COSEWIC
Assessment and Update Status Report

on the

Round-leaved Greenbrier
Smilax rotundifolia

Great Lakes Plains population
Atlantic population

in Canada

Great Lakes Plains population – THREATENED
Atlantic population – NOT AT RISK
2007

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 reports:

COSEWIC. 2001. COSEWIC assessment and status report on the round-leaved greenbrier *Smilax rotundifolia* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 18 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Ambrose, J.D. 1994. COSEWIC assessment and status report on the round-leaved greenbrier *Smilax rotundifolia* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Pages 1-18.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur la smilax à feuilles rondes (population des plaines des Grands Lacs et population de l'Atlantique) (*Smilax rotundifolia*) au Canada — Mise à jour.

Cover illustration:
Round-leaved greenbrier — Terminal portions of round-leaved greenbrier female vines with flowers and fruit (see Holmes 2002, p. 475)

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COSEWIC
Assessment Summary

Assessment Summary – November 2007

Common name
Round-leaved greenbrier – Great Lakes Plains population

Scientific name
Smilax rotundifolia

Status
Threatened

Reason for designation
The species is currently known from 13 highly fragmented populations in Ontario's Carolinian Zone. Four populations have been found since the previous COSEWIC assessment due to more extensive surveys, and although no population was lost, habitat declines have occurred. Population size and trend are poorly known due to the clonal nature of the species. Many Ontario populations appear to have plants of only one sex and therefore cannot produce seed. The plants, however, are vigorous, long-lived and resistant to habitat changes.

Occurrence
Ontario

Status history
Designated Threatened in April 1994. Status re-examined and confirmed in May 2001 and November 2007. Last assessment based on an update status report.

Assessment Summary – November 2007

Common name
Round-leaved greenbrier – Atlantic population

Scientific name
Smilax rotundifolia

Status
Not at risk

Reason for designation
The species is known from at least 50 sites in southern Nova Scotia where there are estimated to be at least 3,000 to 10,000 individuals (crowns). The actual number of mature individuals for this clonal species is, however, unknown. No declines have been documented and threats are limited.

Occurrence
Nova Scotia

Status history
Designated Not at Risk in November 2007. Last assessment based on an update status report.

COSEWIC
Executive Summary

Round-leaved Greenbrier
Smilax rotundifolia

Great Lakes Plains population
Atlantic population

Species information

Round-leaved greenbrier (*Smilax rotundifolia*) is a woody climbing vine that can reach a length of over four metres. Main stems are rounded and bear stout flattened prickles; its branchlets are sometimes four-angled. Leaves are alternate and simple, 5-10 cm long, with an ovate blade and a heart-shaped base. Plants are unisexual, with the small green male and female flowers clustered in rounded umbels whose stems arise from the leaf angles. Each female umbel produces a few blue-black, mostly two-seeded berries.

Distribution

The species is found across much of eastern North America from southwestern Nova Scotia to northern Florida, eastern Texas and north to eastern Michigan and southwestern Ontario. In Canada, it occurs near the north shore of Lake Erie in southern Ontario and in southwestern Nova Scotia. The 13 extant populations in Ontario cover an Extent of Occurrence of about 2500 km^2 and an Area of Occupancy of 13 km^2 if a 1x1 km grid is applied and 40 km^2 if a 2x2 km grid is used. The >50 Nova Scotia populations have an Extent of Occurrence of <5000 km^2 and an Area of Occupancy >> 50 km^2.

Habitat

In Ontario round-leaved greenbrier prefers open moist to wet woodlands, often growing on sandy soils. In Nova Scotia it commonly occurs along lakeshores. In other jurisdictions it is very variable in its habitat use.

Biology

This woody vine is dioecious, having its unisexual flowers on separate male and female plants. It forms clusters of shoots from a single crown and spreads vegetatively by its rhizomes and stolons. Only populations of mixed sexes produce fruits. Seeds seem to require a cold period before germination occurs. It is possible that for seedling establishment, open areas are required in the woodland canopy. Because of vegetative reproduction, the clones produced can become widely spread over time and individual clones can have a long life span.

Population sizes and trends

There are 14 confirmed sites of this species in Ontario, one of which is known to be extirpated. Six of the 13 potentially extant sites were confirmed in 2006 and one in 2007; one other was confirmed in 2005. The remaining five sites were not surveyed in 2006 but were assumed to be extant because the habitat was still present (landowners were either unavailable or they denied field workers access to their properties). Of the 13 sites, four have been discovered since the initial COSEWIC status assessment. There are between approximately 1000 and 5000 extant crowns (each representing a multi-stemmed “individual” that may or may not be physically separated from other such individuals). More than 50 occurrences are known from Nova Scotia where the total population is considered stable and consists of between 3,000 and 10,000 individuals.

Limiting factors and threats

Although round-leaved greenbrier reproduces asexually and is relatively long-lived, it is limited in Ontario because few sites are occupied by plants of both sexes. This limited capability for seed production potentially reduces the amount of natural variability and therefore the adaptability of the Ontario populations. Urban expansion and the reduction of available habitat in the Niagara area of Ontario also threaten the sites in this portion of the species' range. Threats to the Nova Scotia populations appear to be limited or absent in most cases.

Special significance of the species

No significant Aboriginal Traditional Knowledge on current uses for round-leaved greenbrier is known. In areas where it is a common component of woodlands, it is an extremely important wildlife food.

Existing protection or other status designations

In Ontario, one population is in a city park, and portions of another are on Long Point Region Conservation Authority property. The others are on private land, without specific protection. No specific data have been compiled on this species in Nova Scotia since the species is considered secure in the province, but it is known to occur in some protected areas such as Kejimkujik National Park and Tobeac Wilderness Area.

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 (2007)

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.

Environment Canada
Canadian Wildlife Service

Environnement Canada
Service canadien de la faune

Canada

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

Update
COSEWIC Status Report

on the

Round-leaved Greenbrier
Smilax rotundifolia

in Canada

2007

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SPECIES INFORMATION

Name and classification

Scientific name: *Smilax rotundifolia* L.
Pertinent synonyms: None in recent regular usage, but note: *Smilax caduca* L.; *S. quadrangularis* Muhlenberg ex Willdenow
Common name: Round-leaved greenbrier, roundleaf greenbrier, common greenbrier, common catbrier
Family name: Smilacaceae, Greenbrier Family (often included within Liliaceae by earlier authors)
Major plant group: Angiosperm, monocotyledon

Morphological description

Round-leaved greenbrier is a perennial woody vine that climbs over shrubs and into trees, to four metres or more (Figure 1). Branches are rounded in cross-section, and branchlets sometimes four-angled, with stout, flattened prickles on major stems. Leaves are alternate, simple, ovate to broadly ovate with cordate bases and reticulate secondary venation, much as in bristly greenbrier (*S.tamnoides* (= *S. hispida; S. tamnoides* var. *hispida*)). Plants are dioecious; flowers are small and green; inflorescences with peduncles about as long as the subtending petioles. Berries are few, in a compact umbel. Further descriptions can be found in Fernald (1950), Voss (1972), Scoggan (1978-1979), Soper and Heimburger (1982), Roland (1998), and Holmes (2002).

Figure 1. Terminal portions of round-leaved greenbrier female vines with flowers and fruit (see Holmes 2002, p. 475).

The male and female flowers are morphologically distinct, with only staminate flowers featuring functional stamens, and only pistillate flowers developing fruiting tissues (photos in Kevan *et al*. 1991). The staminate flowers are slightly larger than the pistillate ones (averaging 6.6 mm in diameter versus approximately 4.6 mm, in the populations sampled by Kevan *et al*. 1991), and pistillate inflorescences appear to tend towards slightly higher flower numbers, but the difference was not significant.

There are only two woody monocotyledons in southern Ontario: Round-leaved greenbrier and bristly greenbrier. In most cases these two are easily distinguished by observers familiar with the species, but some sterile specimens of either species can be superficially similar. In particular, large robust climbing bristly greenbrier individuals can closely resemble spineless round-leaved greenbrier until one notices the distinctive dense thin prickles at the very base of bristly greenbrier stems. Key characters differentiating these taxa are presented in Table 1. Round-leaved greenbrier is the only *Smilax* in Nova Scotia.

