

Ontario Species at Risk Evaluation Report

for

Lowland Toothcup (*Rotala ramosior*)

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

Assessed by COSSARO as ENDANGERED

January, 2015

Final

Rotala rameux (*Rotala ramosior*)

Le rotala rameux (*Rotala ramosior*) est une petite plante annuelle de la famille de la salicaire. Il croît dans des zones ouvertes et temporairement humides, comme les berges des rivières, les rivages exposés, les bordures des étangs, les dépressions interdunaires et, de temps à autre, sur le pourtour des champs. Le rotala rameux est une plante indigène de l'hémisphère occidental qui est présente en Amérique du Nord jusqu'en Amérique centrale et en Amérique du Sud. Au Canada, on le trouve seulement en Ontario et en Colombie-Britannique, ce qui représente la ceinture nord de l'aire de répartition du rotala rameux.

Le rotala rameux n'a jamais été courant en Ontario. Il a été signalé uniquement à partir de trois sous-populations distinctes, dont seulement deux se maintiennent. Les autres sous-populations se tiennent le long du pourtour sud du Bouclier canadien dans le comté de Lennox et Addington, sur les rives du lac Puzzle et du lac Sheffield – le lac Long. Selon des relevés effectués en 2011, il y aurait approximativement 1 400 plants dans tous les emplacements. Cette estimation est inférieure aux dénombrements précédents, même s'il est bien connu que cette espèce d'annuelle peut fluctuer considérablement d'une année à l'autre selon les conditions. Les données des recensements ne sont pas suffisantes pour donner une indication claire des tendances. Les principales menaces pour cette espèce seraient les perturbations des rivages et la gestion des niveaux d'eau.

En 2000, le rotala rameux a été désigné par le COSEPAC comme une espèce en voie de disparition au Canada et il a également été désigné comme une espèce en voie de disparition en Ontario. À la suite d'une réévaluation effectuée par le COSEPAC en novembre 2014, la population dans les plaines des Grands Lacs a été qualifiée d'espèce menacée au Canada. En Ontario, le rotala rameux a été réévalué par le CDSEPO comme une espèce en voie de disparition en fonction de sa répartition très limitée et de l'abondance des populations jumelées à sa sensibilité à l'égard de menaces incertaines. Son aire de répartition provinciale minime et son confinement à deux petits lacs adjacents situés à une distance de quelques kilomètres la rendent particulièrement vulnérable aux menaces. De plus, aucune nouvelle sous-population n'a été signalée en Ontario et il n'y a pas de données qui prouvent que l'abondance ou la qualité des habitats du rotala rameux s'améliorent depuis sa dernière évaluation.

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Executive summary

The Lowland Toothcup is a small, annual plant in the Loosestrife family. It grows in open, seasonally wet areas, such as riverbanks, exposed shorelines, pond margins, interdunal swales, and occasionally at the edges of fields. Lowland Toothcup is native to the western hemisphere, occurring from North America to Central America, and South America. In Canada, it is found only in Ontario and British Columbia, which represent the northern edge of the Lowland Toothcup's range.

The Lowland Toothcup has never been common in Ontario. It has been reported only from three separate subpopulations, of which only two are extant. The remaining subpopulations are found along the southern edge of the Canadian Shield in Lennox and Addington County, on the shoreline of Puzzle Lake, and Sheffield – Long Lake. Surveys in 2011 estimated approximately 1400 plants at all sites. This is lower than previous counts, although it is well known that this annual species can fluctuate substantially between years depending on conditions. Census data are insufficient for a clear indication of trends. The main threats to this species are thought to be shoreline disturbance, and water level management.

In 2000, the Lowland Toothcup was designated by COSEWIC as Endangered in Canada, and has also been designated as Endangered in Ontario. A COSEWIC re-assessment in November 2014 resulted in the assessment of the Great Lakes Plains population as Threatened in Canada. The Lowland Toothcup in Ontario has been re-assessed by COSSARO as Endangered based on its very small distribution, and population abundance, combined with its sensitivity to uncertain threats. Its very small provincial range and confinement to two small adjacent lakes within a few square kilometers make it highly vulnerable to threats. Additionally, no new subpopulations have been reported in Ontario, and there is no evidence that Lowland Toothcup's abundance or habitat quality are improving since its last assessment.

