

**Ontario Species at Risk Evaluation Report for River  
Redhorse (*Moxostoma carinatum*)**

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

Assessed by COSSARO as Special Concern

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Final

## Chevalier de rivière (*Moxostoma carinatum*)

Le chevalier de rivière est l'une des nombreuses espèces morphologiquement proches des meuniers (*Catostomus*) de genre *Moxostoma*, mais, contrairement à eux, qui sont sujets à l'hybridation, il est isolé sur le plan phylogénétique. Il s'agit d'un poisson de grande taille (pouvant atteindre une longueur de 80 cm) préférant les rivières peu profondes. L'âge de sa maturation varie de 5 à 17 ans. Comme l'espèce emprunte les rivières pour migrer vers un habitat de frai approprié, leur fragmentation peut avoir des répercussions sur sa viabilité. Au Canada (Ontario et Québec), l'espèce est isolée de la population principale du Centre et de l'Est des États-Unis. En Ontario, on les retrouve dans les rivières Thames, Grand, Trent, Mississippi et des Outaouais, et dans le fleuve Saint-Laurent, ainsi que dans le bassin versant de la baie de Quinte.

Le chevalier de rivière est sensible à la dégradation de son habitat, attribuable aux effluents agricoles, à la pollution et à la fragmentation (turbidité, atterrissement, pollution toxique ou par les nutriments et fragmentation de l'habitat à cause des barrages). Il n'y a pas de données disponibles sur la taille de la population, mais il est probable qu'elle soit demeurée stable en Ontario; certes, le nombre de sites de capture a augmenté, mais c'est vraisemblablement en raison de l'intensification de l'échantillonnage. Par ailleurs, il semble que la population historique de la rivière Ausable soit maintenant disparue. Le chevalier de rivière est classé dans la catégorie des espèces préoccupantes en Ontario parce qu'on le retrouve seulement à quelques endroits et que certaines sous-populations sont maintenant disparues. Beaucoup de ces endroits sont des habitats menacés par les barrages et d'autres formes de dégradation. Si rien n'est fait pour résoudre ces problèmes, l'espèce pourrait être menacée d'extinction.

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## Executive summary

The River Redhorse is one of many morphologically similar sucker (*Catostomus*) species in the genus *Moxostoma*, and while hybridization is known among sucker species, the River Redhorse is phylogenetically isolated. The River Redhorse is a large fish (up to 80 cm total length) that prefers shallow river habitat. Age of maturation varies from 5 to 17 years. The River Redhorse typically migrates to suitable spawning habitat in rivers and thus river fragmentation can impact population viability. Their distribution in Canada (Ontario and Quebec) is disjunct from the primary range in the central and eastern United States. Ontario populations are reported in the Thames, Grand, Trent, Mississippi, Ottawa and St. Lawrence rivers, as well as in the Bay of Quinte drainage basin.

The River Redhorse is susceptible to habitat degradation due to agriculture run-off, pollution and fragmentation (i.e., turbidity, siltation, toxic and nutrient pollution and habitat fragmentation by dams). Population size data are not available, and while the number of capture sites has increased, the number of locations is probably stable in Ontario with the increased number of capture sites likely being due to intensified sampling. The historic Ausable River population is apparently extirpated. River Redhorse is listed as Special Concern in Ontario because it occurs in a small number of locations, and some subpopulations have been lost. Barriers and other forms of habitat degradation threaten many remaining locations. This species may become Threatened, if these stressors or threats are not addressed.

# 1. Background information

## 1.1. Current designations

- GRANK: G4 (NatureServe June 5, 2016)
- NRANK Canada: N2N3
- COSEWIC: SC (November 2015)
- SARA: SC (Schedule 1)
- ESA 2007: SC (2008)
- SRANK: S2

## 1.2. Distribution in Ontario

The River Redhorse has a broad but scattered distribution in Ontario (Figure 1), with capture reports in the Thames, Grand, Trent, Mississippi, Ottawa (three areas of capture) and St. Lawrence rivers, as well as in the Bay of Quinte. The River Redhorse also occurs in Quebec (COSEWIC 2015); however, we included all reported captures in the Ottawa River as part of the Ontario distribution. Historic records indicate River Redhorse were found in the Ausable River; however that population is likely extirpated (last capture in 1936; NHIC). The Michigan Natural Feature Inventory reports that River Redhorse once occurred in the Detroit River and St. Clair River (Stagliano 2001).

