Ontario Species at Risk Evaluation Report for Channel Darter (*Percina copelandi*)

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

Assessed by COSSARO as Special Concern

May 2017

Final

Dard gris (*Percina copelandi*)

Le dard gris (ou fouille-roche gris) est un petit poisson bentophage de la famille des Perches. Se nourrissant d'invertébrés, il vit habituellement dans les lacs et les rivières au débit modéré où les substrats sont granuleux. En Ontario, on recense l'espèce dans trois régions : le bassin versant du lac Sainte-Claire et du lac Érié, le bassin versant des rivières de la baie de Quinte, ainsi que la rivière des Outaouais et le ruisseau Little Rideau, dans l'Est de l'Ontario. On ne dispose d'aucune donnée sur la taille de la population, mais l'espèce serait disparue du centre et de l'Est du lac Érié, et présumément en déclin dans l'Ouest de ce même plan d'eau en raison de l'invasion du gobie à taches noires et de la pollution domestique et agricole. Le gobie à taches noires a aussi élu domicile dans la rivière Trent et pourrait envahir d'autres habitats du dard gris dans l'Est de l'Ontario.

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Executive summary

Channel Darter is a small bottom-feeding fish in the darter subfamily. They are found in both rivers and lakes, typically in areas with moderate water flow and coarse substrate. They feed on invertebrates. The species occurs in three regions of Ontario: the Lake St. Clair-Lake Erie drainage; rivers in the Bay of Quinte drainage; and the Ottawa River and Little Rideau Creek in eastern Ontario. Population size data is not available, but this species is known to have been extirpated from central and eastern Lake Erie, and is apparently declining in western Lake Erie. This decline is attributed to the invasive Round Goby, and household and agricultural pollution. The Round Goby has also established in the Trent River, and may spread to further Channel Darter habitat in eastern Ontario.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Channel Darter is a taxonomically distinct species. Its closest relatives do not occur in Ontario, and several morphological features distinguish it from other similar *Percina* species.

1.1.2. Designatable units

COSEWIC (2016) divided Channel Darter into three Designatable Units: DU1, including the Lake St Clair and remaining Lake Erie subpopulations; DU2, including the Bay of Quinte subpopulations (Skootamatta, Salmon, Moira and Trent); and DU3, including the Ottawa River and Little Rideau Creek subpopulations. DU3 also includes Quebec subpopulations on the east side of the Ottawa River and downstream in the St. Lawrence around Montreal.

COSEWIC (2016) provides four justifications in support of these DUs:

First, each of the DUs is geographically isolated from the others, with at least 300 km of uninhabited area between each unit.

Second, microsatellite data shows some limited genetic differentiation among putative DUs (Reid et al. 2013).

However, mitochondrial haplotypes collected for the study outlined above displayed no spatial structure corresponding to the DUs (Reid et al. 2013). Of 67 mtDNA haplotypes identified, only six occurred in more than one subpopulation within a putative DU. Similarly, the microsatellite data reveals that most of the genetic variation in Channel Darter is due to variation among individuals. The three putative DUs account for only 3% of the total variance, with >90% of the variance being partitioned among individuals (Reid et al. 2013). In other words, 90% of the genetic diversity in Channel Darter has no relationship to either the putative DUs or even the subpopulations within the DUs. Bayesian clustering (STRUCTURE) does reveal distinct groups corresponding to DU1 and DU3, but there is no group corresponding to DU2. The Trent River population clusters with DU3 (Ottawa River), while the Moira and Salmon River form a cluster of their own (Figure 2 in Reid et al. 2013).

Third, COSEWIC (2016) notes the southwestern Ontario DU occurs in large lakes, in contrast to the riverine habitat in the other two DUs. This ecological difference is inferred to affect morphology and life history, although there is no data to support this.

Fourth, the three DUs are hypothesized to represent distinct post-glacial recolonization events, citing the similar distribution of Eastern Sand Darter as corroborating evidence. However, the disjunct distribution of Eastern Sand Darter may also be a consequence of (long-term) decline in habitat conditions in Lake Ontario (Williams 1975, cited in Reid

and Dextrase 2014), and no data is available to test these two alternatives.

The COSEWIC report also identifies the risk of further increasing the disjunction between DUs should the southeastern Ontario group, DU2, be lost. This is not relevant for the definition of DUs.