Table 1. Key characters distinguishing round-leaved greenbrier (*Smilax rotundifolia*) from bristly greenbrier (*Smilax hispida* = *S. tamnoides*; from Holmes 2002; Soper and Heimburger 1982; and Voss 1972).

	Bristly Greenbrier	**Round-leaved Greenbrier**
Prickles	Slender, rounded (spines) and dense (towards base of plant; prickles may be absent from the middle and upper stems).	Broad and flattened at base, typically green with a dark tip and present on most sections of the branches (often less frequent in the upper portions of the plant).
Fruiting peduncles	At least twice as long as the subtending petiole.	Less than twice as long as the subtending petiole.
Ripe fruit	Dark, no waxy bloom	Whitish waxy bloom
Berries	Numerous (10-25)	Few (5-12)
Cross-section of young branchlets	Round or weakly angled	Four-angled
Lower leaf surface near petiole	Smooth	Frequently with minute spines
Rhizomes	Knotted and short	Linear

This species is well illustrated in Soper and Heimburger (1982), but Gleason's (1963) illustrations of this species and *Smilax hispida (=S. tamnoides*) are ambiguous.

Genetic description

No genetic investigations are known to have been undertaken on this species, let alone within its Ontario or Nova Scotia ranges. However, the dominant presence of isolated unisexual clones (see Table 2) in the Ontario populations suggests that most of these populations are a) the result of a single dispersal event or at least a very small number of such events and b) not experiencing any gene flow from other populations. As such, individual populations are likely strongly genetically homogeneous. This

hypothesized pattern of rare dispersal events (rather than the current populations being remnants of a formerly much more widespread distribution) is supported by the fact that only a single population is known to be extirpated (see Table 2).

Designatable units

Round-leaved greenbrier occurs in two widely separated areas of Canada: southwestern Ontario and the coastal plain in southwestern Nova Scotia. These two areas of distribution warrant separate Designatable Unit designations due to their occurrence in two different Ecological Areas recognized by COSEWIC (Great Lakes Plains and Atlantic) and because of their different conservation status. In Ontario, the Great Lakes Plain population is listed as Threatened provincially and by COSEWIC (2001) in an update report that includes an addendum. The Atlantic population in Nova Scotia is recognized provincially as secure based on the General Status of Species in Canada assessment (Wild Species 2005).

Although the present report includes data on both Designatable Units, the Ontario Unit is covered in greater detail, due to its documented risk of extirpation in the original report (Ambrose 1994). The limited information compiled for the Nova Scotia populations reflects the fact that the species has not been tracked provincially or by the Atlantic Canada Conservation Data Centre because of its relatively high frequency of occurrence and apparently secure status (S4) in the province (NatureServe 2006).

DISTRIBUTION

Global range

Round-leaved greenbrier occurs naturally across much of eastern and central North America, from southern Nova Scotia to northern Florida, westward through southern Ontario to Michigan and southwest to eastern Texas (Figure 2). It is globally secure (G5), and of the states where it has a conservation status rank it is S5 (secure) in all but Illinois, where it has a rank of “S3?” (NatureServe 2006).

Canadian range

Round-leaved greenbrier occurs in two widely separated regions in Canada, around the north shore of Lake Erie in the Carolinian Forest of the Great Lakes Plains (e.g. Soper and Heimburger 1982), and in the Atlantic Coast Plain of southern Nova Scotia (e.g. Roland 1998). Various Ontario-focused literature has failed to note the Nova Scotia population or has been inaccurate in describing it. White *et al*. (1982) and Soper and Heimburger (1982) called round-leaved greenbrier "rare in Canada", while Argus and White (1977) considered it "rare and possibly extirpated in Canada", despite the fact that it had been documented as a locally common species in southern Nova Scotia since Fernald’s expedition in 1920 (Fernald 1921).

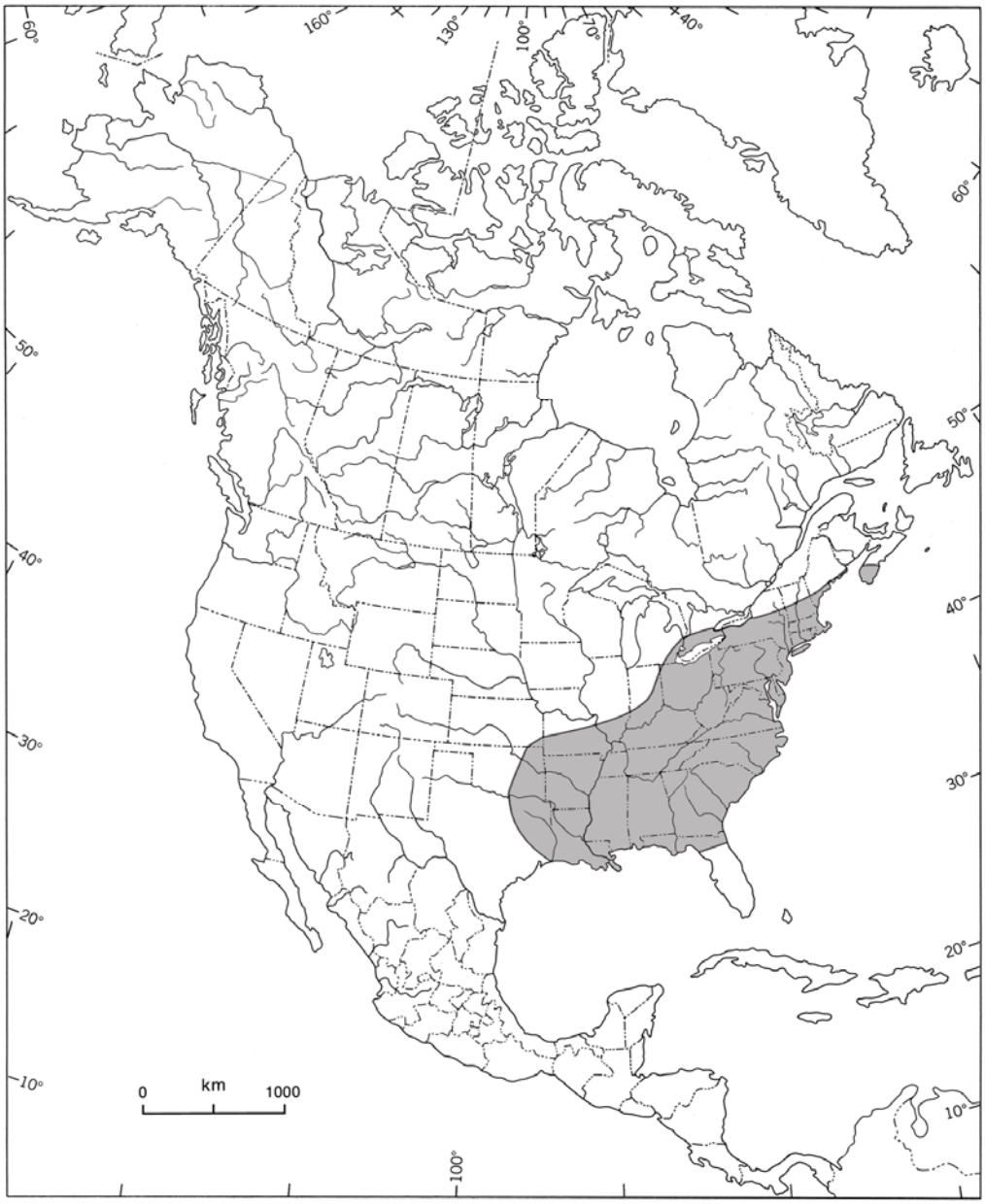

Figure 2. Global range of round-leaved greenbrier, based on Holmes (2002).

The status of the Ontario population was unclear until 1982 with Argus and White (1977) and White *et al*. (1982) indicating that it was possibly or probably extirpated in Ontario. It was also not recorded in detailed surveys of the Essex County flora (Botham 1981) and natural areas (Oldham 1983).

