

COSSARO Candidate Species at Risk Evaluation
for
Butler's Gartersnake (*Thamnophis butleri*)

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

Assessed by COSSARO as ENDANGERED

February 2011

Final

La **couleuvre à petite tête** (*Thamnophis butleri*) est en voie de disparition en Ontario à cause de ses petites populations isolées et de la disparition de ses habitats (prairies à graminées hautes). Il s'agit d'une couleuvre remarquable et relativement petite qui se trouve dans une aire de répartition qui se limite au Midwest nord-américain (Wisconsin, Michigan, Illinois, Ohio, Ontario). En Ontario, on la trouve dans quatre zones limitées du sud-ouest, dont une colonie de populations entre les régions de Windsor et de Sarnia, et une autre assez importante dans la région du marais Luther. La situation des populations dans les deux autres régions (alentours de Parkhill et de Skunk's Misery) est incertaine, car on n'y a observé aucune couleuvre ces dernières années. La disparition totale d'habitats et la fragmentation de ceux qui restent sont les principaux dangers qui menacent l'espèce.

Cette publication hautement spécialisée (COSSARO Evaluation for Butler's Gartersnake) n'est disponible qu'en Anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. *Pour obtenir de l'aide en français, veuillez contacter le secrétariat de COSSARO par courrier électronique à l'adresse COSSAROsecretariat@ontario.ca.*

PART 1: COSSARO Candidate Species at Risk Evaluation Form

February 2011

Butler's Gartersnake (*Thamnophis butleri*)

Current designations:

GRANK – G4 (Last reviewed, Sept 2006, NatureServe Feb. 2011; <https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/generalQuerySubmit.do>; website checked: 7 February 2011) [link inactive]

NRANK Canada – N2 Nov. 1998

COSEWIC – Endangered [http://www.cosepac.gc.ca/eng/sct1/searchform_e.cfm - status assigned, November 2010 [designated as Special Concern in 1999, uplisted to Threatened in 2001]; website checked: 7 February 2011 [link inactive]

SARA – Threatened. Schedule 1, Part 3 (current as of 16 January 2011; website checked: 7 February 2011)

General Status Canada – At Risk

(<http://www.wildspecies.ca/wildspecies2005/Results.cfm?lang=e&sec=9>; website checked: 7 February 2011) [link inactive]

ESA 2007 – Threatened

SRANK – S2 (NatureServe Feb. 2011)

(<https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/generalQuerySubmit.do>; website checked: 7 February 2011) [link inactive]

General Status Ontario – At Risk

(<http://www.wildspecies.ca/wildspecies2005/Results.cfm?lang=e&sec=9>; website checked: 7 February 2011) [link inactive]

Distribution and status outside Ontario:

Butler's Gartersnake has the smallest global range of any Ontario reptile species, except the Eastern Foxsnake (*Pituophis gloydi*). It occurs in only five North American jurisdictions: southeastern Wisconsin (around Milwaukee), eastern Indiana, northwestern Ohio, southern Michigan, and southwestern Ontario. Throughout its range it is irregularly distributed, but occasionally locally abundant (COSEWIC 2010). The patchy distribution of this species has been cited as an indication that it occupies remnants of the post-glacial 'prairie peninsula' which was thought to have existed in the Great Lakes region in the Hypsithermal period 5000 to 7000 years ago (Schmidt 1938, Smith 1957, Bleakney 1958). It is thought that the species' Ontario distribution was once

much more widespread and endemic to the former tall-grass prairie (Bakowsky and Riley 1992). The NatureServe map exaggerates the area actually occupied by at least an order of magnitude (NatureServe 2011).

Eligibility criteria

Native status

Yes.

Taxonomic distinctness

Yes. No subspecies have been described. Butler's Gartersnake is closely related to the Short-headed Gartersnake (*Thamnophis brachystoma*), which occurs only in northwestern Pennsylvania and southwestern New York. Some animals from Luther Marsh in Ontario show characteristics of the Short-headed Gartersnake (Schueler and Westell 1976, Coulson and Peluch 1984, Harding 1997, COSEWIC 2010), and the relationship between these two species needs to be more closely examined (see DU's below).