After reviewing the available information, the genetic data is not persuasive. Genetic distinction is not a requirement for defining a DU, but in its absence there should be other data to support the DUs. In this case, the population is moderately disjunct, ecological/morphological divergence is suspected, and there are suspected differences in post-glacial colonization routes. On the other hand, DUs for freshwater fish usually correspond to the COSEWIC National Freshwater Biogeographic Zones, and the entire Ontario population of Channel Darter is within a single zone (the Great Lakes - Upper St. Lawrence). There is not enough data to warrant departing from this convention, therefore Channel Darter is designated based on a single DU in Ontario.

1.1.3. Native status

The earliest record of Channel Darter in Ontario in the NHIC database is 1926. However, there is no evidence to suggest that it is not native to the province.

1.1.4. Occurrence

Channel Darter is extant in Ontario, where it forms permanent, year-round populations.

1.2. Eligibility results

Channel Darter (*Percina copelandi*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G4 (NatureServe 2017)
- NRANK Canada: N2N3
- COSEWIC: DU1: Endangered; DU2: Endangered; DU3 Special Concern (December 2016)
- SARA: Threatened (Schedule 1)
- ESA 2007: Threatened (June, 2008)
- SRANK: S2 (ranked in 2001)

2.2. Distribution in Ontario

Channel Darter occurs in three regions of southern Ontario: southwestern Ontario, including Lake St. Clair, the St. Clair and Detroit rivers, and the western basin of Lake Erie; the Bay of Quinte drainage; and the Ottawa River (including the Little Rideau Creek). The distribution of Channel Darter in Lake Erie historically stretched from the

west end as far east as Port Dover. However, it has since been extirpated from the central and eastern basins, and is now found no further east in Lake Erie than Point Pelee National Park.

In the Lake Ontario drainage, Channel Darter is restricted to several rivers in the Bay of Quinte, where it has been confirmed by several recent surveys (COSEWIC 2016).

There are also persistent subpopulations in the Ottawa River, from Ottawa to the Quebec border. There are additional subpopulations of Channel Darter further downstream in Quebec in the St. Lawrence River.

In the most recent COSEWIC (2016) assessment, locations were largely defined by watersheds. This was justified on the basis that the principal threats faced are believed to act at this scale and because genetic evidence suggested dispersal was limited among rivers. Specific threats provided include agricultural pollution and the invasive Round Goby, although no single threat was identified as the most significant plausible threat. For this report, we consider Round Goby to be the most significant threat for the purposes of defining locations.

Within Ontario, the COSEWIC (2016) report identified 12-17 locations, which correspond to 19 NHIC element occurrences (EO):

Lake St. Clair: (3)

- St. Clair River (1 COSEWIC location; 1 extant NHIC EO)
- Lake St. Clair (1 COSEWIC location; 1 extant and 1 historic NHIC EO)
- Detroit River (1 COSEWIC location; 1 extant NHIC EO)

Lake Erie: (1)

- Western Basin (Point Pelee Area; 1 COSEWIC location; 1 extant and 1 historic NHIC EO)
- Central Basin (likely extirpated; 1 COSEWIC location; no NHIC EOs)
- Eastern Basin (likely extirpated; 1 COSEWIC location; 1 historic NHIC EO)

Lake Ontario (Bay of Quinte) (9)

- Trent River (1 COSEWIC location; 2 extant NHIC EOs)
- Moira River (1-4 COSEWIC locations, including the Skootamatta and Black Rivers; 6 extant, 2 historic and one extirpated NHIC EOs)
- Salmon River (2-4 COSEWIC locations; no NHIC EOs)

Ottawa River (2)

- Little Rideau Creek (1 COSEWIC location; 1 extant NHIC EO)
- Ottawa River (main channel; 1 COSEWIC location; no NHIC EOs)

The range of locations given in COSEWIC (2016) for the Bay of Quinte was provided to promote discussion on whether or not to consider locations based on the presence of threats. That is, only sites where Round Goby was already present as a threat would be considered as a location (in which case there are three locations), or alternatively, also including areas that are at risk of future invasion as locations. The latter definition is more consistent with IUCN definitions, so we adopt it for use here: the Ontario population of Channel Darter is considered to be partitioned among 17 locations, 15 of which are extant.

The COSEWIC report also partitioned these subpopulations into three Designatable Units: Lake St. Clair and Lake Erie (DU1), Lake Ontario (DU2), and the St. Lawrence River (DU3), as discussed below.

