

COSSARO Candidate Species at Risk Evaluation

for

Massasauga (*Sistrurus catenatus*)

Great Lakes/St. Lawrence Population

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

Assessed by COSSARO as Threatened

January. 2013

Final

Massasauga (population des Grands Lacs et du St-Laurent) (*Sistrurus catenatus*)

Le massasauga est un serpent à sonnette relativement petit au corps trapu ayant des motifs en sablier caractéristiques sur sa face dorsale. Il vit du sud de l'Ontario vers l'ouest et le sud-ouest en passant par les États du Midwest jusqu'au nord du Mexique. En Ontario, le Massasauga présente deux unités désignables : 1) la région de la baie Georgienne et 2) la région carolinienne le long de la rive nord du lac Érié. Ces deux unités désignables sont séparées de 200 km l'une de l'autre et il n'existe aucune preuve qu'elles ont été historiquement reliées. Les populations de l'unité désignable des Grands Lacs et du St-Laurent sont concentrées dans la partie supérieure de la péninsule de Bruce et de la rive est de la baie Georgienne. L'espèce a besoin d'un habitat semi-ouvert pour lui fournir un couvert et des possibilités de thermorégulation. Dans la baie Georgienne, le massasauga utilise une mosaïque de zones arides de socle rocheux, des marais de conifères, des prairies de castor, des fens, des tourbières et des habitats riverains, tous des habitats distincts de ceux que privilégie le massasauga de l'unité désignable carolinienne. Bien que plusieurs populations soient protégées dans les parcs nationaux et provinciaux, et que cette région est relativement intacte, leur taux de mortalité sur les routes a sensiblement augmenté en raison des réseaux routiers en expansion. Elles ont aussi subi une perte d'habitat en raison d'aménagements récréatifs et étant venimeux, ils souffrent grandement de la persécution par les humains. L'unité désignable des Grands Lacs et du St-Laurent est désignée comme étant **menacée** en Ontario.

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PART 1

CURRENT STATUS AND DISTRIBUTION

Current Designations:

GRANK – G 3 G4 T3Q (Assessed 13/10/2010) (NatureServe, accessed 15/01/2013)

NRANK Canada – N 3 (Assessed 13/10/2010) (NatureServe, accessed 15/01/2013)

COSEWIC – Threatened (COSEWIC, Nov. 2012)

SARA – A single DU for *Sistrurus catenatus* and is **Threatened** (Schedule 1) (Environment Canada, 2012)

ESA 2007 – Threatened (1 DU for all Ontario) (Ministry of Natural Resources, 2002)

SRANK – S3 (NHIC/NatureServe, accessed 15/01/2013)

Distribution in Ontario:

The Great Lakes/St. Lawrence DU supports multiple subpopulations of Massasauga surrounding Georgian Bay. These populations are concentrated in relatively undeveloped areas along the eastern shore of Georgian Bay, from Killarney to Port Severn, and the northern Bruce Peninsula, from Tobermory to Oliphant. Outside these areas, recent observations have occurred as far east as Restoule Lake, as far north as Sudbury, as far west as Vidal Island and Blind River, and as far south as the Collingwood area (COSEWIC 2012; see Figure 4).

Distribution and Status Outside Ontario:

Massasaugas occur in a large but discontinuous range from central Canada to northern Mexico. The subspecies, Eastern Massasauga (*Sistrurus c. catenatus*), occurs in the eastern portion of the species' range, with historical and contemporary occurrences in Ontario, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, and Wisconsin (USFWS 2010). Although the current estimated global range of the eastern subspecies is similar to the presumed historical range, it has become increasingly fragmented (USFWS 2010, 2011). Nine of the 11 jurisdictions within the historical range have lost 30-50% of their populations. Also ~40 % of the counties with historical populations no longer support the subspecies (USFWS 2010). In the U.S., more than 65% of populations are thought to have a low to moderate likelihood of remaining viable in the long term (USFWS 2010).

PART 2

ELIGIBILITY FOR ONTARIO STATUS ASSESSMENT

2.1 APPLICATION OF ELIGIBILITY CRITERIA

Taxonomic Distinctness

Yes. Massasauga has been a recognized species for almost 200 years. The eastern subspecies, *S.c. catenatus* that inhabits Ontario is under review at present and may be elevated to a full species (Crother *et al.* 2012; Kubatko *et al.* 2012), but currently the subspecies is being retained. The Great Lakes/St. Lawrence DU was recognized in the Nov. 2012 meeting of COSEWIC (COSEWIC 2012).

