

COSEWIC Assessment and Status Report

on the

Cucumber Tree *Magnolia acuminata*

in Canada



ENDANGERED
2010

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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Previous report(s):

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White, D.J. 1999. Update COSEWIC status report on the Cucumber Tree *Magnolia acuminata* in Canada, in COSEWIC assessment and update status report on the cucumber tree *Magnolia acuminata* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-10 pp.

Ambrose, J.D., and S.W. Aboud. 1984. COSEWIC status report on the Cucumber Tree *Magnolia acuminata* in Canada. Committee on the Status of Endangered Wildlife in Canada. 29 pp.

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COSEWIC Assessment Summary

Assessment Summary – April 2010

Common name

Cucumber Tree

Scientific name

Magnolia acuminata

Status

Endangered

Reason for designation

This forest canopy species of the Carolinian zone of southern Ontario is present as a series of small populations in a region of highly fragmented forest cover. Its total Canadian population consists of about 200 trees with most of the sites having only a few mature reproductive individuals. Several sites only have single trees without evidence of regeneration, which makes the species highly susceptible to certain catastrophic events, such as ice storms. Its habitat is under continued impact from local disturbances and loss of forest area.

Occurrence

Ontario

Status history

Designated Endangered in April 1984. Status re-examined and confirmed Endangered in April 1999, May 2000, and April 2010.



COSEWIC
Executive Summary

Cucumber Tree
Magnolia acuminata

Species information

Cucumber Tree (*Magnolia acuminata*) is a forest canopy species of the Magnolia family that can grow to 30 m in height. It has simple, alternate leaves 10-24 cm long, oblong-ovate to elliptic shape with a pointed tip. The buds have a single scale covered with short downy hairs. The bark is brownish-grey and longitudinally furrowed into loose scaly ridges. Flowers are solitary, greenish-yellow and 6-8 cm long. Immature fruits are elongate and cucumber-like, and mature into a red knobby cone-like structure from which the seeds are suspended on long slender threads. Mature seeds have a fleshy orange to scarlet seed coat.

Distribution

Cucumber Tree's natural range is in eastern North America, extending from southern Ontario and western New York, south to Georgia and west to Arkansas. The range of the species in Canada extends over an area of only 557 km².

Habitat

Cucumber Tree grows in rich, moist sites of the Carolinian Forest, often on elevated areas within or at the edge of swamps.

Biology

The species is intermediate in shade tolerance and hence requires forest openings for seedling establishment, such as wet woods with scattered pools. Trees flower in May and release their ripe seeds by the first week of October. Although a few seeds will be produced on lone trees, seed production is best where there are opportunities for cross-pollination.

Population sizes and trends

Because of recent more extensive fieldwork from 1998 to 2008, a total of about 200 trees are estimated to occur in 2008 within natural habitats in southwestern Ontario. These occur at 18 sites grouped within two centres of distribution. The total includes 141 confirmed (47 large) and 47 unconfirmed trees, the latter where access was denied. In 1998-2001, 173 trees (13 unconfirmed) were reported; the difference between the totals (188 in 2008 and 186 in 1998-2001) is not considered significant. This compares with fewer than 50 canopy-sized trees known in 1984, when fewer sites were known. Looking at the total population site by site, most sites have numbers similar to the 1998-2000 inventories done by the Ministry of Natural Resources. Some loss of trees has been documented, but several of the increases are due to trees growing from one class to the next larger (e.g., sapling to tree). One site showed the greatest decline of those properties where the owners allowed access: 20 trees down to 9. In addition to the decline in numbers, some forested areas appear to have been reduced through clearing of edges; with this reduced habitat in areas where access was denied, the status of the trees that could not be confirmed is uncertain. Overall, the Ontario populations appear to be at a steady state.

Threats and limiting factors

Cucumber Tree is threatened by tree-cutting and clearing that occurs on private land where most of the known sites occur. The species is also limited by the reduced reproductive potential of isolated trees and its need for forest openings or gaps for seedling establishment.

Special significance

Cucumber Tree is an infrequent canopy tree of the Carolinian Forest in southwestern Ontario. The seeds are eaten and dispersed by several species of birds and small mammals. The lumber has been used and marketed as Yellow-Poplar and as Tulip-Tree. The wood of Cucumber Tree is fine grained and similar to Yellow-Poplar, except it is harder and stronger. It is used for cabinet work, sashes, doors, interior trim, boxes and crates. Parts of the tree have been used for various medicinal purposes by the Cherokee and Iroquois people.

Existing protection, status, and ranks

Cucumber Tree is now protected under the Ontario *Endangered Species Act, 2007* and the national *Species at Risk Act*; it is listed as an Endangered species in Canada (May 2000) and Ontario. Three Cucumber Tree populations are under Woodlot Management Agreements with the Ontario Ministry of Natural Resources and one population occurs within the Long Point National Wildlife Area.

NatureServe lists three outlying states (Florida, Oklahoma and Illinois) with a status of S1 (Critically Imperiled); in Ontario it is ranked as S2 (Imperiled). Nationally, Canada has a rank of N2 (Imperiled) with that in the USA as N5 (Secure); globally its rank is G5 (Secure).

