

Ontario Species at Risk Evaluation Report for Lake Sturgeon (*Acipenser fulvescens*)

Saskatchewan-Nelson River populations

Southern Hudson Bay-James Bay populations

Great Lakes-Upper St. Lawrence populations

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

Saskatchewan-Nelson River populations
Assessed by COSSARO as Threatened

Southern Hudson Bay-James Bay populations
Assessed by COSSARO as Special Concern

Great Lakes-Upper St. Lawrence populations
Assessed by COSSARO as Endangered

November 2017

Final

Esturgeon jaune (*Acipenser fulvescens*)

L'esturgeon jaune est un poisson bentophage à espérance de vie élevée et à maturité tardive. Il s'agit de l'un des plus gros poissons d'eau douce au Canada. On le reconnaît à ses grosses plaques osseuses et à son museau large et rond. Son aire de répartition regroupe les importants lacs et rivières qui vont du bassin versant de la rivière Saskatchewan en Alberta, à ceux de la baie d'Hudson et du fleuve Saint-Laurent au Québec, jusqu'au cours inférieur du fleuve Mississippi au sud. Sa répartition est étendue en Ontario, où on le recense dans tous les grands bassins versants de la province. Il revêt d'ailleurs une importance particulière pour les Autochtones. L'Ontario a identifié trois unités désignables (UD) en fonction de la différenciation génétique au sein de l'espèce (COSEPAC, sous presse), du plan d'eau occupé et de la séparation physique des populations : rivière Saskatchewan et fleuve Nelson, Sud de la baie d'Hudson et de la baie James, et Grands Lacs et haut Saint-Laurent. En Ontario, le nombre d'individus dans deux des UD (populations de la rivière Saskatchewan et du fleuve Nelson et celles des Grands Lacs et du haut Saint-Laurent) a chuté de plus de 90 % en 100 ans, principalement en raison de la pêche commerciale, de la pollution de l'eau, des obstacles à la migration que sont les barrages hydroélectriques et de la menace que posent les activités de gestion de l'eau et de régularisation du débit, ces dernières pouvant restreindre la disponibilité de la nourriture. Avec l'amélioration de la qualité de l'eau et la réduction des activités de pêche, certaines populations montrent maintenant des signes de rétablissement, alors que de nombreuses autres continuent de voir leur nombre décliner ou maintiennent un niveau inférieur par rapport aux estimations historiques. Chacune des populations provinciales ainsi que leur statut sont traités séparément ci-dessous.

Populations de la rivière Saskatchewan et du fleuve Nelson

Cette unité désignable du Nord-Ouest de l'Ontario est considérée comme étant menacée en raison du déclin du nombre d'individus matures depuis trois générations, les causes du déclin étant claires et réversibles et ayant cessé. Il s'agissait de l'UD la plus à risque de la province, vu les antécédents d'exploitation et de pollution de l'eau, ainsi que la perturbation et la fragmentation de l'habitat attribuables aux activités hydroélectriques. Cependant, comme la pêche dans cette UD est actuellement fermée, certaines populations se rétablissent. De plus, des efforts ont été déployés par les autorités autochtones et les gouvernements pour favoriser le rétablissement de l'esturgeon par l'ensemencement. Si ces efforts viennent surtout du Manitoba et des États-Unis, ils ont une incidence sur l'ensemble de l'UD, et aussi dans une certaine mesure sur les populations ontariennes grâce à la migration. Par ailleurs, l'entrée en vigueur des lois en matière de protection de l'eau a contribué à améliorer la qualité de l'habitat. Les principaux problèmes affectant l'espèce sont sa sensibilité à l'exploitation et à la perturbation de son habitat, auxquels s'ajoutent les déclins passés ainsi que la production d'énergie hydroélectrique. Cette unité désignable satisfait aux critères minimaux pour la désignation en tant qu'espèce en voie de disparition, mais vu l'accroissement observé des populations en Ontario, la fin ou la réduction des menaces ayant mené à son déclin historique (excès de récolte) ainsi que la difficulté à comparer

le poids des captures historique et les estimations pour les populations actuelles, on juge qu'il respecte l'esprit des critères pour la désignation comme espèce menacée.

Populations du Sud de la baie d'Hudson et de la baie James

Cette unité désignable nordique est considérée comme étant préoccupante. En Ontario, les populations du Sud de la baie d'Hudson et de la baie James semblent être les plus résilientes et les moins à risque de toutes les populations de la province, notamment en raison de l'éloignement des activités de développement industriel et de pêche commerciale. Un nombre relativement élevé de populations saines subsistent, mais elles sont toujours exposées aux menaces de perturbation de l'habitat et des populations découlant des projets d'aménagement ou d'expansion hydroélectriques dans de nombreuses rivières du Nord de l'Ontario. Vu la responsabilité et élevée à l'égard de la conservation de l'espèce à l'échelle mondiale et les risques ciblés mais non résolus, le statut d'espèce préoccupante est approprié et conforme à l'évaluation précédente du CDSEPO.

Populations des Grands Lacs et du haut Saint-Laurent

Les individus de cette unité désignable sont considérés comme étant en voie de disparition en raison du déclin des individus matures depuis trois générations, les causes de ce déclin étant toujours présentes. Dans le passé, cette UD a subi durement les répercussions des chantiers d'installations hydroélectriques et de l'exploitation commerciale en Ontario. Des populations saines et de taille relativement importante subsistent, mais la plupart demeurent à un niveau assez faible en comparaison des niveaux historiques, et les menaces – notamment les répercussions de l'effluent industriel et d'origine agricole sur la qualité de l'eau – persistent dans l'ensemble de l'aire de répartition. Certaines populations continuent de voir décliner le nombre d'individus matures. Le CDSEPO avait précédemment estimé que l'espèce dans cette UD était menacée, mais ce changement de statut n'est que théorique (c.-à-d. qu'il ne reflète pas une réelle détérioration du statut de l'espèce depuis la dernière évaluation), puisqu'il découle en partie de changements dans les critères d'évaluation du CDSEPO depuis la dernière évaluation.

