

**Ontario Species at Risk Evaluation Report for  
Cleland's Evening-primrose  
Onagre de Cleland  
(*Onethera clelandii*)**

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

Assessed by COSSARO as Endangered

April 2024

Final

## Executive summary

Cleland's Evening-primrose is a biennial, sometimes annual, forb that initially grows a basal rosette of lanceolate leaves and later develops small branching flower stalk (Illinois Wildflowers 2024). The plants are capable of cross and self-fertilization and produce seeds contained within a capsule that can be up to 3/4" long (Illinois Wildflowers 2024). Seeds of the Cleland's Evening-primrose are viable for up to several decades in the soil and require disturbance in order to germinate (COSEWIC 2024).

Cleland's Evening-primrose typically grows in sandy and disturbed well-drained soils. It's associated plant communities are tall grass prairie, sandy savannahs, sand dunes, open fields, and railway Rights-of-Ways (Illinois Wildflowers 2024).

Cleland's Evening-primrose seeds disperse primarily within proximity to the parent plant. Secondary dispersal can occur by ornithochory (seed dispersal by birds) to greater distances. However, given the fragmentation of suitable habitat, germination and establishment of the species by means of ornithochory is unlikely.

The threats assessment conducted by COSEWIC (2023) assigned an overall threat impact of Very High – High. The assigned overall threat impact was based on the following known threats: residential and commercial development, and natural systems modifications.

Although no plants have been recorded since 2001, it is thought that it may still be present within the soil seed bank. The primary cause of decline has been habitat loss and degradation resulting from land development, suppression of disturbance and competition from non-native and native plants as a consequence of community succession.

Cleland's Evening-primrose (*Oenothera clelandii*) is classified as Endangered, in Ontario based on meeting criterion A2ace; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C2a(i); D1. The species was not previously assessed by COSSARO.

# 1. Eligibility for Ontario status assessment

## 1.1. Eligibility conditions

### 1.1.1. Taxonomic distinctness

Cleland's Evening-primrose (*Oneothera clelandii*) is a member of the genus *Oneothera*, in the Onagraceae (evening primrose) family.

### 1.1.2. Designatable units

Four subpopulations of Cleland's Evening-primrose occur in southwestern Ontario, two in Komoka just west of London, one in Jaffa immediately south of St. Thomas and one in Mississauga. These Ontario subpopulations of Cleland's Evening-primrose are considered to be one designatable unit (COSEWIC 2023, IN PRESS).

### 1.1.3. Native status

Cleland's Evening-primrose (*Oneothera clelandii*) is native to Ontario (COSEWIC 2023, IN PRESS).

### 1.1.4. Occurrence

The current distribution of Cleland's Evening-primrose in North America is known to be from the United States (U.S.) Midwest and southern Ontario, including Michigan, Illinois, Wisconsin and Minnesota, to Arkansas and Kentucky (COSEWIC 2023, IN PRESS). In Ontario there are four subpopulations in the Carolinian Zone, two in Komoka just west of London, one in Jaffa immediately south of St. Thomas and one in Mississauga (COSEWIC 2023, IN PRESS).

## 1.2. Eligibility results

Cleland's Evening-primrose (*Oneothera clelandii*) is eligible for status assessment in Ontario.

# 2. Background information

## 2.1. Current designations

- GRANK: G4: Apparently Secure (NatureServe 2024)
- IUCN: No Status
- NRANK Canada: N1: Critically Imperiled (NatureServe 2024)
- COSEWIC: Endangered (December 2023)
- SARA: No Status
- ESA 2007: No Status
- SRANK: S1: Critically Imperiled (ranked in 2015)

## 2.2. Distribution in Ontario

In Ontario, Cleland's Evening-primrose has been recorded as four subpopulations occurring within remnant prairie communities in Komoka (2), Jaffa (1), and Mississauga (1) (COSEWIC 2023, IN PRESS). Its distribution prior to European settlement is thought to have extended between Windsor and Rice Lake, and north to Barrie (Bakowsky and Riley 1994). Although suitable habitat remains at these locations, surveys conducted in 2022 found that no individuals were present at any of the four previously recorded subpopulation sites (COSEWIC 2023, IN PRESS). The last known observations of Cleland's Evening-primrose in Ontario were in 2001 at Komoka (COSEWIC 2023, IN PRESS).