Designatable units

The COSEWIC report (2010) concluded that there is only one Designatable Unit of Butler's Gartersnake in Ontario, but there is some evidence to warrant listing two DU's. There are data signifying that the snakes in Luther Marsh might constitute a separate DU from those in the Windsor-Sarnia area. This possibility is based on Luther Marsh's isolation from other populations (128-175 km), the unique genetics and morphology of *T. butleri* in Luther Marsh, and that Luther Marsh is located in a different ecoregion from locations in the rest of Ontario (COSEWIC 2010). A lack of dispersal between Luther and other extant populations presumably explains the morphological and genetic differences between the two regions.

There was also significant variation among regions in nuclear DNA markers (D. Noble, J. Choquette, unpublished data). Using seven microsatellite DNA loci, Bayesian assignment tests clearly differentiate individuals from the Luther Marsh population with highly significant F_{ST} values between Luther Marsh and Windsor-Sarnia populations ranging from 0.15-0.20 (Noble et al., unpublished data, 2010). Furthermore, Luther Marsh contains a large number of private alleles (1-5 alleles per locus) at five of these seven loci. Although there are fairly large differences in nuclear DNA, there is no mitochondrial variation among individuals across Ontario, and all snakes sampled had an identical haplotype (COSEWIC 2010). Based on these and other conflicting indicators, Butler's Gartersnake is considered to be a single DU, unless more evidence can clarify the issue and suggest otherwise.

Priority-setting criteria

Recent arrival

No. The species was first described from Ontario in 1938 (Logier 1939), but undoubtedly has been here much longer.

Non-resident

No.

Primary criteria (rarity and declines)

1. Global rank

Not in any category. G4.

2. Global decline

Not in any category. No global trend has been described or detected, but there are few data to test the hypothesis.

3. Northeastern North America ranks

THREATENED. Ranked S1 or S2 in 2 of 4 jurisdictions.

4. Northeastern North America decline

Not in any category. There are few range-wide data on trends in abundance or aerial extent, and the existing data do not indicate a trend.

5. Ontario occurrences

THREATENED. 22 Element Occurrences are recorded in the NHIC (18 of these were visited during preparation of the COSEWIC (2010) report, 6 of which are now presumed to be extirpated, due to failure to find snakes or suitable habitat, resulting in 16 EOs presumed extant.

6. Ontario decline

THREATENED. Both Element Occurrences and COSEWIC locations indicate that the species has been lost from about 33% of sites. Butler's Gartersnake is/was found in five "regions" (Windsor-Sarnia, Skunk's Misery, Parkhill, Rondeau P.P., and Luther Marsh.

In field searches in 2009, it was not found in Skunk's Misery or Rondeau, and has not been confirmed in either site in over 20 years. Parkhill was not searched but there is only a single record from there, and that was 20 years ago. Also, most sites between Windsor and Sarnia have been lost (COSEWIC 2010). During preparation of the COSEWIC update status report, 18 of 22 element occurrences for *Thamnophis butleri* were checked, and it was found at 12 (67%) and not found at 6 (33%), giving a rank of Threatened. Of 44 locations described in the COSEWIC report, 27 (66%) were considered extant or possibly extant (not searched), qualifying the species as SC.

These data taken together suggest that perhaps 60% of the species' range has been lost since it was discovered in 1938.

7. Ontario's conservation responsibility

THREATENED. Ontario constitutes about 16% of the global range (COSEWIC 2010). It should be recognized that much of NatureServe's (2011) mapped global range on both sides of the Canada-U.S.A. border is not occupied, but the proportion unoccupied is not known. Therefore, the estimate of proportion of the global range in Ontario is uncertain.

