

Ontario Species at Risk Evaluation Report for Pygmy Whitefish (*Prosopium coulterii*)

DU5: Great Lakes - Upper St. Lawrence populations

DU7: Saskatchewan-Nelson River populations

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

Great Lakes - Upper St. Lawrence populations (DU5)
Assessed by COSSARO as Not At Risk

Saskatchewan-Nelson River populations (DU7)
Assessed by COSSARO as Data Deficient

May 2017

Final

Corégone pygmée (*Prosopium coulterii*)

Le corégone pygmée est présent dans l'ensemble de l'Amérique du Nord, mais sa distribution est remarquablement éparse, avec des aires de répartition isolées, qui découlent possiblement d'une colonisation dans trois refuges glaciaires distincts. Au Canada, le COSEPAC classe les corégones pygmée en sept unités désignables (UD). Seule une petite partie de son aire de répartition se trouve en Ontario, où on ne recense que deux des sept unités désignables (UD 5 : populations des Grands Lacs et du haut Saint-Laurent et UD 7 : populations de la rivière Saskatchewan et du fleuve Nelson). Le corégone pygmée vit dans les lacs froids, profonds et oligotrophes, habituellement à plus de 30 mètres de profondeur, quoiqu'il ait aussi été aperçu en eau peu profonde. Ayant une espérance de vie plutôt courte pour un corégone (de 3 à 10 ans), il atteint la maturité entre 1 et 4 ans. La difficulté d'accès à son habitat de prédilection rend le recensement de l'espèce difficile dans le cadre des études habituelles sur les populations de poissons; c'est pourquoi on en connaît peu sur les variations démographiques ou du cycle biologique propres aux populations des lacs et à chacune des unités désignables. Les menaces à l'espèce en Ontario sont peu connues, d'une part en raison de sa répartition éparse, surtout dans le Nord de l'Ontario, et d'autre part en raison du manque d'information sur l'espèce. Par conséquent, aucune menace n'a été relevée en Ontario. Comme les populations de la rivière Saskatchewan et du fleuve Nelson (UD 7) n'ont pas fait l'objet d'un échantillonnage systématique (le MRNF a échantillonné 10 % des 752 lacs représentant un habitat adéquat), il est possible qu'elles comprennent des populations saines non échantillonnées, compte tenu de la disponibilité et de la qualité de l'habitat. Quant aux populations des Grands Lacs et du haut Saint-Laurent (UD 5), l'échantillonnage systématique réalisé dans le cadre des activités d'évaluation des poissons du lac Supérieur ne donne pas lieu de croire à un déclin important de cette unité désignable.

Ce rapport vise les deux unités désignables (UD).

Les populations des Grands Lacs et du haut Saint-Laurent (UD 5) sont classées comme « Non en péril », vu l'absence de signe d'un quelconque déclin.

Pour les populations de la rivière Saskatchewan et du fleuve Nelson (UD 7), les données sont jugées insuffisantes en raison de leur vaste répartition et du manque d'information sur d'autres populations éventuelles et sur les menaces potentielles.

Cette publication hautement spécialisée «COSSARO Candidate Species at Risk Evaluation for Pygmy Whitefish» 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 CDSEPO au COSSAROSecretariat@ontario.ca.

Executive summary

Pygmy Whitefish (*Prosopium coulterii*) is distributed across northern North America; however, they have a remarkable disjunct distribution, with isolated ranges likely colonized from three separate glacial refugia. In Canada, the Pygmy Whitefish are divided into seven designatable units (DUs) by COSEWIC. Relatively little of the species range is in Ontario where only two of seven DUs are found (DU5: Great Lakes - Upper St. Lawrence populations and DU7: Saskatchewan-Nelson River populations). The Pygmy Whitefish inhabits cold, deep, oligotrophic lakes usually at depths greater than 30 m, although they have been caught in shallower waters. Pygmy Whitefish are relatively short lived for whitefish (expected lifespan 3-10 years) and mature from 1-4 years of age. The preferred habitat of Pygmy Whitefish makes it difficult to catch in standard fish surveys, hence little is known about their demography or life history variation among lakes or DUs. Little information exists on specific threats for this species in Ontario, partly due to the isolated nature of parts of its range, especially in northern Ontario, and partly due to limited information on the species. No specific threats have been identified for this species in Ontario. Saskatchewan-Nelson River populations (Northern Ontario - DU7) has not been systematically sampled (10% of 752 lakes with suitable habitat has been sampled by MNRF) thus it likely includes unsampled healthy populations based on the availability and quality of the habitat. Great Lakes – Upper St. Lawrence populations (DU5) has been systematically sampled as part of Lake Superior fish assessment efforts, and there is no evidence for a significant decline in this DU.