Although Ontario populations are nearly contiguous with the core distribution of round-leaved greenbrier further south, plants in Nova Scotia are disjunct from the nearest populations in southern Maine by approximately 200 km across the Gulf of Maine (Holmes 2002; Figure 3). In Nova Scotia, round-leaved greenbrier is a fairly

common species over the region within about 115 km of the southernmost end of Nova Scotia (Roland and Smith 1969, Roland 1998). Its northern limit appears to be quite abrupt beyond that zone; it is a strong indicator species for the region supporting the greatest diversity of Atlantic Coastal Plain flora in Nova Scotia (S. Blaney, M. Elderkin, pers. comm.). Figure 3 maps the known distribution of the species from herbarium and sight records compiled by the Atlantic Canada Conservation Data Centre up to 2006. Within its limited region of occurrence, it is present in shrub thicket and forest near the shores of most river systems and larger lakes, although it tends to be less common toward headwater regions (Roland and Smith 1969, S. Blaney, pers. comm.).

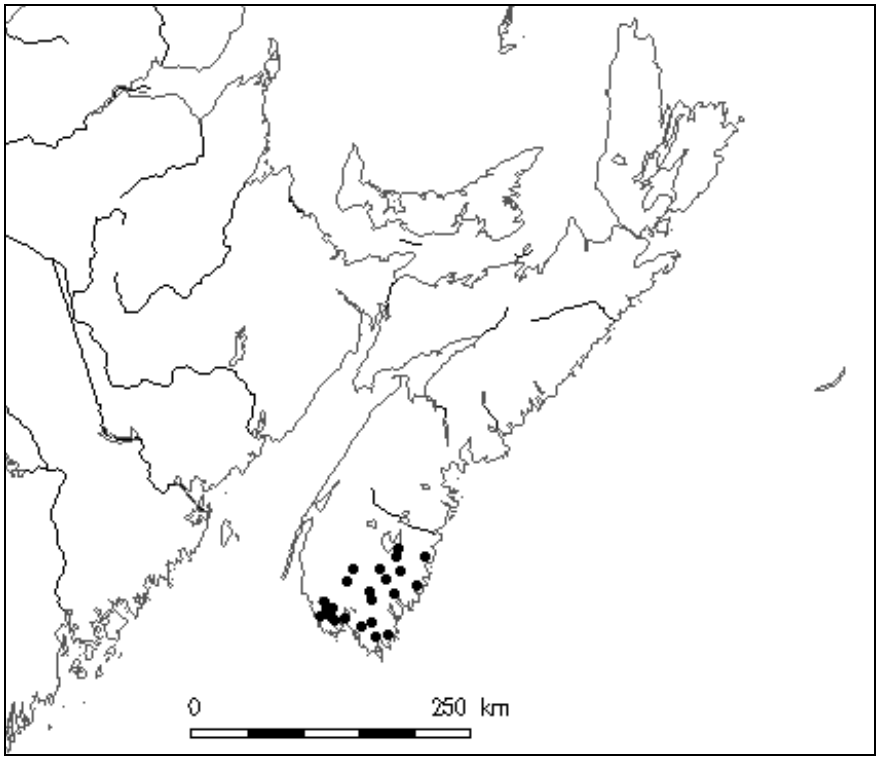

Figure 3. Distributional area of round-leaved greenbrier in Nova Scotia. The number of solid circles do not reflect the total number of populations (>50) documented for the province. (Map by Pamela Mills, Nova Scotia Department of Natural Resources, Kentville, Nova Scotia. Reprinted from COSEWIC 2001.)

The 13 extant populations in Ontario cover an Extent of Occurrence of about 2500 km^2 based on two convex polygons including Essex and Kent counties in the westernmost polygon and Niagara/Norfolk counties in the eastern portion of the species range in the province; its Area of Occupancy is 13 km^2 if a 1x1 km grid is applied and about 40 km^2 if a 2x2 km grid is used. The >50 Nova Scotia populations have an Extent of Occurrence <5000 km^2 and an Area of Occupancy > 50 km^2.

Biogeographical and phytogeographical history in Ontario

In Ontario, the distribution of this species appears to be concentrated at the two extremities of the Carolinian Zone, possibly reflecting the likely paths of post-glacial

migration from the south, across the two points of land between adjoining lakes (Figure 4). Why there are so few collections in between is difficult to explain, considering that many birds eat the fruit and may be important agents of dispersal and the relatively similar habitats and moderated climates in the region between the two centres of distribution. It is conceivable that perhaps the forested habitats between these centres were cleared before comprehensive botanical surveys were conducted in this region. The region is also dominated by clay soils rather than sandy soils that may not have served as optimum substrate for this species.

The open squares in Figure 4, representing unsubstantiated literature reports from Soper and Heimburger (1982) appear to have no documented basis. These authors specifically stated that this species occurred only in Essex and Kent counties, thereby excluding the Middlesex County records (upper two open squares in Figure 4). No information is available to substantiate the two Kent County records (lower two open squares in Figure 4) mapped by Soper and Heimburger (1982) since the catalogue of records compiled by Soper and used by him for mapping is no longer available.

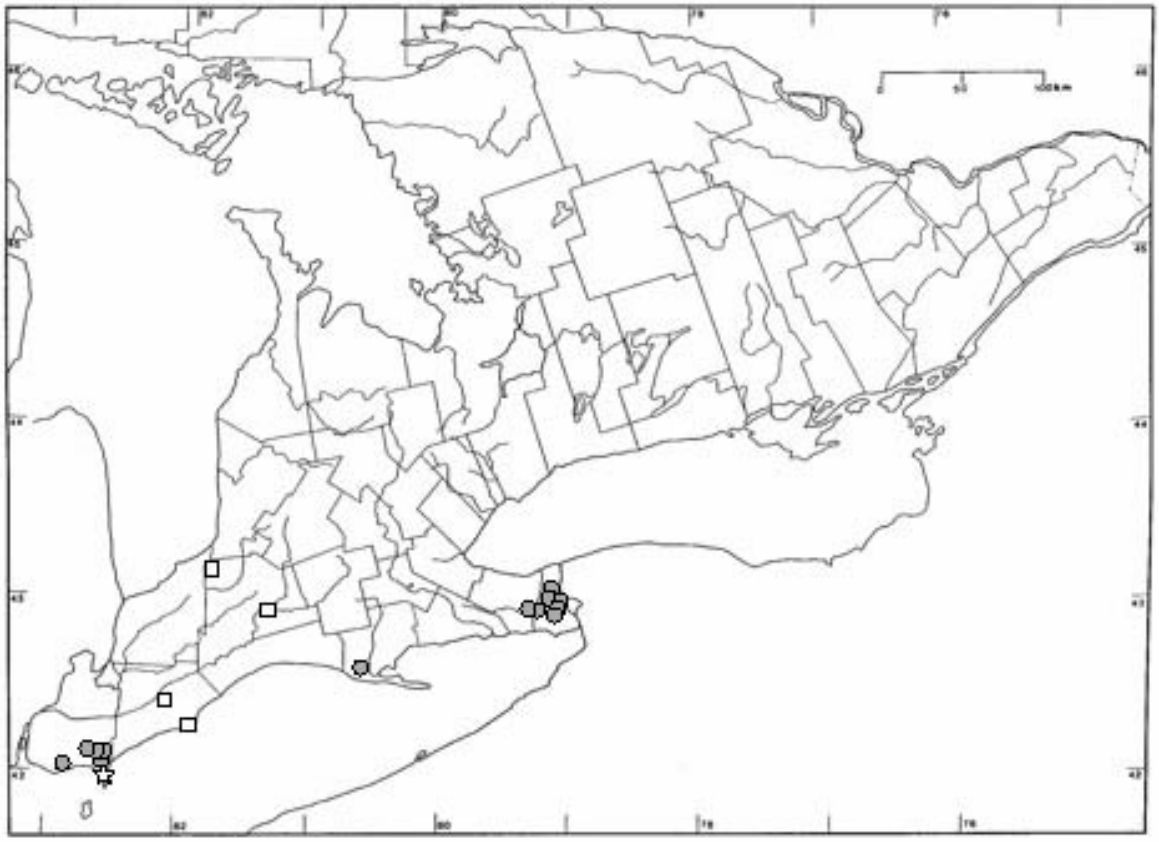

Figure 4. Known and reported occurrences of round-leaved greenbrier in Ontario. Filled circles represent sites confirmed within the last 20 years. The open star at Point Pelee is an extirpated population; open squares are unsubstantiated literature reports from Soper and Heimberger (1982).

