresh-moist sugar maple, beech, basswood red oak, red maple, shagbark hickory **FOD6-3** – Fresh-moist sugar maple, yellow birch , hemlock deciduous forest	2 trees (one recently toppled)
VIII. ***Fonthill Kame: West Slope***	Sugar Maple, Beech, Red Oak, Red Maple		**FOD6-5** - Fresh-moist sugar maple, beech, basswood red oak, red maple, shagbark hickory	7 trees and 1 sapling
IX. ***North Fenwick Footslope Forest ANSI***	Red Maple, Sugar Maple, Beech, Black Cherry, Red Oak, Black Oak, Eastern Hemlock, Tulip Tree	Gray Dogwood, Meadowsweet, Sassafras	**SWD3-1** – Red maple mineral deciduous swamp **FOD6-5** - Fresh-moist sugar maple, beech, basswood red oak, red maple, shagbark hickory **SWT2-6** – Meadowsweet mineral thicket swamp **SWD2-9** – Gray dogwood mineral thicket swamp	35 trees and regeneration
X. ***Fenwick Slough Forest Woodlot + nearby woodlot***	Sugar Maple, Red Maple, Silver Maple, Beech, Black Cherry, Red Oak, Eastern Hemlock, Black Oak	Sassafras, Witch Hazel, Trembling Aspen	**FOD6-5** – Fresh to moist deciduous sugar maple deciduous forest **FOC3** – Fresh to moist hemlock coniferous forest **SWD3-1** – Red maple mineral deciduous	41 trees and regeneration

Population Name & #	Overstorey	Dominant Understorey	Ecological Land Classification (ELC) Description	Number of Trees
			swamp	
XI. ***Northwest Fenwick Forest ANSI***	Red Maple, Eastern Hemlock, Beech, Red Oak, White Ash, Trembling Aspen	Sassafras	**FOM6-1** – Fresh to moist sugar maple-hemlock mixed forest **FOM6-2** - Fresh to moist hemlock-hardwood mixed forest **SWM2-1** – Red maple-conifer mineral mixed swamp **SWD3-1** – Red maple mineral deciduous swamp **FOD8-2** – Fresh to moist sassafras deciduous forest	16 trees and abundant regeneration
XII. ***Memorial Drive east of Balfour St.***	Red Maple, Sugar Maple, Black Cherry, Shagbark Hickory	Sassafras, Witch-hazel, Maple-leaved Viburnum	**FOD2-4** – Dry-fresh oak maple-hickory hardwood	1 tree

13.2 Critical Habitat:

SARA defines critical habitat as "the habitat that is necessary for the survival or recovery of a listed wildlife species". In order to identify critical habitat, a comprehensive understanding is required of the species habitat requirements at all stages of its life. Sufficient information is not currently known to accomplish this in its entirety. As a result, Critical Habitat is identified to the extent currently known and a schedule of studies has been developed to identify the necessary information required to complete the identification (see Section 13.4). The schedule of studies is not an exhaustive list and it is expected that further questions will arise as research proceeds. It is expected that modification of the Critical Habitat identification may occur as a result of further research and a population viability analysis (PVA).

Critical habitat for Cucumber Tree is being identified, to the extent possible, and includes the vegetation communities in which the populations occur, as defined by the characteristics of those populations in the two meta-population areas that have 10 or more mature trees and are showing successful regeneration. Provincial habitat mapping guidelines (MNR 1998) have been developed for Cucumber Tree for the purposes of the Conservation Land Tax Incentive Program, which could be applied to map critical habitat. The habitat identified for this exercise included the occupied habitat and the extent of the vegetation communities (based on Ecological Land Classification) in which a Cucumber Tree population occurs (referred to as the Endangered Plant Community in CLTIP guidelines). If the Endangered Plant Community is less than 100m from the occupied habitat and adjoins a natural plant community, then a buffer is included to extend the area to be protected up to 100m. These areas are critical to the survival of the species and will form the basis of its natural expansion into recovery habitats once threats are alleviated.

