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# Ontario Species at Risk Evaluation Report for American Ginseng Ginseng à cinq folioles (*Panax quinquefolius*)

Committee on the Status of Species at Risk in Ontario (COSSARO)

Assessed by COSSARO as Threatened

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# Executive summary

American Ginseng (*Panax quinquefolius*) is a long-lived perennial herb in the Araliaceae (Ivy Family) and individuals can live more than 50 years. It grows in rich, moist, undisturbed mature Sugar Maple (*Acer saccharum*), White Ash (*Fraxinus americana*) and American Basswood (*Tilia americana*) dominated deciduous woods with deep, nutrient rich soil over limestone or marble bedrock. American Ginseng is an obligate understory species and plants are typically found under an overstory (canopy, subcanopy and shrub layer) that provides approximately 75% percent shade.

Mature plants have a single stem which has one to five leaves and each leaf has five leaflets radiating from a central point at the end of the leaf stem. The fruit consists of bright red berries in a cluster that are produced in late summer or fall. Plants can be between 20 cm and 70 cm in height.

American Ginseng plants take three to eight years to mature, and reproduction is through sexual reproduction only. In order to germinate, seeds require an 18 month dormancy period and the seed predation and seedling mortality are high, each seed has a less than 1% chance to reach maturity making American Ginseng populations extremely sensitive to harvest.

In Canada it is found in southern Ontario and southwestern Quebec. In the US it ranges from Louisiana and Georgia to New England and Minnesota.

American Ginseng is classified by COSSARO as Threatened.

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# 1. Eligibility for Ontario status assessment

## 1.1. Eligibility conditions

### 1.1.1. Taxonomic distinctness

American Ginseng is taxonomically distinct. Only one other species of *Panax* (Dwarf Ginseng) also occurs in northeastern North America, but is easily separated from American Ginseng by having three nearly sessile leaflets, while American Ginseng has five stalked leaflets.

### 1.1.2. Designatable units

There is a single designatable unit considered in Ontario. Note that there are wild and cultivated subpopulations in Ontario, with the cultivated populations derived largely from Ontario wild populations, with some inclusion of Wisconsin plant stock. While these two subpopulations occur in Ontario, they do not meet the threshold for being treated as unique designative units, but are isolated from each other genetically as distances between wild plants and cultivated plants are substantial enough to suggest negligible exchange of genetic material (COSEWIC, 2020).

### 1.1.3. Native status

American Ginseng is native to Ontario with records going back to 1862.

### 1.1.4. Occurrence

American Ginseng is found in southern Ontario, along the Niagara Escarpment and the eastern edge of the Precambrian Shield.

## 1.2. Eligibility results

American Ginseng (*Panax quinquefolius*) is eligible for status assessment in Ontario.

# 2. Background information

## 2.1. Current designations

- GRANK: G3G4 (2005)
- IUCN: Not yet evaluated
- NRANK Canada: N2N3
- COSEWIC: Endangered (May 2000)
- SARA: Endangered (Schedule 1)
- ESA 2007: Endangered (2008- already assessed as endangered by COSSARO, January,1999)
- SRANK: S2 (ranked in 2015)

## 2.2. Distribution in Ontario

Wild populations of American Ginseng are found in southern Ontario, along the Niagara Escarpment and the eastern edge of the Precambrian Shield. Field-grown cultivated populations also occur in the same region. NHIC data reports 288 EOs in southern Ontario, with 89 records more than 13 years old, and 38 are considered extirpated.

Less than 1% of the global population of American Ginseng occurs in Canada, however, abundance estimates are not available for Ontario. Although the species appears to be severely declining, lack of data relating to the number of extant populations as well as the absence of abundance data for many of them precludes population trend analyses (ECCC, 2018). A study of the genetic structure of American Ginseng in eastern Canada included one Ontario subpopulation within the analyses, and the results suggested there may be localized genetic structure but then did note that the support for this was potentially limited by sample size and resultant confidence measures of the data (Joly et al. 2017).

## 2.3. Distribution, status and the broader biologically relevant geographic range outside Ontario

American Ginseng is restricted to North America where it occurs over a large portion of the eastern United States, from New England and Minnesota south to Louisiana and Georgia (Figure 1). In Canada, it occurs in the provinces of Ontario and Quebec. It is considered rare or uncommon in most of its range (ECCC, 2018).