HABITAT

Habitat requirements

Across its range, round-leaved greenbrier grows in a wide variety of habitats, ranging from moist woods, to heath balds, rhododendron thickets, and old fields (Carey 1994). In Ontario, this species typically occurs in moist to wet wooded habitats, often on sandy soil. In a study of open habitats in Connecticut (Niering and Goodwin 1974), round-leaved greenbrier clones grew significantly faster in moister habitats. The authors attribute the slow growth on xeric sites to both drought stress, and the impacts of lagomorph herbivory. Slightly closer to the Ontario populations, round-leaved greenbrier has been observed as locally abundant in xeric sands with largely open canopy in southwestern Michigan (Brewer *et al*. 1973).

Round-leaved greenbrier is an understorey component and a pioneering successional species (Smith 1974). Forest openings and surface disturbance may be required for effective seedling establishment, and the species appears to particularly favour more open woodland habitats (for example: Brewer *et al*. 1973). In a study by Hall and Kuss (1989) in Virginia, round-leaved greenbrier was found to be more important close to trails than in inaccessible areas, supporting the idea that it prefers openings, and suggesting that it is resistant to disturbance (Carey 1994).

The Ontario populations are within the Deciduous Forest Region (Rowe 1972), also known as the Carolinian Floral Zone (Scoggan 1978-1979) and the Moderate Temperate Ecoclimatic Province (Ecoregions Working Group 1989). Following the broad COSEWIC classification of terrestrial habitats, round-leaved greenbrier occurs, in Ontario, in the Great Lakes Plains National Ecological Area (see http://www.cosewic.gc.ca/images/cdn_National_ecological_e.jpg). There is no evidence that it was ever common within this region.

Based on fieldwork for the original report (Ambrose 1994), the frequently associated tree and shrub species in Ontario are:

Acer rubrum	*Sassafras albidum*
Quercus rubra	*Quercus alba*
Quercus palustris	*Hamamelis virginiana*
Carpinus caroliniana	*Nyssa sylvatica*
Fraxinus americana	

Occasional associates:

Fraxinus pennsylvanica	*Fagus grandifolia*
Ulmus rubra	*Viburnum acerifolium*
Quercus bicolor	*Cornus florida*
Acer saccharum	*Castanea dentata*
Acer saccharinum	

Infrequent associates:

Populus grandidentata	*Carya glabra*
Populus deltoides	*Carya ovata*
Betula alleghaniensis	*Juglans cinerea*
Liriodendron tulipifera	*Vitis riparia*
Prunus serotina	*Cornus racemosa*
Tilia americana	*Lindera benzoin*
Ulmus americana	*Zanthoxylum americanum*
Carya laciniosa	*Smilax tamnoides*

Round-leaved greenbrier has been observed with *Cornus florida* (COSEWIC Endangered), *Eurybia divaricata* (COSEWIC Threatened), *Juglans cinerea* (COSEWIC Endangered) and *Castanea dentata* (COSEWIC Endangered). *Arisaema dracontium* (COSEWIC Special Concern) was also present at Site 1, where *Smilax* was not relocated in 2006, but where it may well still be extant. Other species listed as provincially rare (S1 through S3) by the Natural Heritage Information Centre (Oldham 1999) that have been seen to occur in the vicinity of round-leaved greenbrier in Ontario include: *Carya glabra* (S3), *C. laciniosa* (S3), *Nyssa sylvatica* (S3), *Quercus palustris* (S3), *Carex swanii* (S3), *Carex squarrosa* (S2), and *Desmodium rotundifolium* (S2). Interestingly, especially given its predilection for successional habitats, round-leaved greenbrier was noted as being associated with old-growth *Nyssa sylvatica* at Site 8 (Paul O'Hara s.n. specimen data—HAM16237).

According to Nova Scotia Department of Natural Resources biologist M.F. Elderkin, the round-leaved greenbrier population in Nova Scotia is confined mostly to lakeshores in the southwest where it shares a distribution characteristic of many other plants in the Atlantic coastal plain (M.F. Elderkin, pers. comm. 2006).

Habitat trends

In Ontario, with the exception of a portion of the woodlots at Sites 5 and 13, the main habitats present during the preparation of the 1994 report appear to be extant (specific habitat characteristics may have changed).

That fact notwithstanding, this species is under considerable threat from habitat development, especially in Essex County, where it is confined to scattered small isolated woodlots, surrounded by inhospitable agricultural settings. Furthermore, woodlot blocks, while extant, are not necessarily still suitable for this species. For example, Site 4, which fieldworkers were not permitted to access in 2006, is likely highly impacted (from the perspective of round-leaved greenbrier) by the conversion of half of the woodlot into a fenced "deer enclosure." Regardless of the specifics of the habitat alteration, high densities of deer threaten round-leaved greenbrier survival.

In Niagara, where the pool of potential habitat is larger, the development pressures are probably even greater than they are in Essex. One population there (Site 13) is the site of an active development proposal (an 83-unit development), and another (Site 7)

persists in a woodlot remnant adjacent to a major suburb. All sites (with the possible exception of Site 12, which is in a city park) in Niagara are at risk of development pressures including the proposed “Niagara to GTA Corridor.” Site 12 itself was historically at least twice its current size; it was divided for roadway construction and residential development (Garofalo pers. comm. 2006).

Some losses had already been documented during the preparation of Ambrose’s 1994 status assessment. He notes that “although more sites are now known than before, current habitat loss in Niagara Region appears to be causing a pronounced recent decline in the range of this species (G. Meyers, pers. comm.). The loss of one known habitat has also been documented in Essex County (M. Oldham, pers. comm.).”

No specific information was compiled on habitat trends in Nova Scotia in view of the relatively stable populations in the province and the limited threats to the species.

Habitat protection/ownership

In Ontario, the majority of sites are in private ownership, with the exception of:

- Portions of Site 6, which are owned by the Long Point Region Conservation Authority.
- Site 12, which is in a city park in Welland; and possibly
- Portions of Site 1 (listed as property of the Essex Region Conservation Authority in Ambrose 1994, but this statement was contradicted in conversation with ERCA staff in 2006).

No detailed information has been compiled on habitat protection and ownership in Nova Scotia since the species is not tracked by the province or the Atlantic Canada Conservation Data Centre. However, some of the populations are known to occur in protected areas such as Kejimkujik National Park and the Tobeac Wilderness Area.

BIOLOGY

Life cycle, reproduction, and population biology

Round-leaved greenbrier is dioecious, meaning that individual plants are either functionally male or functionally female. This species flowers from late May to mid-June in southern Ontario. Fruit matures in the fall, but typically some is retained over the winter to the next spring.

In their survey of seven Ontario round-leaved greenbrier populations, Kevan *et al*. (1991) found two to contain both male and female plants, two to be unisexually pistillate, two to be unisexually staminate, and one to be "probably unisexual" (no fruit was seen, but the observers were unable to determine the sex of the plants present). The 2006 field surveys occurred too late to observe flowering status, but, of the six populations located in 2006, only one had fruiting plants (Table 2). Population 11, seen in flower in 2007 (Table 2) was potentially all male.

Table 2. Reproductive status, population size, and trends at Ontario round-leaved greenbrier sites.