Cette publication hautement spécialisée «COSSARO Candidate Species at Risk Evaluation for Lake Sturgeon» 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

The Lake Sturgeon is a long-lived, late-maturing, bottom-dwelling fish and it is one of the largest freshwater fish species in Canada. It can be recognized by the large bony plates that cover its body and the broadly rounded snout. It is widely distributed in large lakes and rivers from the Saskatchewan River drainage in Alberta to the Hudson Bay and St. Lawrence River drainages in Quebec, and south to the lower portion of the Mississippi River. It has a broad distribution in Ontario, occurring in all major watersheds across the province. It also has special significance to Indigenous peoples. Ontario has recognized three Designatable Units (DUs) based upon genetic differentiation (COSEWIC 2017), watersheds and physical separation: Saskatchewan-Nelson River, Southern Hudson Bay – James Bay, and Great Lakes/Upper St. Lawrence River. Two of Ontario's DUs (the Saskatchewan-Nelson River populations and Great Lakes-Upper St. Lawrence populations) experienced declines of over 90% over 100 years ago due to largely from commercial fishing and water pollution, along with barriers to their migration through the development of hydroelectric dams, and threats from water management and flow regulation, which can have an impact on food availability. Due to improving water quality and reductions to harvest, some populations are now showing signs of recovery; many others persist at low levels, compared to historical estimates, or are declining in numbers. Each provincial population and its current status is discussed below separately.

Saskatchewan-Nelson River populations

This northwestern Ontario DU is assessed as Threatened based on declines in mature individuals over the past 3 generations where the cause of decline is reversible, understood and ceased. Previously this DU was the most at risk DU in the province due to the historical exploitation and water pollution, along with habitat disruption and fragmentation from hydroelectric power development, but Ontario fisheries for this DU are now closed, and some populations are recovering. There has also been effort to support sturgeon recovery through stocking efforts by both Indigenous and governmental communities; while the majority of these efforts have occurred in Manitoba and the USA, they benefit the overall DU and have some impact on Ontario populations through migration. Habitat quality has also improved since the implementation of legislation to protect water quality. The major concerns are the species' sensitivity to exploitation and habitat disruption, combined with past declines, and future development of hydroelectric power. This designatable unit meets the thresholds for Endangered, but due to the observed increase in abundance in Ontario populations, and cessation/reduction of the threats that lead to its historic decline (overharvest), and the issues of comparing historical catch weights with modern population estimates, it is considered here to meet the spirit of the criteria for Threatened.

Southern Hudson Bay-James Bay populations

This northern designatable unit is assessed as Special Concern. In Ontario, the Southern Hudson Bay-James Bay populations appear to be the most robust and least at

risk of the provincial populations, in part due to its distance from industrial development and active commercial fisheries. There are relatively large numbers of extant healthy populations, but the threat of habitat and population disruption from new or expanded hydroelectric power development on many of the northern rivers in Ontario remains. Given the significant global conservation responsibility and identified but unmitigated risks, Special Concern is appropriate and consistent with COSSARO's previous assessment.

Great Lakes-Upper St. Lawrence River populations

This DU is assessed as Endangered based on declines in mature individuals over the past 3 generations where the cause of decline has not ceased. In Ontario, this DU was greatly affected in the past by hydroelectric development and commercial exploitation. There are some relatively large healthy populations but most populations are still at low levels compared to historic times and ongoing threats, including industrial effluent and agricultural impacts on water quality, are not declining across the majority of these populations' range. Some populations continue to show a decline in the number of mature individuals. This DU was previously assessed by COSSARO as Threatened; this change in status is non-genuine (i.e., does not represent a true deterioration in species' status since the last assessment), and is in part, a result of new COSSARO assessment criteria since the last assessment.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Yes. The Lake Sturgeon is recognized as a distinct species and is the only member of the genus *Acipenser* that occurs in Ontario. It is most similar to the Shovelnose Sturgeon (*Scaphirhynchus platyrhynchus*) but that species has fringed barbels (smooth in Lake Sturgeon), two papillose lobes on the lower lip (Lake Sturgeon have four), lacks a spiracle (present in the Lake Sturgeon) and has a caudal peduncle length greater than the distance from the front of the pelvic fin to the front of the dorsal fin (in Lake Sturgeon, the distance is less); the snout of the Lake Sturgeon is also much more rounded than in the Shovelnose Sturgeon.

1.1.2. Designatable units

In Canada, COSEWIC (2017) currently recognizes four Designatable Units (DUs); three of these occur in Ontario. These DUs are named based on the watersheds in which they occur and are the Saskatchewan-Nelson River populations, Southern Hudson Bay-James Bay populations and the Great Lakes-Upper St. Lawrence populations. Unpublished microsatellite analysis of the Canadian Lake Sturgeon populations by Wilson *et al.* (unpublished; microsatellite delineation of the designatable units given in Fig. 1 of COSEWIC 2017) supports this treatment. The Great Lakes-Upper St. Lawrence populations are thought to have originated from a Mississippian glacial refugium, while the other two DUs are thought to have originated from a Missouriian glacial refugium. Although originating from a common glacial refugium, the Saskatchewan-Nelson River populations is considered separately from the Southern Hudson Bay-James Bay populations due to the major barriers to dispersal between the watersheds that define the eco-geographic regions (COSEWIC 2017) that they occupy.

1.1.3. Native status

The Lake Sturgeon is a native fish species to Ontario. It is a culturally important fish species to First Nations and was one of the first commercial fisheries in Ontario (Scott and Crossman 1973, Kerr *et al.* 2010). All three DUs are naturally occurring in Ontario.

1.1.4. Occurrence

Yes, all three DUs of the Lake Sturgeon are extant in Ontario.

1.2. Eligibility results

All three DUs of Lake Sturgeon (*Acipenser fulvescens*) are eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

Saskatchewan-Nelson River populations

- GRANK: G3G4TNR (NatureServe 2017, as Population 1)
- NRANK Canada: N2
- COSEWIC: Endangered (April 2017)
- SARA: No schedule, no status.
- ESA 2007: Threatened (September 2009).
- SRANK: S2 (ranked in 2009)

Southern Hudson Bay-James Bay populations

- GRANK: G3G4TNR (NatureServe 2017, as Population 2)
- NRANK Canada: N3
- COSEWIC: Special Concern (April 2017)
- SARA: No schedule, no status.
- ESA 2007: Special Concern (September 2009).
- SRANK: S3 (ranked in 2009)

Great Lakes-Upper St. Lawrence populations

- GRANK: G3G4TNR (NatureServe 2017, as Population 3)
- NRANK Canada: N3
- COSEWIC: Threatened (April 2017)
- SARA: No schedule, no status.
- ESA 2007: Threatened (September 2009).
- SRANK: S2 (ranked in 2009)

2.2. Distribution in Ontario

Saskatchewan-Nelson River populations

This DU is found in northwestern Ontario in the Lake of the Woods-Rainy River, Winnipeg-English Rivers, and Lake Winnipeg watersheds (Figure 1). The Lake of the Woods population is the largest population.

