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Proceedings of the Zonal Peer Review of the Recovery Potential Assessment – Lake Sturgeon, *Acipenser fulvescens*, Designatable Unit 4 (Great Lakes-Upper St. Lawrence Populations)

Meeting dates: March 19–20, 2019
Location: Gatineau, QC

Chairpersons: Chantelle Sawatzky and Justin Shead
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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A zonal science peer-review meeting was held on March 19–20, 2019 in Gatineau, Québec. The purpose of the meeting was to assess the recovery potential of the Great Lakes-Upper St. Lawrence populations (Designatable Unit [DU] 4) of Lake Sturgeon (*Acipenser fulvescens*), to provide advice that may be used for the listing decision, development of a recovery strategy and action plan, and to support decision making with regards to the issuance of permits and agreements. Participants included DFO Science, Species at Risk, and Policy programs, Ministère des Forêts, de la Faune et des Parcs du Québec, Hydro-Québec, Ontario Ministry of Natural Resources and Forestry, Ontario Power Generation Inc., the Anishinabek/Ontario Fisheries Resource Centre, and environmental consultants.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated Lake Sturgeon in DU4 as Threatened in April 2017. COSEWIC's reason for designation is that Lake Sturgeon is one of the largest, longest-lived, freshwater fish species in Canada and has special significance to Indigenous Peoples. The main reasons for historical declines in most populations, harvesting and dams, are clearly reversible and understood, but have not ceased in all populations. Some populations appear not to have been severely impacted and some populations appear to be recovering but are not yet secure.

This proceedings report summarizes the relevant discussions from the meeting and presents recommended revisions to be made to the associated research documents. The Proceedings, Science Advisory Report, and Research Documents resulting from this science advisory meeting are published on the DFO Canadian Science Advisory Secretariat (CSAS) website.

INTRODUCTION

Fisheries and Oceans Canada (DFO) has been asked to assess the recovery potential of Lake Sturgeon, Aci*penser fulvescens* (Great Lakes-Upper St. Lawrence populations, Designatable Unit [DU] 4). As a result, a peer review meeting was held on March 19–20, 2019 in Gatineau, QC. Participants included DFO Science, Species at Risk, and Policy programs, Ministère des Forêts, de la Faune et des Parcs du Québec, Hydro-Québec, Ontario Ministry of Natural Resources and Forestry, Ontario Power Generation Inc., the Anishinabek/Ontario Fisheries Resource Centre, and environmental consultants (Appendix 1).

The intent of this meeting, as described in the Terms of Reference (Appendix 2), was to provide up to date information, and associated uncertainties, to address the following elements of Lake Sturgeon:

- biology, abundance, distribution, and life history parameters;
- habitat and residence requirements;
- threats and limiting factors to the survival and recovery of this species;
- recovery targets;
- scenarios for mitigation of threats and alternatives to activities; and
- allowable harm assessment.

The meeting generally followed the agenda (Appendix 3). The rapporteurs for this meeting were Joanna James and Karine Robert. One of the meeting chairs provided a brief overview of DFO's Canadian Science Advisory Secretariat (CSAS) Science Advisory Process and the guiding principles for the meeting.

The Proceedings summarizes the relevant meeting discussions and presents the key conclusions reached during the meeting. The advice from the meeting will be summarized in a Science Advisory Report. The Research Documents (Lacho et al. 2021; van der Lee and Koops 2021) that include the technical details supporting the advice will be revised based on the information from this meeting. All reports will be published on the DFO Canadian Science Advisory Secretariat (CSAS) website.

INFORMATION IN SUPPORT OF A RECOVERY POTENTIAL ASSESSMENT OF LAKE STURGEON (DU4)

BIOLOGY, ABUNDANCE, DISTRIBUTION, AND HABITAT REQUIREMENTS

Presenter: Cam Barth

Abstract

The Lake Sturgeon is a large cartilaginous fish found exclusively in North America. In Canada, it is found as far east as the North Saskatchewan River in Alberta, west to the St. Lawrence River estuary, north to the Churchill River, and south to rivers and lakes that border the United States. Like most sturgeon species, Lake Sturgeon populations were affected by historical overharvesting, and habitat loss and alteration. In most areas in its range, Lake Sturgeon populations exist at a fraction of their historical abundance.

The status of the Lake Sturgeon in Canada was assessed by COSEWIC in 2017. Lake Sturgeon populations were divided into four designatable units (DUs) primarily following previously identified Canadian freshwater fish biogeographic zones: Western Hudson Bay (DU1), Saskatchewan-Nelson River (DU2), Southern Hudson Bay-James Bay (DU3), and Great Lakes-Upper St. Lawrence (DU4). The Lake Sturgeon population in DU1 was classified as Endangered because the distribution and abundance of mature individuals had declined significantly. Similarly, Lake Sturgeon in DU2 were classified as Endangered as harvesting and dams have caused historical declines and populations were still not considered secure. Populations in DU3 were classified as Special Concern as populations mainly exist in pristine rivers, although some are impacted by harvesting and dams. Populations in DU4 were classified as Threatened as populations have been impacted by dam construction and historical overharvesting; some populations seem to have not been greatly impacted and others are recovering but not yet secure.

A Recovery Potential Assessment (RPA) is developed by Fisheries and Oceans Canada (DFO) to provide information and scientific advice needed to fulfill requirements of the *Species at Risk Act* (SARA), including informing both scientific and socioeconomic elements of the listing decision and permitting activities that would otherwise violate SARA prohibitions, and the development of recovery strategies. This Research Document describes the current state of knowledge of the biology, ecology, distribution, population trends, habitat requirements and threats to Lake Sturgeon populations in DU1, DU2, and DU4. The information contained in this document may be used to inform the development of recovery documents and for assessing permits, agreements and related conditions, as per sections 73, 74, 75, 77, 78, and 83(4) of the SARA as well as to prepare for the reporting requirements of SARA section 55. The scientific information for the RPA also serves as advice to the DFO Minister regarding the listing of the species under the SARA and is used when analyzing the socio-economic impacts of adding the species to the list as well as during subsequent consultations, where applicable. This assessment updates and consolidates the available scientific data pertaining to the recovery of Lake Sturgeon (DU1, DU2, and DU4) in Alberta, Saskatchewan, Manitoba, Ontario, and Québec. Information pertaining to DU4 will be reviewed at this meeting.