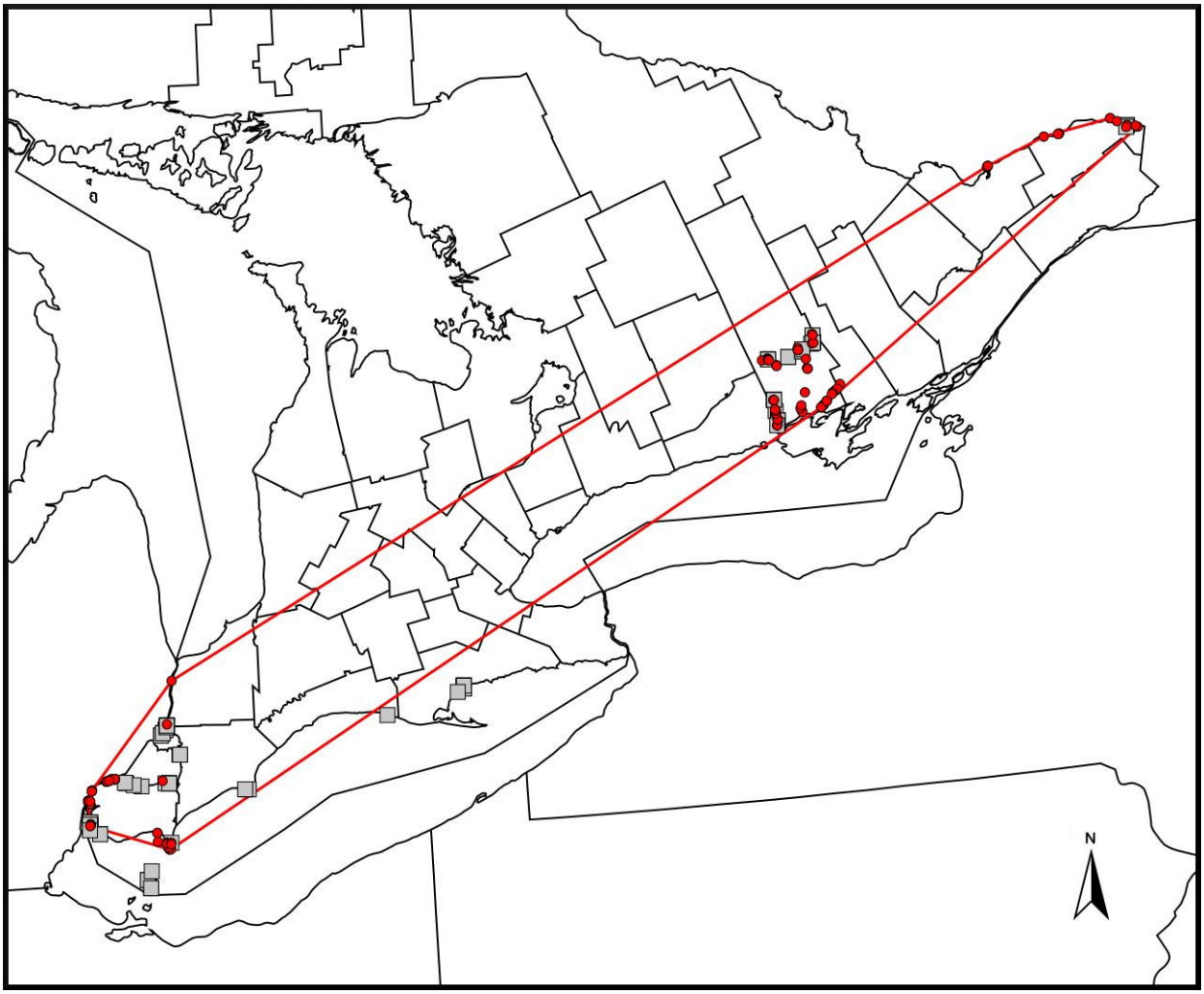

Figure 1. All Ontario Channel Darter records from NHIC observation database. Gray squares represent pre-2000 records. Red circles represent post-2000 records, which were used to calculate the EOO and AOO estimates in this report. The EOO for

Channel Darter is shown as a red polygon.