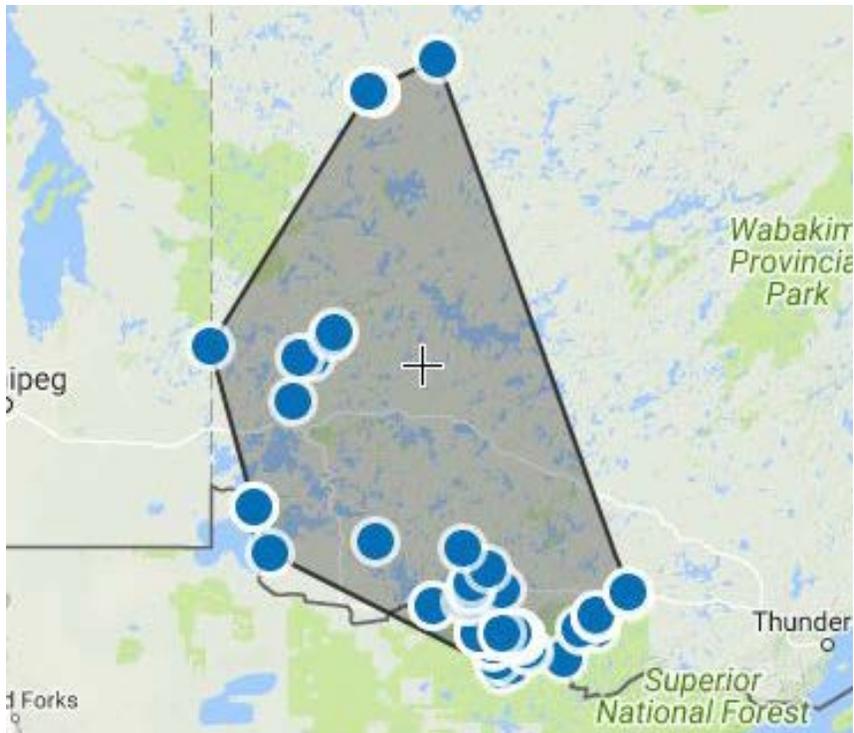


Figure 1. Saskatchewan – Nelson River Lake Sturgeon populations in Ontario based on georeferenced observations provided by the Natural Heritage Information Centre. Created for this report using [GeoCAT](#) [website accessed November, 2017].

Southern Hudson Bay-James Bay populations

This DU is found in northern Ontario in various watersheds that belong to the Hudson Bay and James Bay watersheds (Figure 2). The full extent of occurrence of Lake Sturgeon throughout these waterways is largely unknown.



Figure 2. Hudson Bay – James Bay Lake Sturgeon populations in Ontario based on georeferenced observations provided by the Natural Heritage Information Centre. Created for this report using [GeoCAT](#) [website accessed November, 2017].

Great Lakes-Upper St Lawrence populations

This DU is found in the Great Lakes Basin in Ontario from Lake Superior to the St Lawrence (Figure 3). The largest population occurs in Lake St. Clair.

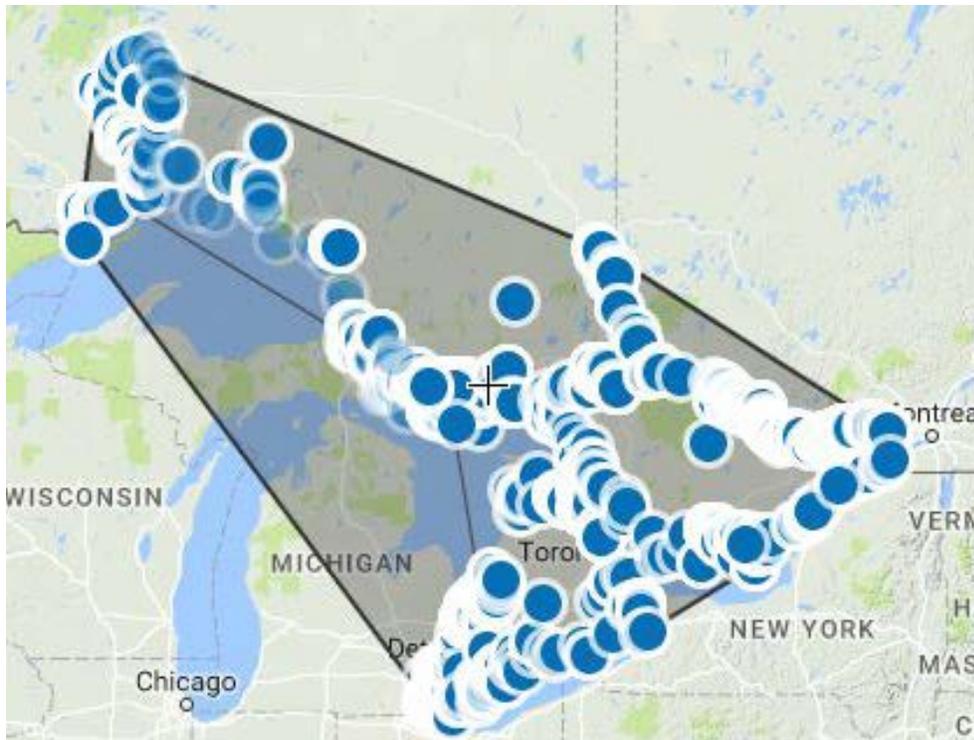


Figure 3. Great Lakes – St. Lawrence Basin Lake Sturgeon populations in Ontario, based on georeferenced observations provided by the Natural Heritage Information Centre. Created for this report using [GeoCAT](#) [website accessed November, 2017].

2.3. Distribution and status outside Ontario

Saskatchewan-Nelson River populations

This DU also occurs in Alberta (SU), Saskatchewan (S2), Manitoba (S2/S3), North Dakota (SX) and Minnesota (S3).

Southern Hudson Bay-James Bay populations

This DU also occurs in Manitoba (S2/S3) and Quebec (S3). The populations of the watersheds in both these provinces is poorly known but three river watersheds in Manitoba are each thought to have more than 500 mature individuals.

Great Lakes-Upper St. Lawrence populations

COSEWIC (2017) limit the range of this DU to Ontario and Quebec and does not include the American portion of the Great Lakes basin. Occurrences (at least in part) in Ohio (S?), Michigan (S2), Pennsylvania (S1) and New York represent, at least in part, additional occurrences of this DU but DU-specific data and rankings are not available for New York.

2.4. Ontario conservation responsibility

The extent of each DU's distribution into the U.S.A. is unclear and the data provided here represent an estimated proportion of the population.

