

Ontario Species at Risk Evaluation Report for

Eastern Sand Darter

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Indigenous Name (unknown)

Ammocrypta pellucida

Southwestern Ontario population

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

Southwestern Ontario population

Assessed by COSSARO as Threatened

November 2022

Final

Executive summary

Eastern Sand Darter (*Ammocrypta pellucida*) is a small-bodied fish of the genus *Ammocrypta* and is the only member of its genus that occurs in Canada and the United States. Its body is translucent, slender, and elongate, and it is a species that utilizes sand and clean gravel habitats in rivers and lakes. It is a short-lived species with a maximum age of 4 years, and it feeds primarily on benthic invertebrates. It exhibits fossorial behaviour. It is considered a species that has low dispersal ability, considered able to move within a stream system, but unlikely to disperse far as it is a sedentary species (COSEWIC 2022, IN PRESS).

More recent studies by Ginson *et al.* (2015, as cited in COSEWIC 2022, IN PRESS) revealed distinct genetic variation between drainage systems, but connectivity within the river systems. Through these studies, the genetic structure of the Canadian populations indicated genetic discreteness between the Québec population, the West Lake population (Lake Ontario watershed) and the Southwestern Ontario population. As a result, 3 designatable units were identified in Canada, and two occur in Ontario, namely the DU1 Southwestern Ontario population and DU3 West Lake population. DU2 is the third designatable unit, the Québec population. Formerly only two designatable units were identified in 2009 as Québec and Ontario.

Eastern Sand Darter also occurs in the United States and is imperiled or critically imperiled to vulnerable in 7 of the 9 states where it occurs. The global range of Eastern Sand Darter includes the Ohio River basin in Ohio, Indiana, Illinois, Kentucky, West Virginia, and Pennsylvania. It has been recorded from the Lake Huron, Lake St. Clair, Lake Erie, and Lake Ontario watershed in Michigan, Ohio, New York, Pennsylvania, and Ontario. It also occurs further east in the St. Lawrence River and Lake Champlain watershed in Québec, Vermont, and New York.

Ontario data trends indicate a retraction of its range and extirpation from the Lake Huron system for the Southwestern Ontario population. Three populations (Ausable River, Catfish Creek and Big Otter Creek) are considered extirpated, and one new population was discovered in Detroit River, since the last COSEWIC assessment (COSEWIC 2022, IN PRESS). Threats to the Southwestern Ontario population include habitat changes (quality and quantity) and invasive species.

The West Lake population represents a new population not identified during the last assessment, in the nearshore areas off Sandbanks Provincial Park. The population occurs at a specific location identified by a single ongoing threat of invasive species, namely Round Goby (*Neogobius melanostomus*).

Threat of climate change to this species is unknown, but it is assumed changes to temperature and precipitation will alter stream hydrology and habitat.

Global ranking for Eastern Sand Darter is G4 (Apparently Secure).

National ranking for Canada is N2 (Imperiled) and the United States is N4 (Apparently Secure). It is listed as S2 (Imperiled) in Ontario and Québec, in subnational ranks. It is

listed as S1 (Critically Imperiled) in Pennsylvania, Vermont and Michigan; S2 (Imperiled) in New York, S3 (Vulnerable) in Ohio, West Virginia and Illinois, and S4 (Apparently Secure) in Kentucky and Indiana.

Eastern Sand Darter is classified as Threatened under Schedule 1 of the federal Species at Risk Act and as Endangered under Ontario's Endangered Species Act, 2007 at the time of this assessment. Critical habitat identified under the Species at Risk Act covers 187km² in Ontario.

The COSEWIC 2022 (IN PRESS) status assessment classified the Southwestern Ontario (DU1) and the West Lake (DU3) populations as Threatened, whereas the Québec population (DU2) was assessed as Special Concern.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Eastern Sand Darter (*Ammocrypta pellucida*) (Putnam 1863) is a small member of the perch family (Percidae). It is the only member of the genus to occur in Ontario.

1.1.2. Designatable units

Analysis of genetic structure identifies three discrete populations, DU1 is Southwestern Ontario, DU2 Québec, and DU3 West Lake. The genetic differentiation indicates isolation of approximately 10,000 years (COSEWIC 2022, IN PRESS).

The Ontario populations are split into DU1 and DU3. The DU3 West Lake population represents a new discovery of a population since the 2009 COSEWIC assessment. A new population was also discovered in the DU1 Southwestern Ontario population in Detroit River in 2013 for a total of 7 populations in the DU1.