Site #	Reproductive status 1994*	Population size 1994*	Reproductive status 2006	Population size 2006
1	Unknown (not fruiting)	2 subpops; 20-30 clusters		Plants not found.
2	Unisexual: male	3 subpops; 12-16 clusters		Unable to access.
3	Both male and female: fruiting	3 subpops; ~50 clusters		Access denied.
4	Unisexual: male	3 subpops; ~60 clusters		Access denied.
5	Both male and female: fruiting	1 subpop; 7 clusters	Not fruiting.	Locally abundant (dozens of clusters) and widespread as small clusters (at least two subpops, for each of the woodlots)
6	Unisexual: unknown (not fruiting)	1 subpop; 12 clusters	Not fruiting.	Three main areas; ~6 subpops; >100 clusters. Two of the subpops each contain dozens of clusters in a more-or-less continuous tangle. Certainly other smaller subpops exist in the area, and in several areas for which permission to access was not available.
7	Both male and female: fruiting	1 subpop; 24 clusters	One cluster was fruiting.	Three subpops seen, in close proximity. The larger covered an area of approximately 10m in diameter; the others consisted of a single cluster, and a double cluster.
8	Unisexual: female (not fruiting)	1 subpop; 11 clusters	No fruits seen	Population extended along Garner Road for 15 m, and was wider further in from **the road, extending at least 30** m back in **places (but** permission to enter the property was not available). Locally dense.
9	Unisexual: unknown (not fruiting)	2 subpops; ~6 clusters	None found, but permission to access the woodlot where the species most likely occurs was not available.	
10	Not surveyed		Not fruiting.	Abundant. Thousands of stems, in areas very dense (dominant), in mixture of tall tree-climbing plants, and smaller scrubby ones. Area of main patch approximately 0.7 ha (mapped).

Site #	Reproductive status 1994*	Population size 1994*	Reproductive status 2006	Population size 2006
11	Unisexual male		Access to property was not available in 2006. OMNR surveys in 2004 reported at least five patches, one of which was "large and vigorous." Permission obtained in 2007 by the Niagara Peninsula Conservation Authority (NPCA) and site visited by M. Oldham with NPCA staff including A. Garofalo on 25 May 2007; hundreds of stems, some climbing to 5 m or more in tree limbs, with plants covering a large linear patch about 50-60 m x 5 m; all flowers seen and examined were male; no threats evident	
12	Not surveyed		Not fruiting	Common in patch ~60 m x 7 m (mapped).
13	Not surveyed		None visible from the road (2006). In 2005 fieldworkers reported a patch of approximately 36 m by 10 m. Reproductive status of plants was not noted (Brinker pers. comm. 2006)	
14	Presumably extirpated		Presumably extirpated	

*Observations listed under the "1994" headings are from Ambrose 1994. The actual observations were made from a period spanning 1982 to 1990.

Round-leaved greenbrier is also clonal. Large single-sex, contiguous populations (such as those typifying the larger Ontario populations) are likely the result of clonal spread of one individual by means of the plant's stolons and rhizomes. The pattern of dense contiguous patches is typical of this species, and not restricted to its Ontario range. For example, in some areas in southwest Michigan, populations of round-leaved greenbrier have reached very high local densities, taking over acres, especially in more open habitats (Brewer *et al*. 1973).

The unisexually pistillate populations are unable to set fruit, although they will do so if exposed to pollen from another site. Even the mixed-sex populations are pollen limited: artificial pollination of pistillate plants in mixed-sex populations significantly increases fruit set (Kevan *et al*. 1991). This situation is likely due to a paucity of pollinators. Round-leaved greenbrier pollen grains are linked to each other by viscin threads, which prevent wind dispersal, reducing this species to dependence on insect pollinators. Kevan *et al*. (1991) suggest that mosquitoes are the most likely candidate pollinators for the Ontario populations, although small flies, small bees, and bumble bees are also possible. This breadth of candidate species does not necessarily indicate extensive pollinator activity—in their 50 person-hours of observations Kevan *et al*. (1991) witnessed only a single *Bombus* and two mosquitoes visit round-leaved greenbrier flowers.

No seedlings were observed during fieldwork for the original report (Ambrose 1994) or this one. Young plants that were investigated were found to be attached to a stolon or rhizome.

Field experiments in Arkansas (Shelton and Cain 2002) show that round-leaved greenbrier seeds can remain in the seedbank for at least three years with little to no effect on their germinability. Given suitable conditions, however, the seeds start to germinate rapidly, with little or no lag time, regardless of whether they had been in the seed bank for one, two, or three years (Shelton and Cain 2002). Under controlled conditions, the seeds can last for considerably longer: after being stored for five years at

between two and seven degrees Celsius (and approximately two per cent moisture), the seeds were still highly viable (Pogge and Bearce 1989 in Carey 1994). Harvested seeds will germinate after a cold stratification pretreatment of undetermined duration (H. Kock, pers. comm. cited in Ambrose (1994)).

Herbivory

All species of *Smilax* are browsed by wildlife and the rhizomes are sometimes dug and eaten by domestic stock (Holmes 2002). *Smilax* species were among the most heavily grazed of 73 browse species in a study of an east Texas hardwood forest (Goodrum 1977). The tender shoots are very palatable, and the leaves are eaten all year round. In areas where this species is a considerable component of the understorey vegetation, it can be among the most important browse species (Smith 1974).

Rabbit browse has been cited as a stressor in a 1974 study by Niering and Goodwing, but Goodrum (1977) notes that species of *Smilax* can withstand heavy grazing by herbivores such as deer. Rhizomes usually produce new canes annually and if the tips are nipped off, new branches will form at the remaining nodes. Fifty to sixty per cent of the annual growth of *Smilax* species may be eaten without killing the roots (Goodrum 1977).

Physiology

In their Maryland study of three non-native vines (*Pueraria lobata, Lonicera japonica, Hedera helix*) and five native ones (*Rhus radicans, Clematis virginiana, Smilax rotundifolia, Vitis vulpina, Parthenocissus quinquefolia*) Carter and Teramura (1988) found that round-leaved greenbrier was physiologically strongly plastic in its responses to sunlight, being able to function under low-light conditions, while also being able to rapidly achieve relatively high photosynthetic rates under bright sunshine. This ability distinguished it from taxa like *Pueraria*, but was shared with *Parthenocissus* and *Vitis*, and suggests that, although it is well-adapted to understorey conditions, it is better able to flourish in openings and edge situations.

Dispersal/migration

Seeds are dispersed primarily by birds and mammals that eat the fruit. Ruffed Grouse, Northern Bobwhite, Wild Turkey, and at least 38 species of songbirds are known to eat round-leaved greenbrier fruit, as well as mammals such as White-tailed Deer, Black Bear, Opossum, Raccoon, squirrels and rats (Goodrum 1977). The fruits are an especially important late winter and early spring food for wintering birds (Baird 1980 in Carey 1994). While animals are the primary dispersers, seeds have also been reported to be dispersed by water (Newling 1990 in Carey 1994).

Interspecific interactions and related management issues

Round-leaved greenbrier is included in Richburg *et al*.'s (2001) list of 19 "invasive woody species in the Northeast and Mid-Atlantic states." They note that it can be a

problematic competitor of small trees and shrubs, and can also act as a “ladder fuel,” increasing a forest’s susceptibility to fire.

Their general conclusions are echoed by Brockway *et al*. (2003), who describe the development of dense midstorey vegetation (including round-leaved greenbrier) in southern (USA) pine forests during periods of fire suppression, with a concomitant reduction in understorey plant diversity and an increase in risk of high-intensity wild fires (the fire ladder effect). In Ontario, however, round-leaved greenbrier populations and distribution are too limited for it to be a significant factor in this regard, a position which is supported by Smith (1974) who notes that, “in the northeast, [round-leaved greenbrier] rarely overburdens the supporting trees, and it seldom interferes seriously with tree or shrub regeneration.”