Discussion

Species Biology and Ecology

A participant asked about lowered Lake Sturgeon survival rates at 0°C and whether that was linked to the slowing of water at that temperature. This was confirmed by the presenter.

Historic and Current Distribution and Abundance and Trends

A participant noted that there was a mark-recapture population assessment in 2015 and 2016 on the ‘K’ river (MU1). Preliminary results from this assessment show a steep increase in abundance for this species at that location. The participant will send this information to the research document authors.

It was noted by another participant that Ontario Power Generation operates a hydroelectric facility on this river and there are pulp and paper facilities downstream. Due to the implementation of mitigation measures, ecosystem health has improved over the last few years and this has improved conditions for Lake Sturgeon. Additional information on this work, including an estimate of effective breeders, will be provided to the research document authors. It was noted that the estimate of the number of effective breeders is low, but higher than previously thought.

A participant mentioned that members of a First Nation frequent the Pigeon River to harvest Lake Sturgeon. Lake Sturgeon are caught periodically (in low numbers off of the mouth of the river) but there is no evidence of spawning. The participant questioned whether the abundance should be described as 'low' or 'unknown'. There was some discussion around whether or not the Pigeon River is being used by this species. Some participants felt that the information regarding Lake Sturgeon in this river was presented in a more positive light than what was warranted.

Population Status

MU1: Western Lake Superior

A participant suggested that there could be a 'very low' category to represent population estimates as low as 10 to 40 individuals because populations of this size face different risks. The presenter noted that the abundance classifications provided in the Population Status Matrix were used for the population assessment and a 'very low' category is not included in these.

A participant suggested that there could be improvements in water quality in MU1 as evidenced by an increase in Lake Sturgeon abundance – in 2015/16, 173 adult Lake Sturgeon greater than 1 meter in length were recaptured resulting in a population estimate of 557 adults. In comparison, in 1987 no Lake Sturgeon were found living in the lower basin (although some were found in the river). The presenter acknowledged that the population of MU1 is increasing but it still falls within the 'poor' category.

MU2: Lake Nipigon

A participant suggested changing the wording in the research document to reflect that sampling for sturgeon has caught hundreds of individuals, therefore it can be stated with certainty that Lake Sturgeon are present in this area. Another participant noted, however, that only five individuals were caught in 2015 after 5 to 6 years of sampling. The participant will provide additional information to the presenter. There is also data from an environmental assessment that shows that Lake Sturgeon were present in this area 10 years ago.

MU3: Northern Lake Superior

This MU was assessed as 'poor'. The status of 'extirpated' for the Prairie River population was contested by a participant – there is data from juvenile surveys to suggest that there is a spawning population in this river, although it is possible that the sampled fish could have moved in from elsewhere. It was argued that since five to ten juveniles were caught during surveys that this particular population could not be extirpated. It was also mentioned that surveys were last conducted in the Little Pic River and seven juveniles were detected. This information will be included in the research document since there is reason to believe the Little Pic River could support a viable population.

MU4: Eastern Lake Superior

This MU was assessed as 'good'. The relative abundances of Lake Sturgeon in the Batchawana River and Goulais Bay were disputed. The research document states that the Batchawana River population is 'medium' and 'stable' while the Goulais Bay population was categorized as 'small' and 'stable'. It was suggested that the population in Goulais Bay is considerably higher, with a population estimate of 11,599 individuals. However, these are mostly juveniles which makes it difficult to use this data to estimate adult abundance (perhaps approximately 1,000 adults). This data will be sent to the research document author.

MU5: Lake Huron North Channel

St. Marys River

There was a suggestion to include confidence intervals when giving population estimates.

Garden River

Over the past three years 59 Lake Sturgeon were detected at the mouth of of the Garden River which flows into St. Marys River. The sturgeon are known to overwinter in St. George Lake. More information is needed on how Lake Sturgeon are using the St. Marys River – only two sturgeon were detected in the river and larvae were collected at four locations along the river. A study was mentioned in which individual Lake Sturgeon were sampled at the mouth of the Garden River, so there is evidence that this species is present. It was noted that this population uses the south channel of the St. Marys River below the dam. There is anecdotal evidence that Indigenous people of the area harvest Lake Sturgeon from the Garden River.

Mississagi and Spanish Rivers

There were no comments on this section. However, a participant requested to re-examine the population assessment for MU4. It was asked why this MU was assessed as 'good' and how the population was assessed as 5,000 individuals given that they are mostly classified as juveniles. It was clarified that the population assessment should be based on adult Lake Sturgeon. It was agreed that the population assessment for MU4 should be revisited to ensure that it was determined correctly.

MU6: Lake Nipissing

A participant asked if information from the Aboriginal Funds for Species at Risk project reports was included in the RPA and if Indigenous communities were approached for any relevant information. The participant noted that a number of projects have been funded over the years. The summaries of these reports are available, but there are sensitivities when it comes to sharing any data related to these reports.

MU7: Georgian Bay-Lake Huron

A participant questioned the population assessment of 'medium' for the Nottawasaga River. This assessment was based on the capture of 350 Lake Sturgeon which were sampled during spawning and in the lower part of the river at other times of the year. This data was provided by the Ontario Ministry of Natural Resources and Forestry. There was agreement that this is evidence for a strong population but the participant felt that an assessment of 'medium' is only warranted in situations where more robust information is available. A participant commented about the population assessment rating system used in RPAs and the potential for inconsistencies when assessing a river with 350 sampled fish, for example, as 'medium'. It was felt that one could attain the threshold for 'medium' simply by increasing the sampling effort, and the assessment is therefore not reflective of the actual population. There was a suggestion to report catch-per-unit-effort.

