

Ontario Species at Risk Evaluation Report for River Darter (*Percina shumardi*)

Saskatchewan - Nelson River populations (DU1)

Southern Hudson Bay - James Bay populations (DU2)

Great Lakes - Upper St. Lawrence populations (DU3)

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

Saskatchewan - Nelson River populations (DU1)

Assessed by COSSARO as Not at Risk

Southern Hudson Bay - James Bay populations (DU2)

Assessed by COSSARO as Not At Risk

Great Lakes - Upper St. Lawrence populations (DU3)

Assessed by COSSARO as Endangered

December 2016

Final

Dard de rivière (*Percina shumardi*)

Le dard de rivière (*Percina shumardi*) est une espèce répartie à très grande échelle; on la retrouve du Texas, sur la côte du golfe du Mexique, aux bassins versants de la baie d'Hudson, en passant par le bassin du Mississippi. Elle se caractérise toutefois par une répartition mondiale disjointe et éparse. On retrouve généralement le dard de rivière en faibles nombres dans son aire de répartition, quoique l'inefficacité du matériel d'échantillonnage pourrait en être en partie la cause.

Ce poisson atteint la maturité à l'âge d'un an, et peut vivre quatre ans. Il fraye dans les habitats fluviaux et lacustres contenant des galets ou du gravier propre et un débit d'eau important. On sait que le dard de rivière migre vers l'amont au printemps et vers l'aval en automne. En revanche, on sait peu de choses sur les menaces qui pèsent sur l'espèce dans son aire de répartition, même s'il est possible qu'à certains endroits, son déclin soit en partie attribuable aux espèces introduites, aux barrages, à l'altération de l'habitat (par exemple, l'artificialisation des rives) et aux effluents industriels, urbains et agricoles. Auparavant, le dard de rivière était considéré comme une seule unité, et a reçu la désignation « non en péril » en avril 1989. Dans le cadre d'une nouvelle évaluation réalisée récemment par le COSEPAC, l'espèce a été divisée en trois unités désignables, correspondant aux trois zones biogéographiques nationales d'eau douce dans lesquelles on la retrouve. Ces trois unités sont présentes en Ontario, du moins en partie : UD1 – populations de la rivière Saskatchewan et du fleuve Nelson; UD2 – populations du Sud de la baie d'Hudson et de la baie James; UD3 – populations des Grands Lacs et du haut Saint-Laurent (Sud-Ouest de l'Ontario). L'UD1 et l'UD2 n'ont pas été systématiquement échantillonnés, mais d'après la disponibilité et la qualité de leur habitat, il est probable que leurs populations soient en santé. L'UD3, quant à elle, a fait l'objet d'un échantillonnage systématique, et les résultats semblent indiquer clairement que le nombre de ses sous-populations est en net recul.

En raison de leur répartition relativement importante et de l'absence de signes de déclin, les populations de la rivière Saskatchewan et du fleuve Nelson (UD1) et les populations du sud de la baie d'Hudson et de la baie James (UD2) sont considérées comme des espèces non en péril en Ontario.

Cette publication hautement spécialisée «COSSARO Candidate Species at Risk Evaluation for River Darter» 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 des Richesses naturelles et des Forêts au recovery.planning@ontario.ca.

Executive summary

River Darter (*Percina shumardi*) is a very broadly distributed darter with populations ranging from Texas on the coast of the Gulf of Mexico throughout the Mississippi River basin north to watersheds draining into Hudson Bay; however, it is characterized by a disjunct and patchy global distribution. The River Darter is generally found in low abundance throughout its range, although this may in part be due to the use of inappropriate sampling gear.

This fish matures at 1 year of age and can live for up to 4 years. It spawns in both river and lake habitats with cobble or clean gravel and substantial water flow. River Darter is known to migrate upstream (spring) and downstream (fall) seasonally. Little information exists on specific threats for this species in parts of its range, although introduced species, dams, habitat alteration (including shoreline hardening) and industrial, urban and agricultural effluents may contribute to their decline in some areas. River Darter was previously considered a single unit and designated Not at Risk in April 1989. However, it was recently re-assessed by COSEWIC as three separate DUs based on its presence in three National Freshwater Biogeographic Zones. All three separate designable units (DUs) occur (at least in part) within Ontario: DU1: Saskatchewan-Nelson River population; DU2: Southern Hudson Bay - James Bay population; DU3: Great Lakes - Upper St. Lawrence (southwestern Ontario) population. DU1 and DU2 have not been systematically sampled; however, it is likely they include healthy populations based on the availability and quality of the habitat. DU3 has been systematically sampled and there is good evidence for a significant decline in these subpopulations.