Figure 1. Distribution of the River Redhorse (*Moxostoma carinatum*) in Ontario with Extent of Occurrence outlined in green (re-drawn using data from COSEWIC 2015). Red dots are reported capture sites from 1990-2013.

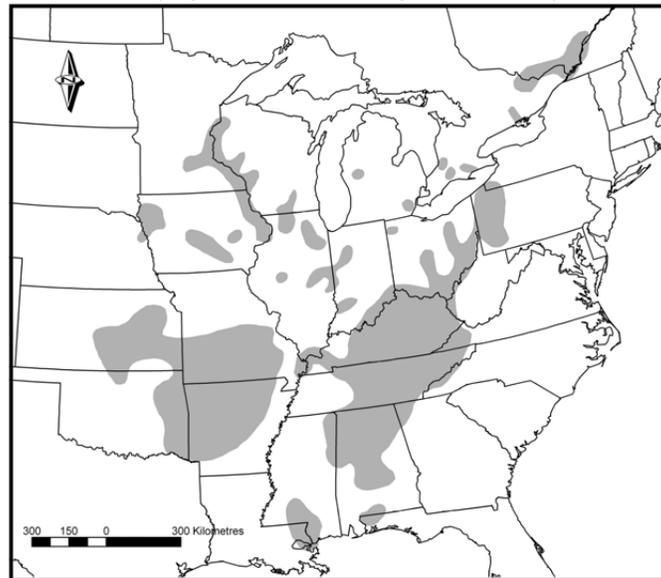


## 1.3. Distribution and status outside Ontario

The River Redhorse is found in 24 states and two Canadian provinces (Ontario and

Quebec). Their global distribution is highly disjunct, with geographically isolated ranges from Florida to Quebec and from North Carolina to Oklahoma (Figure 2). Although the River Redhorse is listed as G4 globally, in states bordering Ontario, it is ranked S1 in Michigan, S2 in New York and Wisconsin, S3 in Ohio and S3S4 in Pennsylvania, while it is listed S2S3 in Quebec.

Figure 2. Global distribution of the River Redhorse (*Moxostoma carinatum*) is shaded grey. Source COSEWIC 2006 (reproduced with permission).



#### 1.4. Ontario conservation responsibility

The proportion of the River Redhorse's global range in Ontario is estimated to be much less than 5% (see Figure 2), particularly as the conservation status of the more southern populations is more robust.

#### 1.5. Direct threats

Direct threats for the Ontario River Redhorse fall into two categories: water quality (pollution, turbidity and siltation) and habitat quality (water level, flow and river fragmentation):

Water Quality: Suckers in general are sensitive to urban and agricultural pollution (Tsai 1970; COSEWIC 2006), and the River Redhorse is also expected to be impacted by toxin and nutrient loadings (COSEWIC 2006; 2015). This is evident from the historical declines observed in areas of high urban and agricultural impacts (COSEWIC 2006). While agricultural and urban pollution is generally expected to increase or remain at currently levels in River Redhorse habitat in Ontario, river habitat improvement efforts will likely assist in River Redhorse recovery (e.g., [Thames River Recovery](#)). The River Redhorse is also susceptible to sediment loading and turbidity through both direct effects on their viability as well as impacts on their food availability (COSEWIC 2006).