In addition to the habitat description in section 13.1, the critical habitats are further characterized by the presence of the following associated species, listed in order of highest frequency: *Acer rubrum, A. saccharum, Betula papyrifera, Fagus grandifolia, Prunus serotina, Quercus rubra*, and *Tsuga canadensis*. The following are occasional associates: *Amelanchier arborea, Betula alleghaniensis, Castanea dentata, Fraxinus americana, Lindera benzoin, Liriodendron tulipifera, Pinus strobus, Quercus alba, Quercus velutina*, and *Sassafras albidum*.

Cucumber Tree is listed as Endangered under the federal *Species at Risk Act* and is regulated under Ontario's *Endangered Species Act*. This provides protection to the tree and its habitat. Ontario's *Provincial Policy Statement* also offers protection by not permitting development or site alteration in its significant habitat.

List of Critical Habitats:

***Norfolk County*:**

1. Smith Tract and adjacent properties
2. Shining Tree Woods (NANPS)
3. Long Point National Wildlife Area

Regional Municipality of Niagara:

4. North Fenwick Footslope Forest ANSI
5. Fenwick Slough Forest Woodlot
6. Northwest Fenwick Forest ANSI

In addition to the critical habitats identified above there are other extant populations that for various reasons are considered marginal for regeneration. These include populations of a few or single tree or populations which are restricted by a very limited area of suitable habitat (e.g. Lynedoch and Walsh). These also include several remaining Element Occurrence sites that are documented in the NHIC database. However most if not all of these latter populations are now extirpated (Ambrose & Aboud, 1983). Some of these sites may present opportunities to increase the viability of the population if the habitat remains suitable for re-introduction and the landowners are agreeable. They may be included in the critical habitat if Cucumber Trees are confirmed or the characterization of the species' habitat has not been altered and it is determined they are necessary for recovery, based on the results of the research activities identified in Section 13.4.

List of Other Habitats:

Norfolk County

Extant:

1. Lynedoch
2. Walsh
3. Baker Tract

Extirpated:

1. Fairground, 0.5 km west of, last two trees cut in early 1980s
2. Forestville, 3.3 km NNW. Last seen in late 1950s
3. Green's Corners, south of (1948)
4. Lynedoch, 2 km WSW of (1992). Woodlot logged in 1992. (Dougan, 1998).
5. Turkey Point (1932)

Regional Municipality of Niagara

Extant:

1. North Pelham Valley
2. Fonthill Kame
3. Memorial Drive

Extirpated:

1. Hurlburt's Woods near Fonthill (1947).
2. Three Mile Woods (1942)
3. West Lincoln Tp. (1978)
4. St. Catharines, near (1897)
5. St. David's roadside (1998)

More information is needed on characterizing optimal habitat so suitable unoccupied habitat can be delineated in the regions of known populations to focus management, restoration and possible introduction efforts. The occurrence of small populations in isolated forest patches also suggests that there is a minimum habitat area to support a viable population.

13.3 Examples of activities that are likely to result in destruction of the critical habitat

The primary activities that will likely result in destruction of the critical habitat are:

- Forest clearing and fragmentation (although small patches may assist Cucumber tree germination and regeneration).
- Activities which alter drainage patterns, ground water flow and/or soil moisture levels.

13.4 Schedule of Studies

Due to the lack of information required to identify the critical habitat of Cucumber Tree in southern Ontario, a schedule of studies has been developed (see Table 6). This will direct efforts to acquire the necessary information to complete the description of critical habitat. These activities will be completed under the direction of the Recovery Team and Ministry of Natural Resources staff.