TECHNICAL SUMMARY

Magnolia acuminata

Cucumber Tree

magnolia acuminé

Range of Occurrence in Canada: Ontario

Southern Ontario: Norfolk County and Regional Municipality of Niagara

Demographic Information

Generation time	Likely at least 45 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	No
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Insignificant reduction over last 10 years but possibly considerable over three generations dating back to early settlement of the region in the early 1800s
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future. Slow increase to stable in undisturbed sites: 17 to 43% increase, but mainly due to saplings growing into trees; 5-55% losses in others	Unknown
Are the causes of the decline clearly reversible and understood and ceased?	No
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	557 km ²
Index of area of occupancy (IAO) (Always report 2x2 grid value; other values may also be listed if they are clearly indicated (e.g., 1x1 grid, biological AO)).	23 km ² (1x1 km grid) 60 km ² (2X2 km grid)
Is the total population severely fragmented? Potentially seeds can be moved long distances but at least 12 of 18 sites have <10 trees with questionable viability of the populations and additionally 33% of the "populations" (sites) contain only one to a few trees without regeneration. These factors tend to imply that severe fragmentation may be applicable. Also no young Cucumber Tree populations without mature trees have been discovered reflecting the lack of establishment of new populations through dispersal events	Likely yes
Number of "locations" Uncertain of applicability of the definition to the 18 sites where no serious threats are documented.	Undetermined
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	No

Is there an [observed, inferred, or projected] continuing decline in number of populations?	No
Is there an [observed, inferred, or projected] continuing decline in number of locations? There are 18 populations recognized but locations are not defined due to lack of serious threats.	Unknown
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Minor decline in quality and extent at some sites; most sites stable.
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations*?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each population)

Population	N Mature Individuals
1. Smith Tract and adjacent properties	43
2. Baker Tract	7
3. St. Williams	4
4. Smith Transport, Walsh	18
5. Lynedoch	3
6. Shining Tree Woods and adjacent property	20
7. Langton	1
8. Long Point	11
9. Short Hills	1
10. Peninsula Lakes	5
11. Balfour Street properties	9 [+13 unconfirmed]
12. Maple Street	[34 unconfirmed]
13. Cherry Ridge	5
14. RR4 Fenwick	3
15. Canboro Road West	5
16. RR1 Fenwick	3
17. Memorial Drive	1
18. Fenwick roadside	2
Total	~200 [141+ ~ 47 unconfirmed]

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Analysis not available
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Threats (actual or imminent, to populations or habitats)

Limited threats. Some locations in Norfolk and Niagara are experiencing local disturbance and loss of forest size.
--

Rescue Effect (immigration from outside Canada)

Status of outside population(s)? More secure in USA, but some peripheral states with S1 status: Florida, Oklahoma and Illinois.	
Is immigration known or possible?	Unknown and unlikely
Would immigrants be adapted to survive in Canada?	Yes, but perhaps not optimally

* See definition of location.

Is there sufficient habitat for immigrants in Canada?	Yes
Is rescue from outside populations likely?	No

Current Status

COSEWIC: Endangered (April 2010)

Status and Reasons for Designation

Status: Endangered	Alpha-numeric code: D1
Reasons for designation: This forest canopy species of the Carolinian zone of southern Ontario is present as a series of small populations in a region of highly fragmented forest cover. Its total Canadian population consists of about 200 trees with most of the sites having only a few mature reproductive individuals. Several sites only have single trees without evidence of regeneration, which makes the species highly susceptible to certain catastrophic events, such as ice storms. Its habitat is under continued impact from local disturbances and loss of forest area.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Total number of mature individuals likely stable.

Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. EO and IAO are within threshold values and populations are severely fragmented, but total population size appears relatively stable and only limited habitat disturbances have been documented.

Criterion C (Small and Declining Number of Mature Individuals): Not applicable. No continued decline in the number of mature individuals demonstrated.

Criterion D (Very Small or Restricted Total Population): Meets Endangered D1 with the total number of mature individuals <250.

Criterion E (Quantitative Analysis): None available.



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 5, 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 (2010)

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

COSEWIC Status Report

on the

Cucumber Tree *Magnolia acuminata*

in Canada

2010

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SPECIES INFORMATION

Name and classification

Scientific name: *Magnolia acuminata* (L.) L.
Common name: Cucumber Tree; Cucumber Magnolia
Nom français: Arbre aux concombres; Magnolia acuminé
Family name: Magnoliaceae (magnolia family)
Major plant group: Eudicot flowering plant

Morphological description

Cucumber Tree is a forest canopy species that can reach 30 m in height. Its leaves are simple, 10-24 cm long and oblong-ovate to elliptic in shape with a pointed tip and alternate in attachment on short stalks. The buds have a single scale covered with short downy hairs. The bark is brownish-grey and longitudinally furrowed into loose scaly ridges. Flowers are solitary, greenish-yellow and 6-8 cm long (Figure 1). Fruits are cone-like (Figure 2), 3-8 cm long bearing seeds with a fleshy orange to scarlet seed coat. At maturity, the seeds are suspended by long slender threads from the opened follicles of the red cone-like fruit.