Within Ontario, Saskatchewan-Nelson River populations (DU1) and Southern Hudson Bay - James Bay populations (DU2) are assessed as Not at Risk due to their relatively large distribution and lack of evidence of decline.

Great Lakes-Upper St. Lawrence populations (DU3) of River Darter are assessed as Endangered due to their small range, low number of locations, and continuing declines as well as declines in habitat quality related to the presence of invasive species and habitat modifications.

1. Background information

1.1. Current designations

- GRANK: G5 (NatureServe 2016)
- NRANK Canada: N5
- COSEWIC: DU1 & DU2: Not at Risk (April, 2016); DU3: Endangered (April 2016)
- SARA: No Status, No Schedule
- ESA 2007: Not Listed
- SRANK: S3

1.2. Distribution in Ontario

The River Darter is distributed in three disjunct and isolated regions in Ontario. Based on preliminary mtDNA sequence analyses and biogeographical zone boundaries, the three distributional areas have been identified as designatable units (DU1: Nelson River populations; DU2: Southern Hudson Bay - James Bay populations; DU3: "Great Lakes – Upper St. Lawrence" populations).

Saskatchewan- Nelson River populations (DU 1): In Ontario, these populations occur in the Nelson River and its tributaries (Figure 1). Estimated EOO based on all Ontario records is 52,000 km² (Figure 1) which is likely a substantial underestimate due to limited sampling effort, inaccessibility of the region and the use of inappropriate gear for catching this benthic darter species (COSEWIC 2016). Discrete IAO is 112 km² (28 capture sites and 2 km X 2 km grids), again likely an underestimate.

Southern Hudson Bay – James Bay populations (DU 2): These populations occur in northwestern Ontario (Figure 2). Estimated EOO based on all Ontario records is 64,660 km² (Figure 1) which is likely a substantial underestimate due to limited sampling effort, inaccessibility of the region and the use of inappropriate gear for catching this benthic darter species (COSEWIC 2016). Discrete IAO is 48 km² (12 capture sites and 2 km X 2 km grids), again likely an underestimate.

Great Lakes - Upper St. Lawrence populations (DU3): These populations occur in southwestern Ontario in Lake St. Clair and its tributaries (Figure 3). Extensive targeted sampling has been completed on this DU and the distribution of River Darter in this area is likely well represented in Figure 3. Estimated EOO based on all recent (2005-2014) Ontario records is 907 km² (Figure 3). Discrete IAO is 16 km² (4 capture sites and 2 km X 2 km grids), again likely an underestimate. Estimated EOO prior to 2005 was 2,244 km² and IAO was 64 km². The decline in EOO and IAO is due to failure to recapture this species at previously known locations (COSEWIC 2016).

Figure 1. Ontario River Darter records for River Darter DU1 (Nelson River). Blue circles are reports from all years (before 1989, between 1989-2004 and from 2005-2014). Given low sampling effort and inaccessible area, EOO is estimated using all reports (blue line) as 52,000 km², 28 capture records exist, generating a discrete IAO of 112 km², likely both EOO and IAO are substantially underestimated. Redrawn using data from COSEWIC 2016.

