COSSARO Candidate Species at Risk Evaluation for

Silver Shiner (*Notropis photogenis*)

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

Assessed by COSSARO as THREATENED

June, 2011

Final
PART 1

CURRENT STATUS AND DISTRIBUTION

Current Designations:

NRANK Canada – N2N3 (NatureServe accessed May 2011)
SARA – Special Concern (Schedule 3) (Environment Canada 2011)
ESA 2007 – Special Concern (Ministry of Natural Resources 2011)
SRANK – S2S3 (NHIC/NatureServe, accessed 30/05/11)

Distribution in Ontario:
Southwestern Ontario is the only area in Canada where Silver Shiners are found. Here it is restricted to the tributaries of Lakes St. Clair (Thames River), Erie (Grand River) and Ontario (Bronte Creek). Recent surveys by Fisheries and Oceans Canada, the Royal Ontario Museum (ROM) and the Ministry of Natural Resources (MNR) have resulted in range extensions farther downstream in the Thames and Grand Rivers and Bronte Creek (COSEWIC 2011).

Distribution and Status Outside Ontario:

The Silver Shiner is endemic to North America, where it is primarily found in the Ohio and Tennessee River drainages in the eastern U.S. The species is rarer in tributaries of the lower Great Lakes (Lake St. Clair, Lake Erie, and Lake Ontario) in Michigan, Ohio, Pennsylvania, and Ontario (NatureServe 2011; COSEWIC 2011).
PART 2

ELIGIBILITY FOR ONTARIO STATUS ASSESSMENT

For each criterion below, consider whether the species satisfies necessary conditions for status assessment in Ontario.

2.1 APPLICATION OF ELIGIBILITY CRITERIA

Taxonomic Distinctness
Yes. The Silver Shiner is superficially similar to the Rosyface Shiner (*Notropis rubellus*) and Emerald Shiner (*Notropis atherinoides*). It is, however, distinguishable by the position and number of pelvic and pectoral rays, appearance of stripe along the middle of the back, and dark crescent-shaped marks between the nostrils (COSEWIC 2011). While slightly larger in size, these features are only possible to identify upon careful examination, which is often not possible in the field. In a study on the differences in the CO1 gene as part of the Barcode of Life initiative the Silver Shiner was found to be distinguishable from all other Canadian species of fishes (Hubert et al. 2008). It is also recognized as a valid species by Nelson et al. (2004).

Designatable Units
The watersheds inhabited by Silver Shiners are all within the Great Lakes – Upper St. Lawrence Freshwater Biogeographic Zone. Since no studies have been conducted on their genetic structure, the Canadian populations are, therefore, considered as one designatable unit (COSEWIC 2011).

Native Status
Yes. Although discovered in Canada in 1971, Silver Shiners have been identified from Ontario collections made as early as 1936 (Baldwin 1988). While it is used in some places in its range as a bait fish, Gruchy et al. (1973) believed that it was unlikely that the Silver Shiner had been introduced into Canada in bait buckets because it is not a hardy species and is not abundant north of the Ohio River Valley.

Presence/Absence
Present. Although discovered in Canada in 1971, it has been identified from Ontario collections made as early as 1936 (see above).

2.2 ELIGIBILITY RESULTS

Assess whether or not the putative taxon or DU satisfies all eligibility criteria and is therefore subject to further evaluation:

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, extirpated from Ontario or extinct? Present
PART 3
ONTARIO STATUS BASED ON COSSARO EVALUATION CRITERIA

3.1 APPLICATION OF PRIMARY CRITERIA (Rarity and Declines)

1. Global Rank
Not in any category. The Silver Shiner has a global rank of G5 (NatureServe 2011).

2. Global Decline
Insufficient information. While it is common and secure in the center of its range (Ohio, Indiana, Pennsylvania, West Virginia, Virginia, Kentucky, Tennessee and North Carolina), the Silver Shiner is rare and imperiled at the edge of its range (Ontario, New York, Michigan, Alabama, and Georgia) (NatureServe 2011). Some extirpations from watersheds are known to have taken place (NatureServe 2011); however, declines have not been quantified.

3. Northeastern North America Ranks
Special Concern. Silver Shiners are ranked S2 or S1 in three of the nine northeastern jurisdictions where they are found (Appendix 1).

4. Northeastern North America Decline
Insufficient information. Silver Shiners are rare at the northern limits of their distribution, and are seldom the subject of targeted surveys. They have been extirpated from several watersheds in Pennsylvania, Indiana, Ohio, West Virginia, and Michigan (NatureServe 2011). Any declines that may have occurred, however, have not been quantified.