Figure 1. A single flower of Cucumber Tree (photo by J. Ambrose).



Figure 2. Leafy branch of Cucumber Tree with upright, red, immature cone-like fruits (photo by J. Ambrose).

Spatial population structure and variability

The total Ontario population occurs in two distinct regions with a series of clustered sites within each. These occur in similar moist to wet forested habitats, often in headwater areas as well as in palustrine wetlands. A few sites have significant numbers of trees (many over 10, a few 20-43) with reproduction (Table 1): Norfolk: # 1, 2, 6 and 8; Niagara: # 10, 11, 12, 13, 14, 15, and 16 (the latter 3 sites are part of one dispersed but contiguous “endangered plant community” and might be technically considered as one population). Other sites are mostly single large trees with regeneration, sometimes conspicuously in atypical habitat (e.g., on a dry sandy site) but still reproducing, leading one to question whether they are remnants of a cleared forest or were planted from local, nearby stock: # 3, 4 and 5. There are a few single trees that appear to be in a more typical habitat but have no regeneration around them: # 7, 9 and 17. Two adjacent large trees are in a cultured roadside setting and are not reproducing: # 18; other roadside trees have been recorded in the past near these natural populations but are no longer present.

Table 1. Cucumber Tree abundance compared for two survey periods.

Site/Population	1998- 2001	2008-09
Norfolk County		
1. Smith Tract and adjacent properties	30 trees (7 large), 21 saplings, 2 seedlings	43 trees (12 large), 1 dead tree, 9 saplings and 2 seedlings
2. Baker Tract	6 trees (1 large) and 2 seedlings	7 trees (1 large); no seedlings*
3. St. Williams	4 trees (2 large) and 1 sapling	4 trees (2 large) and 1 sapling; no seedlings*
4. Walsh	14 trees (1 large) and 3 saplings	18 trees (2 large) and 2 saplings; no seedlings*
5. Lynedoch	1 large tree; 10 saplings plus 9 seedlings	3 trees (1 large), 5 saplings; no seedlings*
6. Shining Tree Woods and adjacent property	23 trees (1 large), 2 saplings, 2 seedlings	20 trees (4 large), 1 sapling; no seedlings*
7. Langton	1 large tree, no regeneration.	1 large tree, no regeneration.
8. Long Point	11 trees (10 large), 2 seedlings	11 trees (10 large)
Regional Municipality of Niagara		
9. Short Hills	2 trees (1 large), 1 other large tree, unconfirmed	1 large 3-trunked tree; 1 dead tree, no regeneration
10. Peninsula Lakes	6 trees (2 large) + 2 recent blow-down, 1 sapling,	5 trees (2 large), 3 saplings
11. Balfour Street properties	20 trees +1 dead tree, 1 sapling (13 trees unconfirmed)	9 trees (4 large) and 2 saplings; no seedlings. (13 trees unconfirmed)
12. Maple Street	34 trees (1 large), 6 saplings, 9 seedlings.	(34 trees unconfirmed) permission denied
13. Cherry Ridge	4 trees, 1 sapling, 1 seedling	5 trees (1 large); no seedlings;
14. RR4 Fenwick	4 trees (1 large), 2 saplings, 100+ seedlings	3 trees (1 large), 3 saplings and 23 seedlings
15. Canboro Rd. W.	7 trees and 1 sapling	5 trees (3 large), 2 saplings and 5 seedlings
16. RR1 Fenwick	3 trees on two adjacent lots	3 trees on two adjacent lots; no regeneration
17. Memorial Dr.	1 tree	1 tree; no regeneration
18. Fenwick roadside	2 large trees	2 large trees
SUMMARY	173 trees (31 large); (+13 unconfirmed), 48 sapl., 127+ sdlg.	141 trees (47 large); (+47 unconfirmed), 28 sapl, 30 sdlg.*

* Seedling observations adversely affected by late timing of site visit
Tree: 10+cm dbh (large tree 50+cm); sapling: 2-9cm dbh; seedling: <2cm dbh

Since similar habitats near known locations have been surveyed in the past ten years with no new finds, it appears likely that 1) most of the Ontario total population has now been documented and 2) that occasional dispersal and establishment occurs in appropriate habitats in the two regions where the populations occur in southern Ontario. It is not known if the populations in these two regions are genetically distinct, nor how similar they are genetically to the nearest populations to the south.

Designatable units

No morphological or genetic distinctions have been documented between the populations in the two disjunct regions of the Carolinian Zone of southern Ontario. A single designatable unit is therefore recognized for Cucumber Tree in Canada. The populations all occur within the Great Lakes Plains Ecological Area recognized by COSEWIC.

DISTRIBUTION

Global range

Cucumber Tree occurs in eastern North America from southern Ontario and western New York, south to Georgia and west to Arkansas (Ambrose and Aboud, 1984; Figure 3). Its only Canadian occurrence is in extreme southern Ontario.