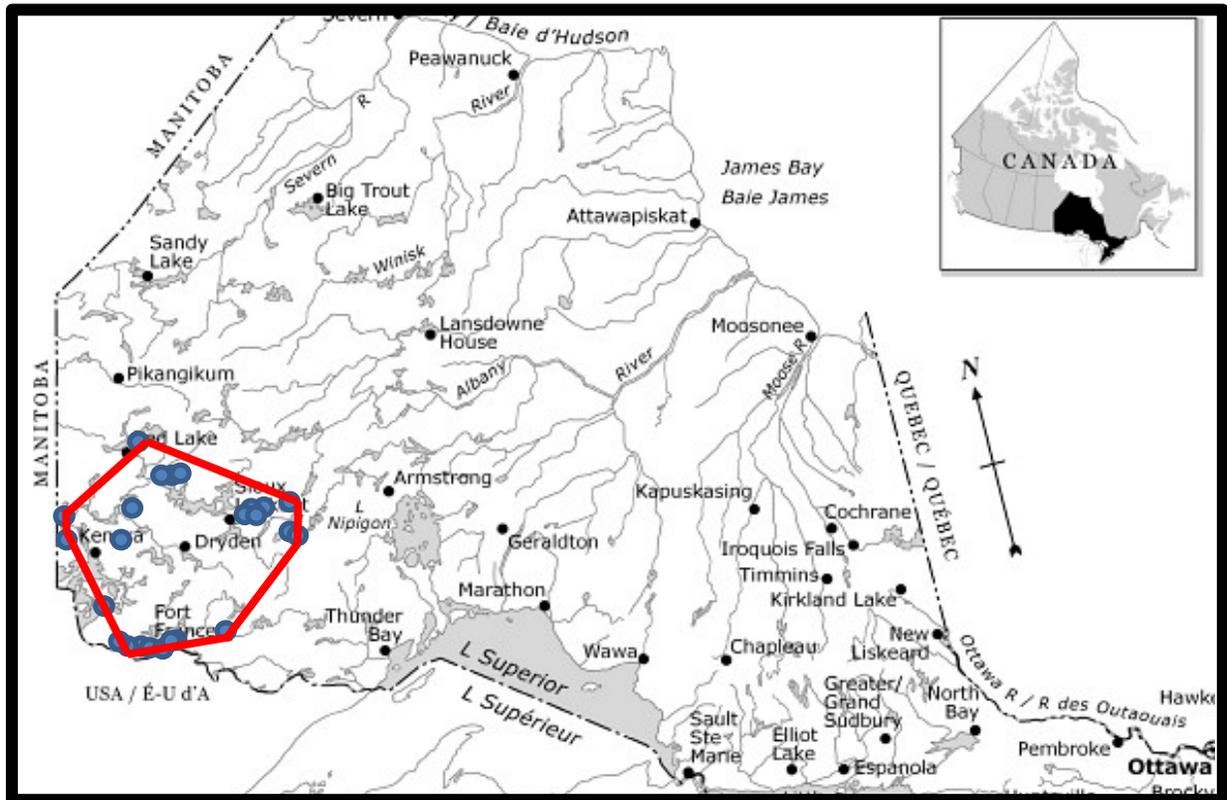


Figure 2. Ontario River Darter records for River Darter DU2 (Southern Hudson Bay-James Bay) from NIHC. Open circles with dots are reports from before 1989 while solid circles are from 2005-2014 (no records exist between 1989 and 2005). Given low sampling effort and inaccessible area, EOO is estimated using all reports (green line) as 64,660 km², 12 capture records exist, generating a discrete IAO of 48 km². EOO and IAO are likely substantially underestimated. Source: COSEWIC 2016 (reproduced with permission).