This report includes both designatable units (DUs).

The Great Lakes-Upper St. Lawrence populations (DU5) are assessed as Not at Risk due to the lack of demonstrated population decline.

Within Ontario, the Saskatchewan-Nelson River populations (DU7) are assessed as Data Deficient due to their wide distribution and lack of data on other likely populations and possible threats.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Pygmy Whitefish are highly diverged from all other species of whitefish based on phylogenetic and morphometric analyses (Blanchfield et al. 2014; Witt et al. 2011).

1.1.2. Designatable units

Ontario Pygmy Whitefish occur in two designatable units: Great Lakes-Upper St. Lawrence populations (DU5), and Saskatchewan-Nelson River populations (DU7). The DU classification is based on known population isolation that includes population genetic analyses for Pygmy Whitefish in other areas (Taylor et al. 2011) and the inferred isolation of the two areas based on water drainage patterns (COSEWIC 2016).

1.1.3. Native status

Ontario Pygmy Whitefish have been known to exist in Lake Superior since at least the 1960s (COSEWIC 2016), and this species is typically not introduced intentionally or accidentally. While the Pygmy Whitefish in the Saskatchewan-Nelson River populations were only discovered about 10-15 years ago (COSEWIC 2016), this species is not used for baitfish (due to their deep water habitat) and are not generally identified as desirable for intentional introduction. It is likely that the Saskatchewan-Nelson River Pygmy Whitefish are native, yet escaped detection due to their inaccessible habitat and the remote nature of these populations.

1.1.4. Occurrence

Pygmy Whitefish have been captured in Ontario as recently as 2016 (COSEWIC 2016).

1.2. Eligibility results

Pygmy Whitefish (*Prosopium coulterii*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G5 (NatureServe 2017)
- NRANK Canada: N4N5 (NatureServe 2017)
- COSEWIC:
 - a. Great Lakes – Upper St. Lawrence populations (DU5): Threatened (November 2016)
 - b. Saskatchewan-Nelson River populations (DU7): Data deficient (November

2016)

- SARA: No Status (No Schedule)
- ESA 2007: No status
- SRANK: SU (NatureServe 2017)

2.2. Distribution in Ontario

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

The Great Lakes-Upper St. Lawrence populations (DU5) occur throughout Lake Superior, from Sault Ste. Marie to Thunder Bay (Figure 1).