Saskatchewan-Nelson River populations

Ontario has less than 10% of the global range for this DU, although the Lake of the Woods population is one of the largest populations in Canada. Mosindy and Rusak (1991), Stewig (2005) and Heinrich and Friday (2014) provide support that the Lake of the Woods population is increasing, although Haxton and Friday (2017) suggests that total population and associated increases in the Lake of the Woods may have been overestimated due to issues with mark-recapture sampling protocols (i.e., field collection methods violate too many of the mark-recapture model assumptions, resulting in poor confidence of the model output).

Southern Hudson Bay-James Bay populations

Ontario has ~33% of the global range for this DU, and more than 50% of the populations.

Great Lakes-Upper St. Lawrence populations

Ontario contains >50% of the recorded Canadian populations of Lake Sturgeon, and has ~67% of the Canadian range.

2.5. Direct threats

Saskatchewan-Nelson River populations

Historically, the largest threats to this DU were overharvest by commercial fisheries, water pollution, and hydroelectric development. Modern threats include fishing and harvesting, hydroelectric dams and water management. Hydroelectric dams alter riverine habitat by fragmenting continuous waterways, and also create barriers for migration. Water and flow management can be a negative impact on food availability for juvenile fish (Haxton and Findlay 2009). These modern threats were assessed as 'low' in the COSEWIC threats calculator exercise (COSEWIC 2017).

Southern Hudson Bay-James Bay populations

The major threat to this DU are hydroelectric developments, which may act as barriers to migration of individuals between populations or to viable habitat, and water and flow management. This threat was assessed as 'low' in the COSEWIC threats calculator exercise (COSEWIC 2017).

Great Lakes-Upper St. Lawrence populations

Historically, the largest threat to this DU was over harvesting from commercial fisheries, hydroelectric development of waterways, and water pollution. Modern threats include poaching, dams (altering habitat and creating barriers for migration), pollution and

subsistence harvesting; invasive species also affect some Quebec populations. Lampricide application was considered to be a 'medium-low' threat in the COSEWIC threats calculator exercise, while the remaining modern threats were assessed as 'low' (COSEWIC 2017). Cumulatively, these threats were considered to have an overall threat impact of 'high-medium' for this DU but this was adjusted to 'medium-low' because some threats are overlapping and potentially overquantified.

2.6. Specialized life history or habitat use characteristics

The extreme k-selected life history of the Lake Sturgeon makes it exceptionally vulnerable to any disturbances that affect recruitment or survival of adults. Lake Sturgeon mature at a late age (males 18-20, females 20-24; COSEWIC 2017) and the generation time is estimated between 25-50 years (COSEWIC 2017). Generation time has been shown to be lowered in exploited populations and the natural generation time can vary over latitudinal clines from 35 to 54 years (COSEWIC 2006). Individuals do not spawn every year (males every 2-3 years, females every 3-5 years). The species is extremely long-lived and has high fecundity which provides some resilience. The drastic declines observed in many populations associated with exploitation, pollution and dam construction demonstrate its extreme sensitivity to disturbance, but many populations that persisted at very low levels for many years are now showing signs of modest recovery. Stocking efforts in Canada and the U.S.A. have helped increase populations in both Saskatchewan-Nelson River and Great Lakes – Upper St. Lawrence populations. The major stocking efforts have been made in the U.S.A. and Manitoba but are thought to benefit Ontario populations through migration. The riverine and lacustrine habitats preferred by the Lake Sturgeon are common and widespread throughout this ecozone but are often fragmented by hydroelectric development. Auer (1996) suggested that Lake Sturgeon populations require 250–300 km of barrier free waterways to be able to maintain a viable population, but McDougall *et al.* (2017) suggest that this is an overestimate of required barrier free waterways, suggesting as small as 10 km will sustain viable populations – where habitat is of sufficient quality and meets specific geomorphic and hydrological conditions that supports the spawn-drift-settle life process of Lake Sturgeon.

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

Saskatchewan-Nelson River populations

Meets Endangered A1bcde. This DU was heavily impacted by historical commercial fisheries, along with degradation of habitat quality. Yields from Rainy River were 809,000 kg in 1893 but had declined to nearly non-existent levels by the 1930s (COSEWIC, 2017). Lake of the Woods was known as the “greatest sturgeon pond in the world” in the late 19th century, with an average annual commercial catch of 225,000 kg (Macins 1972, p1, in COSEWIC 2006). By 1915 annual catch had declined to 1000 kg, representing over 99% decline at that time. However, between 1995 and 2006, the

number of sturgeon >1 m in length increased from 15,000 to over 50,000, representing a 3.33-fold increase. These estimates of mature individuals are disputed by Haxton and Friday (2017) who indicate that the population estimates from the mark/recapture studies were overexaggerated, and that the number of mature individuals is closer to 15,000 currently and the increase is only 0.5-fold, having increased from ~10,000 in 1995. However, both interpretations of the data suggest there is an increasing trend in the population. Additionally, all of the waterbodies found in the Saskatchewan-Nelson River DU in Ontario for which information on Lake Sturgeon is available show either a currently stable or increasing population trend (COSEWIC, 2017). It is not known how the recent increases in population compare with stocks prior to the extreme population declines of the last century. Continuous riverine habitat has been fragmented by existing dams (COSEWIC 2017). The IAO did decrease for this DU but this is thought to be sampling effects and not a distinct range reduction. Flow management, such as winter draw-downs of reservoirs, can negatively impact food availability for juveniles (Haxton and Findlay 2009). Habitat quality also decreased in the early 1900's from pollution from pulp and paper mills (historical), along with industrial, agricultural and forestry pollutants, but water quality has increased due to legislative measures to protect Ontario water ways (e.g., Clean Water Act). As such, Criteria A1 is most applicable as the major threats (commercial exploitation and industrial pollution) responsible for the estimated 90% reduction have ceased. Subcriteria b is met, based on historical commercial catch rates. Subcriteria c is met as there was a decrease in the quality of habitat from the development of hydroelectric dams and flow management. Subcriteria d is met as a commercial fishery historically exploited this DU. Subcriteria e is met as there was substantial water pollution. Although the threshold for Endangered has been met (>70% reduction), there is evidence to support increasing abundance in Ontario's populations from natural recovery, stocking efforts by both Indigenous and governmental communities, and the status is downlisted to Threatened.

Southern Hudson Bay-James Bay populations

Not applicable. Insufficient information is available to determine historical population sizes in this DU.