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

The distribution of Cleland's Evening-primrose ranges from the U.S. Midwest and southern Canada south to Arkansas, with the greatest concentration of populations in Michigan, Illinois, Wisconsin, and Minnesota (Figure 1) (COSEWIC 2023, IN PRESS). The species is ranked as S1 Critically Imperilled in Ohio and Arkansas, S2 Imperilled in Missouri, S4 Apparently Secure in Illinois and Indiana, and is not ranked in Minnesota, Wisconsin, Michigan, New York, Iowa and Kentucky (Table 1; Nature Serve, 2024). Subpopulations near Duluth, Minnesota and the northern Lower Peninsula of Michigan represent the northern extent of the range (COSEWIC 2023, IN PRESS).

The Broader Biologically Relevant Geographic Range (BBRGR) for Cleland's Evening-primrose outside of Ontario is considered to include the immediately adjacent states listed in Table 1. The potential for cross pollination between subpopulations in Ontario and the adjacent states is limited given the geographic distance between subpopulations (COSEWIC 2023, IN PRESS).

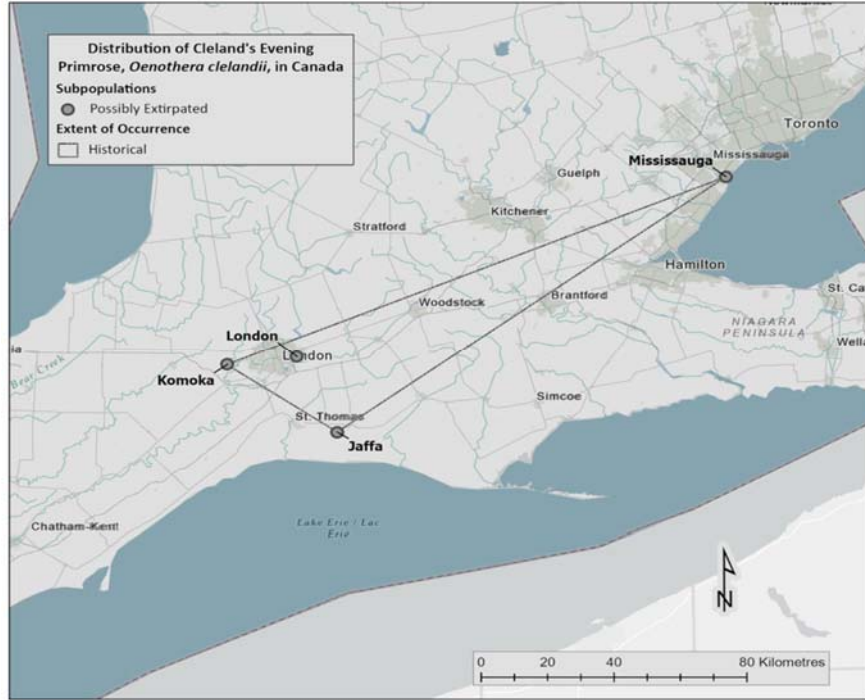


Figure 1. Distribution of Cleland’s Evening-primrose historical subpopulations in Ontario, Canada (map produced by Alain Filion of the COSEWIC Secretariat August 2023).

Migration of the subpopulations between the adjacent states and Ontario is also limited given the fragmentation of suitable habitats, distance between subpopulations and barriers, including waterbodies (lakes Erie, St. Clair, Huron and the Detroit and St. Clair rivers) (COSEWIC 2023, IN PRESS). Cleland’s Evening-primrose seed dispersal by natural means is limited to short distances by direct seed rain and long-distance dispersal by seed-eating birds (COSEWIC 2023, IN PRESS).