MU8: Lake Huron/Erie Corridor

A participant asked if Lake Sturgeon drift to lentic environments in the lower Niagara River after spawning and if this could lead to recruitment in this area. It was noted that studies from the Winnipeg River show that Lake Sturgeon larvae settle quickly, as evidenced by genetic separation between sections of rapids, therefore it is unlikely that larvae are drifting to the lower Niagara River.

It was noted the population estimates from the United States (US) were not included in this data, although data were obtained from a joint Canada-US mark-recapture survey.

This population was assessed as ‘good, which could mean up to 40,000 individuals. It is not known if the population is at capacity. In this specific case the population was classified as greater than 5,000 individuals.

A participant asked about historical reports of Lake Sturgeon from this area. The presenter was not aware of any historical reports. It was noted that Purdy’s fishery has tagged an average of 200 Lake Sturgeon per year since 2012. The author was not aware of any evidence of Lake Sturgeon spawning in the Grand River.

A participant pointed out that in the RPA document in states that the historical estimate for the Lake St. Clair population is 35,400 individuals. Unless there has been habitat degradation, the population estimate suggests that carrying capacity has not been reached.

A participant noted that there is a very useful Lake Sturgeon website which has comprehensive information in the annual reports. It lists all of the tributaries found in the US and also lists a shoal off of Point Pelee provincial park. Spawning on shoals is identified on this website.

MU9: Lower Niagara River

There were no comments on this MU.

MU10: Eastern Lake Ontario/Upper St. Lawrence River

There were no comments on this MU.

MU11: Ottawa River Watershed

A participant noted that at least 3 or 4 Lake Sturgeon were captured in 2013 in Baie du Chat. The Ontario Ministry of Natural Resources and Forestry has long term data on Lake Sturgeon in this area which could be included in this assessment if it isn’t already.

It was confirmed that multiyear data was used for the population assessment of this MU.

A participant disagreed with the assessment for Lac Coulonge – it should be ‘good’ rather than ‘poor’. If Lake Sturgeon had been targeted when sampling more would have been caught. Lac-des-Ormeaux should be ‘fair’ because numbers are increasing. It was also suggested that Lac Coulonge and Lac-des-Ormeaux be combined as one unit. Another participant suggested combining Lac Coulonge, Holden Lake, and Allumette Lake into one unit because there are no barriers preventing movement of Lake Sturgeon with the exception of Chats Falls. The group studied a map of MU11. Some participants argued that each area separated by a physical barrier should be treated as a separate group. It was agreed that further discussion would be needed.

MU12: Lower St. Lawrence River

A participant pointed out that a population estimate for MU12 is not included in the research document. The population size could be estimated at over 100,000 Lake Sturgeon based on commercial landings over the past 18 years. This information will be shared with the document authors.

It was noted that there is no description of Lac St. Pierre in the document. It was recommended that a physical description be added because this area is considered prime Lake Sturgeon habitat.

A question was asked about the timeframe for the population trajectory used in the analysis. The presenter stated that the population estimates are variable. This same issue was brought forward at a previous Lake Sturgeon RPA meeting. The presenter confirmed that population trajectory estimates were conservative and only based on robust data.

A participant suggested creating an abundance category of 'very high' (i.e., above 5,000 individuals) if it is decided to create a category of 'very low'.

Further separation of MUs was discussed. There is some debate in the academic community about the population genetic structure of Lake Sturgeon in this area. Studies are ongoing and results are not yet available. The Single Nucleotide Polymorphism (SNP) approach to determining genetic differences was noted as an interesting way of delineating MUs. Questions remain about the validity of this approach. Concerns were raised about areas with 'high definition' data and how one might interpret groups in a manageable way considering that the number of groups might be high (e.g., the St. Lawrence River). One suggestion was to separate the St. Lawrence River and Great Lakes populations. There is not expected to be significant genetic differentiation in MU12 given the generation time and lack of genetic differences at the microsatellite level. It was noted that in Québec Lake Sturgeon are known to move between spawning tributaries. It was suggested that Lake St. Francis should be included in the Upper St. Lawrence MU, and the areas separated by the two dams should be included in a separate group. There was general agreement to this suggestion.

A participant offered to provide additional data on Lac St. Francis to the report authors. It was also suggested to contact the Indigenous peoples of the area (Akwasasne) since they do their own studies on Lake Sturgeon in this area. There are also ongoing studies occurring in this watershed in New York state but information on spawning success is lacking. Upstream of the dam the Lake Sturgeon population appears unhealthy but there is a lack of data. This may be a challenge if the decision is made to split this area into two groups.

The participants viewed a map of the MUs along the Ottawa River by Baker (2019 presentation to local Fisheries Management Zone Council). Some of the participants agreed that the Lake Sturgeon population groupings shown on the Baker (2019 presentation) map are correct. A suggestion was put forward to alter the Ottawa River groups as follows: Section 1 – Timiskaming (bounded by hydroelectric dam); Section 2 – Lac la Cave and Holden Lake (both operate as winter reservoirs); Section 3 – Upper Allumette/Lac Coulonge, Lac du Rocher Fendu/Chenaux, and Lac des Chats/Lac Deschenes; and Section 4 – Lac Dollard-des-Ormeaux. Participants then considered using threats to delineate groups in MU11 rather than hydro barriers. It was argued that it would be most consistent to use hydro barriers as the method to delineate groups. A participant proposed choosing between the options based on how recovery for the species will be measured in the future. The group decided on a combination of the two methods for creating groups within MU11, one that incorporates threats and hydro barriers. It was agreed that the upper and lower Coulonge should be combined in one group.