Habitat Quality: The River Redhorse has specialized spawning habitat needs and are

known to migrate up streams and rivers to access spawning habitat with suitable flow and depth characteristics (COSEWIC 2006). Reid et al. (2008) showed that redhorse species in the Grand River were sensitive to river fragmentation due to dams, and while too few River Redhorse were captured to test for an effect on that species, other redhorse species exhibited habitat preference for larger un-fragmented river reaches. It is unclear if the limitations due to river habitat fragmentation are a result of interrupted reproduction or year-round habitat quality. River Redhorse are also highly sensitive to variation in flow, as they have restrictive depth and flow requirements for successful reproduction and reduced flow increases the risk of loss of developing embryos to siltation. No Threats Calculator has been completed for the River Redhorse, nor is there evidence for substantial increases in the intensity of known or projected threats.

## 1.6. Specialized life history or habitat use characteristics

The River Redhorse has specific spawning habitat characteristics that are required for successful reproduction, and they have been shown in Alabama to migrate more than 15 km to find those habitats (COSEWIC 2006). This makes the River Redhorse susceptible to changes in river flow regimes that affect spawning habitat and by fragmentation of river habitats by dams.

## 2. Eligibility for Ontario status assessment

### 2.1. Eligibility conditions

#### 2.1.1. Taxonomic distinctness

Yes. While the phylogeny of this genus is under debate, River Redhorse is phylogenetically well described (Clements et al. 2012).

#### 2.1.2. Designatable units

No. Genetic analysis of Canada's River Redhorse is underway; however at this time there is no evidence for designatable units.

#### 2.1.3. Native status

Yes. Ontario's River Redhorse has been known to occur since the 1930's.

#### 2.1.4. Occurrence

Extant. River Redhorse have been confirmed in Ontario as recently as 2012.

### 2.2. Eligibility results

River Redhorse (*Moxostoma carinatum*) is eligible for status assessment in Ontario.

## 3. Ontario status assessment

### 3.1. Application of endangered or threatened status in Ontario

#### 3.1.1. Criterion A – Decline in total number of mature individuals

Does not apply. While population size data are limited; however population sizes are likely stable.

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

Does not apply. While River Redhorse meet the Endangered criterion under B2 as they have an index of area of occupancy of less than 500 km<sup>2</sup> (340 km<sup>2</sup>) and they meet the Threatened criterion as they occur at fewer than 10 locations (B2 a), there is no evidence for continuing decline, observed inferred or projected, in the extent of occurrence, index of area of occupancy, area, extent and/or quality of habitat, number of locations or subpopulations, or number of mature individuals. There is also insufficient information to show evidence for extreme fluctuations.

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

Does not apply. Population numbers appear to be stable.

#### 3.1.4. Criterion D – Very small or restricted total population

Does not apply. Estimated number of individuals likely exceed the criteria.

#### 3.1.5. Criterion E – Quantitative analysis

Does not apply. None performed.

### 3.2. Application of Special Concern in Ontario

River Redhorse do qualify for Special Concern in Ontario as their index of area of occupancy is less than 500 km<sup>2</sup> and they occur at less than 10 locations, making them close to qualifying as Threatened. While no evidence for projected continued decline in habitat extent or quality exists, specific threats exist for this species.

### 3.3. Status category modifiers

#### 3.3.1. Ontario's conservation responsibility

Does not apply. Global Rank is G4 and Ontario has < 5% of the global distribution of River Redhorse.

#### 3.3.2. Rescue effect

Does not apply. While it may be possible for River Redhorse to move from adjacent U.S. habitat to augment the Ontario populations, it is highly unlikely. Neighbouring

populations are of conservation concern (S1 to S3S4) and not physically connected to Ontario waters. Where aquatic habitats are connected, River Redhorse are not likely to disperse such distances across unsuitable (deep water) habitat (e.g. Great Lakes). There may be opportunity for the Quebec River Redhorse to supplement Ontario's populations; however, we have included all of the River Redhorse from the Ottawa River as Ontario populations, and the Quebec St. Lawrence River populations are now at very low numbers.

### 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

River Redhorse (*Moxostoma carinatum*) is classified as Special Concern in Ontario based on their near qualification for Threatened status and their susceptibility to a loss of habitat quality and extent.