1. Background information

1.1. Current designations

- GRANK: G5 (NatureServe 2015)
- NRANK Canada: N1N2
- COSEWIC: Great Lakes Plains population – Threatened (2014)
- SARA: No schedule. The Great Lakes Plains population is not currently listed on a SARA schedule. The species was formerly considered as one population, and the entire Canadian population remains listed on Schedule 1 as Endangered.
- ESA 2007: Endangered (2007)
- SRANK: S1 (NHIC 2015)

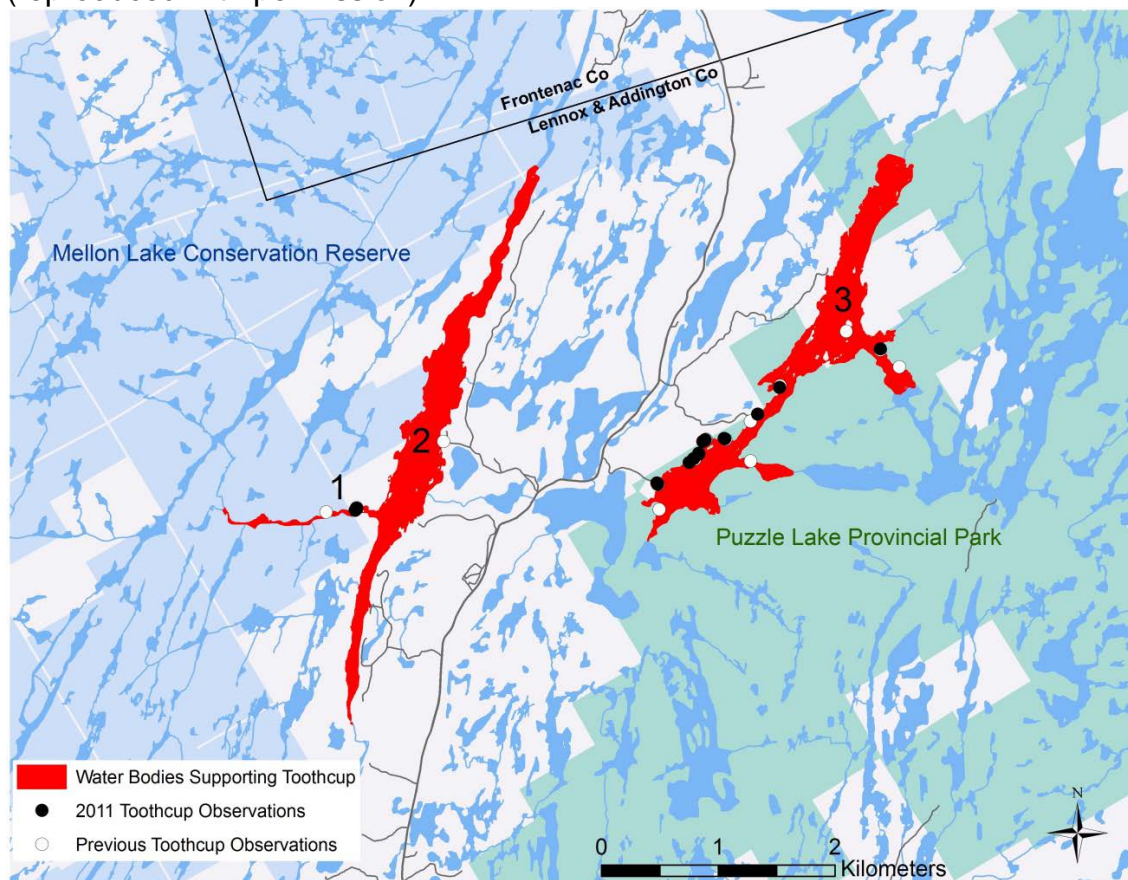
1.2. Distribution in Ontario

In Ontario, Lowland Toothcup is found only in northern Lennox and Addington County at the southern edge of the Canadian Shield. It occurs along shorelines on Puzzle Lake, Sheffield – Long Lake, and the Clare River (Figure 1), near Kaladar, Ontario. These sub-populations are disjunct from the closest population in New York State by almost 500 km (Brownell et al. 1996). Lowland Toothcup was also documented from two sandy fields in Norfolk County (Sutherland 1987), approximately 350 km from the southern Shield populations. The Norfolk Co. sub-populations are extirpated, their locations having been ploughed for cropland by 1987 (COSEWIC 2014).

The two extant Element Occurrences (EO) as defined by the Natural Heritage Information Centre are based on the separation distance of occupied sites. One EO incorporates the Puzzle Lake sites, and another includes sites on Sheffield – Long Lake and the Clare River (see Figure 1). The number of “locations” as defined by COSEWIC is 7. COSEWIC “locations” are identified based upon threat, and the primary threat identified is shoreline development. For Lowland Toothcup, the COSEWIC locations have been identified as follows, based on land ownership:

- For Puzzle Lake, 4 locations are defined (3 private parcels, 1 on public land)
- For Sheffield - Long Lake / Clare River, 3 locations (2 private, 1 public).