Habitat Requirements and Residence

A participant noted that there is evidence that Lake Sturgeon have spawned in shoals off of Point Pelee, and wondered if river current should be included as a limiting factor as a result. Others in the group were skeptical of this evidence.

It was agreed that the concept of residence does not apply to Lake Sturgeon.

RECOVERY POTENTIAL MODELLING

Presenter: Adam van der Lee

Abstract

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has assessed the Lake Sturgeon (*Acipenser fulvescens*) across four designatable units (DUs) as Endangered in

DUs 1 and 2, Threatened in DU4 and Special Concern in DU3. Here we present population modelling to determine population-based recovery targets, assess allowable harm, and conduct long-term projections of population recovery in support of a recovery potential assessment (RPA) for locations within each DU and an additional location within DUs 2 and 4. Under most circumstances population growth rate was most sensitive to changes to the survival rate of young adults (age 26–62). The exception was populations that have reduced adult survival; which were most sensitive to changes to survival rate of older juveniles (age 13–25). This indicates the significance of understanding current stresses and the age distribution of a population when considering applying harm or determining what recovery actions to take. To achieve demographic sustainability (i.e., a self-sustaining population over the long-term) under conditions with a catastrophe probability of 0.15/generation and a quasi-extinction threshold of 25 adult females at a 1% probability of extinction over 250 years, population sizes ranging from 1,255 to 5,860 adult females were required. The range in estimates related to the rate of somatic growth and mortality experienced by the population. Populations with more rapid somatic growth and greater mortality required larger population sizes to achieve demographic sustainability. This required between 700 and 16,500 ha of lake habitat and between 162 and 3,800 ha of river habitat (inclusive of both sexes and all age classes). Recovery times depended on initial population size and the rate of population growth with a significant range.

Discussion

A question was asked about the difference between DU-4A and DU-4B (see Table 3 in van der Lee and Koops 2019). Both are located in the Upper St. Lawrence River, where one is found at Lake St. Clair and the other next to the Québec border. Data from these two locations was used to calculate the growth curves.

Allowable Harm

Concern was expressed about lampricide used to control Sea Lamprey populations and the risk this could pose to age-0 Lake Sturgeon. The presenter stated that periodic harm was not investigated, however it would likely end up somewhere between transient harm and chronic harm in terms of impacts.

It was noted that Lake Sturgeon don't have successful recruitment every year. This would suggest that harm would be greater than predicted if the population was impacted during a large recruitment event.

A participant asked if transient harm is representative of certain categories of threats. Transient harm is anything that causes a population decrease and specific threats were not considered. An activity that threatens habitat would qualify as chronic harm, whereas transient harm more often arises from a one time event. Transient harm can be density dependent.

Recovery Targets and Minimum Area for Population Viability

A participant offered to provide additional data on age at maturity for Lake Sturgeon in the Ottawa River. This will be incorporated into the model.

A participant asked if estimates of minimum area for population viability were available for spawning grounds. The presenter replied that only the inverse of density multiplied by habitat was calculated, and this is not specific to habitat types. There was an assumption that a certain amount of habitat would be needed to reach a particular population density. For example, 700 hectares of habitat is needed for a population of 200 Lake Sturgeon. This amount of habitat seemed low to some participants.

The presenter reiterated that the calculations of recovery targets are minimum estimates based on observed densities, and that different habitats will have different carrying capacities therefore population density may change based on habitat characteristics. The assumption was made that the habitat has all of the features necessary for the population, and that if the habitat was limiting any part of the Lake Sturgeon life cycle it would still be sufficient for the species to persist.

Recovery Times

There were no comments on this section.

THREATS AND LIMITING FACTORS

Presenter: Cam Barth

A participant noted that many river systems are managed based on built structures, especially in urban areas.

It was noted that in some river systems where Lake Sturgeon have declined the population has to re-establish where other species are now dominant (e.g., catfish). It was noted that there are a couple of studies showing that there is no correlation between the abundance of Round Goby and that of Lake Sturgeon in the St. Lawrence River. Likewise, studies have shown that there is no relationship between catfish and Lake Sturgeon. A participant mentioned a study out of the University of Michigan which showed that Lake Sturgeon were successful at recolonizing an area where they were previously extirpated.

There was discussion of the impact of climate change on rainfall and discharge into rivers. This is relevant because spawning success is tied to spring discharge rates. A participant noted that it has been projected that climate change will cause an increase in rainfall in southern Ontario. Others argued that it is still unclear how climate change will affect rainfall patterns.

A participant commented that while dams are still a threat to this and many other fish species, improvements have been made in how dams are operated in order to reduce threats to wildlife. The point was made that if water is not managed by these facilities it could lead to catastrophic flooding. A suggestion was made to separate the Dams and Water Management threat category into two distinct categories. This suggestion was disputed by others.

It was noted that in certain areas (e.g., Lake Huron tributaries, Muskoka region) water levels are tightly controlled due to pressure from cottage owners. Some rivers receive extra water to benefit Lake Sturgeon, but ultimately hydro companies have to answer to stakeholders.

A participant mentioned that lampricide is an important pollutant in the Great Lakes.

Threat Assessment

The meeting chairs pointed out to participants that the level of impact was either a loss of population (% bins) or a threat that would jeopardize the survival or recovery of the population (DFO 2014). It is a mix of quantitative and qualitative aspects. It was suggested that the focus could be on the latter half of the definition for the purposes of this threats assessment as was agreed to at the DU1 and 2 RPA (Lacho et al. 2021). Participants agreed and a statement to this effect will be added to the research document.

Residential and Commercial Development

Participants requested clarification on the definition of ‘commercial development’. The Salafsky et al. (2008) definition was provided. It is considered a broad category that includes imperviuosness and runoff. This threat is particularly relevant around Lake Ontario. It was

suggested that this is an important threat in the Greater Toronto Area, Detroit River, and upper Niagara River. The presenter noted that this threat does affect Lake Sturgeon but the mechanism behind it is unclear. A participant asked whether the harbour development planned for the St. Lawrence River could be included in this threat category. It was agreed that this should be included in the Work and Other Activities threat category.