COSEWIC 2022 (IN PRESS) indicates all 27 populations of the DU2 Québec population occur within the provincial boundaries of Québec. No NHIC records were provided for the Québec population (DU2) in Ontario. The EOO of the Québec population is estimated at 13,811km², and the index of area of occupancy (IAO) at 560km² (COSEWIC 2022, IN PRESS). The Québec population has increased, largely attributed to increased sampling effect (Richard *et al.* 2018, as cited in COSEWIC 2022 (IN PRESS)).

1.1.3. Native status

Eastern Sand Darter is native to Ontario.

1.1.4. Occurrence

The global range of Eastern Sand Darter includes the Ohio River basin in Ohio, Indiana, Illinois, Kentucky, West Virginia, and Pennsylvania. It has been recorded from the Lake Huron, Lake St. Clair, Lake Erie, and Lake Ontario watershed in Michigan, Ohio, New York, Pennsylvania, and Ontario. It also occurs further east in the St. Lawrence River and Lake Champlain watershed in Québec, Vermont, and New York.

1.2. Eligibility results

Eastern Sand Darter (*Ammocrypta pellucida*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G4 Apparently Secure (NatureServe 2022)
- IUCN: Least Concern (19 October 2011)
- NRANK Canada: N2
- COSEWIC: Threatened (May 11, 2022) (COSEWIC 2022, IN PRESS)
- SARA: Threatened (Schedule 1)
- ESA 2007: Endangered (Nov. 2009)
- SRANK: S2 (ranked in 2009)

2.2. Distribution in Ontario

When assessed in 2009 only two designatable units for the species were identified, the Ontario and Québec populations. The COSEWIC (2022, IN PRESS) update includes new information and knowledge about the species including two new locations in Ontario in 2013 and confirmation of distinct genotypes. Three designatable units were identified and assessed as DU1 Southwestern Ontario population, DU2 Québec population and DU3 West Lake population. DU1 and DU3 occur in Ontario.

The Eastern Sand Darter is limited to Southern Ontario, and is currently present in Lake St. Clair, Lake Erie, and Lake Ontario watersheds. It was formerly present in Lake Huron watershed.

The DU1 includes 12 populations (COSEWIC 2022, IN PRESS): Several in Lake Erie which include the Western Basin, Rondeau Bay, Long Point Bay, Grand River, Catfish Creek, Big Otter Creek and Big Creek. Four populations in Lake St. Clair watershed including Lake St. Clair, Thames River, Sydenham River and Detroit River. Historically it was found in the Ausable River in the Lake Huron basin. The population in the Detroit River is a new population identified since the last assessment by COSEWIC.

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

The Endangered Species Act requires that COSSARO consider the broader biologically geographic range (BBRGR) outside of Ontario and that if the BBRGR would result in a species classification indicating a lower level of risk to the survival of the species than

would result if COSSARO considered the condition of the species inside Ontario only, COSSARO’s classification of a species shall reflect the lower level of risk to the survival of the species. The BBRGR is discussed in section 3.3.2 of this species assessment report. Rescue effect that is not the same as the BBRGR is discussed in section 3.3.3 of this species assessment report.

The adjacent jurisdiction’s populations of Eastern Sand Darter are considered Critically Imperiled (S1) to Vulnerable (S3). The New York population of Eastern Sand Darter (S2 Imperiled) is considered to have been declining from 1989 until the 2013 status assessment, and especially the populations of Lake Erie which may be affected by the increase in Round Goby (*Neogobius melanostomus*) (New York State 2013). The populations to the northeast are contiguous to the DU2 Québec population in Canada, unlikely to disperse to Ontario populations. Abundance appears to be stable in the northern New York range (New York State 2013) with a possible range expansion (similar to Canada’s DU3 Québec population).

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

Adjacent Jurisdictions	Biologically Relevant to DU1 (n/a, yes, no)	Condition (NatureServe Explorer 2022)	Notes & Sources
Québec	No	S2	Genetic differentiation between 3 designatable units indicates isolation for ~10,000 years (COSEWIC 2022, IN PRESS)
Pennsylvania	Yes	S1	
Vermont	No	S1	
Michigan	Yes	S1	
New York	No	S2	
Illinois	No	S3	
Ohio	Yes	S3	

Adjacent Jurisdictions	Biologically Relevant to DU1 (n/a, yes, no)	Condition (NatureServe Explorer 2022)	Notes & Sources
West Virginia	No	S3	
Kentucky	No	S4	
Indiana	No	S4	

2.4. Ontario conservation responsibility

About 10 to 20% of the Eastern Sand Darter’s global range occurs in Canada, and of that, about 50% occurs in Ontario (Edwards *et al.* 2007, Fisheries and Oceans Canada 2012).