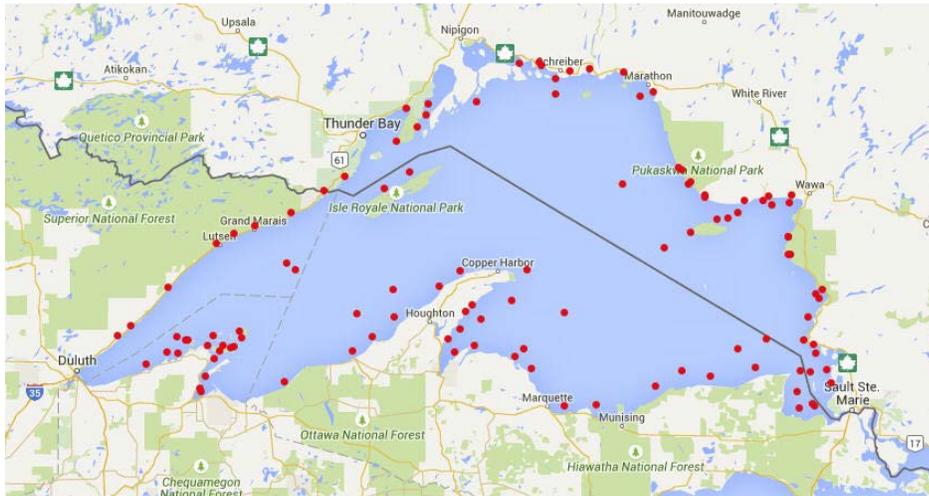


Figure 1. The Great Lakes-Upper St. Lawrence populations (DU5) capture locations (COSEWIC, 2016). Note that only Canadian capture sites are used for distribution calculations. Map used with permission from COSEWIC.

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

The Saskatchewan-Nelson River Pygmy Whitefish populations (DU7) are known from four lakes in western Ontario (Silver, Delany, Winnanage and Mameigwess; Figure 2); however, it is likely they occur in other lakes in the area due to the availability of suitable habitat and the difficulty in catching Pygmy Whitefish using standard fish survey methods.

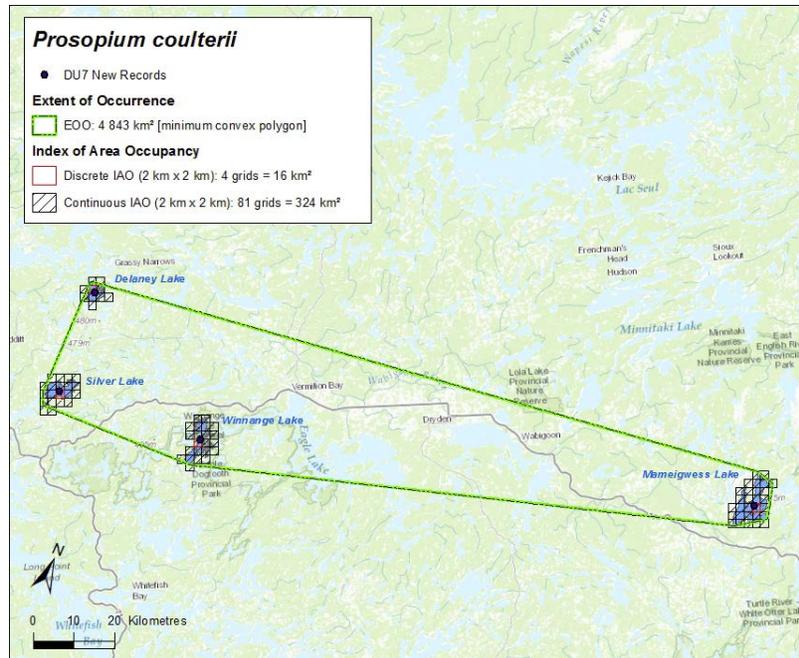


Figure 2. Known Saskatchewan-Nelson River Pygmy Whitefish populations (DU7) (COSEWIC, 2016). Additional lake populations are likely due to suitable habitat and low probability of capture using standard capture methods. Map used with permission from COSEWIC.

2.3. Distribution and status outside Ontario

Pygmy Whitefish are present in Canada, USA and Russia (NatureServe 2017). Canadian Pygmy Whitefish include seven DUs, two in Ontario, and five in BC and Alberta. US populations occur in Alaska, Idaho, Michigan, Minnesota, Montana, Washington and Wisconsin. Pygmy Whitefish populations in Michigan (S4), Minnesota (SNR), and Wisconsin (S3S4) only occur in Lake Superior.

2.4. Ontario conservation responsibility

Given the highly scattered and isolated population distribution of the Pygmy Whitefish, it is difficult to estimate the proportion of their range found in Ontario. Using estimates of the extent of occupancy from COSEWIC (2016), Ontario's Pygmy Whitefish constitute much less than 2.5% of the global distribution (~44,000 km² versus ~1,724,000 km²).

2.5. Direct threats

While COSEWIC's threat calculators identified either "unknown" or "negligible" threats to Ontario Pygmy Whitefish (both DUs), plausible threats include invasive species, siltation and chemical pollution (COSEWIC, 2016).