Designatable Units

Two Designatable Units (DUs) are recognized for the Massasauga (*Sistrurus c. catenatus*) in (Ontario) Canada: the Carolinian and Great Lakes/St Lawrence DUs (COSEWIC 2012). Each unit is discrete and significant based on: genetic distinctiveness, eco-geographic regions, range disjunction, and ecological setting (COSEWIC 2012). All subpopulations (including historical) in the vicinity of Georgian Bay are included in the Great Lakes/St. Lawrence DU, and both Wainfleet Bog and Ojibway Prairie subpopulations are included in the Carolinian DU.

The 2012 COSEWIC report on Massasauga has an extensive discussion on the species' strong population spatial structure and variability and assignment of Designatable Units, which is summarized here. For the subspecies *S. c. catenatus*, three weakly differentiated geographic subunits based on mitochondrial DNA haplotypes have been described (Eastern, Central and Western: Ray 2009; King pers. comm. 2011; COSEWIC 2012, Figures 2, 3). Snakes from the Ojibway population were grouped in the central subunit, whereas snakes from Wainfleet, Bruce County and Parry Sound District were grouped in the eastern subunit (see Figures 2, 3 in COSEWIC 2012). Sample size for Wainfleet Bog was only a single snake so the inclusion of this site in the Eastern subunit should be viewed with caution. Snakes from all Ontario sites sampled belonged to the same Cytochrome B group (Ray 2009).

Analysis of nuclear DNA microsatellites indicates that most sampled Ontario subpopulations are genetically distinct and currently physically isolated from one another (Chiucchi and Gibbs 2010; Dileo and Lougheed (2011). These results, coupled with data from U.S. populations strongly suggest that fine-scale genetic structure is the natural state of Massasauga populations (Gibbs *et al.* 1997; Chiucchi and Gibbs 2010). Broad-scale genetic isolation and low levels of gene flow among populations are thought to derive naturally from limited dispersal and/or long term habitat heterogeneity and not from human-induced habitat fragmentation (Gibbs *et al.* 1997; Chiucchi and Gibbs 2010), although the latter would exacerbate population genetic structure. Identification of DUs based on nuclear genetics alone, therefore, would be problematic at the present time due to 1) the need to define and identify each genetically distinct

subpopulation in the Great Lakes/St. Lawrence DU, (which may amount to dozens if the number of “locations” provides a reasonable estimate of distinct populations); and 2) the lack of genetic data for the majority of subpopulations in the Georgian Bay region.

Populations in the proposed DUs appear to have been disjunct since before European settlement in Ontario. The Wainfleet Bog and Ojibway Prairie subpopulations are the only two remaining from over a dozen historical subpopulations of *Massasauga* in the Carolinian Zone. When viewed as a cluster, these historical Carolinian populations are geographically separated from historical Great Lakes/St. Lawrence populations by a band at least 80 km wide within which there is a total absence of records (Figures 4, 5, COSEWIC 2012). Whereas the current disjunction between the Ojibway Prairie and Wainfleet Bog populations was caused by the extirpation of intermediate subpopulations by people, there is little evidence to suggest a similar cause for the historical disjunction between the two putative DUs. No documented records exist from this gap in distribution and the species’ range is presumed to have already declined perhaps in response to climatic shifts long before European settlement. There is little evidence that *Massasaugas* ever occupied the Lake Huron shore south of the Bruce Peninsula (Rowell 2012), but they still occur in the northern Lower Peninsula of Michigan, including Bois Blanc Island and, until recently, Charity Island at the extreme northern extent of the Lower Peninsula (Holman 2012). This distribution suggests *Massasaugas* may have entered the Great Lakes/St. Lawrence region via northern Michigan rather than from southern Ontario. Regardless, current evidence suggests that populations within the Carolinian DU have been naturally separate from populations within the Great Lakes/St. Lawrence DU for an extended period.

The Wainfleet and Ojibway subpopulations (and all historical Carolinian subpopulations) exist within the COSEWIC Carolinian Terrestrial Amphibian and Reptile Faunal Province, whereas all subpopulations in the Georgian Bay region (including historical) exist within COSEWIC’s Great Lakes/St Lawrence Terrestrial Amphibian and Reptile Faunal Province (COSEWIC 2012).