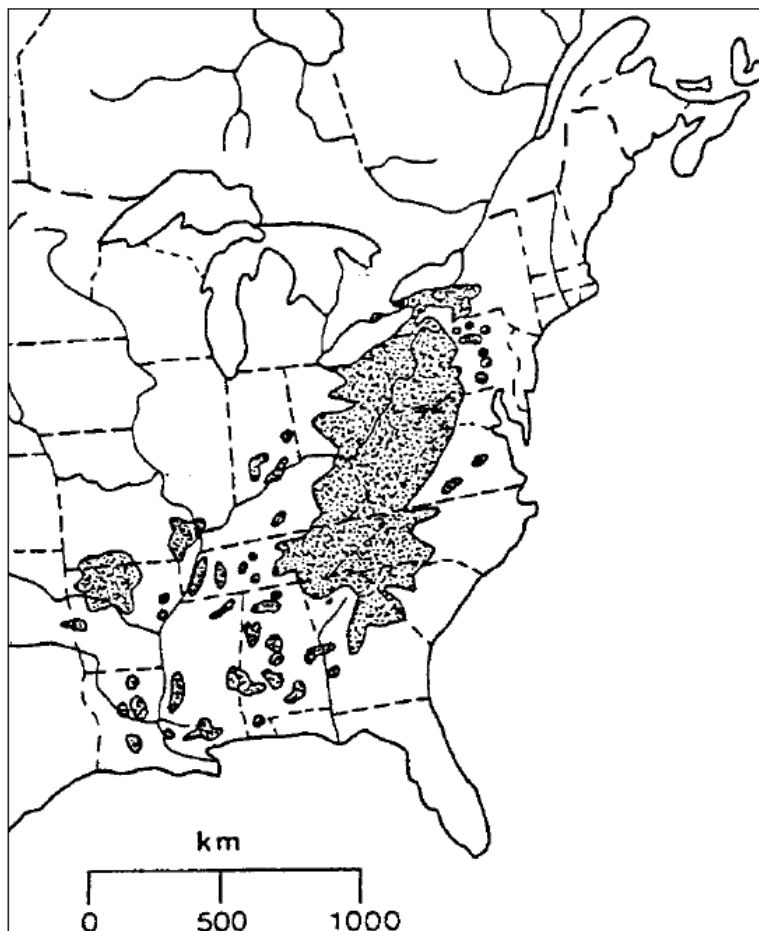


Figure 3. Range of Cucumber Tree in North America (after Little, 1977).

Canadian range

In Canada, two population centres are found in the Carolinian Zone of southern Ontario: one in the Regional Municipality of Niagara with 10 populations and the other in Norfolk County with eight populations (Figure 4). Outside of these two areas of its current natural range, the species is also present as cultivated specimens elsewhere in southern Ontario. No cultivated individuals are included for assessment purposes.

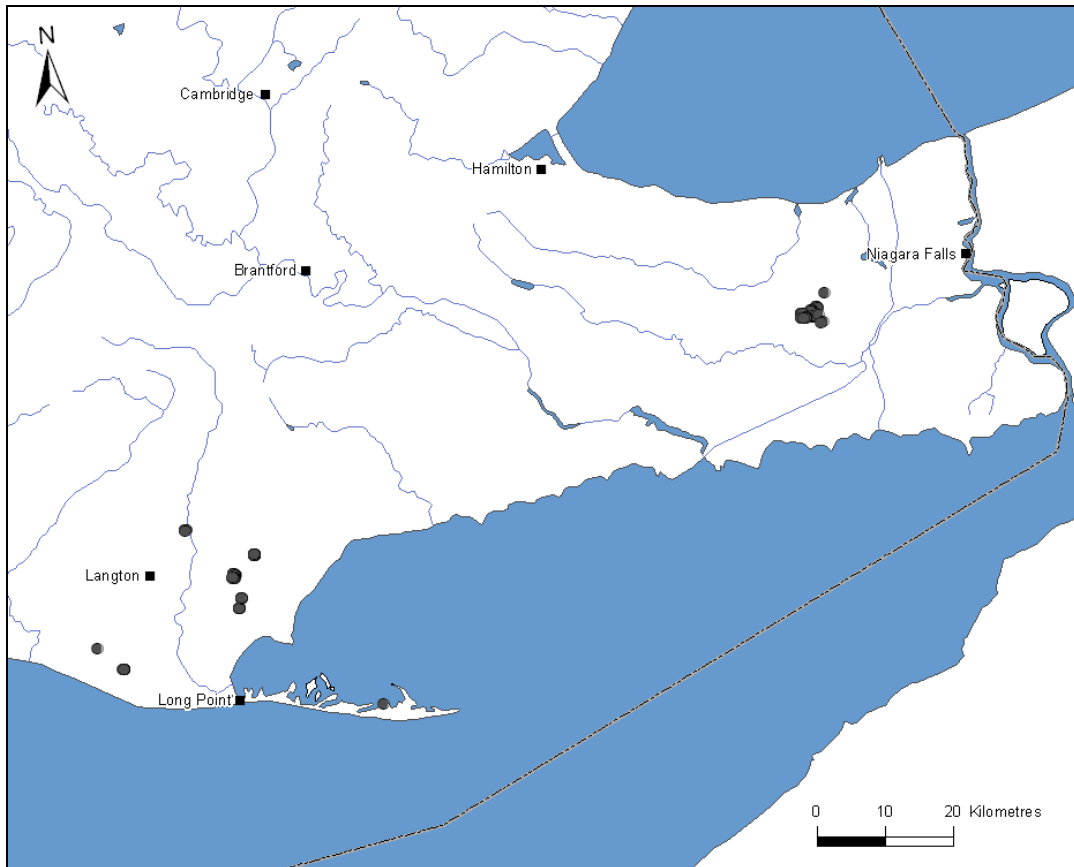


Figure 4. Extant native sites of Cucumber Tree in Ontario (solid black circles).