## 5. Information sources

Clements, M.D., H.L. Bart Jr. and D.L. Hurley. 2012. A different perspective on the phylogenetic relationships of the Moxostomatini (Cypriniformes: Catostomidae) based on cytochrome-b and Growth Hormone intron sequences. *Mol. Phylog. Evol.* 63:159-167.

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NatureServe. 2013. [NatureServe Explorer: An online encyclopedia of life.](#) Version 7.1. NatureServe, Arlington, Virginia. Accessed: June 5, 2016.

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Reid, S.M., N.E. Mandrak, L.M. Carl and C.C. Wilson. 2008. Influence of dams and habitat condition on the distribution of redhorse (*Moxostoma*) species in the Grand River watershed, Ontario. *Env. Biol. Fish.* 81:111-125.

Stagliano, D.M. 2001. Special Animal Abstract for *Moxostoma carinatum* (River redhorse). Michigan Natural Features Inventory. Lansing, MI. 3 pp.

Tsai, C-F. 1970. Changes in fish populations and migrations in relation to increased sewage pollution in Little Patuxent River, Maryland. *Chesapeake Sci.* 11:34-41.

## Appendix 1: Technical summary for Ontario

Species: River Redhorse (*Moxostoma carinatum*)

### Demographic information

Demographic attribute	Value
Generation time. Mature individuals ranged from 5 to 17 years, 11 years in the mean	11 years
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?	Not Applicable. Unknown if there has been a decline.
Are there extreme fluctuations in number of mature individuals?	Unknown

### Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence. Calculated using <a href="http://geocat.kew.org/">http://geocat.kew.org/</a>	75,000 km <sup>2</sup>
Index of area of occupancy (IAO). 85 Observations (NHIC) X 4 km <sup>2</sup>	340 km <sup>2</sup>
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. Yes (River Redhorse do not travel through small river or open lake habitat)

Number of locations. Thames River, Grand River, Trent River, Ottawa River, St. Lawrence River, Bat of Quinte and Mississippi River	7
Number of NHIC Element Occurrences	10
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?	No
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? The River Redhorse habitat is being lost and degraded due to on-going pollution, siltation and water-level modification/dams.	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)

Unknown.

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is Unknown (no PVA performed).

Rescue effect

Rescue effect attribute	Likelihood
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possibly
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario? River Redhorse are habitat limited in Ontario.	No

<p>Is the species of conservation concern in bordering jurisdictions? S2S3 in Quebec, S1 in Michigan, S2? In New York, S3 in Ohio, S3S4 in Pennsylvania and S2 in Wisconsin.</p>	Yes
<p>Is rescue from outside populations reliant upon continued intensive recovery efforts? Rescue is highly unlikely due to conservation status in adjacent jurisdictions and unsuitable intervening habitat.</p>	No

## Appendix 2: Adjoining jurisdiction status rank and decline Information regarding rank and decline of River Redhorse

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S2	n/a	NatureServe 2013
Quebec	S2S3	n/a	NatureServe 2013
Manitoba	Not Present	n/a	n/a
Michigan	S1	Declining. Reported as extirpated in the 1980s, now considered state Threatened.	NatureServe 2013 Stagliano 2001
Minnesota	SNR	n/a	NatureServe 2013
Nunavut	Not Present	n/a	n/a
New York	S2?	It has increased its range and abundance in the last 30 years and, although restricted, is secure. Only occurs in the Allegheny watershed (no immigration to ON possible)	NatureServe 2013 New York Department of Environmental Conservation 2016
Ohio	S3	Believed to now be stable State special concern	NatureServe 2013 Ohio Department of Natural Resources 2016
Pennsylvania	S3S4	Severe decline 1970-1990, some increase since	NatureServe 2013
Wisconsin	S2	n/a	NatureServe 2013

### Acronyms:

AOO: area of occupancy

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

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

EOO: extend of occurrence

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

S4: Apparently secure