The broader biologically relevant geographic range includes the states and provinces adjacent to Ontario that are, or were at some point in time, contiguous with the Ontario American Ginseng populations as they share geological, climatic and other environmental conditions. These populations outside of Ontario help inform region and potential future population trends. This is not considered rescue affect as American Ginseng biology limits rescue to populations perhaps only a few hundred meters away from a given population. This includes Quebec, Michigan, and New York. While

Minnesota, Wisconsin, Pennsylvania and Ohio all border Ontario and have American Ginseng, however, their populations are not thought to have ever have been contiguous with the Ontario population. In Quebec the conservation rank for American Ginseng is S2 (imperiled), in Michigan it is listed as S2/S3 (imperiled/ vulnerable)and in New York it is listed as S4 (apparently secure).

The following provides its status in adjacent jurisdictions:

The wild population in New York state is largely concentrated in the Catskill Mountains. It is thought to be stable,but there is no available data to provide any trends. Over the last decade, there has been a decline in dry weight purchased by licenced dealers in the state; while this may suggest a decline in harvest, it does not capture private usage and sale and is not a good measure of illegal harvest. While harvest is legal in the state, it is illegal to harvest from state lands.

Quebec's wild populations are in decline (estimated between 10-30%, with several occurrences known to have been lost in the last 50 years and "almost all" of the eight protected sites are either very small or under threat from illegal harvest (Centre de donnees sur le patriomoine naturel du Quebec 2022),

Michigan states population may be in decline with a National forest population having apparently lost five of seven locations. The likely causes are thought to be animal browsing, habitat disturbance, climate change, and illegal harvesting (Hackett et al. 2020).

Table 1. Condition of the Species in Adjacent Jurisdictions and Broader Biologically Relevant Geographic Range

| **Adjacent Jurisdictions** | **Biologically Relevant to Ontario (n/a, yes, no)** | **Condition** | **Notes & Sources** |
|---|---|---|---|
| Quebec | yes | S2 | NatureServe 2021 |
| Manitoba | n/a | | Outside of its range |
| Michigan | yes | S2S3 | NatureServe 2021 |
| Minnesota | no | S3 | NatureServe 2021 |
| Nunavut | n/a | | Outside of its range |
| New York | yes | S4 | NatureServe 2021 |
| Ohio | no | S4 | NatureServe 2021 |
| Pennsylvania | no | S3 | Government of Pennsylvania 2021 |
| Wisconsin | no | S4 | NatureServe 2021 |
| *Other Relevant Jurisdiction* | | | |

## 2.4. Ontario conservation responsibility

Ontario has less than 1% of the global range of this species.

## 2.5. Direct threats

American Ginseng is valued for various medicinal uses and is threatened because of the harvest of roots for commercial and personal use. Although the harvesting, possession and export of wild American Ginseng is illegal in Ontario (and Quebec), there appears to be historical evidence that more than 50% of known populations in Ontario show signs of harvest. The size of the plants harvested, and the timing are critical in the impact harvesting may have, e.g., smaller, less viable plants are left behind and loss of seed production if harvest occurs too early in the season. The "Convention on International Trade in Endangered Species of wild Flora and Fauna" because of overharvesting for international trade.

As American Ginseng takes years to reach maturity, as little as a 5% annual root harvest appears to be enough to bring a viable population to extirpation. While cultivated American Ginseng may have alleviated some pressure on wild populations, wild American Ginseng is more sought after as the shape and size of the root are different than the cultivated roots and, as such, is perceived to be a higher social status symbol which drives the price of the wild root up and increases the threat of harvest.

Habitat loss, degradation and fragmentation from urban development and expansion, deforestation, forest harvesting and urban and agricultural, mining and aggregate extraction activities as well as increased recreational uses pose direct threats to American Ginseng populations.

Browsing and predation by white-tailed deer and consumption of seeds by small mammals also pose a direct threat to populations (McGraw and Furedi 2005, McGraw and Chandlre 2018). Damaged and lost leaves are not being replaced during the growing season, which can lead to reduced or stunted growth (McGraw and Chandler 2018) and seeds consumed by rodents are lost to the population. Loss of plants from fungal diseases to roots and foliage is also common (Westerveld, 2010).