Two reports of Cucumber Tree from Lambton County were previously documented by Ambrose and About (1984). These occurrences were based on a stump noted by Fox and Soper (1952) and a sight record of young trees by G. Myers near Ipperwash Provincial Park around 1964. The Myers site had been cleared at the time of the preparation of the status report by Ambrose and About (1984). Field surveys in the Ipperwash area in 1982 failed to find any Cucumber Trees (Ambrose and About 1984). The sight record by Myers, an experienced naturalist, was mapped by White (1999) as a reliable historic record and is also presently recognized as an extirpated population.

The extent of occurrence is 557 km² and is divided into two polygons, based on the wide separation between the two regions of occurrence in the province. The Niagara group of populations has an extent of occurrence of 8 km² and the Norfolk group 549 km². The index of area of occupancy was calculated at 23 km² with a 1X1 km grid, or 60 km² with a 2X2 km grid.

HABITAT

Habitat requirements

Cucumber Tree occurs in forests with rich, moist, medium to coarse-textured soils, sometimes near standing water in swampy woodlands but on slopes or rises above the saturated soils; regeneration occurs in forest openings or areas of partly open forest canopies.

Typical sites alternate between swamps, especially Silver and Red Maple mineral deciduous swamps: SWD3-1, 3-2 (abbreviated designations as in Lee *et al.*, 1998), and sometimes swamp thickets: SWT2-6, 2-9, 3-11, and more upland fresh to moist Sugar Maple deciduous or mixed forests: FOD 6-1, 6-3, 6-5, FOM6-1. These latter upland forests are often in headwater areas, especially in Niagara.

A number of other plants at risk and rare species have been noted as occurring with Cucumber Tree in Ontario and assessed by COSEWIC or recognized as provincially as possibly at risk, for example:

- American Chestnut (*Castanea dentata*): Endangered (COSEWIC)
- Eastern Flowering Dogwood (*Cornus florida*): Endangered (COSEWIC)
- Butternut (*Juglans cinerea*): Endangered (COSEWIC)
- Black Gum (*Nyssa sylvatica*): S3 (provincially vulnerable)

Habitat trends

Since the preparation of the first status report on Cucumber Tree (Ambrose and Aboud, 1984), only limited habitat loss has been documented. Suitable habitat is slowly shrinking in some areas; a few of the occupied habitats were noted as having less area than the previous maps showed, especially at site 11. However, most of the decline of the Carolinian Forest and habitat for Cucumber Tree occurred historically from the earliest days of European settlement in the region. The loss of forest stands and selective lumbering in the region has also resulted in forest fragmentation causing tree isolation thereby potentially reducing cross-pollination success. Decline in habitat quality in recent decades has resulted from the spread of exotic invasive plants such as Garlic Mustard (*Alliaria petiolata*) within the understory of portions of the species' habitat.

Habitat protection/Ownership

Only the Long Point National Wildlife Area location is fully protected; two other sites are managed by the Long Point Conservation Authority and they are pursuing management to protect the trees and enhance natural regeneration.

Other locations are privately owned. Many owners are serious about stewardship and show a keen interest in protecting these trees and other natural heritage values; only a few were not interested and did not allow access.

BIOLOGY

This species is intermediate in shade tolerance (Strobl and Bland, 2000) and hence forest openings promote seedling establishment. Regeneration is evident in most locations with multiple trees, and some with only one old tree. Trees flower in May and start releasing their ripe seeds by early October. The species has bisexual or perfect flowers with the stigmas of the pistils becoming receptive before the anthers release their pollen, promoting cross-pollination. Although lone trees do produce a small number of fruits with few seeds in each because pollination and fertilization between flowers of the same tree are not excluded, seed production is best where there are opportunities for cross-pollination between trees (Ambrose and Kevan, 1990).

Life cycle and reproduction

Trees begin flowering at about age 30 (Strobl and Bland, 2000) and have been observed to be reproductive beginning at sizes between 25-30 cm diameter at breast height (dbh) (Ambrose, 2001). Considering the variability in numbers and sizes of large, mature trees in present-day populations, an average generation time might be in the order of 45 years or possibly more. The determination of generation time for Cucumber Tree in Ontario based on the relative proportions of trees of fruit-bearing age present prior to settlement is not readily possible. Presumably there may have been a greater proportion of older fruit-bearing trees present, in the absence of lumber harvesting, with an associated longer generation time. Some of the Ontario trees have been observed for 80 or more years. However, in the more central part of the species' range in the Appalachians of the US, typical trees are in the order of 60 cm in diameter (but can reach 122 cm in diameter) and mature in 100 years; few, however, live for more than 150 years (Western North Carolina Nature Center, <http://www.wildwnc.org/>). Trees have been recorded as living to 250 years (Strobl and Bland, 2000) or even longer. One live tree in Colonial Heights, Virginia, aged by the number of tree rings in a core, was 348 years old in 2003 (http://www.nativetreesociety.org/species/sp_threads/cucumber_tree_ages.htm).