Work and Other Activities

The definition of this category, the types of activities it includes, and whether or not to include past activities was discussed. The Salafsky et al. (2008) definition, which specifies that military and recreational activities are not included, was provided. Scientific studies and wharf activity are included in this category. Some participants considered the main threat in this category to be bridge construction due to the impact on water flow in rivers. It was suggested that a map of known activities be developed and added to the research document. A participant suggested expanding the definition of 'work' in the document to specify that it includes scientific research activities.

Transportation and Service Corridors

A participant suggested quantifying the amount of dredging that is occurring in Lake St. Clair and the subsequent amount of Lake Sturgeon habitat that is being altered. It was suggested examining the number of projects that have been permitted under the *Fisheries Act* to answer this question.

Invasive Species

The possibility of major projects (e.g., water diversion projects) being a source of diseases and invasive species that could impact Lake Sturgeon was discussed. Asian Carp and invasive mussels were noted as being of particular relevance in this category. It was also noted that invasive mussels could be a supplemental food source for Lake Sturgeon. Although there are no documented direct effects of invasive species on Lake Sturgeon, invasive species are known to cause ecosystem-level effects which could impact Lake Sturgeon. It was recommended to consult Ontario Ministry of Natural Resources and Forestry data to see if there have been any changes in Lake Sturgeon growth over the past 10 years. Examining growth patterns of older Lake Sturgeon (> age 70) was not considered helpful because growth rates slow as Lake Sturgeon age.

Climate Change

A participant noted that water management has changed due to changes in flooding events (single to bimodal) over the last 30 to 40 years. For example, there is more snow in the St. Lawrence valley which results in increased water flow during the spring.

Harvest

A participant recommended that the potential impacts of catch and release fisheries in Michigan and Québec be mentioned in the document even if it is not possible to quantify them. Indigenous fishers could also be included considering that they may have an impact if harvest occurs on spawning grounds. It was noted that subsistence fishing occurs in Lake Nipigon (MUs 2 and 3 and likely others as well), although the amount is not likely to be significant. There is anecdotal evidence of latent mortality in incidental harvest for Walleye or catfish. There is also concern that spawning Lake Sturgeon could be intentionally targeted or harassed. There is evidence of intentional Lake Sturgeon harvest, however this threat would be considered to have a low impact. It was noted that the St. Lawrence commercial Lake Sturgeon fishery was ranked as a low risk threat due to the strict management measures in place, however, this can be revisited.

Dams

It was reiterated that mitigation measures have been put in place at hydro stations and effectiveness monitoring results are scheduled to be published in five years. A participant asked whether or not current dams in DU4 were being retrofitted. In 2009 there were 34 contracts under the Green Energy Act for small scale greenfield systems, however none of these facilities were built (including new facilities proposed for the Ottawa River area). Some contracts on existing facilities did go ahead (15 sites in the Great Lakes basin). It was noted that on the St. Lawrence River (Lac des Prairies), overflow has been managed for Lake Sturgeon since the 1980s, ensuring that one of the largest spawning grounds for this species has enough water. A participant suggested including Sea Lamprey barriers in this section of the document.

Pollution

A participant suggested adding information to the document on chemical pollution from oil refineries in Lake St. Clair and in the Sarnia area in general. Another participant suggested including pollution inputs from sewage treatment into Burlington Bay in the upper Niagara region. Treatment programs were put in place by municipalities in the 1990s and we have yet to see the benefits. Moreover, water treatment plants are not able to mitigate the impacts of pharmaceutical pollution, and overflow spillage can occur. A comment was made relating to sewage outlets having a potential positive effect on some fish populations, as these areas may be more productive.

Detailed Threats Assessment Tables

A participant asked if the threat categories had changed. The co-chair clarified that in keeping with the Lake Sturgeon COSEWIC report, IUCN threat categories have been used for this RPA. Clarification on the definitions of Level of Impact and Causal Certainty was also requested. This was provided by the co-chair. In some instances only high-level threat categories were assessed rather than assessing each sub-category. It was agreed that threat sub-categories would be added to the threat assessment tables in cases where they were relevant to Lake Sturgeon. A participant asked if threats occurring in the United States (US) portion of the distribution that could impact Lake Sturgeon in Canada were considered. The presenter replied that only Canadian populations have been assessed, but if threats in the US are impacting these populations they can be added to the document. A participant noted that many threats have been ranked as ‘unknown’ in the Threat Extent category, however, according to DFO (2014) ‘unknown’ is not an option. The presenter clarified this was a typographical error which will be corrected. It was noted that the threat assessment is a difficult exercise for Lake Sturgeon due to the large range and the difficulty in applying the guidance in DFO (2014) consistently.

Discussion was had about how we would approach the review of the detailed threat assessment tables. It was decided that, in the interests of time and to ensure a productive discussion, the group would go through one full table for an Ontario MU (MU1) and a Québec MU (MU12). The participants would then review the remaining tables for the MUs in which they have expertise and send their comments to the co-chair after the meeting. In the event of discrepancies, it was agreed a teleconference including the relevant participants would be held to try to reach consensus.

MU 1: Western Lake Superior

Residential and Commercial Development

A participant noted that the Cave River is heavily industrialized, thus at least some of the Lake Sturgeon population is impacted. The presenter suggested the Threat Extent be ranked as

'extensive'. A participant noted that in the absence of mitigation, industrialization has an impact on populations, but when the impacts are mitigated they are not as extensive. The co-chair noted that mitigation measures are addressed in a separate section of the document. A participant suggested changing the Level of Impact from 'unknown' to 'high'. The presenter noted that they are not aware of any science linking the effects of residential and commercial development to impacts on Lake Sturgeon. A clear consensus was not reached on this threat category. It was agreed that participants would give this further consideration and send their comments to the co-chair.