Secondary criteria (threats and vulnerability)

1. Population sustainability

ENDANGERED. Butler's Gartersnake can occur in "high" numbers and densities locally and can survive in highly modified habitats (vacant lots, junkyards, gravel pits, etc.), although it was originally a species of tall-grass habitats. However, its distribution is situated almost entirely within areas of high and increasing human population and intensive agriculture and is severely fragmented. The COSEWIC report (2010) suggests that populations in major portions of its Ontario range (Rondeau, and likely Skunk's Misery) have been lost, and that most population losses in the Windsor and Sarnia areas are outside the city limits or in the "suburbs". Other than Luther Marsh, and probably Walpole Island, the remaining populations are small scattered remnants in downtown Windsor and Sarnia. These are unlikely to be sustainable in the long run. No population viability analyses have been conducted to corroborate the hypothesis that Ontario populations cannot be sustained, but species' experts feel that the losses already experienced, as well as the high and increasing level of habitat fragmentation in its range cannot result in long-term sustainability.

2. Lack of regulatory protection for exploited wild populations

Not in any category. Butler's Gartersnake is listed in Schedule 9 (Specially Protected Reptiles) of the Fish and *Wildlife Conservation Act*, as well as in Schedule 1 of the federal *Species at Risk Act* and is also protected under Ontario's *Endangered Species Act*. Although the species is occasionally available in the 'pet' trade, this does not seem to be a major threat. Nevertheless, it is a handsome, small, docile snake, and as it becomes rarer, its desirability probably will increase.

3. Direct threats

ENDANGERED. Habitat destruction and fragmentation likely represent the greatest threats to the persistence of *T. butleri*, as is true of many other Canadian reptiles, particularly snakes. The present disjunct distribution of this species indicates that it occupied a much wider range in the past. Even where suitable habitat has not been converted to agriculture, successional trends have led to a reduction in, for example, savannah habitat (e.g., Skunk's Misery). Drainage of seasonal wetlands, particularly

small ponds and marshes, urbanization, and agricultural practices probably reduced its past distribution in Ontario (COSEWIC 2010). The fragmented nature of urban landscapes resulting from roads and highways is also a major concern. Although no detailed studies have investigated the effects of roads on *T. butleri*, road mortality has been observed across this species' range (Harding 1997; J. Choquette, pers. comm. 2009). The presence of roadways separating suitable habitats may restrict snake movement via road aversion or may increase mortality due to road kills. It is not certain which process plays a stronger role with *T. butleri*. Regardless, the two scenarios result in increased isolation of populations and potential effects from small population size.

These effects have been documented in Black Ratsnakes (*Elaphe obsoleta*) in Ontario (Row et al. 2007). Given the degree of development, the prevalence of roads, and the highly fragmented nature of most of the Butler's Gartersnake's current extent of occurrence (i.e., Windsor to Sarnia), another major threat is that it is distributed in small, mostly isolated populations. As such, these populations are subject to inbreeding depression, and genetic bottlenecks with a consequent loss of genetic variation, and increased vulnerability to genetic and ecological stochasticity (Schaffer 1981, Reed et al. 2003, Traill et al. 2007). Recent assessments suggest that vertebrate populations need to be on the order of a few thousand individuals to ensure long-term survival and to avoid reduced genetic diversity (Traill et al. 2007). None of Butler's Gartersnake populations are likely to be this large, and outside of, possibly, Luther Marsh, none are bigger than a few hundred adults.

4. Specialized life history or habitat-use characteristics

SPECIAL CONCERN. The prevalence of intensive agricultural practices in southwestern Ontario prevents the establishment and subsequent colonization of new *T. butleri* habitat (originally, tall-grass prairie and associated savannah). Continued disturbance, through tilling and ploughing, prevents the establishment of grasses and thatch. Planck and Planck (1977) noted that use of pesticides and herbicides could negatively affect *T. butleri* because of their negative effects on earthworm abundance. The correlation between earthworms and *T. butleri* density (Casbourn et al. 1976) and the fact that *T. butleri* feeds almost exclusively on earthworms, makes this conclusion likely if pesticides/herbicides do indeed negatively affect earthworms (Casbourn et al. 1976; Planck and Planck 1977). [It should be noted that earthworms were not present in the glaciated part of the Butler's Gartersnake's range prior to European settlement. It is uncertain what this species fed upon prior to settlement, although leeches are one possibility]. Furthermore, the conversion of suitable habitat into new arable land has been documented as a cause of decline. Location 18, which was known at one time as one of the largest *T. butleri* populations in Ontario (Planck and Planck 1977), was completely destroyed when it was bulldozed for agriculture in the early 1980s.