The protogynous flowers (the styles are receptive before the anthers dehisce) are pollinated by a number of insects, especially beetles, that enter the basal gaps between the petals of the closed buds shortly before opening (Ambrose and Kevin, 1990). Beetle pollination is well known in the family (Bernhardt and Thien, 1987). Seeds emerge from the ripe fruits and are suspended by a thread. Magnolia seeds lose their viability when they dry out (Smith, 1990).

Seedlings establish most readily in areas of partial canopy openings. Growth can be quite rapid if on a suitable site, as revealed by the diameter increase of individual trees between successive surveys.

Herbivory

Although Smith (1990) noted deer browsing of leaves and buds, no serious browsing or other herbivory was observed.

Physiology

Even though this species' native Canadian range is restricted to the Carolinian Zone of southern Ontario, it survives as a cultivated tree in sites further north, such as Stratford and Guelph.

Dispersal

Cucumber Tree has a fruit type that dehisces when mature, revealing seeds that have a fleshy orange to scarlet seed coat and are suspended by a thread, promoting active dispersal by birds. Cucumber Tree fruits are not listed as a documented turkey forage for Eastern Wild Turkey (*Meleagris gallopavo silvestris*) by Kubisiak *et al.* (2001) or Vance (2002). Species that produce "soft mast" fruits, such as Black Gum (*Nyssa sylvatica*) and Spicebush (*Lindera benzoin*) are listed by these authors and also occur as associated species with Cucumber Tree. It is likely that the fleshy fruits of Cucumber Tree could be attractive to turkeys, which could potentially spread the seeds widely (MNR reviewer pers. comm. 2010). The lack of recently reported populations of young trees, however, tends to indicate that there appears to be limited if any dispersal beyond the immediate core range of each of the known populations. Squirrels may play a dispersal role as well. Seeds that fall to the ground are likely picked up and moved by small ground mammals. Bird dispersal has the potential to move seeds to distant forest habitats but there is no evidence that new populations have become established in recent decades.

Interspecific interactions

This species depends on pollinating insects (mostly beetles that enter the flowers at the late bud stage [Ambrose and Kevan, 1990]) to ensure seed development and possibly frugivorous birds for active dispersal of seeds to suitable habitats.

Adaptability

Cucumber Tree has the ability to sprout from the base of its trunk, after cutting or severe trunk damage. Many multi-trunked trees have likely formed from forest thinning or clearing activity, showing an adaptability to recover from intentional or inadvertent human activity.

Seeds can be readily germinated (Kock *et al.*, 2008) from locally collected seeds and seedlings grow well under cultivation. The University of Guelph Arboretum has a gene bank of trees grown from wild Ontario populations, first collected in the late 1970s. It is expected that they will begin flowering and fruiting within the next decade.

POPULATION SIZES AND TRENDS

Sampling effort

With the precise mapping data available from the OMNR surveys of 1998 and 2001, extant populations were easily found. Individual trees were identified with UTM coordinates using a GPS unit, measured (diameter at breast height) and assessed for viability, regeneration, and ultimate grouping into trees, saplings and seedlings as in Table 1.

Abundance

At the time of the original status report, 10 of the 18 populations reported here were known and five of them had saplings and/or seedlings and seed-bearing trees (Ambrose and Aboud, 1984); two large trees at one roadside produced viable seeds. Surveys by Thompson (1992) and others (e.g., M. Gartshore, pers. comm. 1985) identified additional sites and expanded population sizes. Cucumber Tree has been widely planted in southwestern Ontario, hence it is not always clear whether a particular tree is a remnant of a cleared forest, a planted tree of local origin, or cultivated of unknown origin (Ambrose and Aboud, 1984). Late in the 1990s, the Ontario Ministry of Natural Resources funded endangered species mapping studies for Cucumber Tree and its habitats (Dougan and Associates, 1998; Ambrose, 2001), providing much more detailed information on population sizes, area of occupied habitat and characterization of associated vegetation using ecological land classification (Lee *et al.*, 1998).

In the absence of any information on non-native sources of seeds or seedlings having been used for introductions within the native range and habitats of Cucumber Tree in Ontario, all trees counted are assumed to have originated from local native sources.

At the time of the original status report, some documented sites were recorded as extirpated. No new extirpations since the 1998-2001 surveys were recorded during the current update exercise. Some sites, however, appeared to be smaller in area due to fewer trees being recorded. Overall, the Ontario populations appear to be at a steady state, with several sites showing increases. Many of these increases are due to the increase in size of pre-existing saplings to tree size, or seedling to sapling size, although new seedlings are also recorded in some sites. The number of large trees (50 cm or more in diameter) has increased from 31, in 1998-2001, to 47 in the current survey.