Great Lakes-Upper St. Lawrence populations

Meets Endangered A2bcde. In this DU, Lake Sturgeon is believed to be extirpated from five rivers in Ontario while five lakes along the Ottawa River have small and declining populations. The Lake Huron-Erie Corridor sustains high to very high numbers of adult sturgeon. The Lake Nipissing population is believed to be increasing; however, it remains far below the levels prior to commercial fishing. In 1903, commercial fishing yields were 86,000 kg in Lake Nipissing. They decreased to <10,000 kg in the 1930s and averaged 4,725 kg between 1972 and 1982. The remaining populations in the Ontario portion of this DU have low, very low, or remnant population sizes and either stable or unknown population trajectories. Commercial harvest statistics for the Great Lakes since 1879 are presented below (Figure 4-5), from Baldwin *et al.* (2009). While the threats to this DU are well known and in some cases ceased (closure of the commercial fishery), the threats from the decline in habitat quality due to agricultural and industrial pollution into the Great Lake watershed, invasive species and habitat alteration (subcriteria c) continues (Criteria A2), along with some levels of continued harvest and poaching. This DU was overexploited by the commercially fishery

(subcriteria d) and, combined with historical industrial, agricultural and forestry pollution (subcriteria e), was responsible for a substantial (>90%) decrease over the past 3 generations (135-150 years). This decline is based on catch rates (subcriteria b), an index appropriate for documenting historical Lake Sturgeon numbers.

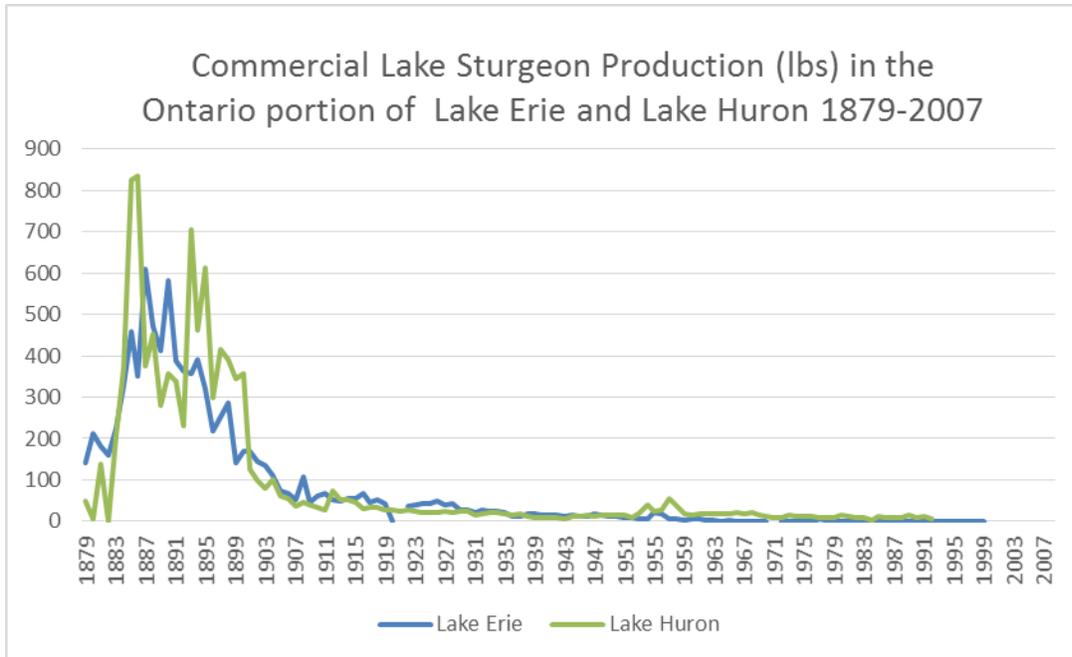


Figure 4. Commercial Lake Sturgeon production in Lake Erie (blue) and Lake Huron (green). Data from Baldwin *et al.* (2009).

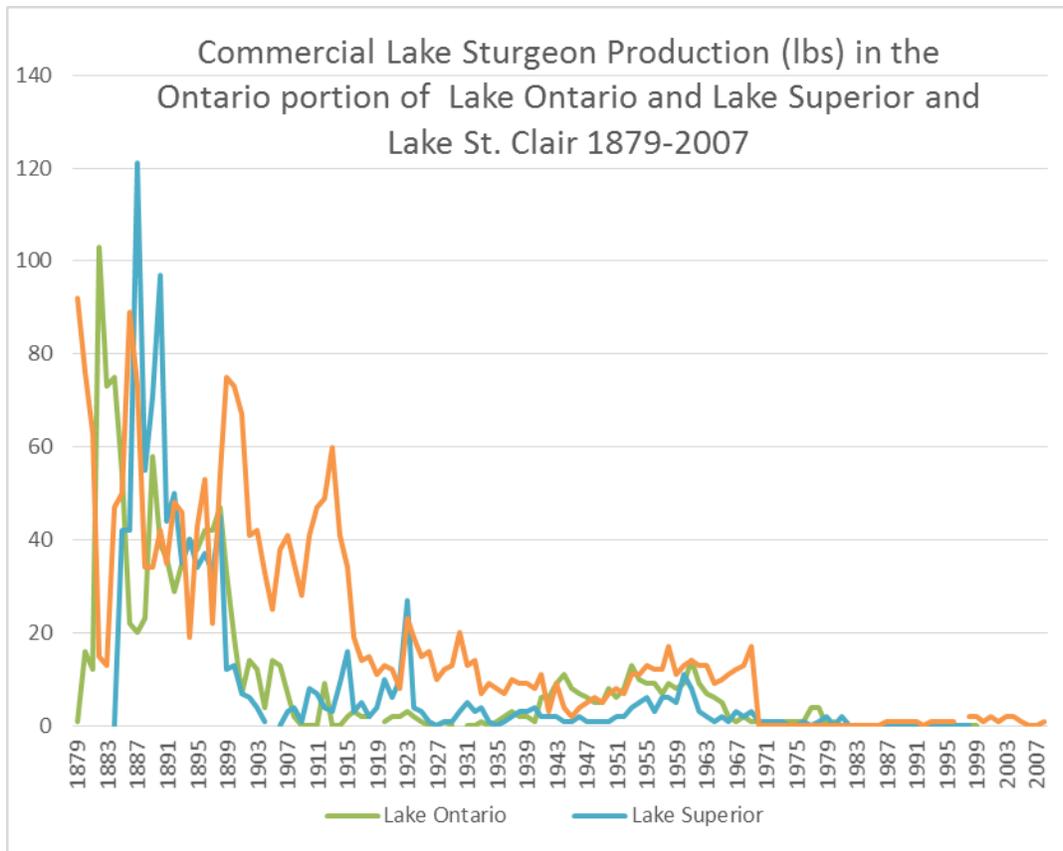


Figure 5. Commercial Lake Sturgeon production in Lake Ontario (green), Lake Superior (blue) and Lake St. Clair (orange). Data from Baldwin *et al.* (2009).