Table 6. Schedule of Studies

Description of Research Activity	Expected Results	Estimated Timeline
Mapping of critical habitat on federal lands and if resources permit on other public lands	A precise definition and mapping of critical habitat to meet the CH requirements of SARA	2 years
Determine demographic rates (survivorship, recruitment, dispersal) and the trends and fluctuations of these rates.	Acquire information needed for a Population Viability Analysis (PVA).	3 years
Complete a PVA.	To determine population viability under current conditions and to help evaluate the number of individuals and amount of habitat required to attain viability.	2 years
Further define the habitat needs of Cucumber Tree at all of its life stages.	To help identify potential habitat for population expansion (if required).	3 years
Complete habitat modelling	To refine critical habitat identification and mapping.	1 year

14. Ecological Role:

As a large forest canopy tree, it is an important forest component of the eastern deciduous forest ecosystems of the broader Appalachian regions of the United States. While very limited in Canada's Carolinian life zone, it can be locally abundant in mountain valleys in the Carolinas and Tennessee (Sargent, 1922). Being shade intolerant in wet forest habitats, it is able to fill gaps from wind thrown trees or other disturbance.

15. Importance to People:

The Carolinian Zone of Canada is an area of high interest for naturalists due to its high biological diversity, especially of southern species such as Cucumber Tree, other plants and associated animals, and thus supports a significant ecotourism industry. The wood of Cucumber Tree is similar to and marketed with that of Tulip Tree (the lumber of which is known as Yellow Poplar). It is fine grained and smooth, with applications for such things as Venetian blinds, furniture, doors and trim.

16. Anticipated Conflicts or Challenges:

Some private landowners may be hesitant to allow protection, and access for management and study. Landscape restoration will depend on defining need, working with local groups such as the Long Point Biosphere Reserve Restoration Program and the Niagara Natural Heritage Corridor Program, and finding willing landowner participants. This will be a challenge, considering the intensity of habitat fragmentation and land utilization in these two regions.

17. Knowledge Gaps:

17.1 Survey Requirements:

This species was the subject of an intensive mapping project undertaken by the Ontario Ministry of Natural Resources for the purpose of endangered species regulation and qualification under the Conservation Land Tax Incentive Program. Thus, the locations and basic demographic information is known for most if not all populations in Canada (Dougan Assoc., 1998; Ambrose, 2001). Additional habitat mapping will be undertaken for newly regulated sites, however, closer attention will be given to defining critical habitat.

17.2 Biological/Ecological Research Requirements:

The pollination and reproductive biology of this species is only marginally understood (Ambrose & Kevan, 1990). Further studies are needed to understand its biology and assess where its reproductive potential is being reduced by factors such as habitat fragmentation and small population size. Further, the population genetics of this species may shed light on impacts of habitat fragmentation in relation to population viability and where best to focus recovery activity to reduce the impacts. Additional research is required to evaluate the demographic rates (survivorship, recruitment, dispersal) and the trends and fluctuations in these rates to improve the ability to determine the population and distribution required for Cucumber Tree recovery and to fully identify the Critical Habitat.

17.3 Threat Clarification Research Requirements*:*

Preliminary studies in the spring/summer of 2002 and 2003 were undertaken to better understand the pollination biology of this species, especially its pollinators and pollination mechanisms, as well as assess demographic data with site characteristics and thereby better define further research needs (Kevan, 2003). Analysis of additional information being compiled by the Long Point Region Conservation Authority at the Smith Tract will be useful for understanding habitat definition and optimal conditions of seedling recruitment (LPRCA, 2005)

18. Ecological and Technical Feasibility of Recovery:

Recovery of the Cucumber Tree is considered both biologically and technically feasible. The mechanics of propagating and growing individual trees is well documented (Kock, 1998), but not likely necessary. Regeneration has been observed in several sites and OMNR management trials have been successful in enhancing recruitment (Ambrose & Aboud, 1983). The recovery of populations to a more stable level awaits better understanding of this species' ecology (especially pollination, seed dispersal and recruitment), including a better quantification of distances for gene exchange and general habitat needs, and how best to manage habitats to promote these ecological functions and the species' population viability. Once the genetic composition of populations is better known, increasing the genetic diversity of small or single parent populations may be warranted.