2.5. Direct threats

COSEWIC (2022, IN PRESS) confirmed threats for the Southwestern population of Eastern Sand Darter as Medium-High. Threats include pollution, invasive species, climate change and natural system modifications. Seven locations are identified based on pollution threat, which includes the newest population identified since the last COSEWIC assessment, but excludes 3 presumed extirpated locations (Ausable River, Catfish Creek and Big Otter Creek). Limiting factors considered relevant to the threat assessment include quality of available habitats, availability of food resources, population recovery capacity, and fragmentation of populations.

2.6. Specialized life history or habitat use characteristics

The species is associated with sand and clean gravel dominant substrates, and is sensitive to siltation (DFO Unpublished data, as cite in COSEWIC 2022, IN PRESS). This species uses sandbars and exhibits fossorial behaviour. Within river systems, the species is strongly associated with suitable habitat (sandbars, shallow pools and sandy raceways of streams and rivers) and individuals aggregate in these areas (Fisheries and Oceans Canada 2012). Lentic populations are often associated with wave-protected sandy beaches, sand dunes, sandy shores, and shallow bays (Fisheries and Oceans Canada 2012, Reid and Dextrase 2017). As a habitat specialist, it is not flexible to habitat changes. Low fecundity of the Eastern Sand Darter may also contribute to population declines (Fisheries and Oceans Canada 2012).

This species may serve as a host species for the glochidia of the Endangered Round Hickorynut (*Obovaria subrotunda*) (COSEWIC 2003).

2.7. Existing Conservation and Recovery Actions

Eastern Sand Darter is listed as Threatened under Schedule 1 of the federal *Species at Risk Act*, and as Endangered under Ontario’s *Endangered Species Act*, 2007. The provincial listing provides species and habitat protection, whereas the federal listing

provides species protection but not automatic habitat protection. Critical habitat was identified under SARA in the Sydenham, Thames and Grand rivers, Big Creek and in Long Point Bay of Lake Erie receive protection. The federal *Fisheries Act* provides general habitat protection. Protection is also provided under:

- The Provincial Policy Statement (PPS) under the provincial *Planning Act*;
- *Lakes and Rivers Improvement Act*,
- *Nutrient Management Act*,
- *Environmental Protection Act*,
- *Water Resources Act*, and
- *Source Water Protection Act*.

The species is not listed in the United States under the *Endangered Species Act*.

Eastern Sand Darter occurs in waters off protected areas of Rondeau, Komoka and Sandbanks provincial parks.

DFO (2012) published the federal recovery status for Ontario populations of Eastern Sand Darter. Short and long-term objectives include research and monitoring, management and habitat protection, and stewardship and education. Ecosystem recovery strategies have been prepared for Ausable, Grand, Sydenham, and western Lake Erie watershed (COSEWIC 2022, IN PRESS). Actions implemented include initiatives to improve the health of streams and watersheds, identification of important habitats and research to address knowledge gaps.

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

Not enough data to inform Criteria A.

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

B1. EOO of 10,603kms (COSEWIC 2022, in press) meets criteria **B1 Threatened** for EOO < 20,000km².

Review of available Natural Heritage Information Centre data and a review of the EOO through GEOCAT (geocat.kew.org) resulted in an EOO of 9,813km² (AOO of 240km²) – when data from 2010 records or newer were included (excluded West Lake population data and a record near Guelph Eramosa that indicates location is not correct). EOO similar that it meets criteria for B1 Threatened for EOO <20,000km².

B2. IAO of 288km² (COSEWIC 2022, in press) meets criteria of **B2 Endangered** of IAO <500km² for under B2. A review of the NHIC data through GEOCAT provided an AOO of 240km².

a) Occurs at 7 locations therefore meets criteria for **B2(a)Threatened** (severely fragmented at less than 10 locations meets criteria, separated from other habitat patches by a distance larger than the species can be expected to disperse).

b) **B2(b) continuing decline (i)** observed in extent of occurrence, **(ii)** observed in index of area of occupancy and **(iii)** for inferred continuing decline to quality of habitat due to threats, and **(iv)** observed number of locations. Not enough information to assess **(v)** number of mature individuals.

c) Does not meet criteria.

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

DU1 – Not applicable. No population estimate/number of mature individuals available. No population fluctuations known.