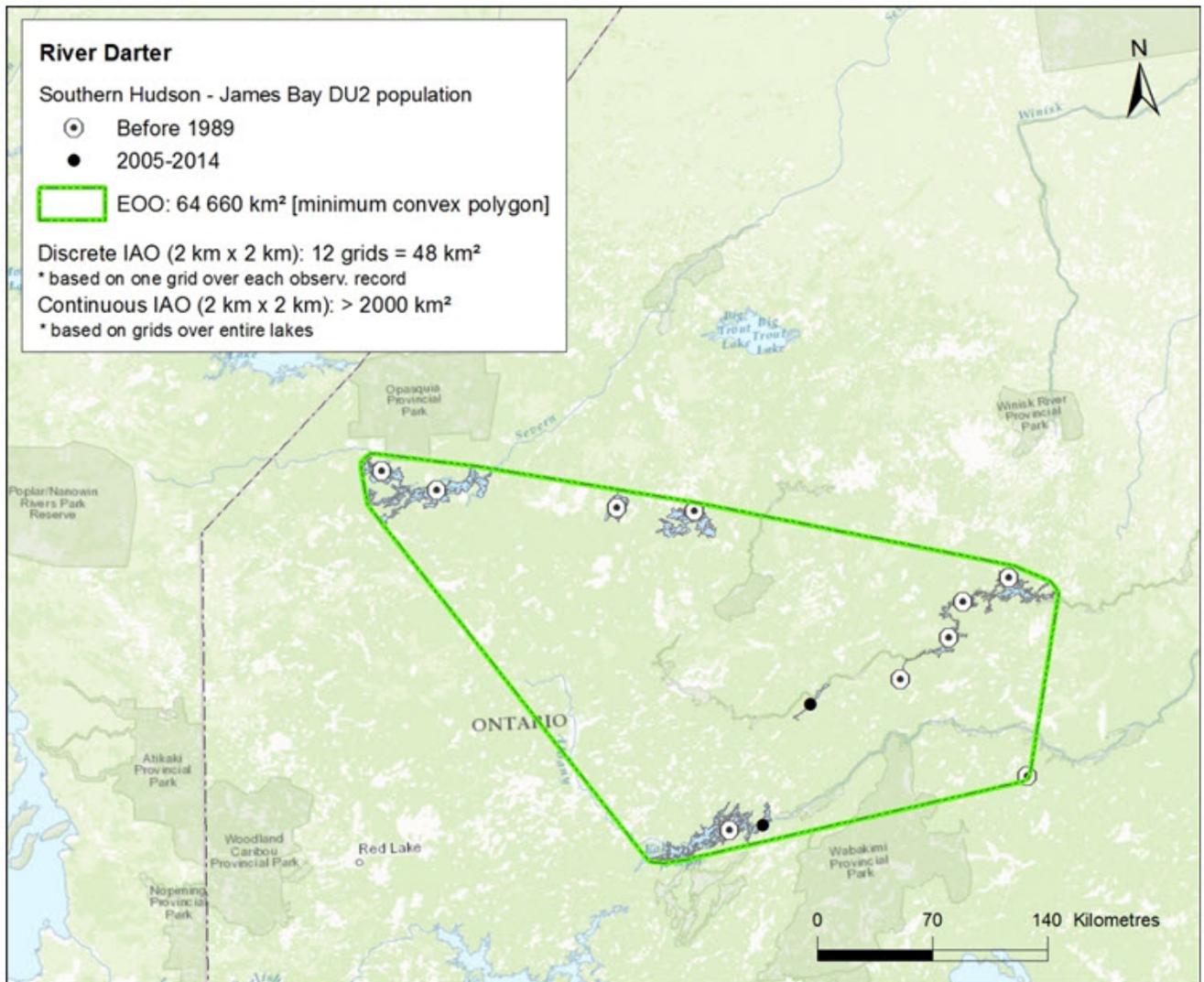
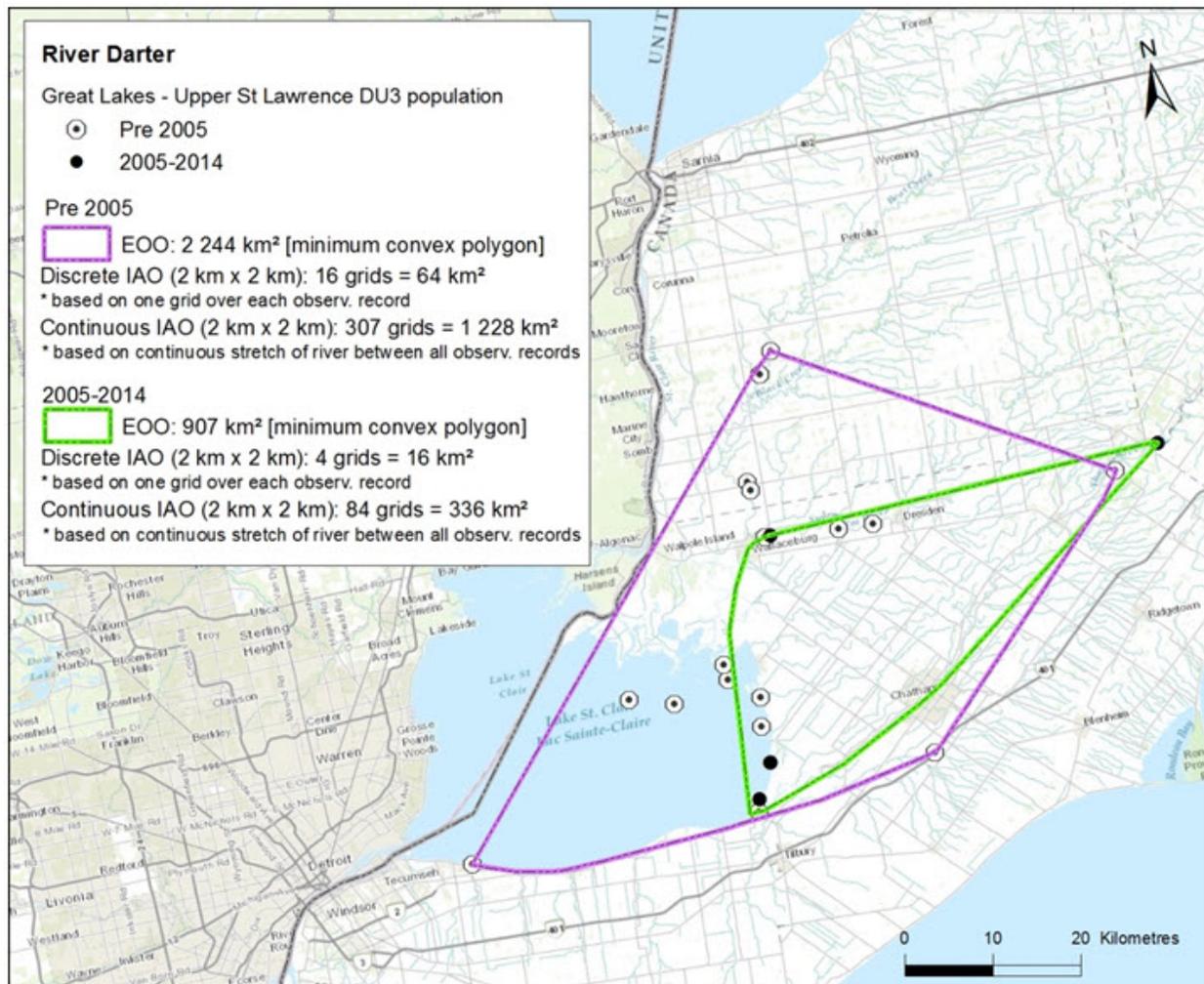