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

Saskatchewan-Nelson River populations

Not Applicable.

Southern Hudson Bay-James Bay populations

Not Applicable. This DU is close to meeting Threatened based on B2a, but it does not meet criteria of b or c. The IAO is most likely greater than reported here as there has not been sufficient effort to sample throughout the expected provincial range. Furthermore, the number of locations is estimated as being more than 8; while the actual number of locations is unknown, the expectation that there are more than 8 locations for this DU further excludes it from consideration under this criteria.

Great Lakes-Upper St. Lawrence populations

Not Applicable. This DU has a large distribution throughout the Great Lakes basin; there has also been a nominal increase in the EOs (COSEWIC 2017).

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

Saskatchewan-Nelson River populations

Not Applicable. Total number of mature individuals exceeds threshold values.

Southern Hudson Bay-James Bay populations

Not Applicable. Total number of mature individuals exceeds threshold values.

Great Lakes-Upper St. Lawrence populations

Not Applicable. Total number of mature individuals exceeds threshold values.

3.1.4. Criterion D – Very small or restricted total population**Saskatchewan-Nelson River populations**

Not applicable. This DU exceeds the requirements and does not meet the criteria set out in D2 for consideration of Threatened in Ontario.

Southern Hudson Bay-James Bay populations

Not applicable. This DU exceeds the requirements and does not meet the criteria set out in D2 for consideration of Threatened in Ontario.

Great Lakes-Upper St. Lawrence populations

Not applicable. This DU exceeds the requirements and does not meet the criteria set out in D2 for consideration of Threatened in Ontario.

3.1.5. Criterion E – Quantitative analysis**Saskatchewan-Nelson River populations**

Does not apply. No population viability analysis has been conducted for this DU.

Southern Hudson Bay-James Bay populations

Does not apply. No population viability analysis has been conducted for this DU.

Great Lakes-Upper St. Lawrence populations

Does not apply. No population viability analysis has been conducted for this DU.

3.2. Application of Special Concern in Ontario**Saskatchewan-Nelson River populations**

Not applicable.

Southern Hudson Bay-James Bay populations

Many waterways that are considered viable habitat for this DU have yet to be surveyed and no population data is available to document number of mature individuals, but there are several factors that support Special Concern. It approaches the thresholds for Criteria B2 but only fulfills one of the subcriteria. There are also possible threats to the health of this DU. Hydroelectric development has caused significant barriers to fish movement in the Mattagami and Abitibi rivers (COSEWIC, 2017), although there has been no hydroelectric development on the Sturgeon, Severn, Winisk, Ekwin nor Attiwapiskat Rivers. There was commercial fishing for this DU but this declined dramatically between the early 1900s and 1980 in the Moose River watershed

(COSEWIC 2017). Due to the susceptibility of this slow reproducing species to habitat disturbance, the historical impact from commercial fishing, the presence of hydroelectric dams, and decline in habitat quality, this population meets consideration for Special Concern.

Great Lakes-Upper St. Lawrence populations

Not applicable.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Saskatchewan-Nelson River populations

Ontario has >70% of the mature individuals for this DU, despite having less than 25% of the global range due to the large population in the Lake of the Woods, but the population estimates for Lake of the Woods may actually be lower than estimated (Haxton and Friday 2017). Ontario has ~7% of the Canadian EOO and ~20% of the Canadian IAO.

Southern Hudson Bay-James Bay populations

For records from 2006 to present, Ontario has ~33% of the Canadian EOO and ~43% of the Canadian IAO.

Great Lakes-Upper St. Lawrence populations

For records from 2006 to present, Ontario has ~67% of the Canadian IAO and ~49% of the Canadian IAO. Although the EOO and IAO is not currently known for this DU in the U.S.A., Ontario has >25% of the Great Lakes basin within its borders, suggesting it has substantial global conservation responsibility for this DU.

3.3.2. Rescue effect

Saskatchewan-Nelson River populations

Possible. Some of Ontario's populations in this DU may be benefitting from stocking efforts in Canada and from the U.S.A. but dams and other barriers along the waterways may limit or negate any possible rescue effect for isolated populations.

Southern Hudson Bay-James Bay populations

Not likely. The majority of this DU occurs in Ontario, making any rescue effect unlikely. The records of Lake Sturgeon in Quebec since 2005 also suggest that the populations are relatively isolated from Ontario due to a number of barriers along the waterways. The populations in Manitoba are also unlikely to provide any rescue effect due to migratory barriers.

Great Lakes-Upper St. Lawrence populations

Stocking efforts in the U.S.A. (e.g. Michigan) may provide some rescue effect but the extent of the benefit from these efforts on Ontario's populations is unclear.

3.4. Other status categories

3.4.1. Data deficient

Saskatchewan-Nelson River populations

Not Applicable.

Southern Hudson Bay-James Bay populations

Not Applicable.

Great Lakes-Upper St. Lawrence populations

Not Applicable.

3.4.2. Extinct or extirpated

Saskatchewan-Nelson River populations

Not Applicable.

Southern Hudson Bay-James Bay populations

Not Applicable.

Great Lakes-Upper St. Lawrence populations

Not Applicable.

3.4.3. Not at risk

Saskatchewan-Nelson River populations

Not Applicable.

Southern Hudson Bay-James Bay populations

Not Applicable.

Great Lakes-Upper St. Lawrence populations

Not Applicable.

4. Summary of Ontario status

Saskatchewan-Nelson River populations

Lake Sturgeon (Saskatchewan-Nelson River populations) (*Acipenser fulvescens*) is classified as Threatened in Ontario based on meeting Criterion A1bcde. There is no change in status of this DU from the 2009 assessment. It meets Endangered threshold for this criteria, but based on increasing population trajectories for this slow reproducing fish it is assessed as Threatened. COSEWIC's (2017) assessment of Endangered was largely influenced by declines in populations outside of Ontario.

Southern Hudson Bay-James Bay populations

The Lake Sturgeon (Southern Hudson Bay-James Bay populations) is classified as Special Concern in Ontario because the DU is likely to become Threatened or Endangered if factors suspected of negatively affecting its occurrence are not monitored and effectively managed. Ontario also has a significant global conservation responsibility for this DU. This assessment is consistent with the previous (2009) assessment.