Figure 1. Extant populations of Lowland Toothcup in Ontario. Numbered water bodies referred to in the text are: 1. Clare River; 2. Sheffield - Long Lake; 3. Puzzle Lake. Solid circles represent subpopulations documented in 2011; white circles represent previously documented subpopulations not observed in 2011. Source: COSEWIC 2014 (reproduced with permission).



1.3. Distribution and status outside Ontario

Lowland Toothcup is native to North America, Central America, and South America (COSEWIC 2014) and also appears to have been introduced in widespread locations including Italy and the Philippines (Matricker 2001). Within North America, it ranges broadly from Massachusetts in the east, west through Ontario to Minnesota, south to Florida and into Mexico. It also occurs in scattered locations in the western US, particularly near the west coast from California to southern British Columbia (see Figure 3 in COSEWIC 2014). The full range of Lowland Toothcup outside of North America is not well known.

The Southern Mountain population in British Columbia has declined due to shoreline development and invasive plants and has been designated as Endangered (COSEWIC 2014). The species is of conservation concern in several states at the edges of its core range (e.g. Michigan, New York, Pennsylvania, West Virginia, New Jersey and several New England states). A conservation and research plan for this species has been developed for New England, where nine of 26 known occurrences were extant in 2004, and the species faces additional threats including invasive species (Matricker 2001).

There is no information on widespread declines in other areas (NatureServe 2015, COSEWIC 2014).

1.4. Ontario conservation responsibility

Because of Lowland Toothcup's very broad range, Ontario's Conservation Responsibility for this species is very low. Less than 1% of the global population and range exists in Ontario.

1.5. Direct threats

Two predominant threats are considered within the COSEWIC status report. Both are considered to be relatively minor.

Shoreline disturbance probably threatens Lowland Toothcup at some sites. Although impacts may be significant, their frequency is thought to be low, and probably localized. Two thirds of the shoreline on Puzzle Lake and one third of the Sheffield-Long Lake/Clare River shoreline are protected by the Provincial Parks and Conservation Reserves Act (in Puzzle Lake Provincial Park and Mellon Lake Conservation Reserve respectively, see Figure 1). The remaining subpopulations on private shorelines are on rocky sites that are difficult to develop. The main impacts are likely to be caused by trampling and recreational shoreline use. Plants at one site with a heavily used private boat launch could not be found in 2011 surveys. Many sites are small and local, and could easily be damaged, or even destroyed.

Water management poses another potential threat to Lowland Toothcup. In the past, water levels on Puzzle Lake have been manipulated by a dam, although the dam has been inactive for many years. Any factors that may change the water regime on either of the major waterbodies (e.g. changes to climatic patterns due to climate change, or renewed water management) could potentially impact a number of sites collectively. Although this is not a current threat, it is certainly plausible. The annual life history of this species magnifies the potential impact of water level stabilization, if it were to occur, could have a significant impact on many sub-populations at once.

1.6. Specialized life history or habitat use characteristics

Lowland Toothcup is an annual plant that is found on newly exposed shorelines, resulting from either natural late summer conditions, or artificial drawdowns. It is dependent on a persistent seed bank. Seeds are long-lived in the soil seed bank although an unpublished germination study found that seeds quickly lost viability, with up to 50% of produced seed becoming non-viable in one year (Mattrick 2001).

As is typical of annual species, populations may fluctuate with respect to the number of mature individuals present during successive years (Mattrick 2001). Fluctuations depend on conditions such as water level and seasonal rainfall; in years of heavy rainfall and high water levels, seed germination may be greatly reduced, and mature plants may fail to appear at known sites (Mattrick 2001).

2. Eligibility for Ontario status assessment

2.1. Eligibility conditions

2.1.1. Taxonomic distinctness

Yes. *Rotala ramosior* (L.) Koehne is a recognized native North American species in the Lythraceae or Loosestrife family (Kartesz 1994). It is the only native *Rotala* in North America.

2.1.2. Designatable units

No. All Ontario plants are considered to be a single designatable unit. In Canada, there are two designatable units recognized for this species: the Southern Mountain DU, which occurs in British Columbia, and the Great Lakes Plains DU, including all subpopulations in Ontario (COSEWIC 2014). Even though the Puzzle Lake and Sheffield – Long Lake populations technically occur in the Boreal Ecozone, they have been included by COSEWIC in the Great Lakes Plains Ecozone DU because of their proximity to the Great Lakes Plains DU, and the fact that Lowland Toothcup is not a boreal species. No further subdivision of Designatable Units in Ontario is warranted, since there does not appear to be any morphological or genetic evidence to suggest that the disjunct populations (extant in central Ontario, and extirpated in Norfolk Co.) are evolutionarily significant.