Transportation and Service Corridors

Participants agreed with the assessment of this threat category as presented in the research document.

Invasive and Other Problematic Species and Genes

The presenter suggested ranking the Causal Certainty of this threat as 'low' or 'unknown' with a preference of leaving it as 'unknown' and adding justification to the research document as there is currently no available data on this matter. A participant suggested ranking it as 'very low' because it would be strange to classify uncertainty with uncertainty. It was agreed to change the causal certainty to 'very low'. Participants agreed on the designations as presented in the research document for the remainder of the table columns in this threat category.

Biological Resource Use: Fishing and Harvesting of Aquatic Resources

A participant suggested that this threat be assessed as 'low' Level of Impact and 'high' Causal Certainty as there are empirical data that show there is an impact of harvest on populations. This is one of the only threats for which there is information available for Lake Sturgeon. Participants agreed with this suggestion.

Human Intrusions and Disturbance: Work and Other Activities

The presenter noted that this threat does not apply to Lake Sturgeon in this MU.

Natural System Modifications: Dams and Water Management/Use

A participant suggested that the Level of Impact be ranked as 'low' for this threat under current conditions due to the mitigation measures that have been put in place by industry. Another participant commented that they do not disagree that there are now mitigation measures and the impacts have been reduced. However, they cautioned that the impact would return to historical levels if the mitigations currently in place were removed and this should be captured in the document. The presenter suggested the Level of Impact be ranked as 'high' and that could apply to every MU. A participant agreed with this comment provided data were available to support it for all MUs. The presenter indicated that even if there are no data, the impact of dams on Lake Sturgeon is known and this should be considered. A participant noted that this should be done with caution because all dams may not have important impacts on Lake Sturgeon populations. Participants agreed that Causal Certainty should be ranked as 'high'.

Pollution

The presenter pointed out that there is some evidence of a link between sewage inputs and Lake Sturgeon populations. There was discussion on whether raw sewage spills into rivers was still occurring in this MU. It was acknowledged that it was a recurrent event in the past. Participants agreed that this threat has a 'low' Level of Impact.

MU 12: Lower St. Lawrence River

Residential and Commercial Development

Participants preferred to review the definition of this category and refer to DFO (2014) on their own and provide comments after the meeting.

Transportation and Service Corridors

A participant noted that data are not available on fish populations prior to dredging in this MU, but that dredging has probably had a high impact on the Lake Sturgeon populations. Participants requested additional time to review the information and indicated comments would be provided after the meeting.

Invasive and Other Problematic Species and Genes

A participant commented that the Likelihood of Occurrence is 'known', the Level of Impact is likely 'low', and the Causal Certainty is 'very low'. This would change the overall threat rank to 'low'. Participants agreed with this assessment.

Biological Resource Use: Fishing and Harvesting of Aquatic Resources

Participants agreed with the assessment of this threat category as presented in the research document.

Human Intrusions and Disturbance: Work and Other Activities

Participants agreed with the assessment of this threat category as presented in the research document.

Natural System Modifications: Dams and Water Management/Use

A participant suggested that the Level of Impact of dams in this MU should be lower than 'high' because of current water management practices. The impact was considered 'high' a century ago. Considering that dams have been present in this MU since the 1920s and Lake Sturgeon are still inhabiting the area, the Level of Impact should be changed from 'high' to 'medium'. The presenter indicated that he would revisit this assessment and would contact participants for more information as needed. The co-chair clarified that the definition of dams is broad and includes more than the impacts linked to construction. Another participant noted that because of the hydroelectric development that occurred in this MU in the past, the most productive area of that section of the watershed was lost which had a large impact on fish productivity. Spawning areas have been limited as a result of hydroelectric development and it has been challenging to find a way to mitigate these impacts. It was suggested the Level of Impact should remain as 'high'. A participant expressed concern about the Level of Impact currently ranked as 'high' in MU11 as well and felt the Level of Impact should be 'high' in only one of these MUs.

The co-chair asked about the dam in MU12, the Rivière-des-Prairies facility. The water management has changed over time and it is managed very differently than it was 50 years ago. A participant noted that according to the definition, dams will always prevent the passage of fish. This is not always the case.

Participants agreed that the Level of Impact should be changed to 'medium'.

Natural System Modifications: Other Ecosystem Modifications

Participants agreed with the assessment of this threat category as presented in the research document.

Pollution

Discussion was had concerning the definition of this threat category and the Salafsky et al. (2008) definition was reviewed. Participants agreed to a Likelihood of Occurrence of 'known' and a Level of Impact of 'high'.

CURRENT AND CANDIDATE MITIGATION MEASURES

Presenters: Cam Barth and Chantelle Sawatzky

Projects and activities that have occurred in Lake Sturgeon habitat between 2013–2018 were linked to mitigation measures outlined in Coker et al. (2010) and this information was presented.

Participants discussed additional mitigation measures for the threat categories: Invasive and Other Problematic Species and Genes, and Biological Resource Use: Fishing and Harvesting of Aquatic Resources as these are not linked to projects that would be authorized by DFO and are therefore not included Coker et al. (2010). The co-chair suggested including the range of mitigation measures that are practiced in different jurisdictions given the large range of Lake Sturgeon. The co-chair mentioned a few of the harvest mitigation measures that were brought up at a previous Lake Sturgeon RPA meeting, including sturgeon management boards. A participant noted that Lake Sturgeon are sensitive to harvest, particularly the younger age classes. According to modeling results, Lake Sturgeon cannot handle a harvest level higher than 4–5%. A participant noted that the issue with this is that it cannot be converted to the number of fish. A participant asked if these modeling results were consistent with other sturgeon species. A model exists for White Sturgeon and this will be checked. A participant asked what the exploitation rate of Lake Sturgeon was in Québec. This is unknown because the current population is unknown. It is known that the population appears to be stable (constant over the past 15 years as the fish landings have been stable) and there are no indications that the population is increasing. Suggestions for additional harvest mitigation measures included quotas, tags, law enforcement in the field, size restrictions, and harvest based on flesh rather than caviar. It was noted that poaching is difficult to account for as data is not available. Information on these measures as currently practiced by provincial authorities will be sent to the report author.