**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	Sources
Michigan	Yes	No Rank	NatureServe 2024
Ohio	Yes	S1 Critically Imperilled	NatureServe 2024
New York	Yes	No Rank	NatureServe 2024
Minnesota	Yes	No Rank	NatureServe 2024
Wisconsin	Yes	No Rank	NatureServe 2024
Iowa	Yes	No Rank	NatureServe 2024
Illinois	Yes	S4 Apparently Secure	NatureServe 2024
Indiana	Yes	S4 Apparently Secure	NatureServe 2024
Kentucky	Yes	No Rank	NatureServe 2024

<b>Adjacent Jurisdictions</b>	<b>Biologically Relevant to Ontario (n/a, yes, no)</b>	<b>Condition</b>	<b>Sources</b>
Missouri	Yes	S2 Imperilled	NatureServe 2024
Arkansas	Yes	S1 Critically Imperilled	NatureServe 2024

## 2.4. Ontario conservation responsibility

Ontario's conservation responsibility is low. The Global Range for the species is less than 5% for all of Canada (COSEWIC 2023, IN PRESS).

## 2.5. Direct threats

The threats assessment conducted by COSEWIC (2023) assigned an overall threat impact of Very High – High. The assigned overall threat impact was based on the following known threats: residential and commercial development, and natural systems modifications.

### Residential and Commercial Development (Very High – Medium)

The Cleland's Evening-primrose subpopulation at Komoka is threatened by the presence and potential creation of new golf cart paths on the adjacent tall grass prairie communities that provide habitat for the species (COSEWIC 2023, IN PRESS). The potential for future redevelopment of the golf course as a residential subdivision further threatens the subpopulation at Komoka (COSEWIC 2023, IN PRESS).

At the Jaffa site, Cleland's Evening-primrose is threatened by the development of new serviced campsites and associated access roads (COSEWIC 2023, IN PRESS).

### Natural Systems Modifications (Very High – High)

Cleland's Evening-primrose requires frequent disturbance from human disturbance to fire to facilitate seed germination and maintain its populations. In each of the four subpopulations in Ontario disturbance has been limited to absent (COSEWIC 2023, IN PRESS). At Komoka, the historical aggregate operations likely maintained the subpopulation until the operations ceased in 2003 with the development of a golf course (COSEWIC 2023, IN PRESS). Since 2003, invasive species (Glossy Buckthorn, Spotted Knapweed and White Sweet Clover) colonization of the remnant tall grass prairie communities has changed the micro-environment to a more dense ruderal community unsuitable for the germination and growth of Cleland's Evening-primrose (COSEWIC 2023, IN PRESS). Similar invasive plant growth at the Jaffa and Mississauga subpopulations has reduced the suitable habitat at those sites as well (COSEWIC 2023, IN PRESS).

## 2.6. Specialized life history or habitat use characteristics

Cleland's Evening-primrose is a biennial, sometimes annual, forb that initially grows a basal rosette of lanceolate leaves and later develops small branching flower stalk

(Illinois Wildflowers 2024). Flowers may be produced along the main stem and as a spike of flowers on the terminus of the central stem. Each flower has four yellow pointed petals, four sepals with a narrow calyx tube, four fused styles and eight stamens. The plants are capable of cross and self-fertilization and produce seeds contained within a capsule that can be up to 3/4" long (Illinois Wildflowers 2024). The night-flowering blooms are pollinated by long-tongued insects and hummingbirds (COSEWIC 2024). Seeds of the Cleland's Evening-primrose are viable for up to several decades in the soil and require disturbance in order to germinate (COSEWIC 2024).

Cleland's Evening-primrose typically grows in sandy and disturbed well-drained soils. Its associated plant communities are tall grass prairie, sandy savannahs, sand dunes, open fields, and railway Rights-of-Ways (Illinois Wildflowers 2024).

Cleland's Evening-primrose seeds disperse primarily within proximity to the parent plant. Secondary dispersal can occur by ornithochory (seed dispersal by birds) to greater distances. However, given the fragmentation of suitable habitat, germination and establishment of the species by means of ornithochory is unlikely.