Figure 3. Ontario River Darter records for River Darter DU3 (Great Lakes – Upper St. Lawrence) from NHIC. Open circles with dots are reports from before 2005, while solid circles are from 2005-2014. Given intensive and targeted sampling by DFO between 2005 and 2014, EOO is estimated using recent reports only (green line) as 907 km², the purple minimum convex polygon is for pre-2005 EOO. 4 recent records exist, generating a discrete IAO of 16 km², likely a reasonably accurate estimate. Source: COSEWIC 2016 (reproduced with permission).



1.3. Distribution and status outside Ontario

The River Darter is found in 21 states and three Canadian provinces. It has a fairly wide range in Ontario and Manitoba. A single specimen has been collected from the Saskatchewan River in Saskatchewan. Their global distribution is highly disjunct, with geographically isolated ranges from Texas to Northern Manitoba and from Pennsylvania to North Dakota. River Darter is listed as G5 globally, however in states bordering Ontario, it is ranked S1 (critically imperiled) in Michigan, Ohio and Pennsylvania, while it is listed S5 (secure) in Manitoba and is not ranked in Minnesota.

1.4. Ontario conservation responsibility

The proportion of the River Darter global range in Ontario is estimated to be approximately 15%; however, DU1 and DU2 make up approximately 50% of the River Darter in its northern isolated range, while DU3 represents approximately 25% of the critically imperiled lower Great Lakes range. See Figure 2 in COSEWIC 2016 for future information.

1.5. Direct threats

DU1 & DU2: A threats calculator was completed by N. Mandrak, T. Pratt, D. Lepitzki, S. Reid, M. Docker, A. Cyr, J. Post and D. Watkinson. The species range for DU1 River Darter is primarily in Manitoba, although the threats are likely to be similar in the Ontario range of DU1, but likely lower due to lower agriculture activity. DU2 occurs entirely within Ontario, hence the threats calculator conclusions apply. Overall, few threats are known; however “low” threats include; Natural system modifications (dams and water management/use) and Pollution (household and urban, agriculture and forestry).

DU3: A threats calculator was completed by N. Mandrak, T. Pratt, D. Lepitzki, S. Reid, M. Docker, A. Cyr, J. Post and D. Watkinson. Threats identified include Natural system modifications (such as dams and water management/use [Low], shoreline hardening, invasive species, specifically the Round Goby [High-Low]), and Pollution (such as household and urban effluent [Low], industrial effluent [Medium-Low] and agriculture and forestry effluent [Medium]).