Populations in each DU persist in unique ecological settings for the species in Canada that are likely to lead to local adaptations. The Carolinian DU supports the only Canadian representatives of a tallgrass prairie-oak-savannah population (Ojibway Prairie) and a peat land-swamp forest-bog population (Wainfleet Bog) (COSEWIC 2012). The Great Lakes/St. Lawrence DU supports the only Canadian representatives of alvar and rock barren populations. These ecological settings have given rise to local behavioural adaptations of site fidelity to hibernacula and of long distance dispersal (COSEWIC 2012).

Native Status

Yes The *Massasauga* has been recognized as a valid species in Ontario’s Georgian Bay region since the 1800’s (Garnier 1881; Nash 1905).

Presence/Absence

Present, The Great Lakes St. Lawrence DU is extant in the Georgian Bay region, including the Upper Bruce Peninsula, some Georgian Bay Islands and the eastern shore of Georgian Bay (COSEWIC 2012)..

2.2 ELIGIBILITY RESULTS

1. The putative taxon or DU is valid. **Yes**
2. The taxon or DU is native to Ontario. **Yes**
3. The taxon or DU is **Present** in Ontario.

PART 3

ONTARIO STATUS BASED ON COSSARO EVALUATION CRITERIA

3.1 APPLICATION OF PRIMARY CRITERIA (Rarity and Declines)

1. Global Rank

Threatened. G3 G4T3Q (NatureServe accessed 15/01/2013)

2. Global Decline

Threatened. Nine of 11 jurisdictions have lost > 30% of their populations (COSEWIC 2012)

3. Northeastern North America Ranks

Endangered. Seven of nine jurisdictions (77%) that list Massasauga rank it S1 or S2 (Appendix 1). The global and northeastern North American ranges are nearly equivalent. If we add Missouri (rank S 1) to complete the global range, then the status remains Endangered (S1 or S2 in 8 of 10=80%). The endangered value is the more credible of criteria 2 and 3 because it is based on more precise data than NatureServe's global rank which seems to rest mostly on the total extent of occurrence.

4. Northeastern North America Decline

Endangered. Applies to the long term (30-70%) or short term (10-50%; NatureServe 2013). This criterion may not warrant inclusion as the northeastern North American range of the species, infraspecific taxon or DU is the same, or largely the same, as its global range. This claim becomes a bit tricky because these reports are dealing with DU's that are entirely in Ontario and there is confusion in the species/subspecies taxonomy (Crother *et al.* 2012).

5. Ontario Occurrences

Not in any category. There are roughly 65 "locations" or "element occurrences" in the Great Lakes/St. Lawrence DU (COSEWIC 2012, Appendix 1).

6. Ontario Decline

Special concern. There has been an historical decline of about 30-60 % (COSEWIC 2012, Figures 6, 7) and there are more than 50 element occurrences. The range of these estimates depends on whether one looks only at losses in southern Georgian Bay and Bruce and Gray counties or one includes more speculative estimates of loss from inland areas of the eastern Georgian Bay region. It seems fairly certain that more than 30 % of the historical range of this DU has been lost. In terms of losses over the past three generations (25 years), a decline can certainly be inferred and documented, but the size of that decline is quite uncertain (e.g., Middleton and Chu 2004; Miller 2005; COSEWIC 2012).

7. Ontario's Conservation Responsibility

Threatened. The Great Lakes/St. Lawrence DU represents about 10 % of the species' global range. However, in terms of population size and conservation significance, the significance of this DU is probably much higher as the eastern Georgian Bay and Bruce Peninsula Massasauga populations are believed to be the largest and most secure found anywhere across the species' entire range (USFWS 2011; COSEWIC 2012; Parks Canada Agency 2012; Rowell 2012).

3.2 APPLICATION OF SECONDARY CRITERIA (Threats and Vulnerability)

8. Population Sustainability

Special concern. The Great Lakes/St. Lawrence population is not in imminent danger of extirpation because it is widespread and much of its range remains relatively undeveloped. However, in areas where the human population is dense and or growing, such as southern Georgian Bay, parts of the Bruce Peninsula and some islands, Massasaugas have declined or disappeared (COSEWIC 2012). On the upper Bruce Peninsula, a PVA model by Miller (2005) suggests that fire is a more important threat to the viability of subpopulations than current and projected rates of development. At the current estimated rate of habitat loss, a slight decrease in population size is estimated in the next 100 years and four out of seven subpopulations in the upper Bruce Peninsula are expected to decline (Miller 2005). Nonetheless, the relative quasi-extinction risk for each subpopulation is low, and the projected declines are not predicted to have a measurable impact on quasi-extinction risk of the entire upper Bruce Peninsula population over the next 100 years (Miller 2005). Overall, the metapopulation appears well buffered against total extinction in most cases (Miller 2005).