2.6. Specialized life history or habitat use characteristics

None.

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

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Not applicable. COSEWIC (2016) reported that the Great Lakes-Upper St. Lawrence populations (DU5) have experienced dramatic declines in abundance over the last several decades, with an overall estimated decline of 48% since 2000 based on USGS trawl capture data (Figure 3). However, bivariate regression indicates the negative slope of the fitted line is not significantly different from zero ($P > 0.25$), and more than 90% of the variance in Pygmy Whitefish density estimates are due to apparent random year-to-year variation (Figure 3), making the interpretation of the decline as evidence for population decline unsupported. The USGS trawl surveys also do not target this species, and the observations are incidental. US stocks of Pygmy Whitefish in Lake Superior are smaller than the Canadian stocks, and in general Pygmy Whitefish do not show the same level of decline observed in other prey fish species (personal communication, Owen T. Gorman, U.S. Geological Survey/Great Lakes Science Center, Lake Superior Biological Station). Analysis of the combined US and Canadian trawl data (Data not shown, provided by O.T. Gorman) show a weak but significant decline since 1989 ($P = 0.045$; $R^2 = 0.12$); however when considering the last 3 generations (12 years) no significant decline is present.

Although invasive fishes are present in Lake Superior, they are not common, but the on-going recovery of native predatory fishes may limit recovery; however, there is no evidence for any of the Criteria under A1 (a to e).

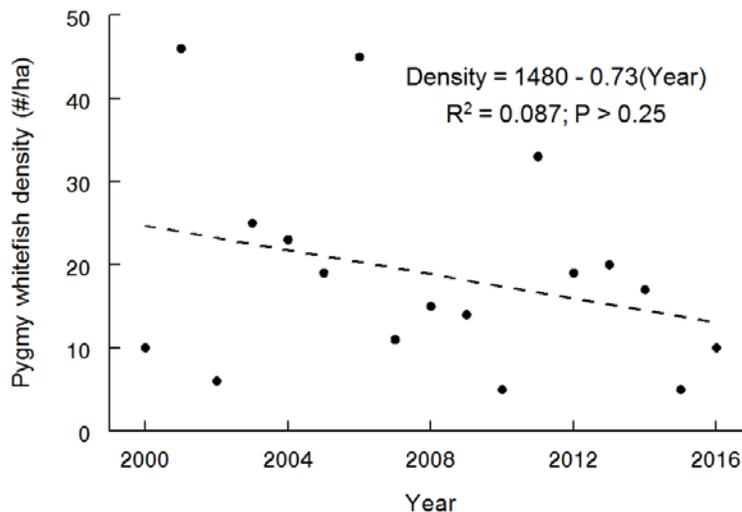


Figure 3: Annual variation in trawl-based density estimates for Pygmy Whitefish in the Canadian range of Lake Superior from 2000-2016 (re-drawn from COSEWIC 2016). R^2

and significance of decline estimated using Bivariate regression in JMP.

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Insufficient information – data deficient. No population estimates are available for DU7.

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

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Not applicable: DU5 exceeded the EO criterion of < 20,000 km² (39,407 km²) and the IAO criterion of <2,000 km² for threatened status.

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Insufficient information – data deficient.

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

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Not applicable. DU5 does not have reliable population size estimates; however there are likely substantially more than 10,000 (Stewart et al. 2016).

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Insufficient information – data deficient. DU7 does not have reliable population size estimates.

3.1.4. Criterion D – Very small or restricted total population

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Not applicable. DU5 does not have reliable population size estimates; however, there are likely substantially more than 1,000 mature individuals (Stewart et al. 2016).

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Not applicable: DU7 does not have reliable population size estimates; however there are likely substantially more than 1,000 mature individuals across the DU7 range.

3.1.5. Criterion E – Quantitative analysis

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Not applicable. DU5 does not have a quantitative estimate for population projections.

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Not applicable: DU7 does not have a quantitative estimate for population projections.