1.6. Specialized life history or habitat use characteristics

None.

2. Eligibility for Ontario status assessment

2.1. Eligibility conditions

2.1.1. Taxonomic distinctness

While River Darter is one of 45 species in the genus *Percina*, they are morphologically distinct from other *Percina* that may co-occur (Holm et al 2009) and their taxonomic distinctness has been confirmed by CytB mtDNA barcode data (Near 2002).

2.1.2. Designatable units

The River Darter has been identified as having three designatable units in Ontario based on their distribution across three National Freshwater Biogeographical Zones: the Saskatchewan-Nelson River (DU1), the Southern Hudson Bay – James Bay (DU2) and the Great Lakes – Upper St. Lawrence (DU3) zones. However, recent evidence

(COSEWIC 2016) suggests gene flow between DU1 and DU2, likely as a result of modified outflow at Lake St. Joseph. A portion of the outflow at Lake St. Joseph (DU1) is diverted into the Winnipeg River drainage (DU2) at Lac Seul. A preliminary genetic analysis using mtDNA sequence (CO1 and CytB) data indicated likely genetic divergence between DU3 and DU1/DU2. However, haplotype data also indicated possible gene flow between DU1 and DU2 (COSEWIC 2016). Due to the nature of mtDNA genetic data, there is no understanding of the magnitude of gene flow. Further genetic analyses are necessary to determine the level of isolation among the three Ontario River Darter DUs. Although the potential gene flow provides some evidence to suggest that it may be appropriate to consider DU1 and DU2 as one unit, in the absence of further genetic analyses, COSSARO voted upon and listed the units as separate DUs to avoid confusion and conflicting nomenclature with COSEWIC.

2.1.3. Native status

River Darter are a relatively cryptic species due to their benthic habitat and low abundance, hence they are generally not identified in fish community sampling efforts. However, they have been reported in Ontario since 1931 (DU1, Vermillion Lake) and in 1939 in DU2. Hence the River Darter is a native species in Ontario.

2.1.4. Occurrence

River Darter has been captured in Ontario as recently as 2014 in DU1 and DU2, and in 2012 in DU3, hence they are currently present in Ontario.

2.2. Eligibility results

River Darter (*Percina shumardi*) is eligible for status assessment in Ontario.

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

DU1: Does Not Apply: Although there are no data on population sizes or trends, it is likely there are many unidentified populations and few threats, making it unlikely that this DU is experiencing declines in total numbers.

DU2: Does Not Apply: Although there are no data on population sizes or trends, it is likely there are many unidentified populations and few threats, making it unlikely that this DU is experiencing declines in total numbers.

DU3: Does Not Apply: Although there are limited data on population sizes or trends, the numbers collected appear to be stable.

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

DU1: Does Not Apply: Total EOO is $> 20,000 \text{ km}^2$, and while DU1 meets Endangered under B2 (estimated IAO is 112 km^2) the IAO is likely severely underestimated. DU1 does not qualify under either a, b or c (locations >10).

DU2: Does Not Apply: Total EOO is $> 20,000 \text{ km}^2$, and while DU2 meets Endangered under B2 (estimated IAO is 48 km^2) the IAO is likely severely underestimated. DU2 does not qualify under either a, b or c (locations >10).

DU3: Endangered B1ab(i,ii,iii,iv) and B2ab(i,ii,iii,iv): Total EOO is $< 5,000 \text{ km}^2$ (B1) and DU3 meets Endangered under B2 (estimated IAO is 16 km^2). DU3 qualified for Endangered with fewer than 5 locations (a) and due to continuing decline in EOO (i) (from $2,244 \text{ km}^2$ to 907 km^2) and in IAO (ii) (from 64 km^2 to 16 km^2) and in the number of locations (iv) (loss of two locations). There is an inferred decline in the quality of habitat (iii) due to invasive species (Round Goby), and habitat modification.

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

DU1: Insufficient information: No quantitative data on the number of mature individuals is available.

DU2: Insufficient information: No quantitative data on the number of mature individuals is available.

DU3: Insufficient information: No quantitative data on the number of mature individuals is available.

3.1.4. Criterion D – Very small or restricted total population

DU1: Does Not Apply: Although there are no data on numbers of mature individuals, total numbers likely exceed 1000 mature individuals.

DU2: Does Not Apply: Although there are no data on numbers of mature individuals, total numbers likely exceed 1000 mature individuals.