9. Lack of Regulatory Protection for Exploited Wild Populations

Not in any category. The Massasauga is currently listed as Threatened under the Ontario *Endangered Species Act, 2007* and Threatened (Schedule 1) under the federal *Species at Risk Act, 2002* (Parks Canada 2012). This species is also a "specially protected reptile" under Ontario's *Fish and Wildlife Conservation Act* (January 1999). It is illegal to harm, harass, possess, or kill a Massasauga in Ontario.

10. Direct Threats

Special concern. Historically, it appears that the most significant cause of decline of Massasauga was the conversion of wetland habitats to agriculture. This conversion is not a major threat over most of the Georgian Bay region, but habitat degradation occurs widely nevertheless. Of greatest concern has been the ongoing loss, degradation and fragmentation of habitat in the upper Bruce Peninsula and southern Georgian Bay from expansion and improvement of road systems (Fenech *et al.* 2000; Watters 2003; COSEWIC 2012, Figure 11), cottage and residential developments and intensification of developed areas (Watters 2003; Miller 2005, Crowley pers. comm. 2012). On the southern Georgian Bay coast, low intensity agriculture and low density residences are

being replaced with high density developments (MacKinnon *et al.* 2005), and the human population in this area is growing faster than in any other area in Ontario (Watters, 2003). On the eastern shore of Georgian Bay as a whole, loss of habitat is presumed to be less relative to total amount of protected area as one goes north.

Because Massasaugas are venomous, they are often intentionally killed especially when close to human habitation. Persecution of Massasaugas was commonplace historically on both private and public land (Rouse 2005; Weller 2010). Mortality from persecution is probably less frequent than previously due to changing attitudes and outreach efforts, nevertheless, negative attitudes persist and many Massasaugas are still being intentionally killed (Rowell 2012; Crowley pers. comm. 2012).

Traffic on roads, and even off roads, is a significant anthropogenic source of mortality for rattlesnakes as these reptiles are generally small, not readily visible to drivers, and slow moving (J. Baxter-Gilber; J. Riley; J. Noganosh pers. comm. 2013). Evidence of the impact of road mortality on Massasauga is clearly indicated in the species' current and historical distribution in Figure 11 in COSEWIC (2012). This figure shows road density in southern Ontario in 1995, but as the source document points out (Fenech *et al.* 2000) that the number (density) of Ontario roads and their traffic volume and speed continue to increase inexorably. All these metrics increase mortality rates of Massasaugas in occupied habitat (e.g., Row *et al.* 2010, 2011; Rouse *et al.* 2011; Farmer and Brooks 2012; Rowell 2012), but the full impact goes well beyond direct mortality from vehicles to all anthropogenic threats contingent upon increasing road network densities. Although, road networks are still sparser in the upper Bruce Peninsula and in the western and northern Georgian Bay region than further east and south, these areas are under pressures from ever-expanding recreational and urban development, all dependent on more and bigger roads.

Rates of road mortality are high where roadways bisect snake dispersal paths (Weatherhead and Prior 1992; Rouse *et al.* 2011, Farmer and Brooks 2012; Rowell 2012). Road-killed Massasaugas have been observed across the species' range in Canada (Pratt *et al.* 1993; Oldham *et al.* 1999; NatureServe 2013; Rowell 2012) and Massasauga road mortality has been investigated in detail at a few "locations" (Bruce Peninsula, Tonge 2006; eastern Georgian Bay, MacKinnon *et al.* 2005). Some studies have found relatively low rates of Massasauga road mortality (MacKinnon *et al.* 2005) probably because of low population densities or limited survey methodologies (Choquette 2011).