2.3. Distribution and status outside Ontario

Channel Darter is widely distributed across the eastern United States, with disjunct populations in Arkansas, Louisiana, Kentucky, Michigan, and New York/Quebec. It has a national status of N4 in the United States, and is rare (S1-S2) in Indiana, Louisiana, Michigan, New York, Ohio, Vermont and Virginia. Its Canadian range extends into Quebec, where it is listed as Vulnerable. The Ottawa River subpopulation straddles the border between Ontario and Quebec.

2.4. Ontario conservation responsibility

The proportion of the global population in Ontario is unknown, but is probably less than 1%.

2.5. Direct threats

The most significant plausible threat to Channel Darter is the invasive Round Goby. This fish competes with Channel Darter for space and resources, and may also prey on Channel Darter eggs. Correlative studies have shown that Channel Darter abundance is inversely related to Round Goby abundance, and > 80% of the decline in Channel Darter in the St. Clair River has been attributed to Round Goby (Burkett and Jude 2015). Round Goby is now well-established in the Lake St. Clair and Lake Erie areas, as well as the Trent River in the Bay of Quinte. It has not yet established itself in the other rivers in the Bay of Quinte, where dams restrict its further spread. Round Goby's status in the Ottawa River is uncertain. However, it has invaded areas downstream in the St. Lawrence River, where it has a direct impact on the Quebec population of Channel Darter.

Shoreline modifications are also a threat for Channel Darter, which depends on moderately moving water over clean sandy or gravel substrate for breeding. This issue is most critical in Lake Erie and Lake St. Clair, less so in the Bay of Quinte and the Ottawa River. However, altered flow regimes are a concern in the Bay of Quinte rivers. Navigational dams along the Trent-Severn Waterway have been observed to cause water level drops of up to 0.5 m, and in some instances Channel Darters have been observed stranded by such events. COSEWIC (2016) classified this as a "low impact" threat in the Threats Calculator, due in part to the capacity for the risks to be mitigated by canal managers.

2.6. Specialized life history or habitat use characteristics

Channel Darter requires moderate current and clean sand or gravel substrate for breeding. As such, it is sensitive to shoreline modification and flow alteration. It may migrate seasonally, between relatively shallow summer habitat to deeper water in winter; however, further research is needed to confirm this.

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 applicable, as no data on current population size or trends/decline is available.

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

Not at Risk. Meets the B2 threshold for Endangered, but listing requires that it also meets at least two of the subcriteria a-c, and it only meets one (b).

- B1: EOO 54324 km^2, exceeds thresholds
- B2: AOO 240 km^2, meets the EN threshold
    - a: 15 extant locations, does not meet thresholds; does not apply
    - b: continuing decline in habitat quality and/or number of mature individuals inferred, due primarily to Round Goby (iii,v). This may lead to further loss of locations in Lake Erie, so (iv) may also apply.
    - c: no extreme fluctuations, does not apply

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

Does not apply, no estimates of the number of mature individuals can be made.

3.1.4. Criterion D – Very small or restricted total population

Does not apply, as no numerical estimate of population size can be made. Furthermore, it seems likely that if such an estimate were possible, it would exceed the threshold of 1000 mature individuals necessary to qualify for Threatened.

3.1.5. Criterion E – Quantitative analysis

Does not apply.

3.2. Application of Special Concern in Ontario

Channel Darter is extirpated from the central and eastern basins of Lake Erie, presumably due to a combination of pollution and the impacts of the invasive Round Goby. Round Goby is likely to have a continuing impact in Lake Erie, and could lead to further loss of subpopulations. Round Goby has also become established in the Trent River, and it poses a plausible threat to the other rivers in the Bay of Quinte drainage. Its status is less clear in the Ottawa River. Expansion of Round Goby could plausibly

lead to a reduction in the number of locations from 15 to 10, at which point B2(ab) applies. Thus, Special Concern status is appropriate for this species.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Ontario has less than 25% of the global conservation responsibility for this species.

3.3.2. Rescue effect

Rescue of the Lake Erie subpopulations from Michigan is possible. However, Channel Darter is rare in Michigan (S1S2), Ohio (S2), and Pennsylvania (S2), so this is unlikely. The Ottawa River subpopulation is actually part of a larger subpopulation that straddles the Ontario/Quebec border. Thus, there is likely ongoing migration of Channel Darters into Ontario from Quebec, as well as out of Ontario into Quebec. However, Channel Darter is rare in Quebec (S2S3), and this subpopulation is listed as Special Concern by COSEWIC (2016). Consequently, the migration of animals into Ontario from Quebec is unlikely to mitigate against declines in Ontario over the medium to long term.