3.2. Application of Special Concern in Ontario

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Not applicable. None of the criteria for Special Concern apply to this population.

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Not applicable due to lack of data on status, and population extent.

3.3. Status category modifiers

Not applicable for either DU.

3.3.1. Ontario's conservation responsibility

Not applicable for either DU.

3.3.2. Rescue effect

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Highly Likely: DU5 is comprised of the Canadian component of the Lake Superior Pygmy Whitefish population and is likely to receive immigrants from US waters as whitefish are known to disperse (although little is known of the Lake Superior Pygmy Whitefish dispersal capacity).

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Not applicable: DU7 does not have suitable habitat connections with any other Pygmy Whitefish population – Rescue effect is not possible.

3.4. Other status categories

3.4.1. Data deficient

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Not applicable

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Data deficient: Little is known of the size or trends of the populations in the four known lakes, and there are likely many additional populations in other lakes in the region.

3.4.2. Extinct or extirpated

Not applicable for either DU.

3.4.3. Not at risk

Pygmy Whitefish Great Lakes-Upper St. Lawrence populations (DU5)

Great Lakes-Upper St. Lawrence populations (DU5) is Not at Risk because there is no evidence of decline, population estimates are high and few direct threats exist.

Pygmy Whitefish Saskatchewan-Nelson River populations (DU7)

Does not apply: this DU is Data deficient.

4. Summary of Ontario status

Pygmy Whitefish (*Prosopium coulterii*) Great Lakes-Upper St. Lawrence populations (DU5) is classified as Not at Risk in Ontario based on not meeting any criterion. This classification differs from that of COSEWIC (2016) classification of Threatened as COSSARO's analysis of trawl capture data in Lake Superior did not provide evidence of population decline in this DU.

Pygmy Whitefish (*Prosopium coulterii*) Saskatchewan-Nelson River populations (DU7) is classified as Data Deficient in Ontario.

5. Information sources

Blanchfield, P.J., E.B. Taylor & D.A. Watkinson. (2014) Morphological and genetic analyses identify a new record of a glacial relict: pygmy whitefish (*Prosopium coulterii*) from northwestern Ontario. Can J Zool 92: 267-271.

COSEWIC. 2016. [COSEWIC assessment and status report on the Pygmy Whitefish *Prosopium coulterii*, Southwestern Yukon Beringian populations, Yukon River populations, Pacific populations, Western Arctic populations, Great Lakes – Upper St. Lawrence populations, Waterton Lake populations and Saskatchewan - Nelson River populations in Canada](#). Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxxvi + 69 pp. ([Species at Risk Public Registry website](#)).

NatureServe 2017. [Prosopium coulterii - \(Eigenmann and Eigenmann, 1892\) Pygmy Whitefish](#). NatureServe Explorer, An online encyclopedia of life. [website accessed on February 8, 2018].

Stewart, T.R., D.H Ogle, O.T. Gorman & M.R. Vinson. 2016. Age, growth, and size of Lake Superior Pygmy Whitefish (*Prosopium coulterii*). Am Midl Nat 175:24-36.

Taylor, E.B., J.L. Gow, J. Witt & R. Zemlak. (2011) Connectivity among populations of pygmy whitefish (*Prosopium coulterii*) in northwestern North America inferred from microsatellite DNA analyses Can J Zool 89: 255-266.

Witt, JDS, RJ Zemlak & E.B. Taylor. (2011) Phylogeography and the origins of range disjunctions in a north temperate fish, the pygmy whitefish (*Prosopium coulterii*), inferred from mitochondrial and nuclear DNA sequence analysis. J Biogeogr. doi:10.1111/j.1365-2699.2011.02497.x

Appendix 1: Technical summary for Ontario

Species: DU5: Great Lakes – Upper St. Lawrence populations
Pygmy Whitefish (*Prosopium coulterii*)

Demographic information

Demographic attribute	Value
Generation time.	4.0 years (Calculated from Stewart et al. (2016) Table 2)
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	No
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. No b. No c. Unknown
Are there extreme fluctuations in number of mature individuals?	Yes. (From COSEWIC (2016) Figure 11 data, mean density is 19 fish/ha (var= 155), see Figure 3.)