### 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 A2 based on (a) direct observation, (c) a decline in the index area of occupancy, extent of occurrence and quality of habitat, and (e) the effects of introduced taxa, hybridization, pathogens, pollutant, competitors or parasites, disturbance climate change or other threats.

All four subpopulations have declined by >50% in the past 30-49 years, and the causes of decline are not reversible, nor have they ceased.

- The Komoka subpopulation was observed (200-300 individuals) in 1990 by M. Oldham and last observed (no reported numbers) in 2001 by G. Buck. In 2022, no plants were observed (P. Deacon) (COSEWIC 2023, IN PRESS).
- Individuals of the London population were observed (no reported numbers) in 1993 (M. Oldham), but during extensive surveys in 2020 (P. Deacon), no individuals were found (COSEWIC 2023, IN PRESS).
- The Jaffa subpopulation was last observed (no reported numbers) by W. Stewart in 1975. In 2022, after conducting an extensive survey, P. Deacon found that no individuals remained (COSEWIC 2023, IN PRESS).
- The Mississauga subpopulation was observed in 1984 by D. Brunton and S. Varga. In 2000 and 2022, S. Varga and P. Deacon, respectively, found no individuals (COSEWIC 2023, IN PRESS).

The extent of occurrence is declining, and quality of habitat is becoming degraded. Suitable habitat is threatened by invasive plant growth and lack of disturbance required

for seed germination.

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

Meets Criterion B1a. The extent of occurrence (EOO) is estimated to be 2,775 km<sup>2</sup>, less than the <5,000 km<sup>2</sup> threshold, and meets Criterion B1b(i)(ii)(iii)(iv)(v).

And,

Meets Criterion B2ab(i,ii,iii,iv,v). The index of the area of occupancy is estimated to be 16 km<sup>2</sup>, less than the <500 km<sup>2</sup> threshold. Meets subcriterion B2a, severely fragmented or known to exist at 4 locations, less than the threshold of <5 locations. Meets subcriterion B2b as the subpopulations have been declining in the (i) extent of occurrence, (ii) index of area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations or subpopulations, and (iv) number of mature individuals.

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

Meets Criterion C2a(i), no subpopulation estimated to contain >250 mature individuals. No mature plants are known to exist in Ontario presently, and the seedbank is projected to continue to decline.

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

Meets Criterion D1. Population is estimated to have <250 mature individuals.

### 3.1.5. Criterion E – Quantitative analysis

Does not apply.

## 3.2. Application of Special Concern in Ontario

Does not apply.

## 3.3. Status category modifiers

### 3.3.1. Ontario's conservation responsibility

Does not apply. The species is classified as G4 globally. Ontario's conservation responsibility is less than 25%.

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

Does not apply.



### 3.3.3. Rescue Effect

Rescue from subpopulations in adjacent states is unlikely due to the long distances between US subpopulations and suitable habitat in Ontario (COSEWIC 2023, IN PRESS).

## 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

Cleland's Evening-primrose (*Oenothera clelandii*) is classified as Endangered, in Ontario based on meeting the following criteria: A2ace; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C2a(i); D1.

This status of this species is consistent with the definition of Endangered under the Endangered Species Act, 2007.

## 5. Information sources

Bakowsky, W.D., and J.L. Riley. 1994. A survey of the prairies and savannas of southern Ontario. In: Proceedings of the Thirteenth North American Prairie Conference.

COSEWIC. 2023. IN PRESS. COSEWIC assessment and status report on the Cleland's Evening-primrose *Oenothera clelandii* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 41 pp. (<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>).

Illinois Wildflowers Information. 2024. <https://illinoiswildflowers.info> [Accessed March 2024].