Great Lakes-Upper St Lawrence populations

The Lake Sturgeon (Great Lakes-Upper St Lawrence populations) is classified as Endangered in Ontario based on meeting Criterion A2bcde. The change of status from Threatened in the 2009 assessment is considered a non-genuine¹ change based on changes in the assessment criteria used by the COSSARO. COSEWIC (2017) assessed this DU as Threatened, noting that it met Endangered thresholds but downlisted it based on the increase of numbers in a few populations, including a population outside of Ontario (lower St. Lawrence River in Quebec downstream of the Beauharnois Dam). These increases were seen in a handful of otherwise healthy populations, while most other populations are in decline and the threats to these other populations remain. Ontario also has a strong conservation responsibility to this DU, supporting the current assessment.

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¹ A change in the classification of a species during reassessment by COSSARO may be for genuine or non-genuine reasons. Genuine reasons may include a reduction in threats to a species such that status of the species has improved, or the continuation of threats to the species such that the status of the species has further deteriorated. Non-genuine reasons may include new information on population size or threats that was not available during a previous assessment, the use of previous COSSARO criteria that may have yielded a different result or, taxonomic revisions that result in changes in range, population sizes or designatable units.

Appendix 1: Technical summary for Ontario

Species: Lake Sturgeon (*Acipenser fulvescens*) – 3 DUs

Saskatchewan-Nelson River populations

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.	~45-50 years
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.	0% decline
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	>90% reduction over previous 3 generations
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.	Observed increase in some populations.
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. Yes b. Yes c. Yes. While barriers remain that continue to fragment populations and future development may further fragment established populations, the major causes of its decline (historic overharvest, decline in water quality) have ceased.
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
<p>Estimated extent of occurrence (EOO).</p> <p>These values were obtained using GeoCAT to analyze the georeferenced NHIC dataset for this DU.</p>	<p>33,548.781 km² (2006 to present) 57,834.585 km² (before 2006) 70,190.823 km² (all NHIC records with associated coordinates)</p>
<p>Index of area of occupancy (IAO).</p> <p>These values were obtained using GeoCAT to analyze the georeferenced NHIC dataset for this DU.</p>	<p>100 km² (2006 to present) 156 km² (before 2006) 248 km² (all NHIC records with associated coordinates)</p>
<p>Is the total population severely fragmented? i.e., is >50% of its total area of occupancy is in habitat patches that are:</p> <p>(a) smaller than would be required to support a viable population, and</p> <p>(b) separated from other habitat patches by a distance larger than the species can be expected to disperse?</p>	<p>a. No b. No (excluding dams)</p>
<p>Number of locations.</p>	<p>As many as 13 locations, based on continuous waterways with no barriers that would inhibit migration</p>
<p>Number of NHIC Element Occurrences</p>	<p>19 (COSSARO 2006 reported 8 previous EOs)</p>
<p>Is there an observed, inferred, or projected continuing decline in extent of occurrence?</p>	<p>No</p>
<p>Is there an observed, inferred, or projected continuing decline in index of area of occupancy?</p>	<p>No</p>
<p>Is there an observed, inferred, or projected continuing decline in number of populations?</p>	<p>No</p>
<p>Is there an observed, inferred, or projected continuing decline in number of locations?</p>	<p>No</p>
<p>Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?</p>	<p>No</p>
<p>Are there extreme fluctuations in number of populations?</p>	<p>No</p>
<p>Are there extreme fluctuations in number of locations?</p>	<p>No</p>
<p>Are there extreme fluctuations in extent of occurrence?</p>	<p>No</p>
<p>Are there extreme fluctuations in index of area of occupancy?</p>	<p>No</p>

Number of mature individuals in each sub-population or total population.

From COSEWIC (2017).

Sub-population (or total population)	Number of mature individuals
English and Wabigoon Rivers	>500
Seine River	>50
Rainy Lake, South Arm	>500
Rainy Lake, Redgut Bay	>50
Namakan Reservoir	>500
Namakan River	~2,730
Sturgeon Lake	~2,050
Lac la Croix	>500
Big and Little Turtle Rivers	>50
Lake of the Woods – Rainy River	~92,000
Winnipeg River, Lake of the Woods to Whitedog	Remnant
Winnipeg River, Whitedog/Caribou to Pointe du Bois (this includes both Manitoba and Ontario portions of the river)	>50
English and Wabigoon Rivers	>500
TOTAL	>99,480

Quantitative analysis (population viability analysis conducted)

No quantitative analysis is currently available. However, COSEWIC (2017) indicates a 10% probability of the Saskatchewan-Nelson River populations (including the populations in Alberta, Saskatchewan, and Manitoba) going extinct within the next 100 years (~2 generations) but does not cite the source of this value.

Threats

A threats calculator was prepared by COSEWIC (2017). Dams and water management use, and fishing and harvesting aquatic resources were the major threats to the Saskatchewan-Nelson River populations.

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Increasing. This is a combination of natural population increase and stocking efforts.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Yes
Would immigrants be adapted to survive in Ontario?	Yes

Rescue effect attribute	Value
Is there sufficient suitable habitat for immigrants in Ontario?	Yes, but access to some waterways limited by dams.
Are conditions deteriorating in Ontario?	No.
Is the species of conservation concern in bordering jurisdictions?	Yes
Is the Ontario population considered to be a sink?	Unlikely.
Is rescue from outside populations likely?	Possible

Sensitive species

Lake Sturgeon is not considered a data sensitive species.

Southern Hudson Bay-James Bay populations

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.	~45-50 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Unknown but unlikely.
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. Yes b. Yes c. No. Future hydroelectric development may threaten established populations.
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO). These values were obtained using GeoCAT to analyze the georeferenced NHIC dataset for this DU.	157,572.182 km ² (2006 to present) 482,218.452 km ² (before 2006) 483,066.271 km ² (all data)
Index of area of occupancy (IAO). These values were obtained using GeoCAT to analyze the georeferenced NHIC dataset for this DU.	272 km ² (2006 to present) 556 km ² (before 2006) 804 km ² (all data)
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, excluding dams.
Number of locations.	At least 8 locations based on continuous waterways with documented populations.
Number of NHIC Element Occurrences	50
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Unknown, but not likely
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Unknown, but not likely
Is there an observed, inferred, or projected continuing decline in number of populations?	Unknown, but not likely
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.
From COSEWIC (2017).