Habitat characterization:

By better understanding the site factors that define an optimal habitat, this species' habitat could be restored on nearby appropriate physical sites and thereby the potential recovery habitat could be enhanced. Seedlings could be reintroduced into extirpated sites or other sites identified as appropriate. However, at this time it is questionable that this latter activity is warranted.

Landscape level habitat restoration:

Restoration on a landscape scale has the potential to link nearby isolated habitats of populations and improve their long term viability, such as through Carolinian Canada's Big Picture program (Jalava et al., 2000). There may be sufficient habitat for occupancy, but not for pollinators, dispersers or maintenance of occasional genetic exchange between sub-populations. Landscape level restoration could address these concerns and improve long term population viability of this and other Carolinian species in jeopardy.

19. Recommended Scale for Recovery:

There are many reasons for considering the recovery of this species in the context of its natural landscape. It typically occurs in sensitive headwater areas, often in association with other plant species at risk (e.g., *Aplectrum hyemale, Castanea dentata, Panax quinquifolium*) and likely animal species that depend on interior forest and/or woodland ponds. While occurring in or near wetlands has likely discouraged land clearing for the expansion of agricultural or other land use, the clearing all around many sites has led to fragmentation of and disconnection from nearby Cucumber Tree populations. Further, as development or agricultural pressures increase, these low forested habitats may come under pressure to clear and drain to the detriment of the species that depend on them as well as viability and ecological functioning of the land to support adjacent human use.

For example an agricultural drain runs through the wet woods just to the east of the Baker Tract and though a sub-population in the North Fenwick Forest ANSI. As an example of how species' occurrences can change with land practices, land surveys of 1805-15 in southern Illinois illustrated that Cucumber Tree was one of the main witness trees (Leitner & Jackson, 1981). Today it has a very limited distribution (and is ranked S?) and critically imperiled (S1) in adjacent Indiana.

Thus, the recommended approach is to take a landscape level approach to natural heritage values and promote the restoration of integrity to the natural landscape. It will serve to address the impacts of fragmentation on this and other species at risk, and to provide an environmentally sensitive framework for future land development. This would follow the concepts of the Carolinian Canada Big Picture project, as well as local initiatives within the zone (e.g., the Long Point Biosphere Reserve restoration program, Niagara Natural Heritage Corridor program).

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ADDENDA

Jurisdiction responses

Ontario

Acknowledgement of Receipt of the
Recovery Strategy for the Cucumber Tree in Canada (May 2006)
by the Ontario Ministry of Natural Resources
on behalf of the Province of Ontario

This Recovery Strategy for the Cucumber Tree has been prepared by the members of the Cucumber Tree Recovery Team in cooperation with Canadian Wildlife Service (CWS) and the Ontario Ministry of Natural Resources (OMNR). It represents advice to the responsible jurisdictions on the recovery goals, approaches and objectives that are recommended to protect and recover the species. It does not necessarily represent the views of all individual members of the recovery team, or the official positions of the organizations with which the individual team members are associated. The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives. Implementation of the plan is subject to policies, appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations

Received by: Cameron Mack
Director, Fish and Wildlife Branch
Natural Resource Management Division
Ontario Ministry of Natural Resources
On behalf of the Province of Ontario

Date: July 2006

Species at risk – act today so they have tomorrow

DECLARATION FROM ENVIRONMENT CANADA

This recovery strategy has been prepared in cooperation with the jurisdictions responsible for the Cucumber Tree. Environment Canada has reviewed and accepts this document as its recovery strategy for the Cucumber Tree, as required under the *Species at Risk Act*. This recovery strategy also constitutes advice to other jurisdictions and organizations that may be involved in recovering the species.

The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives.

This recovery strategy will be the basis for one or more action plans that will provide details on specific recovery measures to be taken to support conservation and recovery of the species. The Minister of the Environment will report on progress within five years.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada or any other jurisdiction alone. In the spirit of the Accord for the Protection of Species at Risk, the Minister of the Environment invites all responsible jurisdictions and Canadians to join Environment Canada in supporting and implementing this strategy for the benefit of the Cucumber Tree and Canadian society as a whole.