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

Not applicable

4. Summary of Ontario status

Channel Darter (*Percina copelandi*) is classified as Special Concern with one designatable unit in Ontario. This differs from the COSEWIC assessment due to the different approach to designatable units, as discussed above. Based on the subdivision of Channel Darter into three DUs, COSEWIC (2016) has listed the Lake Erie and Lake Ontario DUs as Endangered, and the St. Lawrence River DU as Special Concern.

5. Information sources

Burkett, E.M. and D.J. Jude. 2015. Long-term impacts of invasive round goby *Neogobius melanostomus* on fish community diversity and diets in the St. Clair River, Michigan J. Great Lakes Res. 41: 862-872.

COSEWIC. 2016. COSEWIC assessment and status report on the Channel Darter Percina copelandi, Lake Erie populations, Lake Ontario populations and St. Lawrence populations, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 68 pp.

NatureServe. 2017. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. [Accessed: May 16, 2017].

Reid, S.M. and A. Dextrase. 2014. First record of *Ammocrypta pellucida* (Agassiz, 1863) (Actinopterygii: Perciformes) from the Lake Ontario drainage basin. Checklist 10(5). DOI: 10.15560/10.5.1201

Reid, S.M., A. Kidd, and C. Wilson. 2013. Genetic information in support of COSEWIC evaluation of Channel Darter (*Percina copelandi*) designatable units. Unpublished report prepared for COSEWIC Freshwater Fishes Subcommittee. 8 pp.

Appendix 1: Technical summary for Ontario

Species: Channel Darter (*Percina copelandi*)

Demographic information

Demographic attribute	Value
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	2 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Unknown
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Unknown
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.	Unknown
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. Unknown b. Unknown c. Unknown
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).	54324 km^2 Calculated from all NHIC observations since 2000, the same time frame used in the COSEWIC report. Calculated in GRASS GIS
Index of area of occupancy (IAO).	240 km^2 As above
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy is in habitat patches that are:	a. No b. No

Extent and occupancy attributes	Value
(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?	
Number of locations. *See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location".*	15 extant, 2 extirpated
Number of NHIC Element Occurrences	19
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes (loss of eastern and central Lake Erie occurrences, ongoing decline in western Lake Erie)
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Yes (loss of eastern and central Lake Erie occurrences, ongoing decline in western Lake Erie)
Is there an observed, inferred, or projected continuing decline in number of subpopulations?	Yes. Subpopulations in central and eastern Lake Erie have been extirpated, and there is an ongoing decline in western Lake Erie.
Is there an observed, inferred, or projected continuing decline in number of locations?	Yes (loss of eastern and central Lake Erie occurrences, ongoing decline in western Lake Erie)
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes (decline in habitat quality due to Round Goby)
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)

Number of mature individuals in total population is unknown. There is no data on any subpopulation sizes.

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats calculator was prepared for the COSEWIC report. The greatest threats identified were:

- Round Goby (High-Med)
- household sewage and urban run-off (Medium)
- agricultural and forestry effluents (Medium)
- Dam and water use (Low)

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Quebec S2S3 (Special Concern) Michigan (S1S2) Ohio (S2) Pennsylvania (S2)
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Yes
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Possibly
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?	Unknown
Is rescue from outside populations likely?	No

Sensitive species

This is not a data sensitive species.

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for Channel Darter (*Percina copelandi*)

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S2	Unknown	NatureServe (2017)
Quebec	S2S3	Unknown	NatureServe (2017)
Manitoba	not present	N/A	NatureServe (2017)
Michigan	S1S2	Unknown	NatureServe (2017)
Minnesota	not present	N/A	NatureServe (2017)
Nunavut	not present	N/A	NatureServe (2017)
New York	S2	Unknown	NatureServe (2017)
Ohio	S2	Unknown	NatureServe (2017)
Pennsylvania	S2	Unknown	NatureServe (2017)
Wisconsin	not present	Unknown	NatureServe (2017)

Acronyms

AOO: area of occupancy
COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
EOO: extent of occurrence
ESA: Endangered Species Act
GRANK: global conservation status assessments
IAO: index of area of occupancy
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
S3: Vulnerable
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