5. Ontario Occurrences
Threatened. There are 7 extant element occurrences of Silver Shiner in Ontario (NHIC 2011) which is roughly the same number of locations (“approximately six”) used by COSEWIC (2011).

6. Ontario Decline
Insufficient information. Our knowledge of population changes in Ontario is hindered by lack of regular monitoring, problems of identification, selectivity of gear, and time of sampling (COSEWIC 2011). Few surveys that specifically targeted the Silver Shiner have been made since 1983. Between 1995 and 2006 surveys for several species at risk, including the Silver Shiner were conducted in the Grand and Thames river watersheds by the ROM and the MNR. In the Grand River in 1997, four individuals of Silver Shiner were captured at only two of seven sites where the Silver Shiner had been captured in the past and at two new sites (Holm and Boehm 1998). It is unclear whether
this poor result is truly suggestive of a decrease in abundance of this species in this river, or whether it can be attributed to capture methods and time of sampling (COSEWIC 2011). Any declines that may be occurring are therefore not possible to quantify.

7. Ontario’s Conservation Responsibility

Not in any category. Ontario populations are at the northern limit of Silver Shiner distribution. While they represent a significant portion of the Great Lakes populations, the Ontario distribution comprises less than 2% of the global distribution of this minnow (COSEWIC 2011).

3.2 APPLICATION OF SECONDARY CRITERIA (Threats and Vulnerability)

8. Population Sustainability

Insufficient information No published studies examining recruitment or reproduction of Silver Shiners have taken place within its North American range.

9. Lack of Regulatory Protection for Exploited Wild Populations

Not in any category. The Silver Shiner was previously assessed as Special Concern by COSEWIC, and is currently listed as such on Schedule 3 of the federal Species at Risk Act. Therefore, it does not receive any special consideration when a project is being reviewed under the Canadian Environmental Assessment Act. General protection is afforded under the habitat section of the Fisheries Act. As a species of Special Concern, the Silver Shiner is no longer a legal baitfish in Ontario, although harvest for this purpose (incidental and purposeful) has been recently documented and remains a potential concern (COSEWIC 2011).

10. Direct Threats

Threatened. Anthropogenic threats to the Silver Shiner include: 1) agricultural and urban land use; 2) dams and impoundments; 3) sportfish stocking; and 4) bait fish harvesting. The watersheds encompassing the natural range of Silver Shiner in Canada have been dramatically altered in the last 200 years; as most of the forested land was cleared and used for intensive agriculture and growing urban populations (Taylor et al. 2004; Portt et al. 2007). Two consequences of such development are chronic habitat loss and degradation and acute effects of toxic spills.

Southwestern Ontario experiences about as many reported toxic spills (fuel, oils, manure, chemicals, etc.) as the rest of Ontario combined. For instance, during the period 1988-1998, 274 manure spills were reported throughout Ontario (except in southwestern Ontario) and a further 229 were reported in southwestern Ontario. Of these Ontario-wide manure spills 11 resulted in fish kills in, while 46 resulted in fish kills in southwestern Ontario (Ontario Spills Action Centre as reported by Upper Thames River Conservation Authority 2011). This high spill level is not surprising in that southwestern Ontario and the Thames and Grand rivers watersheds specifically, is in the top five areas in Canada in terms of manure production (> 5,000 km/ha, ECO 2011).
This fish has very large eyes, suggesting that vision is important in prey detection and mating success and may be impaired with increased turbidity, which has been demonstrated in other fishes to reduce reproductive success, foraging efficiency and prey consumption, and growth rates (COSEWIC 2011).

Land for livestock and crops comprises 77.8% of the upper Thames River watershed, 88.1% of the lower Thames River watershed (Taylor et al. 2004), and 76% of the Grand River watershed (Cooke 2006). Urban land comprises 8% of the Thames watershed, with London being the main urban centre in the upper Thames River watershed, and 5% in the Grand River watershed distributed mainly in the cities of Waterloo, Kitchener, Cambridge, Guelph and Brantford. The percentage of forest is 4.6% in the lower Thames River watershed, 12.3% in the upper Thames River watershed and 17% in the Grand River watershed. Further habitat deterioration is likely given the projected increases in human population and urban development in the watersheds occupied by the Silver Shiner (see Portt et al. 2007, Taylor et al. 2004). In 2004, the human population was almost 500,000 in the Thames watershed and about 875,000 in the Grand watershed, where it is expected to increase by another 300,000 in the next 20 years (Portt et al. 2007). In the Golden Horseshoe region (which includes Bronte Creek and Sixteen Mile Creek), the human population is expected to increase by almost 4 million by 2031 (MPIR 2004). Agricultural intensification in both the Grand River and Thames River will also put additional stresses on water quality. Damming and channelizing rivers may negatively affect Silver Shiner populations due to relatively restricted stream gradient preferences (McKee and Parker 1982).