In a Kentucky study (Arthur *et al*. 1998), round-leaved greenbrier appeared to be negatively impacted by a single hot fire, and by the combination of a cooler fire and a hot fire, two years apart, as measured by percent cover two years after the second burn. The authors argue that the history of fire suppression in the northeastern United States has favoured round-leaved greenbrier, in terms of both population size, and plant size (height). In pine forests in the southern USA, Brockway *et al*. (2003) reached slightly different conclusions. In their system, round-leaved greenbrier responded favourably to mechanical management of the midstorey followed by prescribed burning. And Smith (1974) reports that *Smilax* responds favourably to fires of any intensity, and, in fact, the hotter the better. Taking the opposite focus (effect of *Smilax* on fire, instead of the effect of fire on *Smilax*), Ohman (2006) notes that old fields invaded by round-leaved greenbrier burn less frequently, but with greater intensity.

As mentioned under the “Habitat” section of this report, disturbance regimes that open up the canopy generally promote *Smilax* growth (e.g. Blair 1960 in Carey 1994). *Smilax* species are resistant to most herbicides, including glyphosate (Wendel and Kochenderfer 1982; Bovey 1977, both cited in Carey 1994).

A study of rights-of-way in Connecticut (Niering and Goodwin 1974) provides some interesting evidence of round-leaved greenbrier’s competitive abilities. In this example, open habitats (rights-of-way and abandoned pastureland) were selectively treated to eliminate tree taxa. The resulting community, comprised largely of clones of *Gaylussacia baccata*, round-leaved greenbrier, and *Vaccinium vacillans*, was relatively stable, and resistant to invasion by tree species, for at least 15 years.

For additional information on interspecific interactions, refer to the “Life cycle,” “Herbivory,” and “Dispersal” sections of this report.

Adaptability

Although round-leaved greenbrier reproduces asexually and is relatively long-lived, it is limited in Ontario by the few sites that have plants of both sexes present. No genetic studies have been published, but the limited capability for producing seeds potentially

could lead to reduced natural variability, genetic diversity and therefore adaptability of the Ontario populations. It is evident, however, that some populations/clones, such as population 11, are clearly growing vigorously.

POPULATION SIZES AND TRENDS

Search effort

The authors spent five days in the field in Ontario during June and July 2006, but a considerable portion of this time was spent attempting to secure access to the properties. In only two cases were we unable to locate the species at sites we accessed, and *Smilax* is quite possibly still extant at both. No exploratory searches of areas of suitable habitat where this species had not been previously reported were undertaken. Specific data on the 2006 field surveys (including search effort per site) are on file with COSEWIC and the Ontario Natural Heritage Information Centre (NHIC), as are the data from the surveys undertaken by the OMNR in 2004 and 2005.

The Niagara Peninsula Conservation Authority (NPCA) has completed extensive surveys during 2006 and 2007 as part of a Natural Areas Inventory. In 2006, field crews visited 76 properties in the municipality of Port Colborne covering 439 ha. In 2007 they surveyed four regions in the Niagara Peninsula covering 179 sites and 868 ha. This represents a total of 255 sites and 1307 ha. Although not every hectare of habitat has been searched in the Peninsula, the field crews are familiar with the species and have looked specifically for it together with other rarities in the region. New populations of some COSEWIC-listed species have been found but none for round-leaved greenbrier, a conspicuous climbing vine (Albert Garofalo, pers. comm. to M.J. Oldham 2007). Few additional populations are likely to be discovered in the Niagara peninsula.

No fieldwork was conducted in Nova Scotia for this report. The species is not tracked by the Atlantic Canada Conservation Data Centre nor the province due to its seemingly secure (S4) ranking in Nova Scotia.

Abundance

The species is locally common in Nova Scotia. It occurs at >50 sites spread throughout four counties. Some of the populations are in protected areas, including Kejimkujik National Park and Tobeatic Wilderness Area (Nova Scotia Museum of Natural History and Nova Scotia Department of Natural Resources' significant habitat database, as cited in COSEWIC 2001. The populations appear to be stable, at between 3,000 and 10,000 individuals (Elderkin, pers. comm. 2006). These values do not represent actual counts but merely rough estimates of the number of plants/root crowns that may reflect the frequency of plants observed in Nova Scotia. It is highly likely that the actual total number of discrete genetic units (distinct plants) of this clonal species is much smaller than the estimates given. The degree of underground connectivity between crowns, consisting of one or more aggregated stems arising from a given rootstock, cannot be readily determined in the field.

Within Ontario, there are 14 sites at which round-leaved greenbrier has been conclusively recorded (see Table 3; and Figure 4). Of those, one is known to be extirpated, and eight have been verified as extant within the past three years (Table 3), leaving five populations possibly extant but not recently confirmed. The "recently verified" ratio is conservative, as several landowners denied fieldworkers access to their properties in 2006. Based on earlier reports (e.g. Ambrose 1994), at least some of these unconfirmed populations are likely still extant.

There are four additional sites described as "not recently verified" in Soper and Heimburger (1982—two from Chatham-Kent, and two from Middlesex), but without supporting documentation. Plants at these sites may be extirpated or the reports may be based on misidentifications. There is no population, extant or otherwise, known from Rondeau Provincial Park, despite a dot there in Soper and Heimburger (Dobbyn pers. comm. 2006).

Table 3. Summary of known round-leaved greenbrier populations at Ontario sites (for data on reproductive status and subpopulation distributions see Table 2).

Site. #	Population Name	First/ Last Obs'd	Ownership (2006)	Comments
1	Cedar Creek ESA (Essex)	1983/1984	Unknown.	None seen in two hours of field surveys in 2006. Some good habitat (similar to the Norfolk sites) persists, so may well be extant.
2	Catbrier Woods ESA (Essex)	1986/1990	Private.	Was unable to secure access to this site in 2006—the owner was on vacation.
3	White Oak Woods ESA (Essex)	1982/1989	Private.	Landowner refused to allow access to the site in 2006.
4	Sweetfern Woods ESA (Essex)	1984/1989	Private (two landowners).	Landowner refused to allow access to the site in 2006.
5	Blytheswood (Essex)	1982/2006	Private (two landowners).	Landowner was interested in the species. C.J. Rothfels 2332, Charles Chevalier; at HAM.
6	South Walshingham Sand Ridges (Norfolk)	1987/2006	Many stems are on Long Point Region Conservation Authority Property (public), with others on private property (two landowners).	Several subpopulations have been discovered by Mary Gartshore and Peter Carson since the initial population was discovered by Don Sutherland. While at least one subpopulation appears to have increased significantly in size since its discovery, most of the increases here are almost certainly due to increased observer effort rather than population changes. C.J. Rothfels 2291, M.Gartshore; at HAM.
7	Drummond Heights (Niagara)	1982/2006	Private.	One cluster in this population was fruiting (the only fruiting plants seen during investigations in 2006). C.J. Rothfels 2344, S. Gibson; at HAM.
8	Garner Road A (Niagara)	1982/2006	Private.	Access denied. Site was searched from the road only.

Site. #	Population Name	First/ Last Obs'd	Ownership (2006)	Comments
9	Cooks Mills (Niagara)	1985/1985	Private.	Access was not secured to the property on which round-leaved greenbrier is most likely because the landowner was not available. Permission was obtained from a second landowner in the area, but no populations of round-leaved greenbrier were found on that property.
10	Fenwick (Niagara)	1999/2006	Private.	Very large population. The primary landowner was interested in trees, pointed out some Castanea on the property, etc. Very friendly, and would be keen to learn more.
11	Lyons Creek North (Niagara)	1999/2007	Private.	Visited by M. Oldham with staff of Niagara Peninsula Conservation Authority. Hundreds of stems in large patch 50-60 m x 5 m; male flowers seen.
12	Woodlawn Park (Niagara)	2005/2006	Public. A park of the City of Welland.	*Eurybia divaricatus* is common in this woodlot. Also seen: *Cornus florida*, *Uvularia sessifolia*, Nyssa. C.J. Rothfels, A. Garofalo, S. Gibson; at HAM.
13	Garner Road B (Niagara)	2003/2005	Private.	The smaller narrow woodlot shown on the topo map (M/3 & M/6) south of the main woodlot is no longer present. Was only able to search this site from the road. This site is slated for development.
14	Point Pelee (Essex)	1881/1881	Unknown.	Presumably extirpated. This record is based on Macoun 27625, at CAN (CAN14747), which is a sterile and unusual specimen without prickles, but confirmed by J.H. Soper, D.J. White, R.V. Maher, and the authors (in our case, based on the squarish stem and the spicules on the underside edge of some leaves).