2.1.3. Native status

Yes. *Rotala ramosior* (L.) Koehne is a recognized native North American species (Kartesz 1994). Lowland Toothcup was first recorded in Ontario in 1987, but this easily overlooked plant was likely present in the province before that date.

2.1.4. Occurrence

Yes. Lowland Toothcup is known from three Element Occurrences in Ontario (COSEWIC 2014; NHIC 2015). Of these, two are extant and one is extirpated.

2.2. Eligibility results

Lowland Toothcup (*Rotala ramosior*) is eligible for status assessment in Ontario.

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

Insufficient information. Monitoring efforts have been somewhat regular, occurring in 2000, 2004 and 2011 at both occurrences (Norris 2004, Brinker, McIntosh & Oldham

2011) and at Puzzle Lake in 2008 (Bonta 2008). However, in the absence of an estimate of detectability, it is not possible to identify trends in the numbers of individuals, especially considering the natural seed banking tendencies of this species. In addition, at some sites within an occurrence past field assessments provided estimated ranges of the number of individuals rather than absolute counts, because plants can occur at high densities and can be difficult to count with accuracy.

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

Endangered, B1ab(iii) + 2ab(iii). The Extent of Occurrence and Index of Area of Occupancy are both estimated at 20 km², meeting the threshold for Endangered under B1 and B2, by orders of magnitude in both cases.

COSEWIC identifies seven “locations” in Ontario, because the predominant threat is thought to be shoreline disturbance, and the management of seven land parcels under different ownership would likely result in different outcomes. The COSEWIC status for the Ontario population was therefore determined to be Threatened, downlisted from Endangered in 2000.

However, there is some uncertainty regarding threats to Lowland Toothcup and their severity. If water levels were to stabilize due to natural or anthropogenic causes, this could impact a number of sub-populations simultaneously. Were this threat to eventuate, the number of locations would likely be lower, since all sites are within the same drainage, essentially confined to two small adjacent lakes. The sites are also within a very limited geographic area. Given the uncertainty regarding the threats, the number of locations is considered to be between two and seven.

There has also been an observed decline in the area, extent and/or quality of habitat, satisfying B1b(iii) and B2b(iii).

Extreme fluctuations could be said to apply, despite limited monitoring. A fluctuation in the order of magnitude of 10 or greater has been observed at the Sheffield – Long Lake / Clare River subpopulation (from a low of 0 to a high of 2,615-4,615, Table 1) (COSEWIC 2014).

Lowland Toothcup therefore meets the criteria for Endangered under criteria B1ab(iii) + 2ab(iii).

Table 1. Ontario populations by survey year. Source: COSEWIC (2014).

Subpopulation	Site	Ownership	Year Discovered	1994	2000	Survey Results 2004	Survey Results 2008	Survey Results 2011
Puzzle Lake	P01	Public	1994	50	5-10	400	400	305
Puzzle Lake	P02	Public	1994		50	150-200	150	0

Puzzle Lake	P15	Public	2011					65
Puzzle Lake	P16	Public	2011					45
Puzzle Lake	P05	Private	2000		200	0	60	454
Puzzle Lake	P06	Private	2004			700	30	12
Puzzle Lake	P17	Private	2011					3
Puzzle Lake	P07	Public	2004			40	75	83
Puzzle Lake	P08	Public	2004			~200	~200	52
Puzzle Lake	P09	Public	2004			50-70	60	40
Puzzle Lake	P10	Public	2004			70-100	0	80
Puzzle Lake	P11	Public	2008		200		140	
Puzzle Lake	P12	Public	2008				100	0
Puzzle Lake	P13	Public	2008				300-400	
Puzzle Lake	P14	Public	2008				25	0
Puzzle Lake Totals				50	455-460	1610-1710	1,540-1,640	1,139
Sheffield-Long Lake/Clare River	S01	Public	2004			215		0
Sheffield-Long Lake/Clare River	S03	Private	1994	33	250-270	1400		305
Sheffield-Long Lake/Clare River	S04	Private	1994			1000-3000		0
Sheffield-Long L./Clare River Totals				33	250-270	2,615-4,615		305

Ontario Totals				83	705-730	4,225-6,325	1,540-1,640	1,444
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* Note: blank cells indicate no survey/no information at a particular site in a given year.

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

Does not apply. Although the total number of mature individuals in Ontario is less than 2500, neither of C1 or C2 applies, since continuing declines cannot be determined from existing data.