EXISTING PROTECTION

There were no comments on the Existing Protection section.

SOURCES OF UNCERTAINTY

Presenter: Cam Barth

A participant asked for additional information on the uncertainty that age estimates were derived from older individuals. The presenter indicated that a study found that age estimates from older Lake Sturgeon were less accurate. Caution is needed when estimating the age of older fish. This will be clarified in the document.

The co-chair reviewed the Terms of Reference and explained that revisions would be made to the research documents based on information received at the meeting and comments sent after the meeting relating to the threats assessment. If necessary, a teleconference will be held to address any discrepancies. The revised research documents, the proceedings of the meeting, and the Science Advisory Report will then be sent to all participants for final review before publication.

The co-chairs thanked everyone for their participation.

REFERENCES CITED

Coker, G.A., Ming, D.L., and Mandrak, N.E. 2010. Mitigation guide for the protection of fishes and fish habitat to accompany the Species at Risk recovery potential assessments conducted by Fisheries and Oceans Canada (DFO) in Central and Arctic Region. Version 1.0. Can. Manuscr. Rep. Fish. Aquat. Sci. 2904: vi + 40 p.

DFO. 2014. Guidance on assessing threats, ecological risk and ecological impacts for species at risk. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2014/013. (*Erratum: June 2016*).

Lacho, C.D., Burnett, D.C., Hrenchuk, C.L. Nelson, P.A., Parker, C.M., and Barth, C.C. 2021. Information in support of a recovery potential assessment of Lake Sturgeon, *Acipenser fulvescens* (Western Hudson Bay, Saskatchewan-Nelson River, and Great Lakes-Upper St. Lawrence populations). Can. Sci. Advis. Sec. Res. Doc. 2021/033. vi + 116 p.

Salafsky, N., Salzer, D., Stattersfield, A.J., Hilton-Taylor, C., Neugarten, R., Butchart, S.H.M., Collen, B., Cox, N., Master, L.L., O'Connor, S., and Wilkie, D. 2008. A standard lexicon for biodiversity conservation: Unified classifications of threats and actions. Cons. Biol. 22: 897–911.

van der Lee, A.S., and Koops, M. 2021. Recovery potential modelling of Lake Sturgeon (*Acipenser fulvescens*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2021/025. iv + 48 p.

APPENDIX 1: MEETING PARTICIPANTS

Name	Organization/Affiliation
Justin Shead (Co-chair)	DFO, CSAS
Chantelle Sawatzky (Co-chair)	DFO, Science
Charley Cyr	DFO, CSAS Regional Coordinator
Tom Pratt	DFO, Science
Marten Koops	DFO, Science
Adam van der Lee	DFO, Science
Shelly Dunn	DFO, SARA
Marie-Pierre Veilleux	DFO, SARA
Hans-Frederic Ellefsen	DFO, Science
Josh Stacey	DFO, SARA
Karine Robert	DFO, NCR
Joanna James	DFO, NCR
Colin Gyles	DFO, Policy
Sing-Yee Low	DFO, Policy
Lexi Sumner	Anishinabek/Ontario Fisheries Resource Centre
Cam Barth	North/South Consultants
Tim Haxton	Ontario Ministry of Natural Resources & Forestry
Dan Gibson	Ontario Power Generation Inc.
David Stanley	Ontario Power Generation Inc.
Jean Caumartin	Hydro-Québec
Isabelle Gauthier	Ministère des Forêts, de la Faune et des Parcs du Québec
Daniel Hatin	Ministère des Forêts, de la Faune et des Parcs du Québec
Simon Bernatchez	Ministère des Forêts, de la Faune et des Parcs du Québec
Yves Paradis	Ministère des Forêts, de la Faune et des Parcs du Québec

APPENDIX 2: TERMS OF REFERENCE

Recovery Potential Assessment – Lake Sturgeon, *Acipenser fulvescens*, Designatable Unit 4 (Great Lakes-Upper St. Lawrence Populations)

Zonal Peer Review Meeting – Central and Arctic Region and Québec Region

March 19-20, 2019
Gatineau, QC

Co-Chairs: Chantelle Sawatzky and Justin Shead

Context

After the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses an aquatic species as Threatened, Endangered or Extirpated, Fisheries and Oceans Canada (DFO) undertakes a number of actions required to support implementation of the *Species at Risk Act* (SARA). Many of these actions require scientific information on the current status of the wildlife species, threats to its survival and recovery, and the feasibility of recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

COSEWIC met in April 2017 and recommended that Lake Sturgeon in designatable unit (DU) 4 (Great Lakes-Upper St. Lawrence populations) be designated Threatened. Lake Sturgeon was previously assessed by COSEWIC in 2006 and prior to that in 1986. The species was divided into eight DUs for the 2006 assessment; five were designated Endangered, one Threatened, and two Special Concern. A Recovery Potential Assessment was undertaken in 2008 for the six DUs designated Endangered and Threatened in the 2006 COSEWIC assessment. The number of DUs has been reduced to four in the 2017 assessment based on the national freshwater biogeographic zones used by COSEWIC and supplemental genetic information. None of the DUs are currently listed under the SARA.

In support of listing recommendations for Lake Sturgeon by the Minister, DFO Science has been asked to undertake an RPA, based on the national RPA Guidance. The advice in the RPA may be used to inform both scientific and socio-economic aspects of the listing decision, development of a recovery strategy and action plan, and to support decision making with regards to the issuance of permits or agreements, and the formulation of exemptions and related conditions, as per sections 73, 74, 75, 77, 78 and 83(4) of SARA. The advice in the RPA may also be used to prepare for the reporting requirements of SARA s.55. The advice generated via this process will update and/or consolidate any existing advice regarding Lake Sturgeon.