As a result of its negative biological impacts on native fauna, the International Union for the Conservation of Nature (IUCN) included Brown Trout in its list of 100 of the World’s Worst Invasive Alien Species (Lowe et al. 2000). In those reaches of the Grand River where their distribution overlaps, the association of Silver Shiner with deep, swift riffles and deep pools would likely result in their vulnerability to predation by large, adult Brown Trout. Cyprinids are known to be vulnerable to predation by Brown Trout (Nannini and Belk 2006), and declines in the abundance of softrayed stream fishes (catostomids and cyprinids) like the Silver Shiner have been documented (Garman and Nielsen 1982).

Parker and McKee (1980) indicated that anglers in the Grand River once favoured the Silver Shiner for use as bait. It is unclear how much of a threat bait fish harvesting continues to be since it became illegal to harvest Silver Shiners for this purpose owing to their Special Concern status. It could be harvested incidentally and has been known to be captured by at least one baitfish dealer in the Grand River (A.Timmerman, MNR, pers. comm., 2008 in COSEWIC 2011).

11. Specialized Life History or Habitat-use Characteristics

Special concern. The Silver Shiner is found primarily in large streams with widths usually greater than 20 m, where it is found in deep riffles or pools adjacent to riffles with moderate to high gradients. This species is rarely in small streams or rivers.
(Trautman 1981; Baldwin 1988, Jenkins and Burkhead 1994). This species appears to avoid areas with heavy vegetation and siltation.

3.3 COSSARO EVALUATION RESULTS

1. Criteria satisfied in each status category
   ENDANGERED – [0/0]
   THREATENED – [1/1]
   SPECIAL CONCERN – [1/1]

List the number of Ontario-specific criteria met in each status category. These are primary criteria numbers 5, 6 and 7.

   ENDANGERED – [0]
   THREATENED – [1]
   SPECIAL CONCERN – [0]

2. Data Deficiency
   No. The number of criteria assessed as “insufficient information” is 4 (3 primary and 1 secondary). While there are no data documenting population trends for this rare species in Ontario or elsewhere, survey data suggest a restricted distribution in Ontario in watersheds facing multiple stressors.

3. Status Based on COSSARO Evaluation Criteria
   The application of COSSARO evaluation criteria suggests that Silver Shiner is Threatened in Ontario.
4.1 Application of COSEWIC Criteria

Regional (Ontario) COSEWIC Criteria Assessment

Criterion A – Decline in Total Number of Mature Individuals
Insufficient Information. Any declines that may have occurred have not been quantified.

Criterion B – Small Distribution Range and Decline or Fluctuation
Threatened B1ab(iii)+2ab(iii). Meets Threatened B1 (EO < 20,000 km²), B2 (IAO < 2,000 km²), subcriterion a (fewer than 10 locations), and b(iii) (inferred continuing decline in habitat quality owing to continuing urbanization and industrialization).

Criterion C – Small and Declining Number of Mature Individuals
Insufficient Information. Neither population size nor declines have been quantified.

Criterion D – Very Small or Restricted Total Population
Insufficient Information. Population size has not been quantified, and area of occupancy > 20 km².

Criterion E – Quantitative Analysis
Insufficient Information. No PVAs have been conducted for this species.

Rescue Effect
No. Silver Shiner populations in the Great Lakes watershed of the United States are located in Michigan (190 straight line km), Ohio (115 km) and Pennsylvania (110 km). To reach suitable habitat in Ontario, individuals from these populations would have to migrate long distances, much of it through unsuitable lake habitat. The Silver Shiner has never been reported from any of the Great Lakes proper (Baldwin 1988, Cudmore-Vokey and Crossman 2000). Rescue from the more abundant populations in the Mississippi River system is prevented by drainage divides. Thus rescue from populations in the United States is unlikely (COSEWIC 2011).