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO).	38,407 km ² (COSEWIC (2016))
Index of area of occupancy (IAO).	>2,000 km ² (Estimate from COSEWIC (2016), uncertainty due to unknown habitat use at depth.)
Is the total population severely fragmented?	a. No

Extent and occupancy attributes	Value
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?	b. No
Number of locations.	1 (No plausible barriers in Lake Superior habitat.)
Number of NHIC Element Occurrences	Not tracked by NHIC (SU)
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?	Unknown, but unlikely
Is there an observed, inferred, or projected continuing decline in number of populations?	Unknown, but unlikely
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
Lake Superior	Unknown

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats calculator was prepared: Bill Tonn, Dwayne Lepitzki (moderator) and Angele Cyr (recorder). Direct threats were either negligible or Unknown, Assigned Overall Threat Impact was Unknown.

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Michigan (S4); Minnesota (SNR); Wisconsin (S3S4)
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possibly (other jurisdictions in Lake Superior)
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/Unknown
Is the species of conservation concern in bordering jurisdictions?	Yes; Wisconsin S3S4 Michigan S4
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Probably

Sensitive species

Not a data sensitive species.

Species: DU7: Saskatchewan – Nelson River populations Pygmy Whitefish (*Prosopium coulterii*)

Demographic information

Demographic attribute	Value
Generation time.	4.0 years (Calculated from Stewart et al. (2016) Table 2.)
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Unknown, but unlikely due to isolated nature of habitats
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, but unlikely due to isolated nature of habitats

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO).	4,843 km ² (From COSEWIC (2016))
Index of area of occupancy (IAO).	16 km ² (From COSEWIC (2016): If extended to whole lake (continuous estimate) = 324 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	a. No b. Yes

Extent and occupancy attributes	Value
(b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	
Number of locations.	At least 4. (Number of lakes known to house Pygmy Whitefish is 4, additional lakes likely.)
Number of NHIC Element Occurrences	Not available
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Unknown, unlikely due to isolation of habitat
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Unknown, unlikely due to isolation of habitat
Is there an observed, inferred, or projected continuing decline in number of populations?	Unknown, unlikely due to isolation of habitat
Is there an observed, inferred, or projected continuing decline in number of locations?	Unknown, unlikely due to isolation of habitat
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Unlikely
Are there extreme fluctuations in number of populations?	Unknown
Are there extreme fluctuations in number of locations?	Unknown
Are there extreme fluctuations in extent of occurrence?	Unknown
Are there extreme fluctuations in index of area of occupancy?	Unknown

Number of mature individuals in each sub-population or total population (if known)

Sub-population (or total population)	Number of mature individuals
Delaney Lake	Unknown
Mameigwess Lake	Unknown
Silver Lake	Unknown
Winnange Lake	Unknown

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats calculator was prepared: Bill Tonn, Dwayne Lepitzki (moderator) and Angele Cyr (recorder). Direct threats were either negligible or Unknown, Assigned Overall Threat Impact was Unknown.

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Minnesota (SNR)
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	No
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	Unknown, likely not
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?	No

Sensitive species

Not a data sensitive species.

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for Pygmy Whitefish
(*Prosopium coulterii*)

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	SU	Reported Lake Superior 48% decline over 10 years	NatureServe (2017); COSEWIC (2016)
Quebec	Not Present	Not applicable	Not applicable
Manitoba	Not Present	Not applicable	Not applicable
Michigan	S4	Unquantified	Nature Serve
Minnesota	SNR	Unquantified	Nature Serve
Nunavut	Not Present	Not applicable	Not applicable
New York	Not Present	Not applicable	Not applicable
Ohio	Not Present	Not applicable	Not applicable
Pennsylvania	Not Present	Not applicable	Not applicable
Wisconsin	S3S4	Unquantified	Nature Serve

Acronyms

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

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

EO: Element occurrence (as defined by NHIC)

EOO: extent 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

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