Objective

- To provide up-to-date information, and associated uncertainties, to address the following elements relevant to Lake Sturgeon in DU4:

Biology, Abundance, Distribution and Life History Parameters

Element 1: Summarize the biology of Lake Sturgeon.

Element 2: Evaluate the recent species trajectory for abundance, distribution and number of populations.

Element 3: Estimate the current or recent life-history parameters for Lake Sturgeon.

Habitat and Residence Requirements

Element 4: Describe the habitat properties that Lake Sturgeon needs for successful completion of all life-history stages. Describe the function(s), feature(s), and attribute(s) of the habitat, and quantify by how much the biological function(s) that specific habitat feature(s) provides varies with the state or amount of habitat, including carrying capacity limits, if any.

Element 5: Provide information on the spatial extent of the areas in Lake Sturgeon's distribution that are likely to have these habitat properties.

Element 6: Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.

Element 7: Evaluate to what extent the concept of residence applies to the species, and if so, describe the species' residence.

Threats and Limiting Factors to the Survival and Recovery of Lake Sturgeon

Element 8: Assess and prioritize the threats to the survival and recovery of the Lake Sturgeon.

Element 9: Identify the activities most likely to threaten (i.e., damage or destroy) the habitat properties identified in elements 4-5 and provide information on the extent and consequences of these activities.

Element 10: Assess any natural factors that will limit the survival and recovery of the Lake Sturgeon.

Element 11: Discuss the potential ecological impacts of the threats identified in element 8 to the target species and other co-occurring species. List the possible benefits and disadvantages to the target species and other co-occurring species that may occur if the threats are abated. Identify existing monitoring efforts for the target species and other co-occurring species associated with each of the threats, and identify any knowledge gaps.

Recovery Targets

Element 12: Propose candidate abundance and distribution target(s) for recovery.

Element 13: Project expected population trajectories over a scientifically reasonable time frame (minimum of 10 years), and trajectories over time to the potential recovery target(s), given current Lake Sturgeon population dynamics parameters.

Element 14: Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present and when the species reaches the potential recovery target(s) identified in element 12.

Element 15: Assess the probability that the potential recovery target(s) can be achieved under current rates of population dynamics parameters, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.

Scenarios for Mitigation of Threats and Alternatives to Activities

Element 16: Develop an inventory of feasible mitigation measures and reasonable alternatives to the activities that are threats to the species and its habitat (as identified in elements 8 and 10).

Element 17: Develop an inventory of activities that could increase the productivity or survivorship parameters (as identified in elements 3 and 15).

Element 18: If current habitat supply may be insufficient to achieve recovery targets (see element 14), provide advice on the feasibility of restoring the habitat to higher values. Advice must be provided in the context of all available options for achieving abundance and distribution targets.

Element 19: Estimate the reduction in mortality rate expected by each of the mitigation measures or alternatives in element 16 and the increase in productivity or survivorship associated with each measure in element 17.

Element 20: Project expected population trajectory (and uncertainties) over a scientifically reasonable time frame and to the time of reaching recovery targets, given mortality rates and productivities associated with the specific measures identified for exploration in element 19. Include those that provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.

Element 21: Recommend parameter values for population productivity and starting mortality rates and, where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts in support of the listing process.

Allowable Harm Assessment

Element 22: Evaluate maximum human-induced mortality and habitat destruction that the species can sustain without jeopardizing its survival or recovery.

Expected Publications

- CSAS Science Advisory Report
- CSAS Proceedings
- CSAS Research Documents

Participants

- Fisheries and Oceans Canada (Ecosystems and Oceans Science, Aquatic Ecosystems, and Strategic Policy sectors)
- Ontario Ministry of Natural Resources; Ministère des Forêts, de la Faune et des Parcs du Québec; US Fish and Wildlife Service; Wisconsin Fish, Wildlife and Parks
- Academia
- Indigenous communities/organizations
- Industry (Hydro Quebec, Ontario Power Generation)
- Other invited experts (environmental non-government organizations, consultants)

References

COSEWIC. 2017. COSEWIC assessment and status report on the Lake Sturgeon (*Acipenser fulvescens*), Western Hudson Bay populations, Saskatchewan-Nelson River populations, Southern Hudson Bay-James Bay populations, Great Lakes-Upper St. Lawrence populations in Canada, 2017. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

APPENDIX 3: AGENDA

Day 1		**Presenter**
9:00	Welcome and Introductions	Chantelle Sawatzky
9:10	Purpose of Meeting	Justin Shead
9:20	Species Biology and Ecology	Cam Barth
9:45	Historic and Current Distribution and Abundance and trends	Cam Barth
10:30	*Health Break*	-
10:45	Population Status	Cam Barth
12:00	*Lunch (on your own)*	-
1:15	Habitat Requirements and Residence	Cam Barth
1:45	Habitat Functions, Features and Attributes	Cam Barth
2:30	*Health Break*	-
2:45	Recovery Potential Modelling	Adam van der Lee
4:30	End of Day 1	-

Day 2		**Presenter**
9:00	Re-cap of Day 1	Justin/Chantelle
9:10	Threats to Survival and Recovery	Cam Barth
10:15	*Health Break*	-
10:30	Threats to Survival and Recovery	Cam Barth
12:00	*Lunch (on your own)*	-
1:15	Current and Candidate Mitigation Measures	Cam Barth
1:25	Sources of Uncertainty	Cam Barth
2:00	Summary Bullets for Science Advisory Report	Justin/Chantelle
2:30	*Health Break*	-
2:45	Review Terms of Reference and Wrap-up	Justin/Chantelle
3:00	End of meeting	-