Herbarium acronyms follow Holmgren and Holmgren (1998).

It is difficult to determine the number of individuals within a given population due to the clonal nature of this species. At least one population (Site 10), supports hundreds to thousands of crowns and at least three others (Sites 5, 6, and 12) support dozens of crowns. The provincial total is between approximately 1000 and 5000 crowns (each of which may or may not be clonally connected to other such crowns). A more realistic measure of numbers of distinct "individual" plants for Ontario is likely in the order of several hundreds of clones (distinct plants) rather than thousands. This is surmised from the fact that plants at 6 of the13 extant Ontario sites are all of single sex and conceivably represent one or only a few genetically distinct colonies having developed from separate propagules originally introduced at the sites. The fact that the colonies tend to be in concentrated patches and not widely scattered throughout the woodlands also argues for localized introduction and vegetative spread forming discrete localized

colonies comprised of crowns whose numbers have increased through vegetative spread. Such clonal species reproducing vigorously through vegetative means can persist and spread in an area likely over many decades and perhaps even centuries to form colonies of substantial size.

Fluctuations and trends

Although the populations in Nova Scotia appear to be stable, the data for Ontario are too sparse to allow the determination of concrete trends in the province. In general, the populations appear roughly comparable between the two assessments (Ambrose 1994 and this report). The discovery of four new populations and several new subpopulations at known sites between the two assessments suggest a positive trend for this species in Canada; however, these new populations most likely represent the discovery of previously undocumented populations rather than recent colonizations.

This trend is also weakened by the degradation of known sites and by the inability of fieldworkers to secure permission to confirm several key Essex region populations.

Rescue effect

No specific data are available on this topic, but one could speculate that rescue is possible for the Ontario populations. Although the frequency and distance of bird dispersal of round-leaved greenbrier has not been documented, it is assumed that potentially long-distance dispersal may be possible, especially since large populations of this species occur in the United States south of Ontario very close to the Canadian border. The species occurs along the edges of Interstate 90 West in New York State, just across the lake from Fort Erie (Garofalo pers. comm. 2006). However, round-leaved greenbrier is dioecious and the establishment of a new sexually reproducing population would require two seeds of different sexes to germinate and survive at the same site. It is conceivable that bird droppings could consist of mixed gender seeds originating in the northern US from populations not too distant from some of the Canadian sites. The deposit of such seeds representing a rescue event would likely occur extremely infrequently.

The populations in Nova Scotia are considerably disjunct from those in the northeastern United States with little chance for rescue.

LIMITING FACTORS AND THREATS

In Ontario, the main threats to this species are habitat destruction and modification and the small number of known populations, the majority of which are confined to small woodlots where they exist as fragmented populations, especially considering that only a few are sexually reproductive.

Specific examples of impacts are reflected in the following examples. In the western portion of its Ontario range in Essex County, half of the woodlot at site 4, containing only male plants, has been converted to a fenced deer enclosure resulting in excessive pressure from browsing. In the eastern portion of its range in the Niagara Peninsula, site 7, one of the few mixed sex colonies in Ontario that was seen to be producing fruit in 2006, is found in a remnant woodlot on private land adjacent to a major suburb where it is potentially at risk from human impacts. In the same region, site 13 is in a remnant woodlot on private land that is scheduled for the development of an 83-unit housing development. A smaller narrow woodlot, formerly present to the south of the main site and representing potential habitat, is no longer present. Site 12, in Woodlawn Park, City of Welland, was historically at least twice its current size; it was divided for roadway construction and residential development.

Considering the relatively extensive surveys in 2006 and 2007 by the Niagara Peninsula Conservation Authority, few new populations/clones are likely to be found in this region. This is highly likely also for Essex County where woodlots are few, extremely small, and fragmented. As a consequence of the species' rarity in Ontario, where it occurs at only 13 small sites, 10 of which are on private land, the species is at risk from further habitat loss and degradation to an already fragmented and small overall population. This is further exacerbated by the fact that likely less than one half of the 13 colonies have both male and female plants and are therefore sexually reproductive. Of the 13 colonies, only 3 are known to have both male and female plants and 6 only have plants of the same gender, with the balance being undetermined. Although the colonies reproduce primarily vegetatively (no seedlings reported by Ambrose in the 1994 status report but no data are currently available on this subject), genetic variability and hence adaptability would appear to be compromised for the Ontario populations/colonies.

In Nova Scotia, threats to the populations are limited. Cottage and residential development along lakeshores have the potential to negatively impact this species (M.F. Elderkin, pers. comm. 2006).

SPECIAL SIGNIFICANCE OF THE SPECIES

In the northeastern USA (Connecticut) round-leaved greenbrier was an important component of a shrub community that was demonstrated to be resistant to reinvasion by tree species provided that the trees were initially removed through herbicide application (Niering and Goodwin 1974). The authors argue that this community type has both ecological values (as stable non-treed wildlife habitat) and economic ones (as a low-maintenance component of hydro rights-of-way or in naturalistic landscaping). In areas where it is more abundant, round-leaved greenbrier is a very important wildlife food.

In Ontario, a few local populations are significant members of the understorey vegetation at their site. This species also provides diverse habitat and contributes to the overall biodiversity of the regional biota.

Smith (1974) reports that some First Nations people and early European settlers used parts of various species of *Smilax.* At present, no significant ATK uses for this species are known (Hess pers. comm. 2006).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Present Legal or Other National Status: COSEWIC, Threatened 2001 (Great Lakes Plains Population).

Present Legal or Other Provincial Status: Ontario MNR Threatened (OMNR 2006). In Nova Scotia, round-leaved greenbrier appears to be secure. The Atlantic Canada Conservation Data Centre ranks round-leaved greenbrier as S4 (Blaney pers. comm. 2006), and the species is considered Green (or "secure") under the Nova Scotia General Status of Wild Species (Elderkin pers. comm. 2006).

In Ontario the habitat of this threatened species is subject to the habitat protection provisions of the Provincial Policy Statement (PPS) under the *Planning Act* when development applications are considered. The PPS prohibits development and site alteration in the significant habitat of T and E species. Round-leaved Greenbrier is also listed as a threatened species on Schedule 4 of Ontario's *Endangered Species Act, 2007*, and consequently the species will be legally protected when the Act comes into force on June 30, 2008. A specific habitat protection regulation will need to be developed to provide legal protection for the habitat (Information provided by OMNR reviewers, Sept. 2007).

TECHNICAL SUMMARY (1)

Smilax rotundifolia

Round-leaved Greenbrier: Great Lakes Plains population

Smilax à feuilles rondes : Population des plaines des Grands Lacs

Range of Occurrence in Canada: southern Ontario

Extent and Area Information

• *Extent of occurrence (EO)(km²)*	Approx. 2500 km², based on the assumption of two post-glaciation points of entry, and thus two polygons (one for the Niagara/Norfolk populations; one for the Essex populations, extended slightly to include potential reports from Chatham-Kent).
• *Specify trend in EO*	Approx. stable
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)*	<20 km² based on 13 populations and using a 1x1 km grid and 40 km² based on a 2x2 km grid
• *Specify trend in AO*	Approximately stable.
• *Are there extreme fluctuations in AO?*	No.
• *Number of known or inferred current locations*	13 extant (only eight recently verified)
• *Specify trend in #*	Seemingly increasing through new sites found in Niagara through greatly increased search efforts but these likely represent previously overlooked colonies
• *Are there extreme fluctuations in number of locations?*	No. Most sites are of recent discovery (since 1985).
• *Specify trend in area, extent or quality of habitat*	Area, extent, and quality of habitat are all gradually declining, due to human activities.