Relatively high rates of road mortality have been witnessed at other sites. For example, one investigator estimated that at a particular site in the Great Lakes/St. Lawrence DU, roughly 50% of Massasaugas attempting to cross roads are killed (R. Willson *in* Johnson and Wright 1999). In Magnetawan First Nation on Highway 69, 84 % of Massasaugas observed on the road were killed by vehicles (Baxter-Gilber, Riley pers. comm. 2013). Two road mortality surveys in and around BPNP detected at least 20 dead Massasaugas along 1100 km of road (0.02 snakes/km) (Tonge 2006) and a

minimum of 31 dead Massasaugas from five roads, including a portion of Highway 6 (Stinnissen unpub. data 2012). When these values are extrapolated to all roads with similar traffic and speed in the upper Bruce Peninsula, it is assumed that annual mortality rates may be in the hundreds (Crowley pers. comm. 2012) from a population of just over 2000 individuals.

Roads may serve as an impermeable or semi-permeable barrier to snake movement (Shepard *et al.* 2008), effectively isolating populations from one another and resulting in genetic isolation and a reduced probability that vacant habitat is recolonized (Rouse *et al.* 2011). For example, genetic substructure in Eastern Foxsnake (*Pantherophis vulpinus*) populations in southwestern Ontario severed by a busy road indicated extremely limited to non-existent dispersal and breeding between subpopulations (Row *et al.* 2010, 2011).

Several investigators assert that this road mortality is a severe threat to Massasauga populations in the U.S. and Canada (Rouse and Willson 2002; Seigel and Pilgrim 2002; Harvey 2008; Crowley pers. comm. 2012) and that roads contribute to regional and local population declines (Middleton and Chu 2004; Miller 2005; Rowell 2012). Massasaugas have become almost completely extirpated from areas in Ontario that now have high road densities, and persist only where road densities are comparatively low (Crowley unpub. data; COSEWIC 2012, Figure 11; Rowell 2012). Unfortunately, no studies have specifically addressed the relative importance of road mortality on Massasauga population persistence (Middleton and Chu 2004). Row *et al.* (2007), however, used data on road mortality rates and abundance for a large snake species (*Elaphe obsoleta*) to show that even relatively low rates of roadkill (~2% of adults killed annually, similar to rates witnessed with Massasauga at Bruce Peninsula National Park and Killbear Provincial Park) increased extinction risk to 99% over 500 years. Although these results are not directly transferable to Massasaugas, they suggest the long-term threat of road mortality on population persistence is severe.

11. Specialized Life History or Habitat-use Characteristics

Threatened. Most females only give birth once every 2-3 years, and given an age of maturity of 3-6 years and a maximum life span of 12 years, most females will not produce more than two dozen young in their lifetime. In the cooler parts of the range, some females may not produce more than one litter in their lives (COSEWIC 2012). Massasaugas also often hibernate in large numbers in the same place which renders them susceptible to a single threat such as cold temperatures or anthropogenic threats such as illegal collection or disturbance for construction of roads, buildings or mineral extraction (COSEWIC 2012). All of these threats, except collection, are ranked as being of “high” level of concern in the draft Massasauga Recovery Plan (Parks Canada Agency 2012). When large proportions of subpopulations share a confined common hibernaculum, threats become more significant. The Recovery Plan rated certainty on the impact of these particular threats as “high”.

3.3 COSSARO EVALUATION RESULTS

1. Criteria satisfied in each status category:

Number of primary and secondary criteria met in each status category:

ENDANGERED – [1/0]

THREATENED – [3/1]

SPECIAL CONCERN – [1/2]

Ontario-specific criteria met in each status category (primary criteria 5, 6 and 7):

ENDANGERED – [0]

THREATENED – [1]

SPECIAL CONCERN – [1]

2. Data Deficiency

No. The number of criteria assessed as “insufficient information” is 0.

3. Status Based on COSSARO Evaluation Criteria

The application of COSSARO evaluation criteria suggests that **Massasauga Great Lakes/St. Lawrence DU** is **Threatened** in Ontario.

PART 4

ONTARIO STATUS BASED ON COSEWIC EVALUATION CRITERIA

4.1 APPLICATION OF COSEWIC CRITERIA

Regional (Ontario) COSEWIC Criteria Assessment

Criterion A – Decline in Total Number of Mature Individuals

Not in any category. No criteria are met due to lack of precise trend and abundance information. However it is possible that the species meets Threatened A4(c) based on an observed, estimated, projected or suspected reduction in total number of mature individuals over a three-generation period including both the past and future, and where the reduction or its causes may not have ceased or may not be reversible.