STRATEGIC ENVIRONMENTAL ASSESSMENT

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below.

This recovery strategy will clearly benefit the environment by promoting the recovery of the Cucumber Tree. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. For management recommendations the form and size of openings will need to be better defined, and it will also be important to consider the positive or negative impacts that such management would have on other species in the forest ecosystem. Because the

majority of the broad strategies focus on improving habitat connectivity, the SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects.

RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* **[Subsection 2(1)]**.

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry: www.sararegistry.gc.ca/plans/residence_e.cfm

CRITICAL HABITAT

Habitat Protection / Ownership

Cucumber Tree is listed as Endangered under the *Species at Risk Act* and is regulated under Ontario's Endangered Species Act. This provides protection to the individual and its habitat. Ontario's Provincial Policy Statement (PPS) also offers protection by not permitting development or site alteration in its significant habitat. Four of the populations are also designated as Areas of Natural and Scientific Interest (ANSIs), three of which are regional and one of which is provincial; however, only provincial ANSIs are afforded protection under the PPS.

All of the private landowners, and the Long Point Conservation Authority, were contacted in 1998 for the purposes of the Endangered Species Act and the associated Conservation Land Tax Incentive Program. Additional landowners were contacted in 2003-2004.

As summarized in Table 3, the populations of Cucumber Tree occur on a wide range of properties in both Norfolk County and the Regional Municipality of Niagara. However, of these twelve populations, only six are identified at this time as Critical Habitat and include:

***Norfolk County*:**

1. Smith Tract and adjacent properties (Long Point Region Conservation Authority)
2. Shining Tree Woods (NANPS - North American Native Plant Society)
3. Long Point National Wildlife Area (Environment Canada - Canadian Wildlife Service)

Regional Municipality of Niagara:

4. North Fenwick Footslope Forest Regional ANSI (private)
5. Fenwick Slough Forest Woodlot (private)
6. Northwest Fenwick Forest Regional ANSI (private)

The population located on Long Point National Wildlife Area is under federal ownership and is considered to be protected (McKeating 1983); however, specific surveys and mapping of Critical Habitat is still required. This site will be protected under SARA s58 (3) 90 days after a description of the critical habitat within the National Wildlife Area is published in the *Canada Gazette.*

SARA s58(2) requires the Minister of Environment to publish this description in the *Canada Gazette* within 90 days of its identification on the SARA public registry.

Long Point Region Conservation Authority has been fully engaged in the recovery planning process and the property is being managed cognoscente of the presence of Cucumber Tree.

The Shining Tree Woods is owned and managed by the North American Native Plant Society and they have been engaged in the recovery planning process and the property is being managed consistent with the strategies outlined in the Recovery Strategy.

The remaining two populations are found on private properties, two or which are also designated as regional Areas of Natural and Scientific Interest (ANSIs).

Schedule of Studies

Environment Canada is responsible for mapping critical habitat in Long Point National Wildlife Area. In addition, Environment Canada will work in cooperation with the province of Ontario to insure that the schedule of studies is completed to the extent possible prior to the timeline for completing the Action Plan.

Table A.1. Schedule of Studies

Description of Research Activity	Expected Results	Estimated Timeline
Mapping of critical habitat in Long Point National Wildlife Area	A precise definition and mapping of critical habitat to meet the CH requirements of SARA on National Wildlife Areas	January 2008
Mapping of critical habitat if resources permit on other public lands	A precise definition and mapping of critical habitat to meet the CH requirements of SARA	2 years
Determine demographic rates (survivorship, recruitment, dispersal) and the trends and fluctuations of these rates.	Acquire information needed for a Population Viability Analysis (PVA).	3 years
Complete a PVA.	To determine population viability under current conditions and to help evaluate the number of individuals and amount of habitat required to attain viability.	2 years
Further define the habitat needs of Cucumber Tree at all of its life stages.	To help identify potential habitat for population expansion (if required).	3 years
Complete habitat modelling	To refine critical habitat identification and mapping.	1 year

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