Invasive/non-native species of animals and plants also pose direct threats to American Ginseng. These include slugs and earthworms that feed on seeds and plants as well as invasive plants species that compete for resources e.g., Garlic Mustard (*Alliaria petiolata*), Dog-strangling Vine (*Cynanchum rossicum*) and European buckthorn (*Rhamnus cathartica*). The loss of Butternut (*Juglans cinerea*) and Ash (*Fraxinus* spp.) from canker and Emerald Ash Borer (*Agrilus planipennis*), respectively, also constitutes a threat to American Ginseng as loss in canopy changes habitat characteristics, reducing the required amount of shading needed for populations to thrive (ECCC, 2018).

Other threats include decline in seed dispersal as most bird species of the Thrush family that play a role in longer distance seed dispersal have been in decline since the late 1960's (ECCC, 2018), and reduced viability of American Ginseng in small, isolated populations (Mooney and McGraw, 2007).

Climate change may be a threat to American Ginseng populations on a local level where severe weather events might result in loss of canopy trees which in turn alter the habitat conditions, e.g., shading and exposure to direct sun light.

The American Ginseng Recovery Strategy (ECCC, 2018) lists commercial cultivation of American Ginseng in woodlands (compared to agricultural fields) as a potentially medium threat with unknown severity and states that cultivation of American Ginseng in woodlands might introduce foreign genes, pathogens and diseases, use seeds of unknown origin and may result in disturbance of wild populations through site preparation. Cultivation of American Ginseng in woodlands is not practiced in Canada and is not currently supported by OMAFRA. However, there are commercial Ginseng farms adjacent to woodlands where wild American Ginseng is present and there is a potential of intermixing by pollinators or seeds being moved back and forth. It should be noted that the seeds used in agricultural cultivation of American Ginseng in Ontario are sourced largely from southern Ontario (some Wisconsin stock may have been imported at one time) and have not been genetically modified, the pathogens and diseases that affect American Ginseng are native and, according to OMAFRA, if ever cultivation in woodlands was to take place, it would not be where wild populations are present (Sean Westerveld, OMAFRA- personal communication).

## 2.6. Specialized life history or habitat use characteristics

American Ginseng is long-lived and individuals can live more than 50 years. Plants take three to eight years to mature, and reproduction is through sexual reproduction only (COSSARO, 1999). In order to germinate, seeds require an 18 month dormancy period and the seed predation and seedling mortality are high, each seed has a less than 1% chance to reach maturity making American Ginseng populations extremely sensitive to harvest. Seeds are largely dispersed by gravity, but can be dispersed farther distances by birds (specifically thrushes), which will ingest the seeds and regurgitate them a short time later (Hruska et al. 2014).

American Ginseng grows in rich, moist, undisturbed mature Sugar Maple (*Acer saccharum*), White Ash (*Fraxinus americana*) and American Basswood (*Tilia americana*) dominated deciduous woods with deep, nutrient rich soil over limestone or marble bedrock. Near cliff faces plants can be found growing in pockets of shallow soils on broken bedrock plateaus and talus slopes. Soils are generally rich in nutrients with a moderately acid to neutral pH and they are usually well drained but moderately moist and texture is almost always a sandy loam but varies from sandy loam to clay loam. American Ginseng doesn't tolerate flooding or regular drought (MECP, 2019). American Ginseng is an obligate understory species and plants are typically found under an overstory (canopy, subcanopy and shrub layer) that provides approximately 75% percent shade.

## 2.7. Existing Conservation and Recovery Actions

A number of recovery actions have been initiated or were recently completed. These include collaboration with American Ginseng experts in Quebec, establishing an Ontario network of experts in American Ginseng conservation, adaptation of standardized conservation protocols from Quebec to Ontario, implementation of a communications plan aimed at reducing threats to American Ginseng.

Nature Conservancy of Canada (NCC), Ministry of Environment, Conservation and Parks (MECP) and Ministry of Natural Resources and Forestry (MNRF) have been completing demographic monitoring and threat monitoring in recent years. Stewardship actions include staff training and re-routing of trails to reduce illegal harvesting, collection and planting of seeds and a root dye program.

Identification of American Ginseng critical habitat has been recommended and implementation has started (ECCC, 2018; MECP, 2019).

# 3. Ontario status assessment

## 3.1. Application of endangered/threatened status in Ontario

### 3.1.1. Criterion A – Decline in total number of mature individuals

Meets Criterion A2cd for Endangered as populations are inferred/suspected to be declining due to historic levels of illegal harvest, which has not ceased, and there is a continued decline of habitat and AOO that has reduced Ontario's population size by more than 50% based on previous assessment. No recent data/population trends are available, but a decline of at least 30% is suspected.