Criterion B – Small Distribution Range and Decline or Fluctuation

Not in any category. The EO and IAO exceed thresholds and would not meet “severe fragmentation” and there are no extreme fluctuations in population size.

Criterion C – Small and Declining Number of Mature Individuals

Threatened. Criterion C2a(i) applies because the range of estimates of total number of mature snakes includes values < 10,000 (range of estimates (9113-22194) (COSEWIC 2012), there is a continuing decline and, based on genetic research into population structuring, no population is estimated to contain >1000 mature individuals.

Criterion D – Very Small or Restricted Total Population

Not in any category. The population size and range greatly exceed the thresholds for endangered or threatened.

Criterion E – Quantitative Analysis

Not in any category. PVA's performed were not considered robust enough to meet this criterion.

Rescue Effect

No. The subspecies is in decline across its North American range, is protected in almost every jurisdiction, and is S1 or S2 in all U. S. jurisdictions where it has been assessed except Michigan. Even in Michigan, they are “uncommon” and in scattered local sites (Harding 1997; Holman 2012), and because of their limited dispersal ability they have little almost no chance of reaching the Georgian Bay region.

Special Concern Status

NA

4.2 COSEWIC EVALUATION RESULTS

1. Criteria satisfied in each status category

ENDANGERED – [no]
THREATENED – [yes]
SPECIAL CONCERN – [no]

2. Data Deficiency

No

3. Status Based on COSEWIC Evaluation Criteria

The application of COSEWIC evaluation criteria suggests that **Massasauga Great Lakes/St. Lawrence DU** is **Threatened** in Ontario.

PART 5

ONTARIO STATUS DETERMINATION

5.1 APPLICATION OF COSSARO AND COSEWIC CRITERIA

COSSARO and COSEWIC criteria give the same result. **Yes**

5.2 SUMMARY OF STATUS EVALUATION

Massasauga (Great Lakes/St. Lawrence DU) is classified as **Threatened** in Ontario.

The Massasauga (*Sistrurus catenatus*) is a relatively small, thick-bodied rattlesnake with distinctive hourglass markings on its dorsum. It ranges from southern Ontario west and southwest through the midwestern United States into northern Mexico. In Ontario, the Massasauga occurs as two Designatable Units: (1) the Great Lakes/St. Lawrence DU in the Georgian Bay region, and (2) the Carolinian DU along the north shore of Lake Erie. The two DUs are separated by about 200 km, and there is no evidence they were ever connected historically. Populations in the Great Lakes/St. Lawrence DU are concentrated in the upper Bruce Peninsula and east side of Georgian Bay.

Massasaugas require semi-open habitat to provide both cover and opportunities for thermoregulation. In Georgian Bay, Massasaugas use a mosaic of bedrock barrens, conifer swamps, beaver meadows, fens, bogs, and shoreline habitats, distinct from habitat used in the Carolinian DU. Although several populations are protected in national and provincial parks, and much of this area is relatively undeveloped, Massasaugas are subjected to substantially increased road mortality due to expanding road networks. They are also affected by habitat loss from recreational development and, being venomous, continue to suffer heavily from human persecution. The Great Lakes/St. Lawrence DU is designated as Threatened in Ontario.

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2. Community and Aboriginal Traditional Knowledge Sources

Information from a presentation to COSSARO Jan. 22, 2013 by Magnetawan First Nation, and ATK information in the COSEWIC (2012) report were incorporated into this report.

APPENDIX 1

NORTHEASTERN NORTH AMERICA STATUS RANK AND DECLINE

	Subnational Rank	Sources	Decline	Sources
CT	NA	NatureServe	See section 3.1.4	NatureServe
DE	NA			
IL	S2			
IN	S2			
IA	S1			
LB	NA			
KY	NA			
MA	NA			
MB	NA			
MD	NA			
ME	NA			
MI	S3S4			
MN	S1			
NB	NA			
NF	NA			
NH	NA			
NJ	NA			
NS	NA			
NY	S1			
OH	SNR			
ON	S3			
PA	S1			
PE	NA			
QC	NA			
RI	NA			
VA	NA			
VT	NA			
WI	NA			
WV	NA			

Occurs as a native species in 10 of 29 northeastern jurisdictions
 Srank or equivalent information available for 9 of 10 jurisdictions = (90 %)
 S1, S2, SH, or SX in 7 of 9 = (77 %)