Special Concern Status
N/A.
4.2 COSEWIC EVALUATION RESULTS

1. Criteria satisfied in each status category
Indicate whether or not a criterion is satisfied in each of the status categories.
   ENDANGERED – [no]
   THREATENED – [yes]
   SPECIAL CONCERN – [no]

2. Data Deficiency
No. While there are no data documenting population trends for this rare species in Ontario or elsewhere, survey data suggest a restricted distribution in Ontario in watersheds facing multiple stressors.

3. Status Based on COSEWIC Evaluation Criteria
The application of COSEWIC evaluation criteria suggests that Silver Shiner is Threatened in Ontario.
PART 5

ONTARIO STATUS DETERMINATION

5.1 APPLICATION OF COSSARO AND COSEWIC CRITERIA

Determine the appropriate method of applying the results obtained in parts 3 and 4:

COSSARO and COSEWIC criteria give the same result. Yes

5.2 SUMMARY OF STATUS EVALUATION

Silver Shiner is classified as Threatened in Ontario.

Found in only three watersheds in southwestern Ontario, the Silver Shiner is a slender and silvery minnow with large eyes. It most commonly occurs in mainstem and larger tributaries, and rarely in small streams or rivers. It is susceptible to continuing habitat loss and degradation in one of the most industrialized areas in Canada, which is under ever-increasing development pressures. Although it is difficult to determine whether declines have occurred, there is some evidence of declines elsewhere in its range, and extirpation from watersheds. The small number of populations and the relatively high degree of threat merits a Threatened status in Ontario.
Information Sources

1. Literature Cited


Campostoma anomalum, Clinostomus elongatus, Notropis photogenis (Cyprinidae), and Fundulus notatus (Cyprinodontidae) in Canada. Canadian Journal of Zoology 60:1347-56.


Parker, B. J., and P. M. McKee. 1980. Rare, threatened and endangered fishes in southern Ontario: Status Reports. Prepared by Beak Consultants Limited for Department of Supply and Services, Department of Fisheries and Oceans, and National Museum of Natural Sciences, Ottawa, Ontario.


2. Community and Aboriginal Traditional Knowledge Sources

None.
3. Acknowledgements

Thanks to Al Dextrase (OMNR) and Rick Taylor (co-chair, COSEWIC Freshwater Fish Specialist Subcommittee) for additional information in the preparation of this evaluation.
APPENDIX 1

NORTHEASTERN NORTH AMERICA STATUS RANK AND DECLINE

<table>
<thead>
<tr>
<th>State</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>Not present</td>
</tr>
<tr>
<td>DE</td>
<td>Not present</td>
</tr>
<tr>
<td>IL</td>
<td>Not present</td>
</tr>
<tr>
<td>IN</td>
<td>S4</td>
</tr>
<tr>
<td>IA</td>
<td>Not present</td>
</tr>
<tr>
<td>KY</td>
<td>S4</td>
</tr>
<tr>
<td>LB</td>
<td>Not present</td>
</tr>
<tr>
<td>MA</td>
<td>Not present</td>
</tr>
<tr>
<td>MB</td>
<td>Not present</td>
</tr>
<tr>
<td>MD</td>
<td>SNA</td>
</tr>
<tr>
<td>ME</td>
<td>Not present</td>
</tr>
<tr>
<td>MI</td>
<td>S1</td>
</tr>
<tr>
<td>MN</td>
<td>Not present</td>
</tr>
<tr>
<td>NB</td>
<td>Not present</td>
</tr>
<tr>
<td>NF</td>
<td>Not present</td>
</tr>
<tr>
<td>NH</td>
<td>Not present</td>
</tr>
<tr>
<td>NJ</td>
<td>Not present</td>
</tr>
<tr>
<td>NS</td>
<td>Not present</td>
</tr>
<tr>
<td>NY</td>
<td>S2</td>
</tr>
<tr>
<td>OH</td>
<td>S4</td>
</tr>
<tr>
<td>ON</td>
<td>S2S3</td>
</tr>
<tr>
<td>PA</td>
<td>S4</td>
</tr>
<tr>
<td>PE</td>
<td>Not present</td>
</tr>
<tr>
<td>QC</td>
<td>Not present</td>
</tr>
<tr>
<td>RI</td>
<td>Not present</td>
</tr>
<tr>
<td>VA</td>
<td>S4</td>
</tr>
<tr>
<td>VT</td>
<td>Not present</td>
</tr>
<tr>
<td>WI</td>
<td>Not present</td>
</tr>
<tr>
<td>WV</td>
<td>S5</td>
</tr>
</tbody>
</table>

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 3 of 9 = (33%)