### 3.1.2. Criterion B – Small distribution range and decline or fluctuation

Does not apply. Although American Ginseng meets criterion B2b (inferred decline in habitat) for Threatened, it does not meet a secondary subcriteria requirement. The number of locations exceeds the values for Threatened, and there are no fluctuations in EOO, IAO, number of locations or number of individuals.

### 3.1.3. Criterion C – Small and declining number of mature individuals

Not applicable as population data trend is not available for the Ontario population. Despite most subpopulations not reaching the viable threshold (>170 individuals), and American Ginseng specialists in Canada reporting severe declines in most areas, abundance estimates are not available for most extant occurrences in Ontario.

### 3.1.4. Criterion D – Very small or restricted total population

Insufficient information on recent total numbers and trends.

### 3.1.5. Criterion E – Quantitative analysis

There has not been a quantitative analysis to determine the probability of extinction

## 3.2. Application of Special Concern in Ontario

Not applicable.

## 3.3. Status category modifiers

### 3.3.1. Ontario's conservation responsibility

Ontario has less than 1% of the global range of this species making its conservation responsibility low.

### 3.3.2. Status modification based on level of risk in broader biologically relevant geographic range

Status modification applies based on level of risk in broader biologically relevant geographic range. Populations in Quebec have listings of S2, Pennsylvania and Minnesota have status listings of S3 and Michigan of S2S3. New York, Ohio and Wisconsin have status listings of S4 but there is no published population data available for those populations. A decline was noted for New York populations (New York Flora Atlas 2021), but they are still considered stable (Denham, pers. comm.), and a decline in number of locations was noted in one study of a Michigan national forest.

### 3.3.3. Rescue Effect

Does not apply. A rescue effect from wild American Ginseng populations from neighbouring jurisdictions is considered to have low probability. Although there are viable populations in the distribution range, wild American Ginseng is rare or uncommon in the US and imperiled in Quebec. As the berry is produced later in the season and seeds are generally not transported long distances before being regurgitated by birds, it is unlikely that any populations outside of the Ontario subpopulations will provide any rescue effect at all. However, there may be a potential rescue effect from commercial populations within southern Ontario but this is very small as most commercial populations are removed from wild populations.

## 3.4. Other status categories

### 3.4.1. Data deficient

Does not apply.

### 3.4.2. Extinct or extirpated

Does not apply.

### 3.4.3. Not at risk

Does not apply.

## 4. Summary of Ontario status

American Ginseng (*Panax quinquefolius*) is classified as Threatened in Ontario based on meeting criterion A2cd for Endangered and modified to Threatened based on its status in the broader biologically relevant range.

## 5. Information sources

Committee on the Status of Endangered Wildlife in Canada. [COSEWIC]. 2000. Assessment and Update Status Report of American Ginseng (*Panax quinquefolius*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa vii + 17pp.

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New York Flora Atlas. 2021. *Panax quinquefolius.* https://newyork.plantatlas.usf.edu/plant.aspx?id=143

Souther, S. 2011. Demographic Response of American Ginseng (*Panax quinquefolius* L.) to Climate Change. Doctor of Philosophy, West Virginia University, Morgantown, WV.

Westerveld, S. 2010. Ginseng production in Ontario. Ontario Ministry of Agriculture and Food and Rural Affairs. Factsheet No. 10-081W AGDEX 268. 8 pp.

Westerveld, S. 2021. Ontario Ministry of Agriculture and Food and Rural Affairs-personal communication.

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# Appendix 1: Technical summary for Ontario

Species: American Ginseng (*Panax quinquefolius*)

## Demographic information

| Demographic attribute | Value |
|---|---|
| Generation time.<br>Based on average age of breeding adult: age at first breeding = X year; average life span = Y years. | 4.5 to 9.5 years<br>(based on combined age of maturity plus seed dormancy requirement) |
| Is there an observed, inferred, or projected continuing decline in number of mature individuals? | Yes, based on minimum requirement of 172 individuals per population for population to be viable. |
| Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations. | >50% decline likely based on only 9 viable populations. |
| Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations. | Unknown as population trends are not available. |
| Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations. | Unknown as population trends are not available. |
| Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future. | Unknown. |
| Are the causes of the decline<br>(a) clearly reversible, and<br>(b) understood, and<br>(c) ceased? | a. Unknown<br>b. Yes<br>c. No |
| Are there extreme fluctuations in number of mature individuals? | Unknown |