DU3: Does Not Apply: Although there are no data on numbers of mature individuals, total numbers likely exceed 1000 mature individuals.

3.1.5. Criterion E – Quantitative analysis

Does not apply: None performed.

3.2. Application of Special Concern in Ontario

Does not apply.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Does not apply : While the three Ontario DUs comprise more than 25% of their regional distribution, Ontario River Darter make up less than 25% of its global range (approximately 15%), and the species is globally secure (G5)

3.3.2. Rescue effect

Rescue effects are possible for DU1 and DU2; however, neither is at risk. DU3 is Endangered; however the likelihood of rescue is low due to the distance and at-risk nature of the possible rescue source populations.

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

River Darter DU1 and DU2 are not at risk as they do not qualify for listing based on any of the criteria above.

4. Summary of Ontario status

River Darter (*Percina shumardi*) DU1 is classified as Not at Risk in Ontario based on not meeting any of the at risk criteria.

River Darter (*Percina shumardi*) DU2 is classified as Not at Risk in Ontario based on not meeting any of the at risk criteria.

River Darter (*Percina shumardi*) DU3 is classified as Endangered, in Ontario based on meeting criteria *B1ab(i, ii, iii & iv)* and *B2ab(i, ii, iii & iv)*.

5. Information sources

Carman, S.M. 2001. Special Animal Abstract for *Percina shumardi* (River darter). Michigan Natural Features Inventory. Lansing, MI. 3pp.

COSEWIC. 2016. [COSEWIC assessment and status report on the River Darter *Percina shumardi*, Saskatchewan – Nelson River populations, Southern Hudson Bay – James Bay populations and Great Lakes-Upper St. Lawrence populations, in Canada.](#) Committee on the Status of Endangered Wildlife in Canada. Ottawa. xix + 53 pp.

Holm, E., N.E. Mandrak, and M.E. Burrige. 2009. The ROM field guide to freshwater fishes of Ontario. Royal Ontario Museum, Toronto, ON. 462 pp.

Ohio Department of Natural Resources. 2016. [Species and habitat guide: river darter.](#) Accessed November 22, 2016.

Thomas J. Near. 2002. Phylogenetic relationships of *Percina* (Percidae: Etheostomatinae). *Copeia*: February 2002, Vol. 2002, No. 1, pp. 1-14.

Appendix 1: Technical summary for Ontario

Species: River Darter (*Percina shumardi*) Saskatchewan-Nelson River populations (DU1)

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.	2 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	No, based on no known threats and minimal disturbance.
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?	a. Not applicable b. Not applicable c. Not applicable
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 (EOO). Estimated using geocat.kew.org . All years reports used for estimate	>53,000 km ²
Index of area of occupancy (IAO). (28 reports and 2 km X 2km grids – all reports used)	>112 km ²

Is the total population severely fragmented? i.e., is >50% of its total area of occupancy 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. No
Number of locations.	28 to >50. The number of known locations based on collection records is 28. Other unsampled locations almost certainly exist within this DU species' range based on suitability of habitat and connectivity patterns, thus there are likely >50 locations.
Number of NHIC Element Occurrences	Unknown (likely > 50)
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?	No
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)

Sub-population (or total population)	Number of mature individuals
All sub-populations	Unknown

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is [unknown].

Threats

A threats calculator was completed by N. Mandrak, T. Pratt, D. Lepitzki, S. Reid, M. Docker, A. Cyr, J. Post and D. Watkinson. However the species range for DU1 River Darter is primarily in Manitoba, although the threats are likely to be similar in Ontario and Manitoba parts of the DU range. Few threats are known, and those identified were all “low”, they include Natural system modifications (Dams and water management/use), Pollution (household and urban, Agriculture and forestry).

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Minnesota (SNR) and Manitoba (S5)
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possibly, while the River Darter is known to be locally migratory, it is unknown if they move larger distances. There are no barriers to movement from Manitoba or Minnesota.
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	No
Is the species of conservation concern in bordering jurisdictions?	No
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Yes

Species: River Darter (*Percina shumardi*) Southern Hudson Bay-James Bay populations (DU2)

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.	2 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	No, based on no known threats and minimal disturbance.
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?	a. Not applicable b. Not applicable c. Not applicable
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 (EOO). Estimate taken from COSEMIC (2016). All years reports used for estimate	>64,660 km ²
Index of area of occupancy (IAO). (12 reports and 2 km X 2km grids – all reports used)	>48 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. No b. No
Number of locations.	11 to >50. The number of known locations based on collection records is 11. Other unsampled locations almost certainly exist within this DU species' range based on suitability of habitat and connectivity patterns, thus there are likely >50 locations.
Number of NHIC Element Occurrences	Unknown (likely > 50)
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?	No
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)

Sub-population (or total population)	Number of mature individuals
All sub-populations	Unknown

Quantitative analysis (population viability analysis not conducted)

Probability of extinction in the wild is [unknown].