Table 1 compares the survey data from 2008-2009 with that obtained in 1998-2001. It is estimated that the total population consists of about 200 trees, with 141 confirmed and 47 unconfirmed from recent surveys where the landowners denied permission to enter their properties. These numbers refer to trees at least reaching the subcanopy and of 10 cm or more in dbh. Trees become reproductive at about 25-30 cm dbh, from our observations, thus not all of these trees are reproductive but will become so within a few years and are more likely to survive than reported seedlings or saplings that may not have a secure position in a canopy opening.

The Canadian populations should be considered to be severely fragmented. The absence of new young populations of Cucumber Tree being discovered in the course of the last decade or more reflects this lack of establishment of new populations based on wide dispersal by birds or other vectors. Also, severe fragmentation should apply based on the COSEWIC/IUCN definition because 12 of the 18 sites have <10 mature trees. Such populations are questionably viable in the long-term over several generations based on the potentially greater impact of stochastic events, such as major ice storms, on such small populations. Considering that about 33% of these small 'populations' contain only one to a few trees without evidence of regeneration, or the presence of only a single large tree or two with some regeneration is a further indication of the susceptibility of such populations to stochastic events. The 18 populations are spatially separated into two disjunct regions in Ontario, separated by about 100 km, due to anthropogenic actions that resulted in a region of highly fragmented forest remnants where formerly forest cover was extensive throughout the region.

Fluctuations and trends

The total population size has been quite steady since the 1998-2001 surveys, with some losses and some noted increases as mid-sized trees have grown to large tree size and saplings have become trees.

Cucumber Tree was designated by COSEWIC as an endangered species in 1984 on the basis of nine extant sites (and one pair of old roadside remnant trees) in southwestern Ontario, specifically in the regional municipalities of Niagara and Haldimand-Norfolk (now Norfolk County). Only three of these sites showed enough regeneration to be considered viable populations (Ambrose and Aboud, 1984); three other sites had limited regeneration. Since the original status report was written, eight new sites have been found within the same two regions for a total of 18. These are all previously undiscovered populations and not recently established ones, considering the presence of sizable trees. Of these 18 recorded here, 10 show recent evidence of regeneration and another four did have regeneration 10 years ago. Although individual trees have been lost since the original status report in 1984, no entire population (which sometimes includes adjoining properties) has been lost in this time.

There are no data specifically documenting the change in populations of Cucumber Tree over a period of time equivalent to about three generations (~135 years). Information gleaned from sources such as the Carolinian Canada web site (<http://www.carolinian.org/index.htm>), however, indicates that forest cover has been reduced in the Carolinian zone from 80% to 11% or even less in some areas. Such a historic decline in the forest area of this region likely began much earlier than the three-generation time period ascribed to the species in this report, when considering that European settlement in the region north of Lake Erie began in earnest in the early 1800s with the land grant to Colonel Thomas Talbot (<http://www.londonhistory.org/talbot.htm>). The substantial loss of forest cover in the Carolinian zone would likely reflect a similar reduction in the relative abundance of Cucumber Tree in Ontario.

The very restricted geographical distribution, the low number of trees at most sites and the occasional logging and clearing on some sites put this species in continued jeopardy. However, most private landowners are receptive to protecting this species and its habitat.

Rescue effect

Periodic movement of birds and mammal vectors carrying Cucumber Tree seeds from southern sources northward likely occurred historically with some frequency as the deciduous forest expanded northward during postglacial times. Movement of Cucumber Tree seeds within the Canadian range of the species has likely also occurred occasionally with the establishment of new populations over a period of many generations but presumably mainly prior to settlement of the region and land clearing. With the extent of forest fragmentation that has occurred over the last century or more, such dispersal events likely became less frequent even within the Canadian range of the species. The seeds must land in an appropriate habitat and in an area with a canopy opening of sufficient but not excessive size to promote seedling development. Given the fragmented nature of the forested habitat and the movement of birds mainly southward at the time of seed availability in the fall, natural long-distance dispersal northward from U.S. seed sources is unlikely to occur with any frequency that might serve to replenish Canadian stocks and function as a rescue effect.

THREATS AND LIMITING FACTORS

Cucumber Tree is threatened by tree-cutting and clearing that occurs on private land where most of the known populations occur. Although most of these sites have experienced no significant disturbance, a few showed signs of cutting or clearing where trees had been recorded in the past. Disturbance and edge clearing was apparent on some properties of sites 1 and 11; clearing of the understory and the subsequent colonization of invasive exotics was evident at site 10, and bark damage to complete girdling of a Cucumber Tree (likely from mechanical clearing activity) was seen at sites 4 and 13. While the invasive exotics likely have little impact on mature trees they likely impede the establishment of seedlings. Forest fragmentation across the Carolinian Zone has resulted in some trees being isolated, reducing effective cross-pollination and seed production in those individual trees. There are no known significant disease agents (Smith, 1990).