Sub-population (or total population)	Number of mature individuals
Severn River	Unknown

Winisk River	Unknown
Attawapiskat River	>50
Albany/Kenogami River	>50
Mattagami River, Little Long Reservoir	~9,890
Frederick House River	~190
Abitibi River	~990
Moose River	~7,090
TOTAL	>18,260

Quantitative analysis (population viability analysis conducted)

No quantitative analysis is currently available; COSEWIC (2017) indicates a 10% probability of the Saskatchewan-Nelson River populations going extinct within the next 100 years (~2 generations) but does not cite the source of this value.

Threats

The threats calculator prepared by COSEWIC (2017) found dams and water management were a low impact threat.

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Quebec; status of the population is not known
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possible but unlikely due to barriers along major waterways that would limit dispersal.
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?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	No

Sensitive species

Lake Sturgeon is not considered a data sensitive species.

Great Lakes-Upper St. Lawrence populations

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.	45-50 years
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.	0%
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	99% decline over the past 3 generations
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown. COSEWIC (2017) suggests increase over next 3 generations
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. COSEWIC (2017) suggests increase over next 3 generations
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. Yes b. Yes c. No. Barriers and water flow regulation from dams remain that fragment populations within this DU.
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO). These values were obtained using GeoCAT to analyze the georeferenced NHIC dataset for this DU.	568,459.949 km ² (2006 to present) 543,006.921 km ² (before 2006) 575,741.826 km ² (all NHIC records with associated coordinates)
Index of area of occupancy (IAO). These values were obtained using GeoCAT to analyze the georeferenced NHIC dataset for this DU.	1840 km ² (2006 to present) 2312 km ² (before 2006) 3716 km ² (all NHIC records with associated coordinates)
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. Yes and No. While this species is able to disperse some distances, barriers (e.g., dams) limit dispersal to viable habitat.
Number of locations.	~15-18 based on continuous waterways without barriers to migration. COSEWIC (2017) indicates 20 locations but this includes Quebec localities.
Number of NHIC Element Occurrences	122
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.
From COSEWIC (2017).

Sub-population (or total population)	Number of mature individuals
Omabika Bay	Unknown
Namewaminikan River	Unknown
Pigeon River	Unknown
Kaministiquia River	≤200
Black Sturgeon River	≤200
Nipigon River	Remnant
Gravel River	Unknown

Prairie River	Remnant
Pic River	< 500
White River	< 500
Michipicoten River	Remnant
Batchawana River	>50
Chippewa River	Unknown
Goulais River	>50
St. Marys River	>200
Mississagi River, Tunnel Lake	>10
Mississagi River, Red Rock and up	>10
Spanish River	>10
Magnetawan River	>50
Nottawasaga River	>~350
Moon River	Unknown
Moon River, Nairn Centre to High Falls	>10
Lake Nipissing	Unknown
Upper St. Clair River, Southern Lake Huron	~35,480
North Channel St. Clair River	~11,720
St. Claire River, Lake St. Clair	~45,510
Detroit River	~4,070
Lower Niagara River	>50
Trent River	>10
Ottawa River, Lac Dollard des Ormeaux	>50
Ottawa River, Lac Deschenes	~202
Ottawa River, Lac Des Chats	>50
Ottawa River, Lac du Rocher Fendu	>50
Ottawa River, Lac Coulonge – Upper Allumette	>1,000
Ottawa River, Holden Lake/Lac la Cave	>50
Ottawa River, Lake Temiscaming	>50
Ottawa River upstream of Carillon Dam	>50
TOTAL	Unknown but provided numerical estimates suggest ~100,000 mature individuals occur in this DU

Quantitative analysis (population viability analysis conducted)

No analysis available; COSEWIC (2017) reports at least a 10% probability of extinction within 100 years but does not cite the source of this value.

Threats

A threats calculator was prepared by COSEWIC (2017) and noted one medium impact threat and seven low impact threats, with an overall threat impact of Medium to Low. The overall threat impact was reduced to “Medium to Low” due to “overlapping and overquantified” threats. The medium threat was pollution (Industrial effluent). Low range threats included Transportation and Service Corridors (shipping lanes), Biological Resource Use (fishing), Natural System Modifications (dams and water management), and Pollution (Agricultural and Forestry Effluents).

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Michigan (S2); population increasing
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Yes
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?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Yes

Sensitive species

Lake Sturgeon is not considered a data sensitive species.

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for Saskatchewan-Nelson River populations

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S2	Unknown	NatureServe 2017
Quebec	Not Present	Not applicable	Not applicable
Manitoba	SNR	Unknown	NatureServe 2017. COSEWIC (2017) indicates S2S3 but does not provide specific population status.
Michigan	Not Present	Not applicable	Not applicable
Minnesota	S3	Unknown	Listed as Special Concern by MNDNR 2017.
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	S3	Unknown	WIDNR 2017

Information regarding rank and decline for Southern Hudson Bay-James Bay populations

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S3	Unknown. Presumed stable	NatureServe 2017
Quebec	SNR	Unknown. Presumed stable	NatureServe 2017
Manitoba	SNR	Unknown. Presumed stable	NatureServe 2017. COSEWIC (2017) indicates S2S3 but does not provide specific population status.
Michigan	Not Present	Not applicable	Not applicable
Minnesota	Not Present	Not applicable	Not applicable
Nunavut	Not Present	Not applicable	Not applicable
New York	Not Present	Not applicable	Not applicable

Jurisdiction	Subnational rank	Population trend	Sources
Ohio	Not Present	Not applicable	Not applicable
Pennsylvania	Not Present	Not applicable	Not applicable
Wisconsin	Not Present	Not applicable	Not applicable

Information regarding rank and decline for Great Lakes-Upper St Lawrence populations

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S3	Stable or slowly increasing	NatureServe 2017
Quebec	S3	Stable or slowly increasing	CDPNQ (2017); NatureServe (2017)
Manitoba	Not Present	Not applicable	NatureServe 2017
Michigan	S2	Increasing	NatureServe 2017
Minnesota	SNR	Unknown	NatureServe 2017
Nunavut	Not Present	Not applicable	NatureServe 2017
New York	SNR	Unknown	NatureServe 2017; DEC (2017) lists Lake Sturgeon as threatened but does not provide SRank or delimit populations
Ohio	S1?	Unknown	NatureServe 2017; Lake Sturgeon is listed as Endangered on the ODNR (2017) website but no information is provided for this specific population. COSEWIC (2017) indicates it as S1 but does not denote if any other populations are involved.
Pennsylvania	S1	Unknown	PNHP (2017); NatureServe (2017)
Wisconsin	SNR	Unknown	NatureServe 2017

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

EO: element occurrence (as defined by NHIC)

EOO: extent of occurrence
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