NatureServe. 2024. NatureServe Explorer: An online encyclopedia of life Website:

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# Appendix 1: Technical summary for Ontario

Species: Cleland's Evening-primrose (*Oneothesa clelandii*)

## Demographic information

<b>Demographic Information:</b>		
Generation time (usually average age of parents in the population)	12-22 years	Based on the plant being biennial. The lifespan of the seed bank is unknown but expected to persist for decades. The three-generation period is estimated as 36-66 years.
Is there an [observed, estimated, inferred, or projected] continuing decline in number of mature individuals?	Yes	No plants were observed at any of the four subpopulations during the 2022 surveys. A decline has been observed based on a comparison of 2022 search results with historical specimen and sight records.
[Observed, estimated, or projected] percent of continuing decline in total number of mature individuals within 3 years [or 1 generation; whichever is longer up to a maximum of 100 years]	Unknown	It is estimated that the species has been extirpated from the four known subpopulations based on surveys conducted in 2022.
Observed, estimated, or projected] percent of continuing decline in total number of mature individuals within 5 years [or 2 generations; whichever is longer up to a maximum of 100 years]	Unknown	It is estimated that the species has been extirpated from the four known subpopulations based on surveys conducted in 2022.
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last 10 years [or 3 generations; whichever is longer]	100% reduction over 47 years (1975-2022)	The Jaffa and Mississauga subpopulations are suspected to have disappeared prior to 2012 as suitable habitat is very limited and subject to long-established competition. It is estimated that the Komoka and London subpopulations may have disappeared prior to 2012 due to golf course construction and low number of plants, respectively.
[Projected, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations, up to a maximum of 100 years]	Unknown	Surveys conducted in 2022 indicate the species may already be extirpated from all four known subpopulation sites or may only be persisting in a seed bank.

## Extent and occupancy information in Ontario

<b>Extent and occupancy attributes</b>	<b>Value</b>
Estimated extent of occurrence (EOO).	2,775 km <sup>2</sup> if the range of historical subpopulations is used.
Index of area of occupancy (IAO).	16 km <sup>2</sup> if the range of historical subpopulations is used.
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy in habitat patches that are: (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No b. Yes
Number of locations.	0-4
Number of NHIC Element Occurrences	0-4
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Yes
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	Yes
Is there an observed, inferred, or projected continuing decline in number of locations?	Yes
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes
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)

<b>Sub-population (or total population)</b>	<b>Number of mature individuals</b>
Jaffa	0
Komoka	0
London	0
Mississauga	0
Total	0

## Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

### Threats

A threat calculator completed by COSEWIC in March 2023 found an overall threat impact of high – medium high based on the following threats:

- i. Ecosystem Modifications (7.3) (Very High to High impact)
- ii. Housing and Urban Areas (1.1) (Very High to Medium impact)
- iii. Tourism and Recreation Areas (1.3) (High to Medium impact)
- iv. Agricultural and forestry effluents (9.3) (Medium to low impact)
- v. Fire suppression (7.1) (Low impact)
- vi. Problematic native species (8.2) (Unknown impact)

### 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	S1 (Critically Imperilled) in Ohio, S4S5 (Apparently Secure) in Michigan; SNR (Not Ranked) in New York
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?	Yes, but limited
Are conditions deteriorating in Ontario?	Yes
Is the species of conservation concern in bordering jurisdictions?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	No

### Sensitive species

This is not a data sensitive species.

## **Acronyms**

BBRGR: Broader Biologically Relevant Geographic Range  
COSEWIC: Committee on the Status of Endangered Wildlife in Canada  
COSSARO: Committee on the Status of Species at Risk in Ontario  
ESA: Endangered Species Act  
EO: Element occurrence (as defined by NHIC)  
EOO: extent of occurrence  
GRANK: global conservation status assessments  
IAO: index of area of occupancy  
IUCN: International Union for Conservation of Nature and Natural Resources  
MNRF: Ministry of Natural Resources and Forestry  
NHIC: Natural Heritage Information Centre  
NNR: Unranked  
NRANK: National conservation status assessment  
SARA: Species at Risk Act  
SNR: unranked  
SRANK: subnational conservation status assessment  
S1: Critically Imperiled  
S2: Imperiled  
S3: Vulnerable  
S4: Apparently Secure  
S5: Secure  
IUCN: International Union for Conservation of Nature and Natural Resources  
CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario