

Ontario Species at Risk Evaluation Report for
Gray Ratsnake
Couleuvre Ratière Grise
(*Pantherophis spiloides*)

Carolinian Population

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

(Carolinian Population)
Assessed by COSSARO as Endangered

November 2020

Couleuvre Ratière Grise (*Pantherophis spiloides*)

Autrefois répandue dans la majeure partie de la zone carolinienne du sud-ouest de l'Ontario, cette espèce occupe une région de plus en plus fragmentée de la province et est menacée par le développement continu et l'expansion du réseau routier. Cette population comprend actuellement seulement deux petites sous-populations disjointes, entourées par des zones d'agriculture intensive et des zones de développement résidentiel et commercial. Selon les estimations, le nombre d'individus matures de la population carolinienne est de moins de 250. Des données indiquent que deux sous-populations additionnelles de cette population ont disparu au cours des 10 dernières années, et que son aire de répartition dans cette partie de la province a diminué au cours de cette même période. Le développement menace grandement les hibernacles communaux, et les routes constituent une importante menace de mortalité puisque les couleuvres obscures s'y chauffent souvent au soleil. Enfin, cette espèce est également persécutée par les humains, à la fois le long des routes et dans les hibernacles. L'immigration en provenance d'autres populations est peu probable car la population carolinienne est disjointe par rapport aux autres populations de l'Ontario et séparée des populations adjacentes des États-Unis par le lac Érié, ce qui porte à croire qu'une aire de répartition plus vaste pertinente sur le plan biologique (ARVPPB) hors de l'Ontario ne s'applique pas à cette population.

Le CDSEPO a évalué que la population carolinienne de la couleuvre obscure est une espèce en voie de disparition, en raison d'une baisse supposée supérieure à 50 % du nombre d'individus matures dans les trois dernières générations; de l'aire de répartition géographique restreinte et de la zone occupée par la population; de la très petite taille de la population, en décroissance. Cette espèce, menacée par la perte et la fragmentation de son habitat, la mortalité sur les routes et par son élimination délibérée, de même que par la perturbation de ses hibernacles, a peu de moyens pour retourner la situation face à ces menaces. Cette évaluation concorde avec la classification fédérale de cette espèce par le COSEPAC (2018).

Cette publication hautement spécialisée «COSSARO Candidate Species at Risk Evaluation for Gray Ratsnake» n'est disponible qu'en anglais conformément au Règlement 671/92, selon lequel il n'est pas obligatoire de la traduire en vertu de la Loi sur les services en français. Pour obtenir des renseignements en français, veuillez communiquer avec le ministère l'Environnement, de la Protection de la nature et des Parcs au cossarosecretariat@ontario.ca.

Remarque :

L'acronyme ARVPPB correspond à « aire de répartition plus vaste pertinente sur le plan biologique » qui se retrouve à l'alinéa 5 (4) b) de la *Loi de 2007 sur les espèces en voie de disparition*.

Executive summary

Gray Ratsnakes are the largest snakes in Ontario. Historically, this species was found across much of the Carolinian zone of southwestern Ontario. Ratsnakes in this population are found in an increasingly fragmented region of Ontario and are threatened by ongoing development and expansion of road networks. The Carolinian population is persisting in only two (2) small disjunct subpopulations, and are surrounded by intensive agriculture, and residential and commercial development. The number of mature individuals in the Carolinian population is estimated to be fewer than 250. Data suggest that two (2) additional subpopulations in this population have been extirpated in the past 10 years, and its range within this portion of the province has declined over that same time period. Development significantly threatens communal hibernacula, while roads represent a significant mortality threat to Gray Ratsnakes, which commonly bask on them. Finally, this species is persecuted by humans along roads and at hibernacula. Rescue from other populations is unlikely as the Carolinian population is disjunct from other Ontario populations and separated from adjacent populations in the U.S. by Lake Erie suggesting that a Broader Biologically Relevant Range outside of Ontario is not applicable to this population.

The Carolinian designatable unit of Grey Ratsnake is classified by COSSARO as Endangered, due to an inferred decline greater than 50% in the number of mature individuals in the past three generations; the small geographic range and area occupied by the population, and the very small and declining population size. The species' threatened by habitat loss and fragmentation, deliberate killing and road mortality, and hibernacula disturbances, and has a poor ability to rebound from threats. This classification is consistent with the federal classification of this species by COSEWIC (2018).

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

The species was originally recognized in western science by Say (1823), and since that time it has been divided into five subspecies: *Elaphe obsoleta obsoleta* (Say 1823), *Elaphe obsoleta lindheimeri* (Baird and Girard 1853), *Elaphe obsoleta quadrivittata* (Holbrook 1836), *Elaphe obsoleta rossalleni* (Neill 1949), and *Elaphe obsoleta spiloides* (Duméril et al. 1854). All Ontario populations were classified as Black Ratsnakes (*Elaphe obsoleta obsoleta*). In 2012, Crother (2012) proposed the genus name *Pantherophis* for most North American *Elaphe* following the division of *Elaphe* into multiple genera. Given these taxonomic uncertainties, the current name for the central clade, *Pantherophis spiloides*, was retained for all Ontario Ratsnakes; however, it is recognized that there are significant genetic differences between the ratsnakes in southwestern versus southeastern Ontario. Gray Ratsnake was the common name given to *Pantherophis spiloides* by Crother (2012).

1.1.2. Designatable units

Gray Ratsnakes are found in two (2) geographically distinct areas in Ontario and as such have been divided into two (2) designatable units (DU) – Great Lakes / St. Lawrence population and the Carolinian population.

1.1.3. Native status

Gray Ratsnakes are native to Ontario (Natureserve 2020).

1.1.4. Occurrence

Gray Ratsnake is known to occur in Ontario (COSEWIC 2018).

1.2. Eligibility results

Gray Ratsnake (*Pantherophis spiloides*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G4G5T1 (NatureServe 2020)
- IUCN: Least Concern (April 18, 2016)
- NRANK Canada: N1
- COSEWIC: Endangered – Carolinian population (April 2018)
- SARA: Endangered (Schedule 1)
- ESA 2007: Endangered (month and year of last assessment)
- SRANK: S1 (ranked in year)

2.2. Distribution in Ontario

Gray Ratsnake is found in two geographically disjunct areas of southeastern and southwestern Ontario; these regions are separated by approximately 300 km. Ratsnakes inhabiting the two regions show significant genetic differentiation (Lougheed *et al.* 1999; Gibbs *et al.* 2006). The Carolinian population is present in small areas of southwestern Ontario along the north shore of Lake Erie.

In 2007, COSEWIC identified the persistence of four (4) small, isolated Gray Ratsnake Carolinian subpopulations. Two (2) of the four (4) subpopulations have not had a verified observations of Gray Ratsnakes in the past 20 years (COSEWIC 2018) suggesting that it is likely that these two (2) subpopulations have now been extirpated. The remaining sub-populations exist in the center of this historic range, primarily in the Big Creek area (Gibbs *et al.* 2006; COSEWIC 2018)

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

Gray Ratsnake is widespread and common throughout the eastern and central United States of America. The Carolinian DU is both geographically and genetically (Gibbs *et al.* 2006) disjunct from continuous portions of the species' range in the United States by several hundred km (Personal communication, G. Blouin-Demers 2020; Y. Man Lee 2020). This DU is separated from adjacent populations in New York, Michigan and Ohio by the Great Lakes and immigration of individuals is unlikely for either of the Canadian subpopulations. Further, populations that exist in neighboring jurisdictions exist in different level III or II ecoregions (Commission for Environmental Cooperation 2016). Therefore, there is no broader biologically relevant geographic range outside of Ontario for Gray Ratsnakes in the Carolinian DU.

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

Adjacent Jurisdictions	Biologically Relevant to Ontario (n/a, yes, no)	Condition	Notes & Sources
Quebec	n/a		
Manitoba	n/a		
Michigan	No	S2S3	Natureserve (2020)
Minnesota	n/a		
Nunavut	n/a		
New York	No	S4	Natureserve (2020)
Ohio	No	SNR	Natureserve (2020)
Pennsylvania	n/a		
Wisconsin	No	S3	Natureserve (2020)
<i>Other Relevant Jurisdiction</i>			

2.4. Ontario conservation responsibility

The Ontario populations of Gray Ratsnake represent less than 1% of the species global range (COSEWIC 2018). However, Ontario has 100% responsibility for the Carolinian DU, due this unit's distinctiveness from the Great Lakes / St. Lawrence DU and populations in the U.S.A (see section 2.3 for more details).

2.5. Direct threats

Gray Ratsnakes have several life history features such as late age of maturity, long life span, biennial reproduction and intermittent juvenile recruitment that predispose this species to be sensitive to disturbances and do not allow for a natural capacity to rapidly rebound from population reductions. Threats to the Gray Ratsnake include habitat degradation, fragmentation and loss, direct mortality, road mortality and disturbance or destruction of hibernacula.

More than 80% of the original forest cover in the Carolinian region has been removed (Butt et al. 2005). Intensive agriculture and an extensive network of roads dominate the Carolinian landscape. This severe reduction in the amount of suitable habitat and associated fragmentation, as well increased mortality from roads and other anthropogenic sources has resulted in range reductions for Gray Ratsnake in this area (COSEWIC 2018). It is currently unknown whether the remaining habitat is sufficient to support viable Gray Ratsnake subpopulations.

The 2007 COSEWIC status report identified only four (4) small, isolated Carolinian subpopulations of Gray Ratsnakes. Two (2) of these subpopulations do not have any verified records in the past 20 years suggesting that, while unconfirmed, these two subpopulations are likely to be extirpated.

1. The Big Creek subpopulation is the largest of the Carolinian subpopulations. This

subpopulation ranges from the base of Long Point to the town of Langton in the north, to the town of St. Williams in the east, and Port Burwell in the west. This subpopulation is considered to be extant based on recent and verified observations (COSEWIC 2018).

2. The Oriskany subpopulation is confined to a relatively small area (<10 km²) in Cayuga and Oneida townships and is generally between the towns of Nelles Corners, Cayuga, and Decewsville. This subpopulation is considered extant based on a limited number of recent and verified observations (COSEWIC 2018).
3. The Skunk's Misery subpopulation was generally located north of the Thames River between Wardsville and Bothwell. The most recent verifiable observations for this subpopulation are from 1984 (Oldham and Weller 2000); however, a single unconfirmed record exists from 1997. Due to a lack of recent and verified observations, this subpopulation is considered to be extirpated (COSEWIC 2018).
4. The Niagara subpopulation was poorly defined and was most likely comprised of several small disjunct subpopulations. Verified historical observations (more than 20 years old) exist near the towns of Fonthill and Ridgeway. Due to the lack of verified records from the past 20 years, despite ongoing search effort, this subpopulation considered to be extirpated (COSEWIC 2018).

2.6. Specialized life history or habitat use characteristics

Gray Ratsnakes are known to aggregate for hibernation (Blouin-Demers et al. 2000) and individuals show strong fidelity to their hibernation sites (Blouin-Demers and Weatherhead 2002a). This species is known to travel up to 4 km (Blouin-Demers and Weatherhead 2002a) from hibernation sites to their active season range. This long-distance movement increases the potential for mortality where individuals are required to cross roadways.

Gray Ratsnakes in the Great Lakes / St. Lawrence DU have a maximum life expectancy of between 25 and 30 years, but do not reach sexual maturity until approximately 10 years of age (Blouin-Demers et al. 2002); it is assumed that these ages are similar in the Carolinian population. Once sexually mature, females will only produce a clutch of eggs every 2–3 years (COSEWIC 2018). Ratsnakes in Eastern Ontario commonly make use of communal nests that are used for multiple years by multiple females (Blouin-Demers et al. 2004); however, there is no comparable information for the Carolinian DU. These life history characteristics make Gray Ratsnakes particularly vulnerable to any increases in adult mortality.

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 criteria for Endangered, A2cd, because there is an inferred decline of > 50% in number of mature individuals over the past 3 generations (30 years), extrapolated from decline in IAO and quality of habitat (c); (d) applies because of deliberate killing and accidental mortality of roads. Meets Endangered, A4cd, because there is a decline of >50% in the number of mature individuals based on past and future projected declines.

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

Meets criteria for Endangered, B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v) as EOO of 826 km² and IAO of 60 km² are below the thresholds, the species is severely fragmented, and there is a continuing observed. Additionally, there is an inferred decline in EOO, IAO, area and quality of habitat, number of locations, and number of mature individuals.

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

Meets criteria for Endangered, C2a(i). The total number of mature individuals <2,500, with an inferred continuing decline and no subpopulation containing greater than 250 individuals.

3.1.4. Criterion D – Very small or restricted total population

Meets the criteria for Endangered, D1. Although actual population size is unknown, it is likely <250 mature individuals.

3.1.5. Criterion E – Quantitative analysis

Insufficient data is available to perform analysis.

3.2. Application of Special Concern in Ontario

Not applicable.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Could apply, however the species is already at the highest ranking. The Ontario populations of Gray Ratsnake represent less than 1% of the species global range. However, Ontario has 100% responsibility for the Carolinian DU, due this units distinctiveness from the Great Lakes – St. Lawrence DU and populations in the U.S.A (see section 2.3 for more details).

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

The Carolinian DU is geographically isolated from neighbouring populations by several hundred kilometers, beyond the range of movement for this species. Accordingly, rescue effect is not expected and does not apply as a modifier.

The Carolinian DU is not considered to have a broader biologically relevant range geographic range, beyond the population's range as assessed (see section 2.3 for details). Therefore the BBRGR modifier does not apply.

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

Gray Ratsnake (*Pantherophis spiloides*) is classified as Endangered in Ontario based on meeting criterion A2cd+4cd; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C2a(i); D1. The conservation responsibility modifier could apply, but was not used because the species was already at the highest ranking. This classification is consistent with COSEWIC (2018).

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

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Appendix 1: Technical summary for Ontario

Species: Gray Ratsnake (*Pantherophis spiloides*) – Carolinian Population

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.	10 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Yes based on inferred decline for the DU. The decline is projected to continue as the causes have not been reversed and threats continue.
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	>50% decline inferred from 89% and 81% declines in EOO and IAO respectively in last 10 years (1 generation).
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	> 50% decline inferred from 89% and 81% declines in EOO and IAO respectively in last 10 years (1 generation).
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.	>50% decline inferred from 89% and 81% declines in EOO and IAO respectively as well as continuing significant threats.
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. No b. Yes c. No
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO).	826 km ²

Extent and occupancy attributes	Value
<i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	
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>	60 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. PVA indicates that 141 individuals are required for population viability and the majority of remaining habitat patches are too small to support that many individuals. b. Yes. The remaining habitat patches are separated by large expanses of unsuitable habitat.
Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.</i>	2-3. This is based on one location for each small extant subpopulation.
Number of NHIC Element Occurrences <i>Request data from MNRF.</i>	Insert if available
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes. There is an observed 22% decline in EOO over 2 generations (COSEWIC 2018).
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Yes. There was an observed 89% decline between the 2007 and 2018 COSWEIC reports.
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	Yes. There was an observed 81% decline between the 2007 and 2018 COSWEIC reports.
Is there an observed, inferred, or projected continuing decline in number of locations?	Yes, decline is inferred based on declining EOO.
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes. There is an inferred and projected decline in area, extent, and quality based on the declining EOO, habitat trends, and threats from road mortality.

Extent and occupancy attributes	Value
Are there extreme fluctuations in number of populations?	Yes. There was an inferred decline of 50% of the known subpopulations between 2007 and 2018 based on a lack of recent, verified observations at two of the four previously identified subpopulations. Additionally, habitat is currently absent from the unoccupied sites.
Are there extreme fluctuations in number of locations?	Yes. There was an inferred decline of 50% in the number of locations between 2007 and 2018 based on a lack of recent, verified observations at two of the four previously identified subpopulations and extensive habitat loss from the unoccupied sites.
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

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

Sub-population (or total population)	Number of mature individuals
<i>Carolinian</i>	<i>Unknown but estimated to be <<250 individuals (COSEWIC 2018)</i>

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

The threat assessment provided in the most recent COSSARO Report (2018) lists the following threats.

Cumulative Overall Threat

Cumulative Overall Threat Impact: Very High – High. Threats Calculator results indicate a possible approx. 10-100% population reduction over the next 3-generations from threats operating for the next 10-years.

Transportation & service corridors: high – medium
 Energy production & mining: medium
 Agriculture & aquaculture: medium - low
 Residential & commercial development: low
 Biological resource use: low
 Natural system modifications: low
 Invasive & other problematic species: unknown
 Climate change & severe weather: unknown

Rescue effect

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	No
Status of outside population(s) most likely to provide immigrants to Ontario	S4 (apparently secure) in New York, S3 in Michigan, and SNR in Ohio.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Unknown but likely impossible as individuals would be required to cross Lake Erie.
Would immigrants be adapted to survive in Ontario?	Probably
Is there sufficient suitable habitat for immigrants in Ontario?	No, habitat loss has been extensive throughout the DU, and it is unclear if enough habitat remains to sustain viable populations.
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 as there is a low likelihood of receiving immigrants.
Is rescue from outside populations likely?	Very unlikely as Lake Erie represents a barrier to movement.

Sensitive species

No, generally locations of this species are not sensitive; however, location of hibernacula and nesting sites are sensitive.

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