COSSARO criteria met (primary/secondary)

Endangered – [0/2]

Threatened – [4/0]

Special concern – [0/1]

Recommended Status: Endangered

Summary

The Butler's Gartersnake (*Thamnophis butleri*) is Endangered in Ontario because of small isolated populations and loss of habitat (tallgrass prairie). It is a relatively small, strikingly marked gartersnake that has a restricted range in midwestern North America (Wisconsin, Michigan, Illinois, Ohio, Ontario). In Ontario, it is restricted to four pockets in the southwest, with a series of populations between the Windsor and Sarnia areas, and another fairly substantial population in the Luther Marsh area. The other two areas, in the vicinity of Parkhill and Skunk's Misery, are of uncertain status, no snakes having been found in either area in recent years. The major threats to the species in Ontario are outright habitat loss and fragmentation of the habitat that remains.

Information sources

<https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/generalQuerySubmit.do> [link inactive]

http://www.cosepac.gc.ca/eng/sct1/searchform_e.cfm [link inactive]

<http://www.wildspecies.ca/wildspecies2005/Results.cfm?lang=e&sec=9> [link inactive]

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Casbourn, H., P. Dwyer, P. Francis, G. Fox, L. Gray, A. Lambert, F. McKillop, and B. Ralph. 1976. Prey species and role of prey in limiting the local distribution of Butler's garter snake (*Thamnophis butleri*). Unpublished report, Ontario Ministry of the Environment. ix + 91 pages.

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- Smith, P. W. 1957. An analysis of post-Wisconsin biogeography of the prairie peninsula region based on distributional phenomena among terrestrial vertebrate populations. Ecology 38: 207-218.
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Appendix 1: Northeastern North America rank, status and decline

Province/State	North America rank, status and decline
CT	NA
DE	NA
IL	NA
IN	S1
IA	NA
KY	NA
LB	NA
MA	NA
MB	NA
MD	NA
ME	NA
MI	S4
MN	NA
NB	NA
NF	NA
NH	NA
NJ	NA
NS	NA
NY	NA
OH	SNR
ON	S2
PA	NA
PE	NA
QC	NA
RI	NA
VA	NA
VT	NA
WI	S3
WV	NA

Occurs as a native species in 5 of 29 northeastern jurisdictions.

S-rank or equivalent information available for 4 of 5 jurisdictions = 80%

S1, S2, SH, or SX in 2 of 4 = 50%

PART 2: Ontario evaluation using COSEWIC criteria

Regional (Ontario) COSEWIC criteria assessment

Criterion A – Decline in total number of mature individuals

No - N/A. Not applicable as the number of mature individuals is unknown.

Criterion B – Small distribution range and decline or fluctuation

Yes – ENDANGERED. Meets Endangered under B2ab (i, ii, iii, iv, v) as the Index of Area of Occupancy (360 km²) is below the threshold for Endangered, the species habitat is estimated to be severely fragmented, and there is a continuing decline.

Criterion C – Small and declining number of mature individuals

No - N/A. Not applicable as the total number of mature individuals is unknown.

Criterion D – Very small or restricted total population

No - N/A. Not applicable as the number of mature individuals is unknown, the Index of Area of Occupancy is larger than 20 km²) and there are more than five locations.

Criterion E – Quantitative analysis

No - N/A. Not performed.

Rescue effect

Possibly. Butler's Gartersnakes might repopulate Ontario from the United States, depending on at least the following: 1) persistence of Michigan populations of *T. butleri* opposite Ontario populations, 2) sufficient immigration and reproduction of individuals dispersing across the St. Clair or Detroit Rivers, and 3) whether snakes arriving by water have access to suitable habitat inland. Successful immigration would be difficult due to strong river currents, lack of shoreline habitat and numerous roads severing shoreline from inland habitat. Given probably low frequency of dispersal across open water, effect of river currents on landing site, presence of roads as barriers and uncertainty whether there are *T. butleri* along the U.S. shores, it is unlikely there would be a reliable rescue effect that would provide measurable conservation benefit, at least in the short term.