3.1.4. Criterion D – Very small or restricted total population

DU1 – No population estimate available. Not applicable under D2 as IAO > 20km² and number of locations >5.

3.1.5. Criterion E – Quantitative analysis

Quantitative analysis not completed.

3.2. Application of Special Concern in Ontario

Not applicable.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

About 10 to 20% of the Eastern Sand Darter's global range occurs in Canada, and of that, about 50% occurs in Ontario (Edwards *et al.* 2007, Fisheries and Oceans Canada 2012).

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

Adjacent jurisdictions rank species at imperilled to critically imperilled. No status modifications based on broader biologically relevant geographic range have been applied.

3.3.3. Rescue Effect

The Eastern Sand Darter is considered to have limited ability to disperse, has very specific habitat requirements, and Canadian populations are isolated between rivers (Gibson *et al.* 2015, as cited in COSEWIC 2022, IN PRESS). The species is adapted to a benthic and sedentary lifestyle.

DU1- For the Southwestern Ontario population, adjacent jurisdictions of Pennsylvania (S1), Michigan (S1) and Ohio (S3) were considered as having populations of Eastern Sand Darter that could in theory disperse to Ontario, but this was still considered unlikely (COSEWIC 2022, IN PRESS). Michigan's population would need to cross Lake Huron to provide rescue effect to the now extirpated Lake Huron population. There are 4 occurrences associated with the St. Clair watershed, last observed 2010 (Michigan State University, n.d.).

Immigration is considered unlikely to improbable from neighboring jurisdictions. Bordering populations are classified as imperiled to critically imperiled. While individuals would be considered well adapted to survive in Ontario, the sedentary nature, specific substrate requirements, and sensitivity to habitat alterations make it very unlikely for this species to traverse distances required to provide a rescue effect.

3.4. Other status categories

3.4.1. Data deficient

Not applicable.

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

DU1 – Not applicable.

4. Summary of Ontario status

Eastern Sand Darter (*Ammocrypta pellucida*) Southwestern Ontario population is classified as Threatened in Ontario based on meeting criterion B1B2ab(i, ii, iii, iv).

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

5. Information sources

COSEWIC. 2022. IN PRESS. COSEWIC assessment and status report on the Eastern Sand Darter *Ammocrypta pellucida*, Southwestern Ontario population, Québec population and West Lake population in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 74 pp.

(<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>).

Edwards, A., Boucher, J., and B. Cudmore. 2007. Recovery strategy for the eastern sand darter (*Ammocrypta pellucida*) in Canada [Proposed Species at Risk Act Recovery Strategy Series, Fisheries and Oceans Canada, Ottawa. vii + 50pp.

DFO (Fisheries and Oceans Canada). 2012. Recovery Strategy for Eastern Sand Darter (*Ammocrypta pellucida*) in Canada: Québec Populations. Fisheries and Oceans Canada. Ottawa, Ontario. vii + 56 pp.

Ontario Ministry of Natural Resources. 2013. Recovery Strategy for the Eastern Sand Darter (*Ammocrypta pellucida*) in Ontario. Ontario Recovery Strategy Series. Ontario Ministry of Natural Resources, Peterborough, Ontario. iii+ 5 pp + Appendix vii + 58 pp. Adoption of Recovery Strategy for the Eastern Sand Darter (*Ammocrypta pellucida*) in Canada: Ontario populations (Fisheries and Oceans Canada 2012).

Michigan State University. N.d. Michigan Natural Features Inventory: *Ammocrypta pellucida*, eastern sand darter. Website: <https://mnfi.anr.msu.edu/species/description/11397/Ammocrypta-pellucida> [accessed October 23, 2022].

NatureServe. 2022. NatureServe Explorer: An online encyclopedia of life. Version 7.1. Web site: <http://explorer.natureserve.org> [accessed October 23, 2022].

New York State. 2013. Species Status Assessment Eastern Sand Darter. Department of Environmental Conservation. Website: https://www.dec.ny.gov/docs/wildlife_pdf/sgcnesandddarter.pdf [accessed on October 31, 2022].

Reid, S.M., and A.J. Dextrase. 2014. First record of *Ammocrypta pellucida* (Aggasix, 1863) (*Actinopterygii:Perciformes*) from the Lake Ontario drainage basin. Check List 10:1201-1203.

Reid, S.M., and A.J. Dextrase. 2017. Monitoring lake populations of Eastern Sand Darter (*Ammocrypta pellucida*): a comparison of two seines. Journal of Freshwater Ecology, 32:1, 499-511.