Population Information

• *Generation time (average age of parents in the population)*	Difficult to assess: clonal – Average age of well-developed vines and clones could readily be several decades or older; age to reproduction could be only a few years.
• *Number of mature individuals* Probably between 1000 and 5000 crowns (largely influenced by a single population); there is much uncertainty as to how many individuals this total represents. Only three populations are currently identified as being mixed gender populations and these have < 100 crowns.	Difficult to assess; possibly <250 mature reproductive individuals but not all of the known populations have been surveyed to determine their ability to reproduce by seeds
• *Total population trend:*	Difficult to assess: perhaps stable in terms of numbers of crowns and presumably population(s) with mixed gender plants

• *% decline over the last/next 10 years or 3 generations.*	NA
• *Are there extreme fluctuations in number of mature individuals?*	No.
• *Is the total population severely fragmented?*	Yes.
• *Specify trend in number of populations*	Increased numbers simply reflect the increased search effort in recent years
• *Are there extreme fluctuations in number of populations?*	No
• List populations with number of mature individuals in each: See Table 2.	

Threats (actual or imminent threats to populations or habitats)

Habitat degradation/destruction: loss of existing potential habitat, urban spread and impacts on adjacent populations, housing development proposed at one site, degradation of site where deer enclosure was built and population biology constraints due to the extreme scarcity of populations with both male and female individuals.

Rescue Effect (immigration from an outside source)

• *Status of outside population(s)?* **USA**: Common globally secure (G5); secure (S5) in all states except Illinois where it is S3? (questionably vulnerable to extirpation or extinction)	
• *Is immigration known or possible?*	Unknown, but possible.
• *Would immigrants be adapted to survive in Canada?*	They would likely be suited to the more temperate areas, such as in the vicinity of known populations.
• *Is there sufficient habitat for immigrants in Canada?*	Extremely scarce in Essex; reasonably good in Niagara.
• *Is rescue from outside populations likely?*	Possible given the proximity of large US populations and dispersal by birds

Quantitative Analysis

[provide details on calculation, source(s) of data, models, etc]	None available.

Current Status

COSEWIC: Threatened (2001, 2007) Ontario MNR: Threatened

Status and Reasons for Designation

Status: Threatened	**Alpha-numeric code**: Met criteria for Endangered, B1ab(iii)+2ab(iii), but designated Threatened, B1ab(iii)+2ab(iii), because plants are long-lived vines reproducing vigorously by vegetative growth.
Reason for Designation: The species is currently known from 13 highly fragmented populations in Ontario's Carolinian Zone. Four populations have been found since the previous COSEWIC assessment due to more extensive surveys, and although no population was lost, habitat declines have occurred. Population size and trend are poorly known due to the clonal nature of the species. Many Ontario populations appear to have plants of only one sex and therefore cannot produce seed. The plants, however, are vigorous, long-lived and resistant to habitat changes.	

Applicability of Criteria

Criterion A: (Declining Total Population): No decline data.
Criterion B: (Small Distribution, and Decline or Fluctuation): Meets Endangered B1ab(iii)+2ab(iii) with EO and AO below maximum limits for Endangered and the occurrence of 13 severely fragmented populations as reflected in part by the fact that perhaps half of these represent unisexual populations. There is continued risk from habitat degradation and loss due to the presence of most on private properties and in highly urbanized regions.
Criterion C: (Small Total Population Size and Decline): NA. Because of the uncertainty as to the actual number of mature individuals present in this clonal species with unisexual plants, the criterion cannot be applied with any confidence.
Criterion D: (Very Small Population or Restricted Distribution): Meets Threatened D2 if the area of occupancy is based on a 1x1 km grid but exceeds 20 km^2 if a 2x2 km grid is used.
Criterion E: (Quantitative Analysis): None available.

TECHNICAL SUMMARY (2)

Smilax rotundifolia
Round-leaved Greenbrier: Atlantic population Smilax à feuilles rondes : Population de l'Atlantique
Range of Occurrence in Canada: southwestern Nova Scotia

Extent and Area Information

• *Extent of occurrence (EO)(km²)*	<5000 km²
• *Specify trend in EO*	stable
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)*	>50 km² based on > 50 populations and using a 1 km² grid or a 2x2 km grid
• *Specify trend in AO*	stable.
• *Are there extreme fluctuations in AO?*	No.
• *Number of known or inferred current locations*	Likely > 50
• *Specify trend in #*	Stable
• *Are there extreme fluctuations in number of locations?*	No.
• *Specify trend in area, extent or quality of habitat*	Uncertain but likely stable

Population Information

• *Generation time (average age of parents in the population)*	Difficult to assess: clonal – Average age of well-developed vines and clones could readily be several decades or older; age to reproduction could be only a few years.
• *Number of mature individuals*	3,000-10,000 individuals (crowns) but number of genetically discrete plants (clones) unknown
• *Total population trend:*	Stable
• *% decline over the last/next 10 years or 3 generations*	
• *Are there extreme fluctuations in number of mature individuals?*	No.
• *Is the total population severely fragmented?*	Uncertain but disjunct from US populations
• *Specify trend in number of populations*	Stable
• *Are there extreme fluctuations in number of populations?*	No
• List populations with number of mature individuals in each: No specific data are available since the populations are not tracked provincially	

Threats (actual or imminent threats to populations or habitats)

Limited and related mainly to cottage and residential developments.

Rescue Effect (immigration from an outside source)

• *Status of outside population(s)?* **USA: Common**	
• *Is immigration known or possible?*	Unknown, but likely not possible
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	No

Quantitative Analysis

[provide details on calculation, source(s) of data, models, etc]	None available.

Current Status

Secure in Nova Scotia (General Status of Wild Species 2005) COSEWIC: Not At Risk (2007)

Status and Reasons for Designation

Status: Not at Risk	**Alpha-numeric code**: Not applicable
Reasons for Designation: The species is known from at least 50 sites in southern Nova Scotia where there are estimated to be at least 3,000 to 10,000 individuals (crowns). The actual number of mature individuals for this clonal species is, however, unknown. No declines have been documented and threats are limited.	

Applicability of Criteria

Criterion A: (Declining Total Population): Not applicable. No declines documented.
Criterion B: (Small Distribution, and Decline or Fluctuation): Not applicable. EO and AO are both below maximum levels allowed for either Endangered or Threatened but there are > 50 populations, no continuing decline has been documented, and the species does not undergo extreme fluctuations.
Criterion C: (Small Total Population Size and Decline): Not applicable. The actual number of mature individuals is unknown due to the clonal nature of the species and no continuing decline has been documented.
Criterion D: (Very Small Population or Restricted Distribution): Not applicable. Total number of mature individuals is unknown but likely > 1000 and there are >50 locations and the AO is much greater than 20 km^2.
Criterion E: (Quantitative Analysis): None available

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[NOTE: pers. Comm.. from M. Oldham; G. Meyers; and H. Kock are all from the 1994 report by Ambrose. Further data not available.]

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Carl Rothfels developed his botanical skills as a summer interpretive naturalist at Algonquin Park, under the tutelage of Sean Blaney, Bill Crins, and other individuals. He subsequently served as Field Botanist and Herbarium Curator at Royal Botanical Gardens in Hamilton from 2001 to 2006. He is currently pursuing post-graduate education in North Carolina. He has worked on several earlier COSEWIC reports, including update reports for *Arisaema dracontium, Phegopteris hexagonoptera,* and *Frasera caroliniensis*.

Sachiko Gibson has had the opportunity to gain experience with plants in various capacities: with the Ecological Monitoring and Assessment Network, Environment Canada; Hamilton's Trees Count program; Green Venture's native plant gardens; and out in the field with Carl. She is currently a graduate student at the School for Resource and Environmental Studies at Dalhousie University.

COLLECTIONS EXAMINED

The major herbaria of southern Ontario and the two national herbaria were consulted during the preparation of the original report (Ambrose 1994), including those at the Canadian Museum of Nature (CAN), Agriculture Canada (DAO), Royal Botanical Gardens (HAM), University of Guelph (OAC), University of Toronto (TRT), University of Western Ontario (UWO) and University of Waterloo (WAT). Acronyms represent the official international designations of public herbaria as listed in Holmgren and Holmgren (1998).