Locations based on threats

A total of 18 sites with one or more trees have been documented. Existing disturbances of a minimal nature have only been documented for about 5 sites as noted above. In view of the lack of documented serious existing threats and uncertainty of how to define locations based on ownership and potential associated risks to the species, the application of criteria dependent on number of 'locations' to the assessment of this species is questionable.

SPECIAL SIGNIFICANCE

Cucumber Tree is an infrequent canopy tree of the Carolinian Forest of extreme southern Ontario. The seeds are eaten and dispersed by several species of birds and small mammals. This species is at its northern extent of distribution in Ontario and likely represents genetic adaptations to these local conditions. Thus local seed stock would likely be more successful than from farther south for re-establishing populations in Canada.

The wood of Cucumber Tree is fine-grained and similar to Tulip Tree (the lumber of which is known as Yellow-Poplar), except it is harder and stronger. It is used for cabinet work, sashes, doors, interior trim, boxes and crates. Parts of the tree have been used for various medicinal purposes by the Cherokee and Iroquois people, as recorded in the Native American Ethnobotany Database (Moerman, 2003).

EXISTING PROTECTION, STATUS, AND RANKS

With the designation of Cucumber Tree as an endangered species in Canada (May 2000), it receives protection under the national *Species at Risk Act* (SARA) on federal lands, the Long Point National Wildlife Area site. This site was noted but not confirmed in the original status report of 1984 and confirmed in 1996 by Canadian Wildlife Service staff and again in 2007.

This species is also protected on private lands and provincial Crown Lands under the Ontario *Endangered Species Act*, 2007, covering the 17 remaining sites. Steps have been taken to enhance the species' chances of survival in Ontario. In 1998, the Ontario Ministry of Natural Resources (OMNR) funded studies to map the distribution of Cucumber Tree and its habitat. The resulting data are compiled in the report by Suggitt and Thompson (2002). OMNR also initiated the development of a recovery strategy (Ambrose and Kirk, 2007).

Non-legal status and ranks

In the U.S., three outlying states (Florida, Oklahoma and Illinois) are listed with a rank of S1 (Critically Imperiled, NatureServe, 2009). The species has not been assessed in adjacent Ohio and is ranked S5 (Secure) in Pennsylvania and New York. In Ontario, it has a rank of S2 (Imperiled). Nationally, Canada has a rank of N2 (Imperiled) and USA as N5 (Secure); globally its rank is G5 (Secure).

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Mike Oldham, Botanist, Natural Heritage Information Centre, Peterborough, provided background information and a listing of known Cucumber Tree records with details of recent confirmations. Donald Kirk provided recent mapping data from the Guelph District OMNR office. Jeff Robinson provided details of the population at Long Point National Wildlife Area. Funding was provided by the Canadian Wildlife Service, Environment Canada.

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BIOGRAPHICAL SUMMARY OF REPORT WRITERS

John Ambrose has over 30 years of professional experience with botanical gardens and conservation programs. As Curator of the University of Guelph Arboretum, he initiated and carried out a program focused on the biology of rare Carolinian trees and shrubs of southern Ontario. For eight years he was Curator of Botany and Manager of Horticulture at the Toronto Zoo, developing the infrastructure for a botanical garden, participating in exhibit development, and overseeing the management of natural areas. In the latter area he developed a scheme for reconnecting and buffering the fragments of natural forest of the Zoo site through volunteer tree planting events.

He has participated in other management and design projects, including a vegetation management plan for Point Pelee National Park (with Geomatics); an update life science inventory and assessment for Komoka Provincial Park, the Shaughnessy Cohen Memorial Savannah and 24 county forests in Norfolk County (with three associates), a Green Infrastructure Plan for the Downsview Park site (with Ecological Services for Planning) and served as an advisor for several park planning exercises in the Toronto area.

He has put considerable thought into the relationship between nature and culture and sees ecological restoration as an important means by which communities can actively participate in healing the wounds of the landscape and achieving a more sensitive management of the land. In 1999, he took early retirement from 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, as well as testing the limits of the long Pelee Island growing season, on a small farm there.

Paul O'Hara is a botanist, landscape designer and native plant gardening expert. Since 1991, Paul has worked in a wide variety of horticulture, botanical consulting, ecological restoration and native plant gardening capacities in both the private and public sectors. Paul was Endangered Species Technician at Royal Botanical Gardens for almost 2 years where he discovered and documented new populations for Red Mulberry, Hoary Mountain Mint and Few-flowered Club Rush. He has participated in numerous botanical surveys with Dr. John Ambrose and Gerry Waldron including for Wild Hyacinth (2001), Dwarf Hackberry (2003), Norfolk County Forests (2004), and

Bickford East Forest Complex (2005). In 2004, Paul was hired as an expert botanical surveyor for the Halton Natural Areas Inventory which led to co-authoring the *The Vascular Plants of Halton Region* published in 2006.

Paul teaches courses, writes articles and speaks widely on plant identification, natural history and native plant gardening. Paul is the owner/operator of Blue Oak Native Landscapes; a business dedicated to creating beautiful natural spaces in the places where we live, work and play.

COLLECTIONS EXAMINED

Collections were initially examined for the first status report but not for this update. The more recent OMNR surveys and NHIC EO reports provided sufficient details for the field verifications.