Appendix 1: Technical summary for Ontario

Species: Eastern Sand Darter (*Ammocrypta pellucida*)

Demographic information

Demographic attribute	Value	DU1
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	2 _ years	2 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Yes/No/Unknown based on _____.	Yes (overall trends inferred decline in habitat area, extent, and quality and from population trends: 2 declining, 2 stable, 3 extirpated, 6 unknown, 0 increasing)
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	___% decline or Unknown	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	___% [reduction or increase] or Unknown	Unknown
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	___% [reduction or increase] or Unknown	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years,	___% [reduction or increase] or Unknown	Unknown

Demographic attribute	Value	DU1
or 3 generations, over a time period including both the past and the future.		
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. Yes/No/Unknown b. Yes/No/Unknown c. Yes/No/Unknown	a. Some, yes b. Yes c. No
Are there extreme fluctuations in number of mature individuals?	Yes/No/Unknown	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value	DU1
Estimated extent of occurrence (EOO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	___ km ²	Current population: 10,603km ² All populations: 20,195 km ²
Index of area of occupancy (IAO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	___ km ²	Current populations: 288 km ² All populations: 576 km ²
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy is 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. Yes/No/Unknown b. Yes/No/Unknown	a. No b. Yes
Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible</i>	Insert number or range of numbers.	Based on pollution threat: 7 (including 1 discovered since

Extent and occupancy attributes	Value	DU1
<i>range to reflect uncertainty if appropriate.</i>		publication of the COSEWIC previous report, excluding 3 presumed extirpated)
Number of NHIC Element Occurrences <i>Request data from MNRF.</i>	Insert if available	12
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes/No/Unknown	Yes, observed.
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Yes/No/Unknown	Yes, observed.
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	Yes/No/Unknown	Yes, observed.
Is there an observed, inferred, or projected continuing decline in number of locations?	Yes/No/Unknown	Yes, observed.
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes/No/Unknown	Yes, in quality.
Are there extreme fluctuations in number of populations?	Yes/No/Unknown	No
Are there extreme fluctuations in number of locations?	Yes/No/Unknown	No
Are there extreme fluctuations in extent of occurrence?	Yes/No/Unknown	No
Are there extreme fluctuations in index of area of occupancy?	Yes/No/Unknown	No

Number of mature individuals in each sub-population or total population (if known)

The number of mature individuals is unknown for the Southwestern Ontario extant populations.

Sub-population (or total population)	Number of mature individuals
Ausable River	Presumably 0 (extirpated)
Lake St. Clair	Unknown
Thames River	Unknown
Sydenham River	Unknown
Detroit River	Unknown
Western Basin, Lake Erie	Unknown
Rondeau Bay	Unknown
Long Point Bay	Unknown
Catfish Creek	Presumably 0 (extirpated)
Big Otter Creek	Presumably 0 (extirpated)
Big Creek	Unknown
Grand River	Unknown
Total (12)	Unknown

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats calculator was completed for this population (COSEWIC 2022, IN PRESS). Overall threat was assessed as high-medium for the Southwestern Ontario population. Pollution such as from domestic and urban wastewater, industrial effluents and agricultural effluents is identified as medium threat. Invasive species and climate change are identified as medium to low threat. And natural system modifications such as through dams and water management, and other modifications is identified as a low threat.

Rescue effect

Rescue effect attribute	Value	DU1
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes/No/Unknown/Probably/Possibly	Yes
Status of outside population(s) most likely to provide immigrants to Ontario	Insert status	Pennsylvania (S1 Critically Imperiled), Michigan (S1 Critically Imperiled), Ohio (S3 Vulnerable)
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Yes/No/Unknown/Probably/Possibly	Possibly, but identified as unlikely
Would immigrants be adapted to survive in Ontario?	Yes/No/Unknown/Probably/Possibly	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes/No/Unknown/Probably/Possibly	Yes
Are conditions deteriorating in Ontario?	Yes/No/Unknown/Probably/Possibly	Yes, habitat degradation
Are conditions deteriorating in Ontario?	Yes/No/Unknown/Probably/Possibly	Yes, appears to be ongoing decline
Is the species of conservation concern in bordering jurisdictions?	Yes/No/Unknown/Probably/Possibly	Yes
Is the Ontario population considered to be a sink?	Yes/No/Unknown/Probably/Possibly	No

Rescue effect attribute	Value	DU1
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes/No/Unknown/Probably/Possibly	Yes
Is rescue from outside populations likely?	Yes/No/Unknown/Probably/Possibly	No

Sensitive species

This is not a data sensitive species.

Acronyms

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