## Extent and occupancy information in Ontario

| Extent and occupancy attributes | Value |
|---|---|
| Estimated extent of occurrence (EOO).<br>*If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.* | 145,864 $km^2$ based on available EO records from the NHIC plotted on geocat.kew.org |
| Index of area of occupancy (IAO).<br>*If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.* | 1776 $km^2$ based on available EO records from the NHIC plotted on geocat.kew.org |

| Extent and occupancy attributes | Value |
|---|---|
| Is the total population severely fragmented?<br>i.e., is >50% of its total area of occupancy is in habitat patches that are:<br>(a) smaller than would be required to support a viable population, and<br>(b) separated from other habitat patches by a distance larger than the species can be expected to disperse? | a. Unknown<br>b. Yes |
| Number of locations.<br>*See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.* | 50 to 243 |
| Number of NHIC Element Occurrences<br>*Request data from MNRF.* | 288 |
| Is there an observed, inferred, or projected continuing decline in extent of occurrence? | Yes, likely- due to threats and number of individuals in populations below the viable threshold. |
| Is there an observed, inferred, or projected continuing decline in index of area of occupancy? | Yes, likely- due to threats and number of individuals in populations below the viable threshold. |
| Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs? | Yes, likely- due to threats and number of individuals in populations below the viable threshold. |
| Is there an observed, inferred, or projected continuing decline in number of locations? | Yes, likely- due to threats and number of individuals in populations below the viable threshold. |
| Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat? | Habitat loss likely to continue through development and deforestation/logging. |
| 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 sub-population or total population (if known)

| Sub-population (or total population) | Number of mature individuals |
|---|---|
| | Varies between single individuals to several |

| | |
|---|---|
| | hundred. No recent population tallies are available |

## Quantitative analysis (population viability analysis conducted)

A population viability analysis on populations of American Ginseng in Quebec found that viable populations contain at least 170 individuals, show good annual recruitment (the seeds survive to produce the next generation) and have a good proportion of mature plants (at least 100 plants with 3 or 4 leaves) (Nantel et al., 1996), but there are other estimates from 55 (Souther 2011) to 800 (McGraw and Furedi 2005) that suggest that the minimum viable population size varies depending on the stresses on a given population. This broad range needs to be addressed, as noted by McGraw et al. (2013), as the upper range makes many populations outside a viable size, while the lower part of the range makes more populations viable. In the absence of a PVA specific to Ontario, it is more likely that the minimum viable population size is closer to those of Quebec (170 individuals) than from other regions based on shared threats, climate and geographical proximity.

## Threats

The threats assessment for American Ginseng was completed by ECCC (2018) and COSEWIC (2000):

i) Harvest of roots- High Impact
ii) Browsing, predation and diseases- High Impact
iii) Introduced and invasive species- High Impact
iv) Deforestation- High Impact
v) Forest harvesting- Medium to High Impact
vi) Climate change- Low Impact

ECCC also listed commercial cultivation of American Ginseng as having medium impact. However, this threat is not applicable. Commercial cultivation has no effect on wild populations as commercial forest cultivation is not practiced in Ontario.

## Rescue effect

| Rescue effect attribute | Value |
|---|---|
| Does the broader biologically relevant geographic range for this species extend beyond Ontario? | Yes |
| Status of outside population(s) most likely to provide immigrants to Ontario | Michigan S2S3<br>Minnesota S3<br>New York S4<br>Pennsylvania S3<br>Ohio S4<br>Quebec S2<br>Wisconsin S4 |

| Rescue effect attribute | Value |
|---|---|
| Does the broader biologically relevant geographic range for this species extend beyond Ontario? | Yes |
| Is immigration of individuals and/or propagules between Ontario and outside populations known or possible? | Possible, but unlikely. |
| Would immigrants be adapted to survive in Ontario? | Yes |
| Is there sufficient suitable habitat for immigrants in Ontario? | Probably |
| Are conditions deteriorating in Ontario? | Yes |
| Is the species of conservation concern in bordering jurisdictions? | In some, e.g., Quebec |
| Is the Ontario population considered to be a sink? | No |
| Is rescue from outside populations likely? | No |

## Sensitive species

Yes, American Ginseng is a data sensitive species as location information could be potentially used to harvest wild populations.