3.1.4. Criterion D – Very small or restricted total population

Threatened. The Ontario population of 1,444 individuals (2011) exceeds thresholds under D1. Considering that the IAO is 20 km², Lowland Toothcup qualifies for Threatened under D2, but it is already considered to meet Endangered under the B criteria, as above.

3.1.5. Criterion E – Quantitative analysis

Does not apply. Quantitative analysis has not been completed.

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. Less than 1% of the global population and range exists in Ontario and Ontario's Conservation Responsibility for this species is very low.

3.3.2. Rescue effect

Does not apply. The likelihood of immigration of seeds from Lowland Toothcup populations in adjacent US states is low. Its small seeds are vagile and are probably mainly dispersed by water, and to a lesser extent, by wind, and waterfowl (Matrnick 2001). However, the nearest known US population is approximately 500 km to the south in New York state, where Lowland Toothcup is considered Imperilled (S2), and the species is also declining in several New England states (Matrnick 2001).

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

Lowland Toothcup (*Rotala ramosior*) is classified as Endangered in Ontario under criterion B1ab(iii) + 2ab(iii).

The species is considered Endangered because it has a very small geographic range and population within Ontario, and is found at a limited number of sites. Some sites are probably threatened by shoreline disturbance, and are sensitive to changes in water level.

The Ontario status differs from the COSEWIC status because there is uncertainty regarding the threats and their severity, resulting in an estimate of fewer “locations”. The species’ inherent sensitivity to water level changes warrants the attribution of a relatively high risk ranking to this threat. Finally, there is no evidence that Lowland Toothcup’s abundance or habitat quality are improving since it was last assessed as Endangered in 2000.

5. Information sources

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Mattrick, C. 2001. New England Plant Conservation Program Conservation and Research Plan. *Rotala ramosior* (L.) Koehne. New England Wild Flower Society and United States Fish and Wildlife Service. Framingham, Massachusetts. 27 pp.

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Appendix 1: Technical summary for Ontario

Species: Lowland Toothcup (*Rotala ramosior*)

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.	Less than 1 year
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?	N/A
Are there extreme fluctuations in number of mature individuals? A fluctuation in the order of magnitude of 10 or greater has been observed at the Sheffield – Long Lake / Clare River subpopulation (from a low of 0 to a high of 2,615-4,615)	Possibly

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence. (Request value from MNRF or use http://geocat.kew.org/)	20 km ²
Index of area of occupancy (IAO). (Request value from MNRF or use http://geocat.kew.org/)	20 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. No b. No
Number of locations (<i>as defined by COSEWIC</i>). 1. Along Puzzle Lake, 4 locations are defined based on land ownership (3 private parcels, 1 for public land) 2. Sheffield - Long Lake / Clare River, 3 locations (2 private, 1 public).	7
Number of NHIC Element Occurrences (<i>Request data from MNR</i>)	2 extant, 1 extirpated
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Unknown
Is there an observed, inferred, or projected continuing decline in number of populations?	No
Is there an observed, inferred, or projected continuing decline in number of locations?	No
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).

Sub-population	N of mature individuals
Puzzle Lake	1,139
Sheffield Long Lake – Clare River	305
Total	1,444

Quantitative analysis (population viability analysis conducted)

n/a

Rescue effect

Rescue effect attribute	Likelihood
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?	Unknown but likely
Is there sufficient suitable habitat for immigrants in Ontario? Unoccupied habitat exists in central Ontario on undeveloped shorelines with fluctuating water levels.	Yes
Is the species of conservation concern in bordering jurisdictions?	Yes
Is rescue from outside populations reliant upon continued intensive recovery efforts?	No

Appendix 2: Adjoining jurisdiction status rank and decline Information regarding rank and decline of Toothcup

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S1	Unknown	NatureServe 2015
Quebec	Not present	n/a	NatureServe 2015
Manitoba	Not present	n/a	NatureServe 2015
Michigan	S3	Unknown	NatureServe 2015
Minnesota	S2	Unknown	NatureServe 2015
Nunavut	Not present	n/a	NatureServe 2015
New York	S2	Unknown (Threatened at state level)	NatureServe 2015
Ohio	SNR	n/a	NatureServe 2015
Pennsylvania	S3	Unknown (Rare at state level)	NatureServe 2015
Wisconsin	SNR	n/a	NatureServe 2015

Acronyms:

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

COSSARO: Committee on the Status of Species at Risk in Ontario

EO: Element Occurrences

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

S2: Imperiled

S3: Vulnerable

COSEPAC: Le Comité sur la situation des espèces en péril au Canada