Threats

A threats calculator was completed by N. Mandrak, T. Pratt, D. Lepitzki, S. Reid, M. Docker, A. Cyr, J. Post and D. Watkinson. Few threats are known, and those identified were all “low”, they include Natural system modifications (Dams and water management/use), Pollution (household and urban, Agriculture and forestry).

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Not applicable
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	No
Would immigrants be adapted to survive in Ontario?	Not applicable
Is there sufficient suitable habitat for immigrants in Ontario?	Not applicable
Are conditions deteriorating in Ontario?	Not applicable
Is the species of conservation concern in bordering jurisdictions?	Not applicable
Is the Ontario population considered to be a sink?	Not applicable
Is rescue from outside populations likely?	No

Species: River Darter (*Percina shumardi*) Great Lakes – Upper St. Lawrence populations (DU3)

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.	2 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Yes, inferred and reduced number of capture locations over past 10 years.
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?	a. Unknown b. Unknown c. Unknown
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 (EOO). Estimate from COSEWIC (2016). Recent targeted sampling used for estimate	907 km ²
Index of area of occupancy (IAO). (4 reports and 2 km X 2 km grids – Recent targeted sampling used for estimate)	>16 km ²

Is the total population severely fragmented? i.e., is >50% of its total area of occupancy 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. No
Number of locations	3 (Sydenham River, Thames River, Lake St. Clair)
Number of NHIC Element Occurrences	7 (?)
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Yes
Is there an observed, inferred, or projected continuing decline in number of populations?	Yes, previously documented populations in the North Sydenham River and Jeanette's Creek (Thames River tributary) were not recovered despite targeted sampling.
Is there an observed, inferred, or projected continuing decline in number of locations?	Yes (loss of North Sydenham River location)
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes, inferred
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)

Sub-population (or total population)	Number of mature individuals
Thames River	Unknown
Sydenham River	Unknown
Lake St. Clair	Unknown

Quantitative analysis (population viability analysis not conducted)

Not conducted.

Threats

A threats calculator was completed by N. Mandrak, T. Pratt, D. Lepitzki, S. Reid, M. Docker, A. Cyr, J. Post and D. Watkinson. Threats identified included:

- Natural system modifications: Dams and water management/use (Low); Shoreline hardening, invasive species, specifically the Round Goby (High-Low),
- Pollution: Household and urban (Low), Industrial (Medium-Low), Agriculture and forestry (Medium).

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Michigan (S1), Ohio (S1), Pennsylvania (S1)
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Unlikely, while the River Darter is known to be locally migratory, it is unknown if they move larger distances. There are no barriers to movement from Michigan, Ohio or Pennsylvania through Lake Erie or the Huron-Erie corridor, but there are no recent records for this species in this drainage area in the US
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	Yes (for this DU)
Is the species of conservation concern in bordering jurisdictions?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Unlikely, species is at risk in all neighboring jurisdictions, and may now be absent for lower Great Lakes drainage in the US

Sensitive species

No.

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for River Darter (*Percina shumardi*)

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S3	See text	NatureServe (2016)
Quebec	Not Present	N/A	N/A
Manitoba	S5	Stable	COSEWIC 2016
Michigan	S1	Declining State Endangered No longer found in several sites. Last recorded in 1941.	Carman 2001
Minnesota	SNR	Unknown	NatureServe (2016)
Nunavut	Not Present	N/A	N/A
New York	Not present	N/A	N/A
Ohio	S1	Declining State Threatened There are no recent reports from the Lake Erie drainage but there are recent records for the Ohio River	Ohio Department of Natural Resources 2016
Pennsylvania	S1	Unknown Ohio River, first found in 2007	NatureServe (2016)
Wisconsin	S5	Unknown	NatureServe (2016)

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

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

S3: Vulnerable

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